



JUN 01 2017

Dominion Diamond Ekati Corporation
c/o Ms. Claudine Lee, Head of Environment and Communities
@ Claudine.lee@ddcorp.ca

Dear Ms. Lee:

Dominion Diamond Ekati Corporation (DDEC) - Approval of Wildlife Effects Monitoring Plan (WEMP), including Caribou Road Mitigation Plan (CRMP)

Thank you for Dominion Diamond Ekati Corporation's (DDEC) submission on March 13, 2017 of the Ekati Wildlife Effects Monitoring Plan (WEMP), including a Caribou Road Mitigation Plan (CRMP). These plans were submitted for approval as directed by Measure 6-1 of the *Report of Environmental Assessment and Reasons for Decision* for the Jay Project (Report of EA) and the subsequent Ministerial decision to adopt the recommendation that the Jay Project be approved. As stipulated in Measure 6-1 and in accordance with sub-section 130(5) of the *Mackenzie Valley Resource Management Act*, the Government of the Northwest Territories (GNWT) provided an opportunity for public review of the December 2016 version of DDEC's WEMP. The GNWT, through the Department of Environment and Natural Resources (ENR) has reviewed the updated WEMP and CRMP, the comments received during public review, and DDEC's response to those comments.

I am pleased to notify you that I have approved the March 2017 WEMP and CRMP (attached) with conditions outlined in the attached Reasons for Decision. I have determined that the WEMP and CRMP satisfactorily address the content requirements for a Wildlife Management and Monitoring Plan (WMMP) identified in subsection 95(2) of the *Wildlife Act* and the requirements of Measure 6-1 from the Report of EA once the conditions outlined in the attached Reasons for Decision are met. Moving forward, these plans should be adaptively modified if monitoring results indicate opportunities to further reduce impacts to wildlife and wildlife habitat.

.../2

Please contact Ms. Andrea Patenaude, Wildlife Biologist, at (867) 767-9237, ext. 53228 or andrea_patenaude@gov.nt.ca if you have any questions.

Sincerely,



Dr. Joe Dragon
Deputy Minister
Environment and Natural Resources

Attachments

- c. Ms. Jaida Ohokannoak, Chairperson
Independent Environmental Monitoring Agency

- Ms. April Hayward, Superintendent – Environment
Dominion Diamond Ekati Corporation

- Ms. JoAnne Deneron, Chairperson
Mackenzie Valley Environmental Impact Review Board

- Mr. Mark Cliffe-Phillips, Executive Director
Mackenzie Valley Environmental Impact Review Board

- Dr. Brett Elkin, Director, Wildlife Division
Environment and Natural Resources

- Mr. Joel Holder, Director, Conservation, Assessment and Monitoring Division
Environment and Natural Resources

- Ms. Lorraine Seale, Director, Securities and Project Assessment
Lands

Reasons For Decision

Approval of the Ekati Wildlife Effects Monitoring Plan (WEMP), including the Caribou Road Mitigation Plan (CRMP) for the Jay Project

Requirement for a Wildlife Management and Monitoring Plan

Under subsection 95(1) of the *Wildlife Act*, a developer may be required to prepare a Wildlife Management and Monitoring Plan (WMMP) for approval by the Minister of Environment and Natural Resources (ENR), and to adhere to the approved plan if the Minister is satisfied that the proposed development is likely to: result in a significant disturbance to big game; substantially alter, damage or destroy habitat; pose a threat of serious harm to wildlife or habitat; or significantly contribute to cumulative impacts on a large number of big game or on habitat. While the requirement for a WMMP is independent of the environmental assessment (EA) process, ENR considers comments made during public review processes such as an EA when determining the need for, and the appropriate content of, a WMMP. In the Technical Sessions for the Jay Project EA in April 2015, ENR advised Dominion Diamond Ekati Corporation (DDEC) to update its Wildlife Effects Monitoring Plan (WEMP) so it could be considered as DDEC's plan for fulfilling the requirements for a WMMP for the Jay Project under the *Wildlife Act*.

The *Report of Environmental Assessment and Reasons for Decision* for the Jay Project (Report of EA) released by the Mackenzie Valley Environmental Impact Review Board (Review Board) on February 1, 2016 included, among others, Measure 6-1 which requires that DDEC develop and submit a Caribou Road Mitigation Plan (CRMP) to ENR for approval prior to construction of the Jay road and that it be appended to the WEMP. The Measure further states that as part of the approval process, the Government of the Northwest Territories (GNWT) should provide the opportunity for public comment. For reference, the full text of Measure 6-1 can be found in Appendix 1.

Opportunity for Public Review

There have been several opportunities for parties to review and provide comment on DDEC's WEMP and CRMP both during and after the EA. During the EA DDEC hosted a workshop on the CRMP in May 2015 and a workshop on the CRMP and WEMP in June 2015 to solicit feedback from interested parties on WEMP drafts. Post EA, DDEC circulated a draft WEMP with the appended CRMP in May 2016 and held a workshop on the WEMP and CRMP in September 2016.

The May 2016 draft and the September 2016 workshop invitation were sent by DDEC to:

- Kitikmeot Inuit Association,
- Deninu Kue First Nation (DKFN),

Attachment 1

- Fort Resolution Métis Council (FRMC),
- North Slave Métis Alliance (NSMA),
- Yellowknives Dene First Nation,
- Łutsel K'e Dene First Nation (LKDFN),
- Tłıcho Government,
- Hamlet of Kugluktuk,
- Independent Environmental Monitoring Agency (IEMA),
- Environment and Climate Change Canada,
- Wek'èezhìi Land and Water Board, and,
- ENR.

The GNWT posted the December 2016 version of the WEMP with the appended CRMP on ENR's website and notified parties to the EA via email that ENR was soliciting comments on the plan from December 16, 2016 to January 13, 2017. ENR, IEMA, LKDFN, DCFN, and FRMC provided comments on the WEMP and CRMP during the December 2016 public review. Based on the results of the public review, ENR advised DDEC in January 2017 to conduct further revisions. Appendix B of the WEMP and Attachment I of the CRMP submitted to ENR for approval in March 2017 contain DDEC's response to comments submitted to ENR during the public review, as well as DDEC's response to comments submitted to DDEC prior to the public review.

ENR's Review

ENR staff have been actively involved in all opportunities to review the document as it evolved, not only to provide advice on aspects of the WEMP but also to take the views of other parties into consideration when determining the extent to which the WEMP meets the legislated requirements of section 95 of the *Wildlife Act*.

The WEMP and CRMP for the Jay Project together represent the first WMMP to be approved under section 95 of the *Wildlife Act* which was enacted in November 2014. ENR is in the process of developing regulations and guidelines on WMMPs, including appropriate content and procedures for WMMP. Therefore, as processes and procedures related to WMMPs in general continue to be developed, it is important to note that approaches ENR has taken in relation to revising and approving the WMMP for the Jay Project, including providing the opportunity for public review, may be different in future WMMP approvals.

ENR has reviewed the WEMP and CRMP from several perspectives. For the purpose of approval of the WEMP, ENR has primarily focused on the content of the WEMP and CRMP as they relate to the requirements of the *Wildlife Act*. Section 95(2) of the *Wildlife Act* requires that a WMMP include:

- (a) a description of potential disturbance to big game and other wildlife included in the regulations, potential harm to wildlife and potential impacts on habitat;

Attachment 1

- (b) a description of measures to be implemented for the mitigation of potential impacts;
- (c) the process for monitoring impacts and assessing whether mitigative measures are effective; and
- (d) other requirements that are outlined in the regulations.

In addition to legislated requirements, ENR also looked to the requirements outlined in Measure 6-1 (Appendix 1) of the Report of EA. These requirements address the contents of the CRMP, a plan specifically designed to reduce impacts of roads and traffic on caribou and to ease their passage through the Jay Project area.

Finally, ENR has evaluated the WEMP and CRMP from a scientific perspective and has provided comments and advice to improve the technical merit and effectiveness of the approaches to mitigation and monitoring taken in the WMMP.

Conditions

ENR is generally satisfied that the main text and attachments of the March 2017 WEMP contains the necessary content outlined in subsection 95(2) of the *Wildlife Act* and Measure 6-1 of the Report of EA. However, ENR notes some elements are still missing and DDEC did not adequately address all of the concerns raised by reviewers (Appendix B of the WEMP and Attachment I of the CRMP). In order to address these deficiencies, ENR's approval of the WEMP and CRMP is conditional on DDEC providing the additional information as set out below.

1. SOP for Site Surveillance

ENR notes that the WEMP does not include a SOP for site surveillance monitoring, which is a basic level of monitoring required to identify wildlife onsite, prevent human-wildlife conflicts, prevent injury to wildlife, and ensure mitigations are effective. Paragraph 95(2)(c) of the *Wildlife Act* requires that a WMMP identify processes for monitoring impacts and assessing whether mitigative measures are effective. Further, DKFN highlighted this omission and recommended that a SOP that outlines the specific methods and data sheets for this type of routine systematic monitoring be included in the WMMP.

Condition: *DDEC will provide ENR with a SOP, including datasheets, for site surveillance monitoring for wildlife within one month of approval of the WMMP.*

2. SOP for Raptor Nesting Deterrence Procedures

ENR appreciates the inclusion of DDEC's SOP for Active Pit Monitoring to identify whether and where raptors are nesting in active mining pits. This is an important first step in compliance with sections 51 and 52 of the *Wildlife Act*; however, given the operational implications of an active raptor nest for mining activity, DDEC has an interest in deterring birds interested in nesting in the pit wall. Given the fine line

between disturbance and deterrence, ENR requires further details on the steps and procedures DDEC uses to deter birds from nesting in the pits.

Condition: *DDEC will provide ENR with a SOP for deterring raptors from initiating nesting in mining pit walls prior to construction of pit walls within one month of approval of the WMMP.*

3. SOP for Surface Mining: Blasting, Guarding and Initiating

ENR recognizes that the physical safety of personnel and caribou are the key objectives behind this SOP; however, sensory disturbance to caribou is an impact identified in the WEMP and was a topic of considerable discussion during the Jay Project EA. ENR does not believe that 750m as a blast exclusion zone for caribou in a tundra environment is sufficient. ENR acknowledges that DDEC's choice of exclusion zone exceeds the 500 m recommendation in the Northern Land Use Guidelines for Northwest Territories Seismic Operations, but notes that those guidelines were primarily developed for forested environments. ENR also notes discussions taking place in other EAs on the range of the Bathurst herd in Nunavut where more conservative setback distances (4 km) for blasting are being discussed for caribou during sensitive time periods. While the Ekati mine is not located in the post-calving or calving ranges and likely does not warrant the highest level of conservatism, ENR believes that until behavioral monitoring can indicate otherwise, something more intermediate is appropriate.

Condition: *DDEC will increase the blast exclusion zone for caribou in the SOP for Surface Mining: Blasting, Guarding and Initiating to a minimum of 1 km. This change will be effective by the start of construction on the Jay Project and included in future versions of the WMMP.*

4. Camera Trapping Methods and Study Design

Camera trapping is an approach identified by DDEC for monitoring the potential for the road to act as a barrier to caribou. ENR acknowledges the addition of text to Section 5.6.7 of the WEMP to clarify the metric that will be used to measure crossing success; however, details on the study design continue to be missing. In particular, details on how the study design will change to better capture deflections that might be occurring further from the road, as recommended by IEMA and ENR, are excluded from the WEMP.

Condition: *DDEC will provide to ENR further details on study design and methods as well as a SOP for camera operation within one month of approval of the WEMP, and incorporate those into future versions of the WEMP.*

5. Monitoring of approaching caribou

The issue of how DDEC will be able to detect caribou approaching the Ekati mine site in order to implement actions in the CRMP was raised during the Jay Project EA, in the WEMP workshops, and in submissions from reviewers. Measure 6-1 requires DDEC to

“describe methods for monitoring approaching caribou at intermediate distances beyond line of sight from the roads, including at night and in poor visibility” and to investigate and implement the use of remote devices to monitor caribou and reduce impacts at the esker crossing. IEMA and other parties have expressed concern with the frequency of availability of collar data from ENR to DDEC and the lack of formalization of the agreement to communicate and share collar data between DDEC and ENR. DKFN’s review indicated concern with the lack of details regarding the use of thermal imaging technology that DDEC has provided in the WEMP.

With respect to the availability of collar data, ENR has determined that increasing the download frequency of locations from the satellites on a daily basis is feasible and has entered into a data sharing agreement with DDEC to provide collar locations on a daily basis; this agreement is attached. ENR believes this, along with the geo-fencing programming on new collars being deployed to Bathurst caribou, will improve DDEC’s ability to detect approaching caribou. Furthermore, ENR understands that DDEC is conducting trials in the use of thermal imaging technology to detect caribou in low light condition, which is particularly important given the recent trend for Bathurst caribou to be spending time near the diamond mines in winter. ENR believes that these elements, in combination with DDEC’s commitment to provide an analysis of collared caribou movements to verify appropriate trigger distances, ensure that there are reasonable assurances in place to support DDEC’s implementation and adaptive management of the CRMP, including at the esker.

Condition: *DDEC will include in its first annual WEMP report for the Project dedicated sections containing:*

- a) results of its trials of the thermal imaging technology and a detailed description of if/how it will be used to monitor caribou on site.*
- b) an analysis of collared caribou movements to inform appropriate trigger distances for implementing actions and monitoring from Level 1 to Level 2 Action Levels in the CRMP.*
- c) Text describing how the results from community engagement regarding monitoring at the esker crossing have been incorporated.*

6. Traditional Knowledge

Measure 6-1 requires DDEC to use traditional knowledge when designing the CRMP. Reviewers from LKDFN expressed general concerns with how Traditional Knowledge (TK) was incorporated into elements of the WEMP and CRMP. ENR is aware of several opportunities through which traditional knowledge can be incorporated into the WEMP and CRMP, including direct engagement with DDEC by Aboriginal governments and organizations, the Traditional Knowledge Elders Group, collaborative research programs funded by DDEC that investigate the causes of the zone of influence for caribou avoidance and incorporate traditional knowledge (Measure 6-5), the Traditional Knowledge Framework, and ‘Boots on the Ground’ community monitoring initiatives. ENR notes most of these opportunities are still being finalized. ENR also

Attachment 1

notes DDEC's commitment to provide Impact Benefit Agreement (IBA) communities at least \$100,000 annually from the start of construction of the Jay Project until the end of operations with the expectation that part of this funding is put towards TK-based research (page 3-2 of the WEMP).

Condition: *DDEC will include reference to specific processes used to incorporate traditional knowledge into the WEMP and CRMP and identify any changes made to the WEMP and CRMP as a result of traditional knowledge in the annual WEMP report.*

Decision

Subject to the conditions listed above, the Minister of ENR approves DDEC's WEMP and associated CRMP.

APPENDIX 1

Jay Project Report of EA

Measure 6-1: Road mitigations from caribou impacts

a) In order to mitigate significant incremental and cumulative adverse impacts to caribou from roads used by the Jay Project, Dominion will:

- use convoys or other methods to manage traffic on the road in order to maximize interval between disturbances from vehicles
- use real-time caribou collar satellite information and other detection systems to enable early detection of caribou in the vicinity of the road as a trigger for action levels for management responses
- construct caribou crossing features along a minimum of 70 % of the length of the Jay road

b) In addition, Dominion will update and revise the Wildlife Effects Monitoring Plan with the appended Caribou Road Mitigation Plan according to GNWT requirements under section 95 of the *Wildlife Act* and any future section 95 regulations. The plan(s) required under section 95 will be in force for the duration of the Jay Project. In the Caribou Road Mitigation Plan, Dominion will:

- investigate and implement innovative actions to mitigate impacts to caribou from barriers to movement at the esker, such as one-way traffic, buried power lines and pipelines, and remote sensory devices to monitor caribou and reduce impacts at the esker crossing
- define specific thresholds that trigger road management responses including actions to slow traffic, stop traffic and close the Jay and Misery Roads for an appropriate period if caribou are on or near these roads
- describe the minimum size of the kimberlite stockpiles at Jay pit and Misery pit necessary to enable extended closure(s) of the Jay road
- indicate how long the road management responses described above will be applied for each slow down or closure and thresholds and triggers for reopening the road
- describe methods for monitoring approaching caribou at intermediate distances beyond line of sight from the roads, including at night and in poor visibility
- prepare a dust management best practices document with adaptive management triggers for additional dust suppression and link to the Air Quality and Emissions Monitoring and Management Plan
- use Traditional Knowledge when designing the Caribou Road Mitigation Plan
- the project components in the Caribou Road Mitigation Plan (including the Jay road, esker crossing and waste rock storage area)
- the monitoring of caribou responses to these components during the operations phase
- describe specific monitoring and mitigation for caribou impacts related to the road during the construction, operations and closure phases of the Jay Project

Attachment 1

c) The Caribou Road Mitigation Plan will detail the means to be employed to avoid and minimize habitat disturbance and include a response framework that links monitoring results to changes in mitigation. When developing monitoring and mitigation, Dominion will give special consideration to the esker crossing and specify contingency measures if caribou do not cross the Jay Road at the esker.

d) Dominion will submit the Caribou Road Mitigation Plan to the GNWT ENR for approval before constructing the Jay Road. As part of this approval process, the GNWT should provide the opportunity for public comment. Dominion will annually report monitoring results, success or failure of mitigation and adaptive management to communities in person, in a culturally appropriate manner.



DATABASE RELEASE AGREEMENT

The Department of Environment and Natural Resources (ENR) (the "Custodian") agrees to make available to **Dominion Diamond Ekati Corporation** (the "User") the following Database for the specific purpose listed below, subject to the following conditions.

Database released:

Locations of collared barren-ground caribou in and around the Ekati study area from May 1 – October 31, 2017, as available. See Appendix B for collar location upload programming.

Purpose for which the Database is to be used:

Collared caribou location data will be used to develop maps and conduct analyses to:

- a) Provide advance detection of caribou approaching the study area to support implementation of the mitigation and monitoring actions outlined in the Caribou Road Mitigation Plan (Wildlife Effects Monitoring Plan Appendix C).
- b) To determine if triggers based on the distance of collared caribou in the Caribou Road Mitigation Plan are appropriate.
- c) Detect temporal and spatial trends in movement of collared caribou through the Lac de Gras Area in relation to mine infrastructure.
- d) Compare with data obtained from other monitoring programs outlined in the Wildlife Effects Monitoring Program that evaluate caribou presence near and response to the mine and related infrastructure (e.g. roads).

Conditions:

1. The copyright of the database remains the property of (ENR). This agreement does not constitute a transfer of copyright of the Database, in whole or in part to the User.
2. The User will not sell the Database or any parts or sections of the data contained in the Database to any third party.
3. The User will not release the database, in whole or in part, to any third party without prior written consent from the Custodian. This agreement is not transferable to a third party.

4. If the User receives written consent to share the Database, the User must also provide the Database's original and complete metadata¹, as provided by the Custodian.
5. The User shall clearly acknowledge the source of the Database whenever it is used, in whole or in part, see Appendix A for formatting of acknowledgement(s).
6. Use of the data provided is restricted to the specific purpose described above. The Custodian retains the right to first publication of research findings.
7. The User shall provide a copy of any publications, reports, presentations or other products made using any part of the Database obtained under this agreement to the Custodian.
8. The Custodian reserves the right to make changes, corrections, additions and/or deletions to the data contained in the database and is under no obligation to supply the User with updates.
9. In supplying the database, the Custodian makes no endorsement of any interpretations of the data made by the User.
10. The Custodian makes no warranties as to the accuracy of the database or its suitability for the User's purpose. The Custodian does not guarantee exclusivity of use of the data.
11. The User will not display publicly any representations of the Database in a manner that may cause damage to rare, endangered or threatened forms of life or natural sites, or in a manner that could directly harm wildlife².
12. The term of this agreement commences with the signing of the agreement and remains in effect until **31 October, 2017** or until terminated by ENR or the User. This agreement can be extended by mutual consent in writing by both the Custodian and the User.
13. The User will destroy all electronic and/or paper copies of the data (excluding products generated from the data such as reports, maps, documents or public communications) at the termination of this agreement.

¹ Metadata are the specific details about who collected the data, date of collection, restrictions associated with the Database, etc.

² e.g. The exact locations be masked, buffered or hidden, please refer to Appendix A if there are specific data elements requiring special care.



- 14. This agreement shall be interpreted according to the laws of the Northwest Territories.
- 15. The User shall indemnify and hold harmless, the GNWT, its officers, employees, servants and agents from and against all claims, actions, causes of action, demands, costs, losses, damages, expenses, suits or other proceedings by whomever made, brought or prosecuted in any manner based upon or related to the activities of the User under this agreement.

16. Other Conditions if applicable (Appendix A).

By signing this agreement, and accepting the database, the User agrees to be bound by the above conditions.

[Handwritten Signature] on behalf of Claudio Lee 2 May 2017
 User (Has signing authority for the User) Date

[Handwritten Signature] April 20, 2017

Custodian for ENR Date
 Director of Wildlife
 Department of Environment and Natural Resources
 Government of the Northwest Territories



Appendix 'A'

5. Format of Acknowledgement(s):

Environment and Natural Resources. 2017. NWT Wildlife Management Information System. Government of the NWT, Yellowknife, NT.

11. Protection of exact locations:

Maps of a larger area leaving a minimum of 10 km buffer around exact locations may be used to mask or hide exact locations.

Or consider maps showing:

- Absence or Presence
- Range Maps
- Density Maps

16. No other conditions.



Appendix 'B'

As of March 2017, collars on the Bathurst herd are programmed to provide location data at the following frequencies:

For GPS/Iridium collars deployed in 2017:

May 1-May 31: Every 2 days

June 1-October 31: Daily

For collars deployed prior to 2017:

June 1 - June 15: Daily

June 16-October 19: Every 2 days

October 32- May 31: Daily



WILDLIFE EFFECTS MONITORING PLAN FOR THE EKATI DIAMOND MINE

Prepared for: Dominion Diamond Ekati Corporation

Prepared by: Golder Associates Ltd.

March 2017

Table of Contents

1	INTRODUCTION	1-1
1.1	The Ekati Diamond Mine	1-1
1.2	Background	1-1
1.3	The Wildlife Effects Monitoring Plan	1-2
1.4	Objectives	1-5
1.5	Concordance	1-8
2	DEVELOPMENT OF THE WILDLIFE EFFECTS MONITORING PLAN	2-1
2.1	Wildlife Study Area and Setting	2-1
2.2	Monitoring Framework and Adaptive Management	2-4
2.3	Environmental Impact Review	2-7
2.4	Valued Ecosystem Components	2-8
2.5	Species of Concern	2-9
3	ENGAGEMENT AND INCORPORATION OF TRADITIONAL KNOWLEDGE	3-1
3.1	Support of Community-Based Traditional Knowledge Studies	3-2
3.2	Incorporation of Traditional Knowledge in Effects Monitoring	3-3
3.2.1	Caribou	3-3
3.2.2	Wolf and Wolverine	3-4
3.2.3	Grizzly Bear	3-4
3.2.4	Traditional Knowledge Inclusion in Effects Mitigation and Deterrents	3-4
4	MITIGATION	4-1
4.1	Mitigation Effectiveness at the Ekati Mine	4-2
4.1.1	Non-Vehicle Wildlife Incidents and Mortalities	4-2
4.1.2	Airstrip Deterrents	4-2
4.1.3	Vehicle-Wildlife Collisions	4-3
4.1.4	Waste Management	4-4
4.1.5	Open Pits	4-4
4.1.6	Dust	4-5
4.1.7	Health Effects from Contaminants	4-5
4.2	Mitigation of Key Environmental Risks or Pathways	4-6
4.2.1	Direct Habitat Alteration and Loss	4-6
4.2.2	Indirect Habitat Alteration and Loss	4-7
4.2.3	Barrier Effects from Roads	4-8
4.3	Protection of Caribou and Other Wildlife	4-9
4.3.1	Direct Mine-Related Mortality and Injury	4-10

4.3.2	Management of Toxic Substances	4-12
4.3.3	Management of Attractants.....	4-13
4.3.4	Deterring Wildlife.....	4-13
4.4	Education	4-14
4.5	Mitigation Review	4-14
5	MONITORING	5-1
5.1	Direct Wildlife Habitat Loss	5-1
5.2	Waste Management.....	5-2
5.2.1	Landfill Monitoring.....	5-3
5.2.2	Waste Bin Monitoring.....	5-4
5.3	Wildlife Mortalities	5-5
5.4	Wildlife Incidents	5-6
5.5	Wildlife-Vehicle and Aircraft Interactions	5-8
5.6	Caribou.....	5-9
5.6.1	Barren-ground Caribou Management Strategy	5-10
5.6.2	Incidental Caribou Observations.....	5-12
5.6.3	Caribou Road Surveys.....	5-13
5.6.4	Collared Caribou Monitoring	5-14
5.6.5	Caribou Zone of Influence Monitoring.....	5-15
5.6.6	Caribou Behaviour: Activity Budgets and Response to Stressors.....	5-16
5.6.7	Camera Trapping	5-19
5.6.8	Long Lake Containment Facility Monitoring	5-21
5.7	Grizzly Bear.....	5-22
5.7.1	Incidental Observations	5-22
5.7.2	Hair Snagging Study	5-23
5.8	Wolf	5-24
5.8.1	Incidental Observations	5-25
5.8.2	Wolf Den Occupancy and Productivity	5-26
5.9	Wolverine	5-27
5.9.1	Incidental Observations	5-27
5.9.2	Hair Snagging Study	5-28
5.10	Raptors.....	5-29
5.10.1	Pit Wall Nest Monitoring and Incidental Observations.....	5-29
5.10.2	Regional Falcon Surveys.....	5-30
5.11	Fox	5-31
5.11.1	Incidental Observations	5-32
5.12	Upland Breeding Birds	5-33

5.12.1	Incidental Observations	5-33
5.12.2	North American Breeding Bird Survey.....	5-34
5.13	Rare or Uncommon Species.....	5-35
6	QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES.....	6-1
7	REPORTING	7-1
8	REFERENCES.....	8-1

Maps

Map 2.1-1	Ekati Wildlife Study Areas, 1997 to 2009.....	2-3
-----------	---	-----

Figures

Figure 2.2-1	Adaptive Management Decision Tree for the Ekati Mine.....	2-6
--------------	---	-----

Tables

Table 1.4-1	Specific Wildlife Monitoring Program Objectives	1-6
Table 1.5-1	Concordance of Legislation/Regulation Requirements and Wildlife Effects Monitoring Plan	1-9
Table 2.4-1	Valued Ecosystem Components for the Wildlife Effects Monitoring Plan.....	2-8
Table 2.5-1	Species of Concern at the Ekati mine.....	2-10
Table 4.3-1	Environment and Climate Change Canada Recommended Setback Distances for Nests of Migratory Birds Species Groups	4-12
Table 5.1-1	Description of Habitat Types within the Ekati Study Area.....	5-1

Appendices

Appendix A	Effects Pathways to Wildlife and Caribou
Appendix B	Reviewer Recommendations and Proponent Responses
Appendix C	Caribou Road Mitigation Plan (CRMP) for the Jay Project
Appendix D	Summary of Changes to Wildlife Monitoring, 1997 to 2014
Appendix E	Hierarchical Mitigation Applied to the Jay Project for Caribou and Wildlife
Appendix F	Standard Operating Procedures

Abbreviations

Abbreviation	Definition
AEMP	Aquatic Effects Monitoring Program
AQEMMP	Air Quality and Emission Monitoring and Management Plan
AQMMP	Air Quality Management and Monitoring Program
ARD	acid rock drainage
CMP	Caribou Mitigation Plan
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRMP	Caribou Road Mitigation Plan
CWS	Canadian Wildlife Service
DAR	Developer's Assessment Report
DDMI	Diavik Diamond Mines (2012) Inc.
Diavik Mine	Diavik Diamond Mine
DNA	deoxyribonucleic acid
DDEC	Dominion Diamond Ekati Corporation
EA	Environmental Assessment
Ekati mine	Ekati Diamond Mine
ELC	Ecological Land Classification
EIR	Environmental Impact Review
EIS	Environmental Impact Statement
ENR	Environment and Natural Resources, Government of the Northwest Territories
GIS	Geographical Information Service
GNWT	Government of the Northwest Territories
IBA	Impact Benefits Agreement
ICRP	Interim Closure and Reclamation Plan
IEMA	Independent Environmental Monitoring Agency
KIA	Kitikmeot Inuit Association
LLCF	Long Lake Containment Facility
LKDFN	Łutsek'e Dene First Nation
NABBS	North American Breeding Bird Survey
NSMA	North Slave Métis Alliance
NWT	Northwest Territories
PM	particulate matter
QA	quality assurance
QC	quality control
SARA	<i>Species at Risk Act</i>
spp.	multiple species
TK	Traditional Knowledge
VEC	valued ecosystem component
WEMP	Wildlife Effects Monitoring Plan
WLWB	Wek'èezhii Land and Water Board
WPKMP	Wastewater and Processed Kimberlite Management Plan

Abbreviation	Definition
WROMP	Waste Rock and Ore Storage Management Plan
WRSA	waste rock storage area
YKDFN	Yellowknives Dene First Nation
ZOI	Zone of Influence

Units of Measure

Unit	Definition
%	percent
>	greater than
<	less than
°C	degrees Celsius
cm	centimetre
km	kilometre
km/h	kilometres per hour
km ²	square kilometre
m	metre
mm	millimetre
s	second

1 INTRODUCTION

1.1 The Ekati Diamond Mine

The Ekati Diamond Mine (Ekati mine, Ekati or Mine), owned and operated by Dominion Diamond Ekati Corporation (DDEC), is located in the Slave Geological Province of the Northwest Territories (NWT), approximately 300 km northeast of Yellowknife between Yamba Lake and Lac de Gras. Construction of the Ekati mine began in 1997 and officially went into production in October 1998. Currently, the Ekati mine has one operational open pit (Misery Pit), two underground mines (Koala and Koala North Underground) and three pits under development (Pigeon, Lynx, and Sable). DDEC is proposing to develop the Jay kimberlite pipe located beneath Lac du Sauvage. The Jay Project will be an extension of the Ekati mine and is expected to extend the life of the Mine by approximately 13 years. In this document, the Ekati mine refers to the main Ekati complex including the Long Lake Containment Facility (LLCF), accommodation and office buildings, processing plant, Koala and Panda pits and airstrip, as well as all satellite deposits such as the Fox Pit, Misery Pit, Pigeon and Lynx projects, and the Jay Project.

1.2 Background

In 1994, baseline wildlife studies were first undertaken as part of an Environmental Impact Assessment for the proposed diamond Mine (BHP 1995a). Additional baseline data were collected in 1995 and 1996 (BHP 1995b,c,d,e, 1996).

In 1997, a Wildlife Effects Monitoring Plan (WEMP) was established as a result of the Environmental Agreement (Government of Canada, GNWT, BHP 1997) signed on January 6, 1997 by BHP Diamonds Inc., the Government of the Northwest Territories (GNWT), and the Government of Canada (BHP 1998). A modified WEMP was developed in 2000 (BHP 2000a). Through adaptive management and input from Aboriginal communities, the Independent Environmental Monitoring Agency (IEMA) and government these initial plans have evolved into the WEMP presented in this document.

The Environmental Agreement (1997) focused on environmental matters that are supplementary to the statutory terms and conditions addressed under legislation, regulations, leases, and permits. Article VI of the Agreement identified the preparation of both a Construction Phase and an Operating Phase Environmental Management Plan. The Construction Phase Plan was in place until the fall of 1998 and addressed issues and environmental matters that were specific to that phase of development. The Operation Phase Plan began in October 1998 and is currently in place.

Article VII of the Agreement called for the preparation of Environmental Monitoring Programs as part of the Environmental Management Plans. The overall goal of the Environmental Management Plans is to develop, implement, and monitor mitigation strategies so that the Mine does not significantly adversely affect the receiving and surrounding environment. The Agreement states that monitoring programs contained within the management plans shall include activities designed to:

- measure compliance with regulatory requirements;
- determine the environmental effects of the Mine;
- test impact predictions; and,
- measure the performance of operations and effectiveness of impact mitigation.

Section 7.2 of the Environmental Agreement requires that wildlife, including caribou and bears, be among the environmental components monitored. The Environmental Agreement also required the establishment of the IEMA, which operates independently from Ekati and the GNWT and national regulators (e.g., Environment and Climate Change Canada). A main role of the IEMA is to serve as a public watchdog of the regulatory process and the implementation of the Environmental Agreement.

1.3 The Wildlife Effects Monitoring Plan

The WEMP has been conducted since 1997. Ekati employs four Wildlife Technicians, a consultant Wildlife Biologist, and an Environmental Advisor dedicated to implement, manage, and guide the WEMP. This document (the WEMP) is an update to the February 2000 WEMP (BHP 2000a), and is intended to incorporate effects identified through the Jay Project environmental assessment (see DDEC 2014 and Appendix A) and the associated proposed changes to the WEMP. This document is also intended to engage interested parties and solicit feedback for these changes through the Jay Project Environmental Assessment (EA) review. Subsequent versions may be issued for the Jay Project land use permit process. Two workshops were held, one on June 25, 2015 and one on September 13, 2016 to discuss feedback on changes to the WEMP with interested parties. Additional feedback was submitted in writing following the most recent version being published (May 2016). The recommendations received during engagement and the actions taken or responses from DDEC have been summarized in Appendix B. Further, the WEMP is a living document that has been reviewed in conjunction with the Environmental Impact Review (EIR) every three years (BHP Billiton 2012), and updated as needed. The scope of the WEMP includes the Ekati mine and all existing and proposed satellite deposits (i.e., Misery, Fox, Sable, Pigeon, Lynx, and Beartooth), and the Jay Project.

The Ekati WEMP is based on the predicted effects to wildlife from the initial Environmental Impact Statement (EIS) (BHP 1995a), the Environmental Assessment Report for the Sable, Pigeon, and Beartooth Kimberlite Pipes (BHP 2000a), and the Developer's Assessment Report (DAR, DDEC 2014) for the Jay Project. Knowledge of the effects of mining on wildlife from the monitoring undertaken to date at Ekati and other diamond mines in the NWT is considered in the WEMP, as are the requirements of the *Draft Wildlife and Wildlife Habitat Protection Plan and Wildlife Effects Monitoring Program Guidelines* (GNWT-ENR 2013a).

DDEC and Diavik Diamond Mines (2012) Inc. (DDMI) have worked cooperatively on some of the monitoring including the falcon nest survey, the wolverine DNA study, the grizzly bear DNA study, the caribou behavioural surveys, and community environmental monitoring and engagement.

Because the Ekati mine has been operating for 18 years, multiple environmental monitoring programs and management plans are in place, and have been effectively improved over time through adaptive management. The key Ekati mine monitoring programs and management plans are described below.

Air Quality Management and Monitoring Program

An Air Quality Management and Monitoring Program (AQMMP) is currently implemented at the Ekati mine. It is designed to monitor air quality annually, with a more intensive program every third year. The program includes the following components: annual air emission and greenhouse gas calculations, air sampling (total suspended particulate), continuous air monitoring (oxides of nitrogen, oxides of sulphur, total suspended particulate, and particulate matter [PM_{2.5}]), and dustfall monitoring. Every three years,

snow chemistry and lichen tissue monitoring are conducted across a larger spatial scale. Results are publicly reported annually and an interpretive report is prepared every third year.

An Air Quality and Emission Monitoring and Management Plan (AQEMMP) has been completed for the Jay Project, which includes an adaptive management approach. This plan allows for comment and feedback through the Water Licence process.

Aquatic Effects Monitoring Program

The Water Licence (WLWB 2014) requires an Aquatic Effects Monitoring Program (AEMP) to detect changes in the aquatic receiving environment that could potentially be caused by the Ekati mine. Aquatic effects are currently monitored every year at 14 lakes and 8 streams, including reference locations. The AEMP evaluates the physical, chemical, and biological components of the aquatic ecosystem.

The AEMP will be expanded to incorporate the Jay Project as part of the Water Licence issuance process following completion of the EA review process. An AEMP Design Plan for the construction phase of the Jay Project was developed for submission with the Water Licence application for the Project.

Routine AEMP monitoring can and has resulted in special studies to assess the environmental significance of changes in the receiving environment and their relationship to the Ekati mine. An annual report is provided to the Wek'èezhì Land and Water Board (WLWB). Additionally, the Water Licence requires that the program is evaluated every three years and that necessary or desired changes are proposed to the WLWB for review and approval.

The Water Licence requires that an Aquatic Response Framework accompany the AEMP. The Response Framework lists early-warning thresholds for adaptive management responses that would prevent negative impacts in the receiving environment.

Caribou Road Mitigation Plan

See Appendix C.

Interim Closure and Reclamation Plan

As a stipulation of the Water Licence, an Interim Closure and Reclamation Plan (ICRP) has been developed with input from regulators and Aboriginal communities. The ICRP incorporates reclamation activities and objectives that describe how reclamation will be completed and documents the performance standards to be met at closure. The Ekati mine ICRP is an all-inclusive plan that addresses all reclamation obligations at the Ekati mine, and which was approved by the WLWB in 2011. Annual reclamation progress and ICRP updates are reported to the WLWB annually.

Under the ICRP, reclamation research studies are completed to address uncertainties in closure planning. The Reclamation Research Plan is a comprehensive, evolving document. The schedule of reclamation research and proposed reclamation activities evolves based on research results and activities at the Ekati mine, with updates reported annually to the WLWB.

The ICRP will be expanded to incorporate the Jay Project during the Water Licence issuance processes. The plan for future reclamation research would be reviewed at that time and updated as necessary to reflect the Jay Project.

Spill Contingency Plan

The Water Licence requires a Spill Contingency Plan, which has been prepared by DDEC to address any environmental emergency that may occur at the Ekati mine operating sites including satellite facilities, such as Misery Camp and exploration activities. This Plan identifies actions to be taken in the event of a spill at any of the Ekati mine operating sites.

The Spill Contingency Plan will be expanded to incorporate the Jay Project as part of the Water Licence process.

Surveillance Network Program

The Surveillance Network Program is a requirement of the existing Ekati mine Water Licence to collect water quality and other environmental data related to minewater and final effluent water that is released to the receiving environment. Minewater quality is monitored in open pits, underground workings, kimberlite containment areas, lake dewatering and drawdown areas, and in final effluent discharges to assess compliance with the discharge criteria set out in the Water Licence (WLWB 2014). The Surveillance Network Program will be expanded to incorporate the Jay Project as part of the Water Licence process.

Waste Management Plan

The Water Licence requires a Waste Management Plan to describe how DDEC maintains a safe and healthy workplace at the Ekati mine so that potential adverse effects to the environment and wildlife are minimized through diligent waste management practices. The Plan includes the Incinerator Management Plan, Hazardous Waste Management Plan, Solid Waste Landfill Management Plan and Hydrocarbon Impacted Materials Management Plan, and provides clear direction to DDEC staff, contractors, communities and public on how waste from the Ekati mine is managed through each of the waste streams to final disposal. The Waste Management Plan covers all activities associated with the Ekati mine including Ekati Main Camp, Misery Camp and exploration activities, and will be expanded to incorporate the Jay Project as part of the Water Licence process.

Waste Rock and Ore Storage Area Seepage Survey Program

As a condition of the Water Licence, annual monitoring and reporting of waste rock storage area (WRSA) seepage quality and ongoing validation of waste rock geochemical characterization are completed. An interpretive report is required every three years as part of the Waste Rock and Ore Storage Management Plan (WROMP). The Waste Rock and WRSA Seepage Monitoring Program will be expanded to incorporate the Jay Project as part of the Water Licence process.

Wastewater and Processed Kimberlite Management Plan

The Wastewater and Processed Kimberlite Management Plan (WPKMP), required by the Water Licence, describes the management of wastewater and fine processed kimberlite. As part of the WPKMP, the fine processed kimberlite is geochemically characterized. The WPKMP describes the use of the LLCF and Beartooth pit for kimberlite deposition, and the use of the minewater management facilities to maintain compliance with the Water Licence. The relevant aspects of a previously separate Environmental Management Plan, the Geochemical Characterization and Metal Leaching Management Plan, was amalgamated into the WPKMP in 2011. The WPKMP and WROMP includes an Acid/Alkaline Rock Drainage (ARD) monitoring component. The WPKMP will be expanded to incorporate the Jay Project as part of the Water Licence process.



1.4 Objectives

The WEMP describes how DDEC intends to monitor the effects to wildlife that may occur within and beyond the Mine footprint, and contribute to regional monitoring initiatives. The WEMP also details the mitigation policies, designs, practices and procedures that will be implemented to avoid and reduce direct and indirect Mine-related effects to wildlife and wildlife habitat.

The global objectives of the WEMP were developed considering the requirements of the Environmental Agreement, the remaining key residual environmental risks to wildlife identified in the EIR (BHP Billiton 2012), and the pathways identified in the Jay Project DAR (DDEC 2014; Appendix A). The global objectives include the following:

- incorporate Traditional Knowledge (TK) and provide opportunities for the involvement and active participation by communities in the implementation of the WEMP;
- documenting Mine-related effects and test impact predictions made in the Environmental Agreement, EIR, and the Jay Project DAR;
- implement operational practices that mitigate disturbance to wildlife and wildlife habitat including migratory birds and their nesting areas, species at risk, and caribou;
- evaluate the effectiveness of mitigation when possible;
- evaluate the accuracy of key predictions made in the Jay Project EA regarding the effects of the Mine directly on wildlife and wildlife habitat and adjust environmental management practices accordingly; and,
- design studies and data collection techniques that are consistent with, and will contribute to, understanding and managing cumulative effects that can be shared across the NWT mining sector.

The specific wildlife monitoring program objectives of the WEMP are summarized below in Table 1.4-1.

Table 1.4-1 Specific Wildlife Monitoring Program Objectives

Monitoring Program		Objectives
Direct Wildlife Habitat Loss		<ul style="list-style-type: none"> determine the amount of direct habitat loss due to Ekati mine activities.
Waste Management	Landfill Monitoring	<ul style="list-style-type: none"> determine whether the Ekati and Misery landfills contain potential wildlife attractants or evidence of wildlife visitation and habituation.
	Waste Bin Monitoring	<ul style="list-style-type: none"> monitor the misdirection of wildlife attractants and hazardous wastes to waste bins to avoid and minimize possible wildlife incidents at these locations.
All Wildlife	Mortalities	<ul style="list-style-type: none"> document and mitigate potential effects of Mine activities on wildlife. reduce risks to both wildlife and people.
	Incidents	<ul style="list-style-type: none"> determine if any wildlife are killed or injured as a result of vehicle and aircraft interactions.
	Vehicle and Aircraft Interactions	<ul style="list-style-type: none"> determine if migratory birds (and other wildlife) are killed or injured as a result of mine-altered waterbodies. determine if wildlife use the esker stockpile. determine the effectiveness of mitigation for minimizing the risks of wildlife injury and mortality from vehicles and aircraft.
Caribou	Incidental Observations	<ul style="list-style-type: none"> identify the composition of caribou groups moving through the study area.
	Road Surveys	<ul style="list-style-type: none"> document the annual timing of caribou movement through the study area to compare temporal trends in migration patterns. track any trends in the number of caribou moving through the study area among years. determine the location, numbers, and proximity of caribou relative to Mine roads.
	Collared Caribou Monitoring	<ul style="list-style-type: none"> determine the location of caribou relative to the Mine and provide action levels for mitigation and monitoring of caribou near the Jay and Misery roads (i.e., Caribou Road Mitigation Plan).
	Zone of Influence Monitoring	<ul style="list-style-type: none"> determine if caribou distribution changes relative to the Mine.
	Behaviour	<ul style="list-style-type: none"> determine if caribou behaviour changes with distance from the Mine.
	Camera Trapping	<ul style="list-style-type: none"> determine the level of caribou (and other wildlife) activity and traffic along Misery and Jay roads; determine caribou (and other wildlife) responses to the road (i.e., crossing and deflecting); determine caribou (and other wildlife) activity at other Mine infrastructure.
	Long Lake Containment Facility	<ul style="list-style-type: none"> determine if any caribou injuries can be attributed to the LLCF; determine the frequency that caribou use the LLCF; and, determine the group size, group composition, and dominant group behaviours of caribou observed within the LLCF.
Grizzly Bear	Incidental Observations	<ul style="list-style-type: none"> avoid and minimize bear-human interactions and the need for mitigation (e.g., deterrents); determine the level of grizzly bear activity within the Ekati study area; and, document and determine the cause of direct Mine-related mortality of grizzly bears.
	Hair Snagging Study	<ul style="list-style-type: none"> provide estimates of grizzly bear abundance and distribution in the study area.

Table 1.4-1 Specific Wildlife Monitoring Program Objectives

Monitoring Program		Objectives
Wolf	Incidental Observations	<ul style="list-style-type: none"> minimize wolf-human interactions and identify the presence and composition of incidental wolf den and wolf pack observations in the study area; and, document and determine the cause of direct Mine-related mortality of wolves.
	Den Occupancy and Productivity	<ul style="list-style-type: none"> determine the presence, distribution, and productivity of active wolf dens throughout the study area.
Wolverine	Incidental Observations	<ul style="list-style-type: none"> avoid and minimize wolverine-human interactions and the need for mitigation (e.g., deterrents); determine the level of wolverine activity within the Ekati study area; and, document and determine the cause of direct Mine-related mortality of wolverines.
	Hair Snagging Study	<ul style="list-style-type: none"> provide estimates of wolverine abundance and distribution in the study area over time.
Raptors	Pit Wall Nest Monitoring and Incidental Observations	<ul style="list-style-type: none"> determine if pit walls or other infrastructure are utilized as nesting sites for raptors; determine nest success in areas of development and document effectiveness of deterrent efforts that may be employed; and, document and determine the cause of direct Mine-related mortalities of raptors.
	Regional Falcon Surveys	<ul style="list-style-type: none"> determine site occupancy and productivity of historic peregrine falcon nest sites in the study area to contribute to the Regional Falcon Survey, which monitors long-term population trends.
Fox	Incidental Observations	<ul style="list-style-type: none"> avoid and minimize fox-human interactions and the need for mitigation (e.g., deterrents); document the level of fox activity in the Ekati study area; and, document abnormal behaviour in foxes to identify possible cases of rabies.
Upland Breeding Birds	Incidental Observations	<ul style="list-style-type: none"> document the presence of breeding birds at the Ekati mine; and, document sightings of uncommon birds or species of conservation concern in the area.
	North American Breeding Bird Surveys	<ul style="list-style-type: none"> contribute data to a continental bird monitoring program, coordinated in Canada by the CWS.
Rare or Uncommon Species	Incidental Observations	<ul style="list-style-type: none"> document trends in the detection of rare or uncommon species in the study area.

CWS = Canadian Wildlife Service; LLCF = Long Lake Containment Facility.

All of the objectives for the WEMP are linked to the Adaptive Management Plan. The WEMP has been developed with input from community representatives and government and will remain a living document that DDEC will adjust based on adaptive management (Section 3.2).

To improve and standardize wildlife monitoring at all diamond mines (Ekati mine, Diavik Diamond Mine [Diavik Mine], and Snap Lake Mine), a series of workshops were organized. The first was in September 2009, and attended by representatives of the three operating diamond mines, governments, monitoring agencies, and communities. The workshop focused on general results from the monitoring programs (Marshall 2009).

A technical workshop in 2010 resulted in specific recommendations for the mining companies to consider incorporating into the objectives, study designs, and methods of their monitoring programs, with an interest in standardizing approaches and regional monitoring objectives across all the mines (Handley 2010). The standardized regional monitoring objectives from this workshop for each valued ecosystem component (VEC) are provided in Section 5.

1.5 Concordance

The WEMP serves to meet DDEC's obligations to a range of authorities. This includes various Acts and regulations relevant to wildlife in the NWT (Table 1.5-1). The WEMP also serves to meet the requirements of both the GNWT *Draft Wildlife and Wildlife Habitat Protection Plan and Wildlife Effects Monitoring Program Guidelines* (GNWT-ENR 2013a). The sections of the WEMP that pertain to the NWT Acts and regulations, and the guidelines for wildlife and wildlife habitat protection and monitoring have also been identified in Table 1.5-1.

Table 1.5-1 Concordance of Legislation/Regulation Requirements and Wildlife Effects Monitoring Plan

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WEMP	Responsible Regulatory Agency
<i>Environmental Agreement</i>	<ul style="list-style-type: none"> • measure compliance with regulatory requirements • determine the environmental effects of the Mine • test impact predictions • measure the performance of operations and effectiveness of impact mitigation 	Entire Document	Government of Canada, GNWT
<i>Migratory Birds Convention Act, Migratory Bird Regulations</i>	The taking of nests or eggs of migratory game or insectivorous or nongame birds shall be prohibited, except for scientific or propagating purposes under such laws or regulations as the High Contracting Powers may severally deem appropriate.	Section 4.6	CWS
<i>NWT Wildlife Act</i>	A wildlife management and monitoring plan must include: <ol style="list-style-type: none"> (a) a description of potential disturbance to big game and other prescribed wildlife, potential harm to wildlife and potential impacts on habitat; (b) a description of measures to be implemented for the mitigation of potential impacts; (c) the process for monitoring impacts and assessing whether mitigative measures are effective; and, (d) other prescribed requirements. 	Entire Document	GNWT
<i>Species at Risk Act and Species at Risk (NWT) Act</i>	DDEC will adhere to requirements of all applicable Regulations or Recovery Plans that may be developed over the duration of the Mine.	Section 2.5	CWS GNWT
<i>NWT Wildlife Act</i>	Draft guidelines for the preparation of wildlife monitoring documents, dated May 2013: <i>Wildlife and Wildlife Habitat Protection Plan (WWHPP)</i>	Section 4.1.1 - Non-Vehicle Wildlife Incidents and Mortalities Section 4.1.2 – Airstrip Deterrents Section 4.1.3 – Vehicle-Wildlife Collisions Section 4.1.4 – Waste Management Section 4.1.5 – Open Pits Section 4.1.6 – Dust Section 4.1.7 – Health Effects from Contaminants Section 4.2.1 – Direct Habitat Alteration and Loss Section 4.2.3 – Barrier Effects from Roads Section 4.3.1 – Direct Mine-Related Mortality and Injury	GNWT

Table 1.5-1 Concordance of Legislation/Regulation Requirements and Wildlife Effects Monitoring Plan

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WEMP	Responsible Regulatory Agency
		Section 4.3.2 – Management of Toxic Substances Section 4.3.3 – Management of Attractants Section 4.3.4 – Deterring Wildlife Section 4.4 – Education Section 5.1 – Direct Wildlife Habitat Loss Section 5.2 – Waste Management Section 5.3 – Wildlife Mortalities Section 5.4 - Wildlife Incidents Section 5.5 - Wildlife-Vehicle and Aircraft Interactions Section 5.6.2 – Incidental Caribou Observations Section 5.6.3 – Caribou Road Surveys Section 5.6.4 – Collared Caribou Monitoring Section 5.6.6 – Caribou Behaviour: Activity Budgets and Response to Stressors Section 5.6.7 – Camera Trapping Section 5.6.8 - Long Lake Containment Facility Monitoring Section 5.7.1 – Incidental Observations Section 5.8.1 – Incidental Observations Section 5.9.1 – Incidental Observations Section 5.10.1 – Pit Wall Nest Monitoring and Incidental Observations Section 5.11.1 Incidental Observations Section 5.12.1 – Incidental Observations Section 5.13 – Rare or New Species	
	Draft guidelines for the preparation of wildlife monitoring documents, dated May 2013: <i>Wildlife Effects Monitoring Program</i>	Section 4.1.6 – Dust Section 5.6.1 – Barren-ground Caribou Management Strategy Section 5.6.5 – Caribou Zone of Influence Monitoring Section 5.7.2 – Hair Snagging Study (Grizzly Bear)	

Table 1.5-1 Concordance of Legislation/Regulation Requirements and Wildlife Effects Monitoring Plan

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WEMP	Responsible Regulatory Agency
		Section 5.8.2 – Wolf Den Occupancy and Productivity Section 5.9.2 – Hair Snagging Study (Wolverine) Section 5.10.2 – Regional Falcon Surveys Section 5.12.2 – North American Breeding Bird Survey	
<i>Jay Project MVEIRB Decision Report Measures</i>	<p>Measure 6-1: Road mitigations for caribou</p> <p>a) In order to mitigate significant incremental and cumulative adverse impacts to caribou from roads used by the Jay Project, Dominion will:</p> <ul style="list-style-type: none"> – use convoys or other methods to manage traffic on the road and maximize intervals between disturbance from vehicles. – use real-time collared caribou information and other detection systems to enable early detection of caribou in the vicinity of the road as a trigger for action levels for management responses. – construct caribou crossing features along a minimum of 70% of the length of the Jay Road. <p>b) In addition, Dominion will update and revise the Wildlife Effects Monitoring Plan with the Caribou Road Mitigation Plan according to the GNWT requirements under section 95 of the <i>Wildlife Act</i> and any future section 95 regulations. The plan(s) required under section 95 will be in force for the duration of the Jay Project.</p> <p>In the Caribou Road Mitigation Plan, Dominion will:</p> <ul style="list-style-type: none"> – investigate and implement innovative actions to mitigate impacts to caribou from barriers to movement at the esker, such as buried power lines and pipelines, and remote sensory devices to monitor caribou and reduce impacts at the esker crossing. – define specific thresholds that trigger road management responses including actions to slow traffic, stop traffic, and close the Jay and Misery roads for an appropriate period if caribou are on or near these roads. – describe the minimum size of the kimberlite stockpiles at Jay pit and Misery pit necessary to enable extended closure(s) of the Jay road 	Appendix C: Caribou Road Mitigation Plan	GNWT

Table 1.5-1 Concordance of Legislation/Regulation Requirements and Wildlife Effects Monitoring Plan

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WEMP	Responsible Regulatory Agency
	<ul style="list-style-type: none"> - indicate how long the road management responses described above will be applied for each slow down or closure and thresholds and triggers for reopening the road 		
	<ul style="list-style-type: none"> • investigate methods for monitoring approaching caribou at intermediate distances beyond line of sight from the roads, including at night and in poor visibility. • Use Traditional Knowledge when designing <ul style="list-style-type: none"> - The Caribou Road Mitigation Plan - The project components in the Caribou Road Mitigation Plan (including the Jay Road, esker crossing, and waste rock storage area) - The monitoring of caribou responses to these components during the operations phase - Describe specific monitoring and mitigation for caribou impacts related to the road during construction, operations and closure phases of the Jay Project c) The Caribou Road Mitigation Plan will detail the means to be employed to avoid and minimize habitat disturbance and include a response framework that links monitoring results to changes in mitigation. When developing monitoring and mitigation, Dominion will give special consideration to the esker crossing and specify contingency measures if caribou do not cross the Jay Road at the esker. d) Dominion will submit the Caribou Road Mitigation Plan to the GNWT ENR for approval before constructing the Jay Road. As part of the approval process, the GNWT should provide the opportunity for public comment. Dominion will annually report monitoring results, success or failure of mitigation and adaptive management to communities in person, in a culturally appropriate manner. 		
	Measure 6-1: b) <ul style="list-style-type: none"> • prepare a dust management best practices document with adaptive management triggers for additional dust suppression and link to the Air Quality and Emissions Monitoring and Management Plan 	Air Quality and Emissions Monitoring and Management Plan	GNWT ECCC
	Measure 6-2(a) <ul style="list-style-type: none"> i. Dominion will offset residual adverse impacts to caribou by human activities that cumulatively affect the Bathurst caribou herd, beyond 	Air Quality and Emissions Monitoring and Management Plan Appendix C: Caribou Road Mitigation Plan	GNWT

Table 1.5-1 Concordance of Legislation/Regulation Requirements and Wildlife Effects Monitoring Plan

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WEMP	Responsible Regulatory Agency
	<p>direct impacts of the Jay Project. Dominion will set out these offsets in a Caribou Mitigation Plan, which it will complete within one year of Minister's acceptance of this EA Report. This plan will be in force throughout the duration of the Jay Project.</p> <p>ii. Dominion will implement the Caribou Mitigation Plan as described in DAR-MVEIRB-UT2-0657 and incorporate the following into the Plan:</p> <ul style="list-style-type: none"> • caribou offsets related to roads that result in enhanced mitigation, such as scheduling of activities during caribou migration or dust suppression offsite from Jay Project. • zone of influence research with funding as committed by Dominion. • identify mitigation actions from the Plan and apply at other Ekati operations. • options for the scheduling of other Ekati operations to offset Jay Project impacts during caribou migration periods. • an enhanced dust mitigation study including: <ul style="list-style-type: none"> • a pilot test on application of dust suppressant • a dustfall sampling program. • report on results and propose improvements to be incorporated into the Air Quality Emission Monitoring and Management Plan. • if dust mitigation improvements are identified, Dominion will apply them on all roads at Ekati. • accelerate progressive reclamation of Long Lake Containment Facility substantially beyond current Interim Closure and Reclamation Plan requirements to return it to productive caribou habitat sooner. • incorporate waste rock storage area egress ramps, designed in consultation with Elders to prevent injuries and entrapment of caribou. <p>iii. Following implementation of the Caribou Mitigation Plan, Dominion will:</p> <ul style="list-style-type: none"> • annually report on the effectiveness of monitoring, mitigation and adaptive management of the Caribou 	<p>Caribou Mitigation Plan Section 3 – Engagement and Incorporation of Traditional Knowledge Section 7 – Reporting</p>	

Table 1.5-1 Concordance of Legislation/Regulation Requirements and Wildlife Effects Monitoring Plan

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WEMP	Responsible Regulatory Agency
	<p>Mitigation Plan to communities in person, in a culturally appropriate manner.</p> <ul style="list-style-type: none"> • annually report on the activities conducted under the Caribou Mitigation Plan and the effectiveness of related monitoring, mitigation and adaptive management, to GNWT ENR, WRRB and IEMA. • submit an updated Caribou Mitigation Plan for approval by GNWT ENR every three years. Prior to approval, the GNWT should provide the opportunity for public comment. <p>iv. The GNWT will enforce the Caribou Mitigation Plan under section 95 of the Wildlife Act</p>		
	<p>Measure 6-5 Traditional Knowledge-based caribou monitoring and mitigation.</p> <p>Dominion will:</p> <ul style="list-style-type: none"> • develop and implement a collaborative research program incorporating Traditional Knowledge designed to identify the causes of the zone of influence for caribou avoidance within one year of acceptance of the Report of EA. • summarize and report annually on this collaborative research program as part of the Wildlife Effects Monitoring Program reporting. • implement the research findings which can help to reduce the size of the zone of influence on caribou. • Dominion will fund a Traditional Knowledge Elders group drawn from Aboriginal organizations that participated in the EA. This group will: <ul style="list-style-type: none"> – advise on the construction and operation of the Jay road, esker crossing and waste rock management area egress ramps that limit impacts to caribou. – monitor caribou reactions to the Jay road use, esker crossing and waste rock storage area egress ramps in coordination with existing caribou management authorities – report on the results of monitoring to Dominion, IEMA, regulators and Aboriginal organizations that participated in the EA. 	<p>Jay Project Road Construction Plan.</p>	<p>WLWB</p>

Table 1.5-1 Concordance of Legislation/Regulation Requirements and Wildlife Effects Monitoring Plan

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WEMP	Responsible Regulatory Agency
	<ul style="list-style-type: none"> - recommend mitigation based on monitoring results. - recommend a contingency plan for the esker crossing if monitoring indicates that the road through the esker is a major barrier to caribou movement. <p>This Traditional Knowledge group will be in place prior to construction, throughout operations and closure.</p>		

GNWT = Government of Northwest Territories; CWS = Canadian Wildlife Service; ; WEMP = Wildlife Effects Monitoring Plan; ECCC = Environment and Climate Change Canada; ENR = Department of Environment and Natural Resources, Government of the Northwest Territories; WLWB = Wek'èezhìì Land and Water Board.

2 DEVELOPMENT OF THE WILDLIFE EFFECTS MONITORING PLAN

2.1 Wildlife Study Area and Setting

Beginning in 1997, wildlife monitoring was conducted in a study area of approximately 1,600 km² surrounding the Ekati mine, which expanded to an area of 2,800 km² by 2005. In 2006, the caribou aerial survey study area was expanded to 6,300 km², referred to as the Ekati study area, which included a 30 km buffer around the Mine site (Map 2.1-1).

In August 2009, the Ekati and Diavik mines collaboratively expanded the aerial survey study area after consultation with regulators and permission from GNWT-Environment and Natural Resources (ENR). The study area was expanded south so that an effective buffer around Diavik Mine was surveyed to accurately assess caribou distribution relative to mine development. The existing transect lines were extended to cover the new area.

The Ekati mine and its surrounding claim block are located approximately 200 km south of the Arctic Circle and 300 km northeast of Yellowknife in the NWT, Canada. The Mine is located within the headwaters of the Coppermine River drainage basin, which flows north to the Arctic Ocean in the Level III Tundra Shield Low Arctic (south) Ecoregion in the Level II Tundra Shield Ecoregion as defined by the Ecological Classification Group (ECG 2012). This Ecoregion is characterized by short, cold summers, very cold, long winters. The annual average temperature in the Tundra Shield Low Arctic (south) Ecoregion is -9°C, ranging from +10°C to +12°C in July to -30°C in January. Average annual precipitation is from 200 to 300 mm with approximately 60% occurring as rain and 40% occurring as snowfall (ECG 2012).

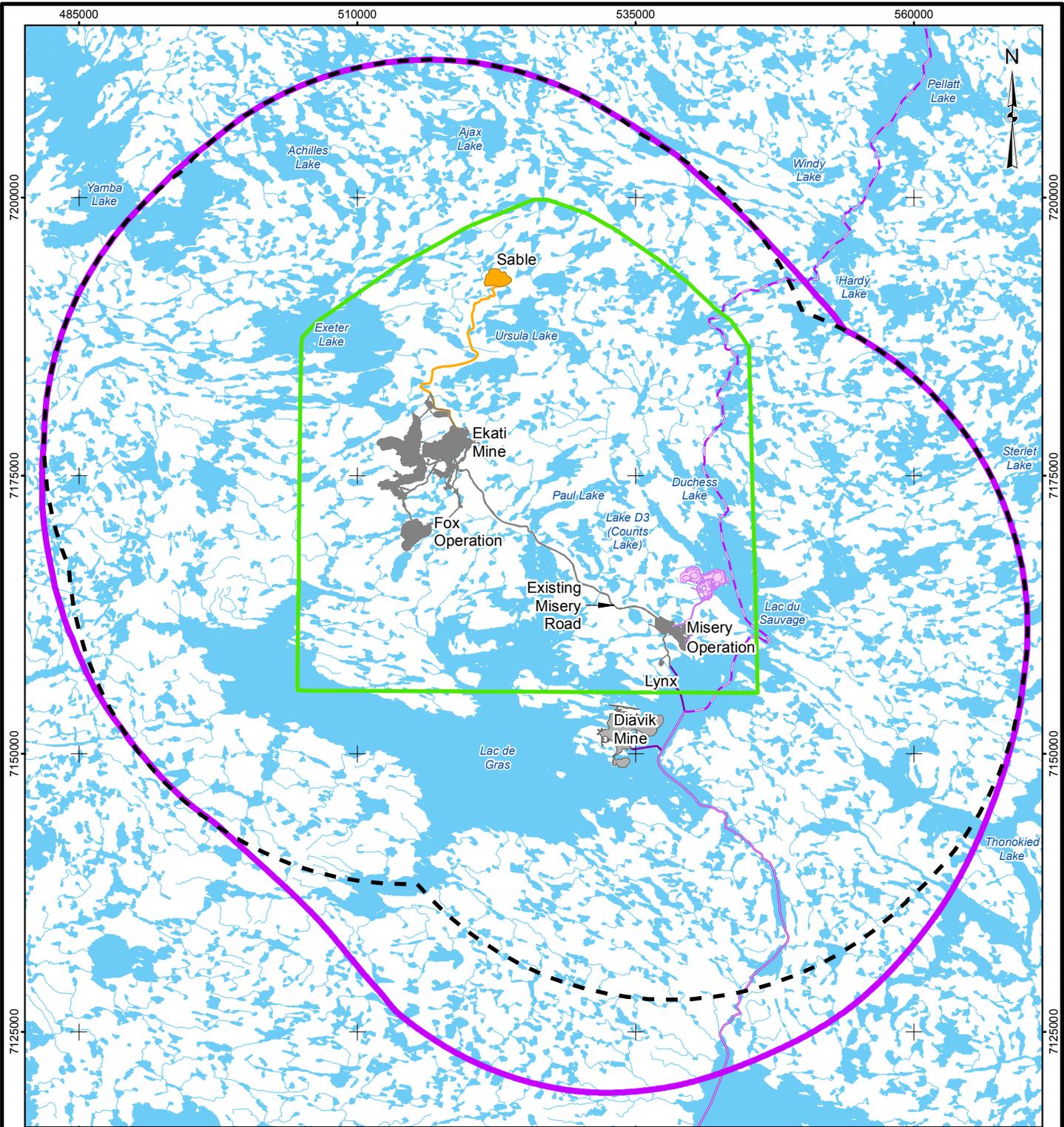
The topography of the region is relatively flat, with the local area characterized by undulating to rolling terrain with northwest to southeast trending ridge features known as eskers and exposed bedrock outcrops. The local terrain is characterized by boulder fields, tundra, and wetlands, and by numerous lakes with interconnecting streams. Permafrost is continuous, typically extending to a depth of 300 m, and is overlain by an active layer, which thaws during the summer and refreezes during the winter. The active layer is typically within 1 to 2 m of the ground surface. The lakes and streams of the area are characterized by clear, soft and low-nutrient waters, typical of Northern aquatic environments. The biological productivity and biomass of plants and animals in streams and lakes are low compared to streams and lakes in southern Canada.

Characteristic vegetation of the Tundra Shield Low Arctic (south) Ecoregion includes continuous to discontinuous low-shrub complexes and erect dwarf-shrub tundra (ECG 2012). The terrestrial vegetation community around the Ekati mine is composed mainly of heath tundra. Characteristic species are Labrador tea, bog cranberry, bearberry, black crowberry, and dwarf birch. Lichen-dominated communities are found on the crests and upper slopes of eskers where the snow does not accumulate and on bedrock or boulder complexes where exposed rock outcrops support these communities. Shrubs, such as willows and dwarf birch, are found in sheltered riparian areas along streams, seeps, and lakeshores associated with poorly drained soils. The vegetation characteristics of the sedge wetlands and tussock hummock



plant communities occurring in depressions are dominantly sedges, cotton grasses, and peat mosses (DDEC 2014).

Despite the harsh climate, the area supports many species of mammals and birds. Most of these animals are migratory (e.g., caribou, wolf, peregrine falcon), others are non-migratory (e.g., grizzly bear, wolverine, Arctic fox, red fox, Arctic hare, and raven). Although uncommon, moose and muskox have been observed in the study area (DDEC 2014).



G:\CLIENTS\DOMINION\DEC_Jay and Lynx\Projects\Figures\1546701_Jay_Stage_4\16000_MngtPlans_MonitorProgram\T20_WEIMP_CRMP\1546701-6000-20_Ekati_and_Diavik_StudyAreas.mxd

LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- PROPOSED SABLE FOOTPRINT
- SABLE ALL-SEASON ROAD
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- WATERCOURSE
- WATERBODY
- WILDLIFE STUDY AREA, 1997 - 2005
- WILDLIFE STUDY AREA, 2006 - 2008
- WILDLIFE STUDY AREA, 2009 - 2012



REFERENCE

NATIONAL TOPOGRAPHIC BASE DATA (NTDB) 1:250,000
 CANVEC © NATURAL RESOURCES CANADA, 2012
 NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
 DATUM: NAD83 PROJECTION: UTM ZONE 12N

PROJECT **DOMINION DIAMOND** JAY PROJECT NORTHWEST TERRITORIES, CANADA

TITLE **EKATI WILDLIFE STUDY AREAS, 1997 TO 2012**

	PROJECT	1546701.6000.20	FILE No.	
	DESIGN	TM	13/05/15	SCALE AS SHOWN
	GIS	ANK	25/01/17	REV. 0
	CHECK	DC	25/01/17	
	REVIEW	JV	25/01/17	

MAP 2.1-1

2.2 Monitoring Framework and Adaptive Management

Adaptive management is a structured process of decision making to deal with uncertainty.

The objective of adaptive management is to reduce uncertainty through monitoring, or “learning by doing” (WLWB 2010). In the case of wildlife monitoring, the “doing” is the environmental monitoring, and the “learning” is continual improvements to environmental management and the monitoring programs.

This requires the monitoring program to be adaptive and flexible. The monitoring program must be flexible enough to incorporate comments, suggestions, and information based both on science and local and TK. The Ekati mine WEMP has and will continue to incorporate adaptive management.

The process of developing a WEMP is collaborative and requires input from communities, IEMA, government and other regulators. As indicated in Section 1.2, the overall objectives of monitoring include:

- testing effects predictions, which can be related to measuring the response of the environment or VEC population to Mine stressors and/or testing the assumptions associated with the predictions;
- testing the effectiveness of mitigation;
- contributing to the assessment and management of regional cumulative effects; and,
- meeting and fulfilling regulatory requirements.

Results from local (i.e., Mine-specific) and regional collaborative monitoring programs are used to provide feedback to Ekati mine operations to determine if the objectives are being met (Figure 2.2-1). Modification and/or implementation of additional mitigation may be required as determined through monitoring results and the adaptive management process. Similarly, changes to the objectives and/or study methods for local and regional monitoring programs may be required if it is determined that the measurement indicator for the associated effects pathway has a low sensitivity to detect Mine-related changes or that the scale of the response does not match the objective. Problems with sampling methods and/or sample size and duration would also require a review and potential modification of the monitoring program for a particular objective (e.g., previous grizzly bear sign surveys and wolverine snow track surveys).

Alternately, the data and results may be sufficient to demonstrate that Mine-related effects on the VEC are negligible, confirming the objective and supporting the decision to stop monitoring that component of the program (Figure 2.2-1). Examples include raptors and upland breeding birds, which after a decade of sampling showed little effects from the Ekati mine relative to natural factors occurring at larger regional scales. Through discussions and engagement with communities, monitoring agencies, and government, the decision was made to remove these VECs from Mine-specific objectives of the monitoring program, and contribute to regional data through the North American Breeding Bird surveys and the Canadian Peregrine Falcon Survey (Marshall 2009; Handley 2010).

In some cases, even when Mine-related effects are determined to be negligible, monitoring may be continued because it can increase the confidence of impact predictions in future environmental assessments and contributes to the assessment and management of cumulative effects by government (Figure 2.2-1). For example, the WEMP provides regional data on caribou, grizzly bear, wolverine, upland migratory birds, and raptors that can be used to better understand the potential cumulative effects on these species. This will further the overall understanding of the tundra ecosystem. In other cases, public

concern may be the key reason to continue monitoring even after years of detecting negligible effects (Figure 2.2-1).

DDEC has and will continue to actively seek input from regulatory authorities and communities through engagement activities and other regional programs led by the GNWT, such as the Zone of Influence Technical Task Group. Annual reports and meetings are ways that DDEC will present the results of the monitoring program, and the basis for communities and regulatory agencies to provide feedback and direction. In accordance with the concept of adaptive management, monitoring programs and mitigations in the WEMP have and will continue to be adaptively managed over the life of the Mine.

The objective of adaptive management is to reduce uncertainty through monitoring, or 'learning by doing' (WLWB 2010). Adaptive management is generally considered to include four themes (Greig et al. 2008; WLWB 2010):

- learning to reduce management uncertainties;
- using what is learned to change policy and practice;
- focusing on improved management; and,
- basing adaptive management on a structured and systematic approach.

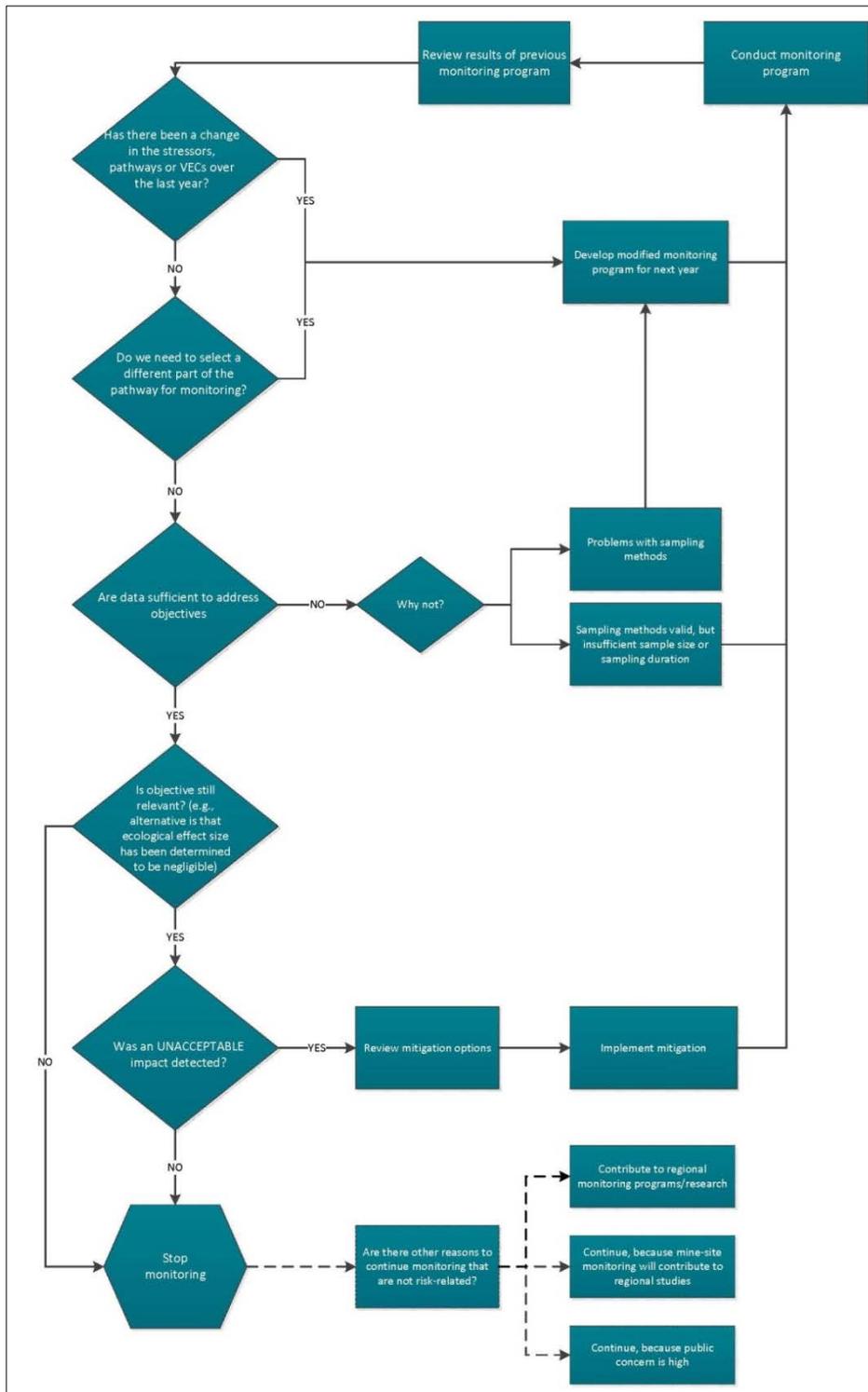
Monitoring programs must be flexible enough to incorporate comments, suggestions, and information based both on science and local and TK. There are no regulator established guidelines for wildlife critical values, threshold conditions, or action levels. If changes to the receiving environment are determined to be greater than the predictions in the DAR, then the most suitable course of action will be determined by DDEC, in discussion with communities and regulatory agencies. This type of process has been used successfully in the past (e.g., Marshall 2009; Handley 2010).

Following the principles of adaptive management, wildlife monitoring has undergone changes since the initial development of the WEMP in 1998 (BHP 1998) and 2000 (BHP 2000a). These changes have been implemented following the results of monitoring and effectiveness of mitigation, recommendations and suggestions from communities, the IEMA, and government agencies. A history of changes to the WEMP since 1997 is provided in Appendix D.

Adaptive management will be an ongoing process throughout the life of the Ekati mine and may include the outcome of no change. If changes are required to the WEMP, they will occur as monitoring results are analyzed and assessed over time. If negative effects are detected, the actions available to DDEC include the following:

- increase monitoring effort;
- implement special studies to further understand the effects; and/or,
- implement additional mitigation to reduce the effects.

Figure 2.2-1 Adaptive Management Decision Tree for the Ekati Mine



2.3 Environmental Impact Review

An EIR report is a requirement of the Environmental Agreement signed in 1997 between BHP Diamonds Inc. (purchased by Dominion Diamond Corporation) and the governments of Canada and the Northwest Territories. As required by the Environmental Agreement, the EIR compares the results of environmental monitoring activities conducted by DDEC at the Ekati mine against the predictions of the 1995 EIS (BHP 1995a). The most recent reporting period for this comparison was from 2009 to 2011 (BHP Billiton 2012).

For the 2009 to 2011 EIR process, there were 22 key residual environmental risks identified by communities, the IEMA, and government within the VEC categories of Air, Land, Water, and Wildlife. Four of the top five environmental risks identified in the EIR report pertain to wildlife (BHP Billiton 2012). The following key residual environmental risks related to wildlife are included in the WEMP:

- caribou migration routes;
- caribou interaction with roads;
- ability to detect changes in carnivore populations;
- caribou interactions with Mine activities and infrastructure (other than roads);
- habituation of carnivores; and,
- breeding bird interactions with Mine activities and infrastructure.

The WEMP also includes monitoring programs and mitigations related to the predicted residual effects from the Jay Project (DDEC 2014). The complete list of effects pathways, associated assumptions, and predictions appear in Appendix A. The three primary effects pathways (or residual environmental risks) from the Jay Project on caribou and other wildlife were:

- direct loss and fragmentation of habitat from the Jay Project footprint causes changes in wildlife abundance and distribution;
- sensory disturbance (lights, smells, noise, dust, viewscape) and barriers to movement causes changes to wildlife movement and behaviour, and changes to caribou energetics and reproduction; and,
- increased traffic on the Misery Road and Jay Road, the above-ground power line along these roads, and the pipelines along the Jay Road may create barriers to wildlife movement, change migration routes, and reduce population connectivity.

Caribou herds are a key concern and DDEC will continue to provide site-specific information relevant to regional cumulative effects studies. Extensive camera monitoring at the Mine has contributed to a better understanding of the fine-scale effects of roads on caribou behaviour and movement. Ekati wildlife advisors have participated in regional government studies and workshops to improve caribou monitoring and examine opportunities to synchronize monitoring with other mines. When possible, collaboration with DDMI has been better able to address the regional impacts of mining on caribou populations (e.g., aerial

surveys and integrated methods for behavioural and other ground-based surveys). Community site visits have also been completed on a regular basis to share caribou monitoring knowledge and address monitoring improvements at Ekati.

Collaborative work with the GNWT, communities, and monitoring agencies on carnivore monitoring continues. This collaboration is intended to address the ability of detecting trends in carnivore populations. DDEC’s participation in DNA studies on grizzly bear and wolverine has produced useful results, and it is anticipated that future work will provide information on Mine impacts on carnivore populations. The WEMP will continue to evolve, and will be responsive to issues and risks identified through the EIR process.

2.4 Valued Ecosystem Components

Valued ecosystem components represent physical, biological, cultural, social and economic properties of the environment that are considered to be important by society. The rationale for choosing the VECs selected for monitoring in the WEMP included the following:

- species are present in sufficient numbers to collect meaningful information;
- monitoring initiatives already exist that DDEC can contribute to;
- monitoring is important to communities, wildlife managers, and regulators;
- species can be monitored effectively with practical and efficient measurement indicators;
- measurement indicators are sensitive enough to detect Mine-related effects; and,
- species of concern (i.e., listed species) are located within the study area and should be monitored.

The VECs included in the WEMP are provided in Table 2.4-1.

Table 2.4-1 Valued Ecosystem Components for the Wildlife Effects Monitoring Plan

Valued Ecosystem Component	Rationale
Barren-ground caribou	Barren-ground caribou are seasonal migrants to the area, are an important component of the culture and economy of the NWT, and DDEC is contributing to the Barren-ground Caribou Management Strategy.
Grizzly bear	Grizzly bears are a species of concern, and regional monitoring is being undertaken.
Wolf	Wolves are secure in the NWT, but DDEC monitors wolves near infrastructure and supports regional wolf monitoring initiatives.
Wolverine	Wolverine are a species of concern, and regional monitoring is being undertaken.
Raptors	Peregrine falcon and short-eared owl are species of concern. Peregrine falcons are known to nest on cliffs in the Mine regional study area. However, based on technical workshops with government, monitoring agencies and Aboriginal communities, annual Mine-specific monitoring of nests in the study area has been removed from the WEMP. DDEC currently contributes to regional monitoring of nest occupancy and production every five years.

NWT = Northwest Territories; DDEC = Dominion Diamond Ekati Corporation.

Other non-VEC wildlife species, such as fox and upland migratory birds, are monitored because they interact with the Mine regularly or results can support regional monitoring initiatives (e.g., North American Breeding Bird Survey). Incidental observations of other wildlife species during monitoring, such as moose and muskox will also be recorded. Following the principles of adaptive management, the VECs and monitoring objectives may be periodically reviewed and changed as necessary.

2.5 Species of Concern

The intent of the federal *Species at Risk Act (SARA)* and the *Species at Risk (NWT) Act* is to prevent wildlife species from becoming extirpated or extinct, to provide for the recovery of extirpated, endangered or threatened species, and to manage species of special concern to prevent them from becoming at further risk. This legislation may be used to prohibit the killing, harming or harassing of listed species, the damage and destruction of their residences, and the destruction of critical habitat. The *Species at Risk (NWT) Act* applies only to birds not already covered by the *Migratory Birds Convention Act*. In the NWT, the Species at Risk Committee will assess species, and the Conference of Management Authorities will prepare the List of Species at Risk, providing legal protection.

For the purposes of the WEMP, species may be considered of concern as a result of their national or territorial status, or their status under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). As the *Species at Risk (NWT) Act* is implemented, the NWT Species at Risk Committee will make further assessments, and the Conference of Management Authorities will prepare the List of Species at Risk, providing legal protection for these species, and possibly leading to changes in the species at risk considered for the Mine and the WEMP.

There are six wildlife species of concern with ranges that are known to overlap or likely overlap with the Mine (Table 2.5-1). In the case of migratory birds, only those birds that breed or winter near the Mine were included; other species that may migrate through the area were not included. Each of the species of concern will be monitored through the WEMP to reduce direct impacts as part of the adaptive management process. Mitigation and monitoring strategies will be consistent with any final and applicable COSEWIC assessment report, SARA recovery strategy, action plan, and management plan that may become available during the life of the Mine.

Table 2.5-1 Species of Concern at the Ekati mine

Species	<i>Species at Risk (NWT) Act</i>	COSEWIC Assessment	<i>Federal Species at Risk Act</i>	Potential Mine Impacts	WEMP
Grizzly bear (western population)	no status	Special Concern	under consideration	<ul style="list-style-type: none"> may be attracted to developments if food is available sensitive to disturbance particularly when accompanied by young or during denning long generation time means one individual may be affected by disturbance seasonally over multiple years, resulting in potential regional population effects 	hair-snagging surveys; habitat loss; and site monitoring
Wolverine	not at risk	Special Concern	under consideration	<ul style="list-style-type: none"> may be attracted to developments if food or shelter are available 	hair-snagging surveys; habitat loss; and site monitoring
Peregrine falcon (anatum-tundrius complex)	no status	Special Concern	Special Concern	<ul style="list-style-type: none"> peregrines have been known to nest on Mine infrastructure and in open pits, where they may be at risk of harm or may cause delays to operations 	monitoring nest occupancy and productivity in the regional study area habitat loss; and site/pit monitoring (particularly for nesting activity)
Red-necked phalarope	not applicable	Special Concern	under consideration	<ul style="list-style-type: none"> loss of shoreline habitat for breeding water birds that use Mine-altered waters may be harmed 	NABBS; habitat loss; and site monitoring (particularly for nesting activity)
Rusty blackbird	no status	Special Concern	Special Concern	<ul style="list-style-type: none"> may nest on Mine infrastructure experiencing population declines as a result of changing environmental conditions on breeding and overwintering habitats 	NABBS; habitat loss; and site monitoring (particularly for nesting activity)
Short-eared owl	no status	Special Concern	Special Concern	<ul style="list-style-type: none"> may be affected by habitat loss sensitive to noise and disturbance and human activity during nesting 	NABBS; habitat loss; and site monitoring (particularly for nesting activity)

Source: NWT SAR (2015).

COSEWIC = Committee on the Status of Endangered Wildlife in Canada; NWT = Northwest Territories; WEMP = Wildlife Effects Monitoring Plan; NABBS = North American Breeding Bird Survey.

3 ENGAGEMENT AND INCORPORATION OF TRADITIONAL KNOWLEDGE

As part of their commitment to the environment, DDEC is mandated under their Environmental Agreement to incorporate available TK in environmental monitoring programs. Wildlife monitoring uses scientific methods and is informed by TK regarding local wildlife and ecology.

The WEMP focuses on wildlife species and habitats identified as being of social or economic importance, or of particular ecological or conservation concern (i.e., VECs). Each year the program is refined as a result of previous information collected and input from government and non-government agencies, Aboriginal communities and IEMA. With the assistance of community experts, land users, and/or TK holders during wildlife and habitat surveys, TK has been used to help understand monitoring results and provide ways of preventing or reducing impacts to wildlife. The WEMP will continue to evolve as DDEC explores further options to improve the program through community and regulatory workshops, community assistant participation, and site visits.

The physical presence of roads and associated traffic can cause wildlife to alter their movement and behaviour. Increased traffic along the Misery and Jay roads, and associated power lines and pipelines that results in barriers to the movement of caribou and other wildlife the Ekati mine site is a key concern for DDEC and communities. In the DAR for the Jay Project, DDEC proposed to construct caribou crossings at appropriate discrete locations along the Jay Road (DDEC 2014). However, due to the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. Approximately 72% of the main section of the Jay Road will be constructed as a caribou crossing to enable caribou movement through area (see Appendix C, Section 4.1.1). DDEC is committed to further integration of TK in the construction of caribou crossings for the Jay Road, which would be incorporated into the final design of the road.

DDEC is responsible for engagement with affected Aboriginal people. In taking ownership of the Mine, DDEC is responsible for respecting existing Impact-Benefit Agreements, and abiding by the Environmental Agreement. As well, DDEC has committed to work with communities so that TK is incorporated into the day-to-day operation of the Ekati mine where appropriate (DDEC 2014).

The overall intent of DDEC's Community Engagement Program is to demonstrate and provide hands-on experience for community members (Elders, adults, and youth) so that they may gain a general awareness on how the Ekati Environment Department conducts its day-to-day, site-based, environmental monitoring programs. The goals for community engagement include:

- increase TK inclusion into site-based monitoring programs;
- enhance feedback to communities on TK initiatives;
- incorporate TK input into community development projects;
- incorporate TK input into Ekati-specific projects; and,
- incorporate TK input into reclamation research (DDEC 2014).

DDEC is committed to engaging with communities to explain proposed changes to the WEMP, to listen to comments, respond to questions and consider suggestions to improve the wildlife monitoring programs. DDEC continues to seek recommendations for improvements from the technical and community workshops to incorporate into future versions of the WEMP. Following the WEMP workshop on June 25, 2015, DDEC committed to producing a WEMP engagement plan, which was provided to the Mackenzie Valley Environmental Impact Review Board on July 24, 2015. This engagement plan details DDEC's commitment to engaging communities, government, and IEMA as the Jay Project regulatory process progresses.

3.1 Support of Community-Based Traditional Knowledge Studies

The Ekati mine has a strong history of supporting community-based TK projects that extends back to the mid-1990s. This includes:

- TK studies for the Ekati mine such as *A Tłı̄ch̄q Perspective on Biodiversity* (Dogrib Treaty 11 Council 2000); and *Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati* (Weledeh Yellowknives Dene 1997) and the *Naonaiyaotit Traditional Knowledge Project* with the Hamlet of Kugluktuk and Kitikmeot Inuit Association (KIA) (Banci et al. 2006);
- support of the West Kitikmeot Slave Study (completed) (WKSS 2001);
- the preservation and digitization of older, analogue TK records with the Tłı̄ch̄q Government, the Goyatiko Language Society (Yellowknives Dene First Nation [YKDFN]) and the Łutsek'e Dene First Nation (LKDFN);
- support of heritage research and database compilation with the North Slave Métis Alliance (NSMA);
- the Caribou and Roads Project (KIA);
- the TK Research Project with the YKDFN, which included a site visit with an archaeologist to provide advice on locations of cultural significance around Lac du Sauvage, and to provide advice on the crossing of the esker for the Project (2014); and,
- the What'aa Eskers Research Project with the Tłı̄ch̄q (DDEC 2014).

As part of the Caribou Mitigation Plan (CMP), DDEC has committed to develop a Caribou Monitoring Strategy/Plan with Impact Benefit Agreement (IBA) communities that will be supported by at least \$100,000 (either direct financial and/or in-kind support) annually from the start of construction of the Jay Project until the end of operations. The expectation is that part of this funding would go towards TK-based research. In addition, DDEC has committed to \$1,050,000 in financial offsetting to support the implementation of technically advanced caribou collars, and research in determining the drivers of the zone of influence (ZOI) and factors responsible for the decline of the Bathurst herd. It is also expected that Aboriginal communities and TK Holders would be involved in guiding the research and follow-up for these projects.

In addition to support for research, Ekati hosted numerous site visits and community meetings to discuss archaeology, wildlife, habitat, water and waste management at the Mine site. Representatives from the

communities have also helped design project activities and components in an effort to minimize potential impacts. For example, in 1996, the Tłı̄ch̄o, Inuit, and YKDFN provided information for the development and design of a rope fence to guide caribou around the Mine site and away from the airstrip (BHP 2000b). Other site-based TK and community engagement programs related to the wildlife monitoring programs have included:

- annual youth and Elder visits for caribou monitoring;
- community participation in wolverine and grizzly bear monitoring field programs;
- annual community participation in group workshops and site visits to demonstrate and discuss air quality, dust, and vegetation monitoring, and other specific topics of interest;
- Caribou and Roads program with Kugluktuk Elders group (2004 to 2008); and,
- periodic Winter Road tours.

Ekati mine staff also regularly participate in community-based meetings and workshops to discuss questions and concerns about ongoing mining activities and monitoring programs.

3.2 Incorporation of Traditional Knowledge in Effects Monitoring

With the assistance of community experts, land users and/or TK holders during wildlife and habitat surveys, TK has been used to help understand the results, or provide ways of preventing or reducing impacts to wildlife. Inclusion of TK in the monitoring of caribou, wolf, wolverine, and grizzly bear is provided below.

3.2.1 Caribou

Caribou monitoring programs include satellite collar, aerial surveys, remote camera and ground surveys that document caribou movement, distribution and behaviour at and around the Mine site. Elders and holders of TK are regularly invited to site to participate in monitoring programs and to share their knowledge about caribou behaviour, diet, health and body condition, and migration movements. Since 2011, all the community engagement programs have included youth participants, which was recommended in previous meetings. These programs have provided opportunities for Elders to pass on their TK to youth, youth to provide support to their Elders and the youth to be equal participants (Rescan 2011).

DDEC is committed to providing communities with the opportunity to participate in mitigation and monitoring study designs and programs for the Jay Road, esker crossing, WRSA, and other Ekati mine roads, and provide feedback on the results. Once the Jay Road is constructed, the effectiveness of the caribou crossings will be monitored during community visits to the Ekati mine as part of adaptive management. Monitoring of the interactions between the Jay Road and caribou by communities may also be conducted through the research funding provided in the CMP.

3.2.2 Wolf and Wolverine

As of 2007, Inuit participants in the Caribou and Roads Program recognized that the wolf population around Ekati was beginning to decline. They noted that wolf and caribou have been living together for thousands of years and that wolves will decline with caribou (Banci et al. 2007). The Inuit have recommended that the eskers and denning areas for wolves and wolverines be protected. One of the main concerns was potential impacts on the presence and health of game in the area for hunting and trapping in the future (BHP 1995f). Incidental sightings are reported and den surveys are carried out as part of the WEMP to monitor wolf presence, occurrence, and productivity near the Mine. Overall, wolf presence within the Ekati mine area has been consistent over the last 12 years (ERM 2015).

In 2000 and 2001, the presence of wolverine in the study area was documented through winter track surveys. According to TK, the best time to obtain estimates of wolverine numbers within an area from snow track surveys was during November and December. More of the young animals' tracks could be located within their mother's home range and all the caribou have gone south for the winter and any animals that have followed the caribou will have usually left the area (BHP Billiton 2002). In 2005, 2006, 2010, 2011, and 2015, a cooperative DNA/hair snagging study was undertaken by Ekati and the Government of the Northwest Territories Department of Environment and Natural Resources (ENR) to replace the snow track survey and monitor wolverine density, abundance and movement on a regional scale (Rescan 2012).

3.2.3 Grizzly Bear

At technical and community workshops held in 2010, regulators, monitoring agencies and community members recommended that the mining industry collaborate on a large scale regional grizzly bear program to assess population status and monitor trends over the long term (Handley 2010). In response, DDEC and DDMI agreed to work together on a large scale, grizzly bear mark-recapture study surrounding their diamond mine properties in the central barrens of the NWT (ERM Rescan 2014a).

A hair snagging pilot study was completed jointly by DDMI and Ekati mine in 2010 and 2011 (DDMI 2012; Rescan 2012). Elders, land users and youth from Kugluktuk, Łutsek'e Dene, Yellowknives Dene, and the NSMA participated in site visits for the Community Engagement Program during the initial planning phases of the program and helped Ekati staff identify habitat locations around the Mine for establishing plots for the grizzly bear DNA Program (ERM Rescan 2014a). Elders also guided the specific location of hair snagging stations in the plots. Surveys were completed by a biologist and a community assistant. Hair samples collected from the barbed wire were identified to species by a community assistant and archived for possible DNA fingerprinting to validate species identification (ERM Rescan 2014a).

3.2.4 Traditional Knowledge Inclusion in Effects Mitigation and Deterrents

In 1997, a semicircular arrangement of wooden stakes formed into crosses with lengths of yellow and silver metallic tape was built around Panda Pit and a rope fence with red and pink flagging tape was constructed around part of airstrip. Historically, these deterrents were designed using TK to redirect caribou to specific locations (Dene Cultural Institute 1995). The purpose of this fence was to deter caribou by deflecting individuals and encouraging them to walk parallel to the fence.

Based on the results of the 1997 caribou/fence monitoring and TK, modifications were made to the fence in 1998, increasing its height by the addition of another strand of rope. Observations made during 1998 and 1999 suggested that the fence was largely unsuccessful at deflecting caribou from the airstrip (BHP 1999, 2000a). While some animals would be deterred along the fence, several animals moved through the fence. Therefore, after further consultation with communities, BHP constructed an electric fence, which was in place by the spring of 2000. In 2001, caribou reportedly gained access to the airstrip on several occasions (BHP Billiton 2002). To further reduce the possibility of caribou entering the airstrip area, improvements to the electric fence were made; an additional two strands of electrical wire were added in 2001 and another two were added in 2002, for a total of eight strands (Rescan 2013).

Between 2002 and 2007, participants in the Caribou and Roads Program provided feedback to Ekati staff to help minimize impacts on caribou and other wildlife. The Kugluktuk Elders Advisory Group recommended that more inuksuk (stone markers) be built and made more visible by adding flagging tape, making them larger or painting “hats” on them. They also suggested that inuksuk be rebuilt and moved each year. Inuksuk and berms are now located at intervals around the airstrip, Beartooth Pit, Fox Pit, and other potentially hazardous Mine structures to deter caribou from these areas. They further recommended that BHP Billiton erect a fence to deflect and protect caribou from mining at the Beartooth Pit (Banci et al. 2007). This fence was erected and regular monitoring began in 2007 (Rescan 2008).

In 2010, after three caribou mortalities due to interactions with the electric fence (and previously the rope), the airport electrical fence was removed and replaced with the same type of fencing as at Beartooth, which is a heavy grade 1.3 m high plastic orange fence with a 5 cm diamond shaped mesh. New fences were also installed to deflect animals at the Pigeon Pit and Misery Camps (Rescan 2011). Participants in the 2011 annual monitoring report workshop suggested that Ekati should install fencing around all the open pits to protect caribou and other wildlife, but also noted that caribou observed around the site appeared to be in good health (Rescan 2012).

Roads and other infrastructure have been of particular interest since they can act as potential barriers to wildlife movement. During site visits, Elders have identified potential barriers and hazards to caribou movement including high ridges and sharp rocks along the edges of site roads (Rescan 2011). Communities and regulators have expressed the need to understand better how caribou respond to encountering roads. Over the years, recommendations from the Elders have been implemented through the construction of caribou crossings to allow caribou to cross with greater ease. These crossing ramps have been constructed using crushed rock (6 inches or less in size) so that the side slopes of the road are flatter and provide easier walking for caribou, and were built where caribou trails were present along sections of the Fox and Misery roads. These crossings are intended to minimize habitat fragmentation by increasing the permeability of the roads. With the help of Elders during the Caribou and Roads Program, caribou crossings that required improvement and places where new crossings were needed were identified (Rescan 2006a). Ground and remote camera observations on how caribou interact with the Mine, roads, pits, and traffic are included as part of the annual monitoring program.

4 MITIGATION

The environmental design features and mitigation policies, practices, and procedures that DDEC will implement to avoid and minimize (limit) effects to wildlife abundance and distribution are collectively referred to as mitigation. The WEMP includes a large number of mitigations implemented on a hierarchy of intensity (action) levels and spatial and temporal scales to protect wildlife and wildlife habitat (Appendix E). Standard mitigation hierarchy includes the following classifications (IFC 2012; BBOP 2015):

- **Avoid:** actions taken to completely avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure and engineered designs of facilities (e.g., waste rock storage areas).
- **Minimize:** actions taken to reduce the duration, intensity and/or spatial extent of impacts that cannot be avoided.
- **Reclaim:** actions taken to rehabilitate degraded ecosystems or restore ecological function following exposure to impacts that cannot be completely avoided and/or minimized.
- **Offset:** measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimized and/or rehabilitated or restored. Offsets are achieved once compensation is sufficient that the outcome is no net loss or a net gain for the feature (e.g., VEC) for which compensation was developed. Offsets can take the form of positive management interventions, such as restoration of degraded habitat, arrested degradation or averted risk, and protecting areas where there is imminent or projected loss.

Adverse effects from a mine or development should be mitigated as much as possible using avoidance, followed by minimization, and reclamation. This is because effects that are avoided entirely or minimized mean that the effects from a development prior to implementing reclamation are reduced.

The Ekati mine and Jay Project will use mitigation that avoids, minimizes, and reclaims adverse effects associated with environmental risks or effects pathways. The results of the environmental assessments for the Ekati mine (BHP 1995a; BHP 2000c) and Jay Project (DDEC 2014) indicate that there are no significant adverse environmental effects. However, during the Jay Project EA review, most of the communities and the IEMA contended that cumulative effects from existing developments, other factors, and the Jay Project on the Bathurst caribou herd are significant. As a result, DDEC developed the framework for a CMP to compensate (offset) the residual adverse effects from the Jay Project on caribou. The CMP is to be formalized and completed through further engagement during 2016 and finalized within one year of Ministerial approval of the Jay Project.

Mitigation at the Ekati mine is applied and intensified or reduced within an adaptive management framework (Appendix E). The ability to manage the intensity of mitigation will depend on the type of environmental design feature and mitigation. For example, designing the development footprint to cover the smallest practicable spatial extent is applied at its maximum level and is therefore constant. Other mitigation, such as the use of wildlife deterrents, occur intermittently and are applied as required. The intensity of the application of this kind of mitigation can be implemented through monitoring and adaptive management. For example, the frequency with which wildlife deterrents are applied could increase or decrease, depending on results of monitoring (Section 2.2; Figure 2.2-1). Similarly, if monitoring

demonstrated that wildlife-vehicle collisions were high or increasing, then the scope or frequency of driver training, speed limits, or other mitigation can be managed adaptively in a way that is intended to reduce the effect. Adaptive management could also include increasing monitoring, consideration of alternate mitigation, or implementing a special study to better understand an effect.

4.1 Mitigation Effectiveness at the Ekati Mine

The Jay Project is an extension of the Ekati mine, which has been in operation for 18 years. Various mitigation designs, policies, practices, and procedures have been implemented, monitored, and evaluated at the Ekati mine and other operating mines such as the Diavik, Snap Lake, and Jericho (now dormant) mines. The WEMP assesses the effectiveness or success of different mitigations implemented at the Ekati mine and incorporates the lessons learned through adaptive management. Some of the improvements include modified landfill practices, use of fencing, construction of skirting around buildings, employee education, and monitoring site nesting activity by raptors. A qualitative assessment of the effectiveness of mitigation is provided below.

4.1.1 Non-Vehicle Wildlife Incidents and Mortalities

Employees at the Ekati mine have found that wildlife mitigation efforts to reduce wildlife conflicts with the Mine can vary. For example, the chain-link fence around the Misery camp that was designed to reduce the presence of wildlife in the camp area is only successful if the gates are kept closed and if the fence is maintained in proper function. Once an animal gains entrance, the chain-link fence makes removal more difficult.

4.1.2 Airstrip Deterrents

The airstrip was initially surrounded by a rope fence with electrical flagging tape in 1997. Caribou were observed moving freely between the crossbar structures and the rope without appearing to notice them. Some employees felt that the metallic tape actually attracted caribou rather than deterring them. In an attempt to improve the deterrence, an additional strand of rope was added to the fence in 1998. Based on the results of monitoring this deterrent was not successful and after engagement with stakeholders, an electric fence was added in 2000. In 2001 and 2002, additional electric strands were added to the fence (from 4 to 8) to help prevent caribou from entering the airstrip.

In 2006, inuksuk (traditional rock structures used to deflect wildlife) were added as an additional deterrent to keep caribou away from the airstrip. In response to several mortalities due to interactions with the rope and electric fence, the inuksuk and fence posts were painted to provide greater contrast and all the rope was removed. In response to several more caribou mortalities in 2009 and 2010, the electric fence was removed and replaced with a heavy-weight orange barrier fence.

Caribou have been observed jumping this orange barrier fence, and in 2011, one caribou was euthanized after many attempts to deter the individual from the airstrip. Plans are being developed to heighten the barrier above a caribou's line of sight to prevent caribou from jumping over it in the future (Rescan 2013). Monitoring indicates that wildlife are able to get past the orange barrier fencing, and the effort required for annual maintenance and ongoing airstrip inspection/clearing is high.

4.1.3 Vehicle-Wildlife Collisions

Mitigation efforts to limit vehicle-caribou collisions, such as speed limits, giving animals the right-of-way, radio communication of wildlife presence, and temporary road closures have been successful. No caribou have been killed at the Ekati mine from vehicle collisions. One wolf (2002), a rough-legged hawk (2005), and a short-eared owl (2013) were killed by vehicles (ERM Rescan 2014b). Most wildlife-vehicle collisions involve fox, Arctic hare, ptarmigan, and Arctic ground squirrel.

Radio communications about the presence of wildlife have limited wildlife-vehicle collisions. The placement of wildlife crossing signs is re-assessed when necessary, when habitat around the Mine changes due to operational or reclamation activities, or as new information about habitat use becomes available. The Ekati mine provides employee training about the wildlife right-of-way policy, including how the Environment Department responds to the calls.

A substantial addition to the WEMP was the deployment of 90 motion sensor wildlife cameras to monitor the interaction of wildlife with Mine infrastructure, with a particular focus on Misery Road (Rescan 2013). The program has provided information on primary caribou movement paths along the Misery Road.

DDEC is currently reviewing the construction and placement of Misery Road berms. The goal of this review is to explore options to minimize caribou deflections from the road while still maintaining compliance with the *NWT Mine Health and Safety Act*.

DDEC has implemented several mitigation practices to minimize potential interactions between Mine-related traffic and wildlife:

- hunting, trapping, harvesting, and fishing are prohibited at the Ekati mine site by all employees and contractors;
- wildlife always have the right-of-way;
- speed limits are posted and enforced; speed limits are 60 km/h along haul roads, and 20 km/h and 40 km/h along other roads;
- vehicles encountering wildlife on roads are required to stop and communicate the presence of wildlife on the road(s) to the Environment Department and others in the area;
- roads are temporarily closed, and these closures are communicated site-wide when wildlife are in the vicinity of the road;
- wildlife carcasses on or near roads are removed to minimize the attraction of predators and scavengers to roads and road edges where they would be at an increased risk of colliding with vehicles;
- wildlife crossing signs are erected at sections of road where wildlife crossings are frequent, or in areas where animals reside near roads;
- visual inspections at the airstrip for wildlife are completed prior to take-off and landing of all aircraft;
- a barrier fence is maintained around the airstrip to deter wildlife from the area;
- a fence is maintained around Misery Camp to prevent wildlife from entering;

- inuksuit are placed at intervals around the airstrip, Pigeon Culvert, Fox Haul Road, and other potentially hazardous Mine structures to deter caribou from these areas; and,
- TK is utilized to enhance caribou monitoring activities.

4.1.4 Waste Management

Mitigating the attraction of carnivores and scavengers (e.g., gulls and ravens) to food garbage, petroleum products, and potential shelter has been an on-going concern at all operating mines. A major improvement in mitigation occurred with a re-design of the Ekati mine landfill in 2002. Prior to the changes, the landfill was a stand-alone facility, covered occasionally with waste rock. In 2002, the Ekati mine incorporated the landfill directly into the waste rock pile. This led to much more frequent covering of garbage, and with improvements to employee education, the percent of landfill inspections where attractants were observed dropped from over 90% to 65% from 2001 to 2003 (BHP Billiton 2004). The number of scavengers present at the landfill was also reduced.

There are indications that improved and continual employee education has resulted in a decrease in the presence of scavengers and food waste items at landfills (Rescan 2010). Specifically, training and education is provided for each department at the Ekati mine and new employees on the importance of following waste management policies and practices, and wildlife awareness to reduce interactions with wildlife. Changes in the operations of waste management practices, in addition to the education and awareness programs for new and current employees include:

- more frequent burning of camp waste in order to reduce chance of wildlife encounters;
- juice boxes are no longer used;
- signs have been added in lunchrooms and additional labels have been added to waste bins to indicate proper waste disposal; and,
- removal of bear proof outdoor waste bins.

The use of skirting on buildings at the Ekati mine has also successfully prevented wildlife from accessing the area underneath buildings as shelter or dens (Rescan 2008). Skirting is most effective if wire mesh, sheet metal sheathing or other chew-resistant material is used and frequent monitoring of the skirting integrity is necessary to prevent wildlife being trapped under buildings.

4.1.5 Open Pits

Open pits may lead to wildlife injury or mortality through the presence of steep sides, fly rock, and traffic. No caribou or other wildlife mortalities from animals entering the open pits at the Ekati mine have been reported (ERM Rescan 2014b). At high risk areas, heavy weight orange barrier fencing was erected to mitigate hazards to caribou and other wildlife. At Beartooth Pit, a single line of fencing was installed in 2006 on the northeast side to deflect caribou around the immediate area, which demonstrated that fencing of this nature can be effective. At Pigeon, a similar type of heavy weight orange barrier fence was placed around the test pit after its completion in 2011. No caribou have been seen inside the Pigeon fence.

Monitoring has been introduced to detect possible nesting by raptors and ravens at the Ekati mine. In 2002, there were two instances of rough-legged hawks nesting or attempting to nest within open pits and a peregrine falcon nested on the stairs of a fuel tank (BHP Billiton 2002). Following these instances, monitoring was implemented each spring to detect nesting behaviour before egg-laying occurred. Mitigation is completed case-by-case in consultation with GNWT, but may include removing or covering the nest or isolating the area from disturbance, depending on the level of risk to the birds. Other types of deterrents that have been less successful in the past include propane cannons, noise makers, and bear bangers. DDEC will not deter birds from nesting in inactive pits. 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. For example, a 250 m work exclusion buffer zone was applied to a falcon nest in an active pit in 2013.

4.1.6 Dust

The Ekati mine produces dust through various sources including blasting and crushing rock, road construction and traffic. As noted in the Traditional Land Use and Traditional Knowledge Baseline Report, concern exists that dust from the Mine could affect animal migration (e.g., caribou), small furbearing animals, birds, hatching birds and birthing animals, vegetation, fish (and specifically in the Lac de Gras area), plants and water (and specifically plants and water to the east of development activity). DDEC will manage dust and particulate emissions with water and chemical suppressant application to control dust emissions on haul roads and the Ekati mine airstrip during summer or the non-frozen period.

Dust is predicted to settle in the area near and around the Mine; however, mitigation and monitoring of dust will not be addressed in the WEMP. Mitigation to control dust at the Ekati mine has included watering and applying dust suppressant to the roads, and monitoring is completed through the AQMMP. The Ekati mine implemented a dustfall monitoring program in 2006 to determine the deposition patterns of fugitive dust from haul roads and other mining activities, which by 2008 was expanded to include additional monitoring stations. The objective of this monitoring program is to assist in determining effective mitigation strategies and monitor performance, based on collected dustfall data.

Further studies on the rate and spatial extent of dust deposition, triggers for adaptive management, and the effectiveness of mitigation methods to limit dust generation are part of the Air Quality and Emissions Monitoring and Management Plan (AQEMMP) for the Jay Project (Section 2.4 DDEC 2017). For example, as part of the CMP and AQEMMP, DDEC will expand the pilot study on determining the effectiveness of dust suppressants along the Misery Road. If successful, the suppressant would be applied to all roads at the Ekati mine as an off-site offset for the Jay Project. Best practices will be shared with other operators, which if successfully used would also be considered as off-site offsetting. Information from the AQEMMP will be also used to help assess the potential drivers of detected changes in the ZOI on caribou distribution and behaviour (see Sections 5.6.5 and 5.6.6).

4.1.7 Health Effects from Contaminants

Further research on metals bioaccumulation related to caribou interaction with processed kimberlite deposited in the LLCF will be conducted as part of DDEC's Reclamation Research Plan (Rescan 2006b). In addition to the reclamation research, an increase in the frequency of wildlife surveys in the LLCF commenced in 2012 to provide a better understanding of wildlife activity as reclamation activities progress.

4.2 Mitigation of Key Environmental Risks or Pathways

Similar to the environmental assessments for the Ekati mine (BHP 1995a; BHP 2000b) and Jay Project (DDEC 2014), the WEMP provides specific mitigation for each of the following key environmental risks or pathways:

- direct habitat alteration and loss;
- indirect habitat alteration and loss;
- barrier to caribou movement and migration from roads and associated power lines and pipelines; and,
- protection to caribou and other wildlife from direct Mine-related mortality.

4.2.1 Direct Habitat Alteration and Loss

Direct habitat loss refers to the physical disturbance and immediate loss of wildlife habitat (e.g., upland and riparian vegetation, wetlands, and water) within the footprint of the Ekati mine. Direct habitat disturbance occurs during construction, such as the creation of roads, WRSAs, core Mine facilities, and increased water levels in local lakes and streams. Direct habitat loss is monitored in the WEMP.

Mitigation for direct habitat loss is designed so that the physical footprint of the Ekati mine does not exceed that authorized in the Land Use Permits and includes the following.

- maintain downstream flows within the natural range of variability;
- maximizing the use of the existing Ekati mine infrastructure for the Jay Project to reduce the environmental footprint to the extent practical;
- new access roads will be as narrow as feasible, while maintaining safe construction and operation practices;
- only one access road crosses the Lac du Sauvage esker, and will be constructed as a caribou crossing;
- the cut through the esker will be aligned to minimize the amount of material removed;
- existing (Misery) and new (Jay) power lines will be parallel to the haul roads to avoid additional fragmentation and minimize the environmental footprint;
- a pipe bench will be constructed to accommodate the pipelines, which will follow existing and proposed road alignments to the extent practical to minimize the Jay Project footprint;
- pipelines will be covered with crushed rock at caribou crossings;
- soil disturbance will be limited to only those areas required for construction and operation of the Jay Project;
- existing Misery and Lynx pits will be used for dewatering and minewater management, limiting the requirement for additional areas to be disturbed for minewater management;

- management practices already in place at the Ekati mine will be implemented to control erosion and sediment;
- progressive reclamation activities may be scheduled as part of the ICRP for mine areas where there is no potential for future benefits or business opportunities, or in areas where there is immediate environmental risk; and,
- conditions will continue to be monitored over time to evaluate the success of the ICRP and, using industry best practice, adaptive management, and newer proven methods as available, to adjust the ICRP as necessary and appropriate.

4.2.2 Indirect Habitat Alteration and Loss

Indirect habitat loss is a result of a decrease in the perceived quality of habitat by wildlife and subsequent changes in movement and behaviour of individuals that occurs outside of the Ekati mine footprint. These changes in movement and behaviour can affect the local abundance and distribution of animals. Changes in movement and behaviour in wildlife can result from sensory disturbance around mining operations (i.e., a ZOI), which may be caused by dust deposition, noise, lights, general human activity, and animal memory of previous encounters with industrial developments. Thus, sensory disturbance can reduce habitat quality for wildlife even where vegetation remains intact.

Currently, it is expected that DDEC will monitor Ekati mine's contribution to cumulative indirect habitat alteration and loss for caribou (ZOI; Section 5.6.5) through regional programs in collaboration with ENR, potentially through the Barren-ground Caribou Management Strategy (Section 5.6.1). Any Ekati mine potential mechanism for the ZOI that is monitored will be completed through the WEMP or other plans such as the AQEMMP. For example, dust has been proposed as a potential mechanism for a caribou ZOI and is monitored through the AQEMMP.

Mitigation is intended to reduce the changes to less than the ZOI predicted in the DAR (15 km; DDEC 2014), and includes the following:

- regular maintenance of equipment to limit noise and particulate matter emissions will continue at the Ekati mine;
- dust suppression will be applied as appropriate to roads, airstrip, and laydown areas;
- speed limits are posted and limit fugitive dust;
- use of existing surface facilities will limit the area disturbed during construction of the Jay Project and minimize the quantity of new sensory disturbances;
- use of shielded lighting fixtures for infrastructure associated with the Jay Project will be considered;
- only one access road crosses the Lac du Sauvage esker, and the intersection will be constructed as caribou crossing;
- the Jay WRSA is set back 200 m from the Lac du Sauvage esker;
- wildlife always have the right-of-way;

- kimberlite stockpile areas have been designed in strategic locations that facilitate continued Mine operations through short-term and long-term of road closures (Section 4.5);
- Misery Road surface height was constructed close to surrounding land surface to facilitate crossing for caribou and other wildlife;
- wildlife crossing signs are erected at sections of roads where wildlife crossings are frequent, or in areas where animals reside near roads;
- minimum flying altitude of 600 m above ground level (except during takeoff and landing and field work) will be maintained for cargo, passenger aircraft, and helicopters outside of the Mine site;
- vehicles are restricted to designated roads and prepared work areas (recreational use of off-road vehicles is prohibited);
- continued education and environmental sensitivity training will be provided to employees and contractors; and,
- continue to use TK to enhance caribou monitoring activities and adaptive management.

4.2.3 Barrier Effects from Roads

The physical presence of roads and associated traffic can also cause wildlife to alter their movement and behaviour. Depending on species and traffic volume, some animals may cross roads, be deflected along roads before crossing, or completely avoid roads. Increased traffic along the Misery and Jay roads, and associated power lines and pipelines that results in barriers to the movement of caribou and other wildlife the Ekati mine site is a key concern for DDEC, communities, IEMA, ENR, and the public. In the DAR for the Jay Project, DDEC proposed to construct caribou crossings at appropriate discrete locations along the Jay Road (DDEC 2014). However, because of input from Aboriginal communities, ENR, IEMA and the Mackenzie Valley Environmental Impact Review Board during the engagement and environmental review process, DDEC has changed the approach to caribou crossings along the Jay Road to reflect that feedback. Furthermore, a specific Caribou Road Mitigation Plan (CRMP) has been developed to avoid and minimize effects from roads at the Ekati mine on wildlife mortality and barriers to movement (Appendix C).

Because of the importance of the esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing using crushed rock (6 inches or less in size) (Section 3). The pipelines will be covered with crushed rock at caribou crossings, except where there are valves or joints that require visual inspection for safe operation as per the NWT *Mine Health and Safety Act*. DDEC will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing. Most of the main section of the Jay Road will be constructed as a caribou crossing to enable caribou movement through area, which was identified as an important migration route by communities and baseline studies on historic trail mapping (Appendix C; Section 4.1.1). The road design allows for approximately 2.0 km of caribou crossings over a total length of 2.8 km between JR1+100 (close to King Pond) and JR3+865 close to the intersection with the Jay North Road (i.e., 70.9% of the road will be built with caribou crossings). This includes a 1.3 km stretch of road through the esker. Two additional caribou crossings will be added to the

Jay North Road and one crossing will be added to the eastern section of the Jay Road towards the dike (Appendix C; Section 4.1.1).

The response of caribou to the Misery and Jay roads, and the effectiveness of mitigation will be monitored in the WEMP and include Aboriginal community members. Mitigation is intended to avoid and limit the barrier effects from roads on caribou and other wildlife, and includes the following.

- only one access road crosses the Lac du Sauvage esker, and the intersection will be constructed as a caribou crossing;
- an increased number of caribou crossings will be constructed along the main section of the Jay Road (i.e., between King Pond Dam and the approach to the active operations area at Lac du Sauvage) to enable caribou movement through area;
- caribou crossings will be constructed using crushed rock (6 inches or less in size) so that the side slopes of the road are flatter and provide easier walking for caribou than the large roadfill rock;
- pipelines will be covered with crushed rock at caribou crossings, except where there are valves or joints that require visual inspection for safe operation;
- roads will be designed that have low side-slopes and low banks to facilitate caribou crossing, except in areas where rock berms are necessary to adhere to regulatory requirements;
- road snow berm height will be managed during winter;
- kimberlite stockpile areas have been designed in strategic locations that facilitate continued Mine operations through short-term and long-term road closures;
- wildlife always have the right-of-way;
- speed limits are posted and enforced;
- vehicles encountering wildlife are required to communicate the presence of wildlife on roads;
- four levels of mitigation and monitoring are included in the CRMP, and the intensity of mitigation and monitoring increases when specific action levels (triggers) are met (Appendix C);
- speed limits will be reduced, and short and long-term road closures may be implemented according to action levels in the CRMP; and,
- DDEC will work with communities to monitor caribou movement and effectiveness of mitigation and provide feedback to adaptive management.

4.3 Protection of Caribou and Other Wildlife

Occasionally, mining operations have contributed to the mortality or injury of wildlife. This may be either accidental (such as vehicle collisions with wildlife), or the deliberate removal (re-location or intentional destruction) of problem wildlife to protect worker safety. Deterrent actions always start with the least intrusive method and then increase with intensity as needed. In the past, an effective way to reduce wildlife mortality has been to establish and enforce low speed limits on Mine roads. Reducing the availability of food and shelter for wildlife, thus limiting the attraction and presence of animals within the

Ekati mine, is also highly effective at preventing mortality or harm to wildlife. Incidents and mortalities, and effectiveness of mitigation for the protection of caribou and other wildlife are monitored in the WEMP.

4.3.1 Direct Mine-Related Mortality and Injury

Mitigation to avoid and limit direct Mine-related mortality and injury to caribou and other wildlife from collisions with vehicles or aircraft, physical hazards (e.g., pits, blasting), Jay Project fish-out, and destruction of migratory bird nests includes the following:

- implementation of the CRMP (Appendix C);
- the current mitigation policies and practices for safety of wildlife on roads, airstrip and other areas of the Ekati mine will be continued (Section 4.1). These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff;
- site environmental technicians will investigate all caribou and other wildlife incidents and mortalities, report to government, and recommend follow-up;
- routine, systematic monitoring of different areas of the Ekati mine will be conducted, including the Jay Project dike, pit area, and WRSA. Information collected will be used for adaptive management;
- the Jay WRSA will have caribou egress ramps to allow animals to exit the structure. DDEC will ask for input from TK Holders and communities on the design of the ramps;
- caribou and other wildlife will be deterred from areas of risk;
- a blasting plan will be implemented to protect caribou and other wildlife from fly-rock during the early stages of pit development (i.e., until the pit is deep enough to contain fly-rock);
- a fish-out plan will be developed for the Jay Project, and will include a mitigation strategy for minimizing the risk of mortality and injury to diving birds. The mitigation strategy will be developed through engagement with Environment and Climate Change Canada, and the fish-out will be monitored to determine the effectiveness of mitigation. Results will be provided in the annual monitoring report;
- wildlife always have the right-of-way;
- speed limits are posted and enforced;
- mitigation is currently in place to minimize human-wildlife interactions, including awareness training;
- pit wall monitoring procedures for raptor nests implemented at the Ekati mine will include the Jay Project;
- birds showing nesting activity in areas of critical risk will be actively deterred. DDEC will not deter birds from nesting in inactive pits;
- if a peregrine falcon, gyrfalcon or rough-legged hawk 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. Nests will be monitored for success and results provided in the annual monitoring report.

- mine-altered waterbodies will be regularly monitored for use by migratory birds, and data collected will be used for adaptive management;
- guy wires are secured and removed if deemed unnecessary;
- visual airstrip inspections for wildlife are completed prior to take-off and landing of all aircraft;
- a barrier fence is maintained around the airstrip to deter wildlife from the area;
- a fence is maintained around Misery Camp to prevent wildlife from entering;
- inuksuit (traditional rock structures used to deflect wildlife) are placed at intervals around the airstrip, Pigeon Culvert, Fox Haul Road, and other potentially hazardous Mine structures to deter caribou from these areas;
- wildlife carcasses on or near roads are removed to minimize the attraction of predators and scavengers to roads and road edges where they would be at an increased risk of colliding with vehicles;
- vehicles encountering wildlife on roads are required to stop and communicate the presence of wildlife on the road(s) to the Environment Department and others in the area;
- the power line will incorporate perching deterrents on poles including cone-shaped pole caps and cross arm perch preventers to prevent large birds from perching and nesting on poles or on dangerous areas around phase conductors;
- bird deterrents (e.g., spinning reflectors) will be installed on the power line in identified areas of concern (e.g., near waterbodies known to represent staging areas); additional locations will be identified through monitoring of bird strikes along the power line;
- to the extent practicable, vegetation clearing will occur outside of the migratory bird nesting period;
- if vegetation clearing is required during the sensitive migratory bird nesting period (May 20 to August 17), activities will be managed to comply with the *Species at Risk Act* and the *Migratory Birds Convention Act*. Non-intrusive survey methods will be used to search the area for nesting activity prior to clearing. Environment and Climate Change Canada will be consulted to determine the most appropriate search method; and,
- Environment and Climate Change Canada (Environment Canada 2015) recommended setback (buffer) distances specific to species groups be implemented around nests detected during pre-clearing (Table 4.3-1). Implementation of setback distances will be based on further discussion with Environment and Climate Change Canada to determine the most practicable setback distances for protecting migratory birds within an adaptive management framework, and how best to monitor the success of such nests. Results will be provided in the annual monitoring report.

Table 4.3-1 Environment and Climate Change Canada Recommended Setback Distances for Nests of Migratory Birds Species Groups

Species Group	Setback Distance for Pedestrians/All-Terrain Vehicles (m)	Setback Distance for Clearing and Construction Activities (m)
Songbirds	30	100
Shorebirds	50 ^(a)	100 ^(a)
Terns/gulls	200	300
Ducks	100	150
Geese	300	500
Swans/loons/cranes	500	750
Rusty blackbird	300	300
Short-eared owl	1,500	1,500
Red-necked phalarope	100	100

a) If project activities may disturb nest of American golden plover, then setbacks should increase to 150 m and 300 m for pedestrians and clearing, respectively.

4.3.2 Management of Toxic Substances

The following mitigation policies and procedures are intended to decrease the risks to caribou and other wildlife from ingestion of toxic substances or encounters with toxic spills on the Ekati mine site:

- regular equipment maintenance (e.g., regular checks for leaks);
- drip trays are used during servicing and refuelling;
- hazardous substances are stored and handled on site in accordance with applicable regulations;
- fuel is stored at a central bulk fuel farm at the Ekati main camp and at satellite fuel farms located at Misery, Fox, and Koala North. Fuel tanks are housed within bermed areas;
- follow Ekati's Spill Response Plan in the event of a spill (spill response training is provided and updated);
- soil and snow affected by hydrocarbon spills will continue to be handled in accordance with the existing Hydrocarbon-impacted Materials Management Plan and soil will be remediated in the landfarm or shipped off-site;
- dewatering and minewater management in the Wastewater and Processed Kimberlite Management Plan will include the pipelines used for ongoing water management of the Jay Pit;
- minewater and fine processed kimberlite slurry pipelines will be monitored and inspected throughout construction (i.e., dewatering of diked area), operations, and closure. Additional mitigation will be applied, if required; and,
- any leaks or spills identified along the pipelines will be addressed and clean-up, and if required, will be implemented following the existing Spill Contingency Plan.

4.3.3 Management of Attractants

The following mitigation and management plans are intended to reduce the numbers of predators and scavenging wildlife (such as carnivores, gulls and ravens) attracted to the Ekati mine, and avoid and limit human-wildlife interactions and changes to predator-prey relationships.

- apply the Waste Management Plan, Landfill Management Plan, and Incinerator Management Plan;
- separate bins will be located throughout the accommodations complex, shops, and other facilities on-site for immediate sorting of domestic wastes;
- food wastes will be collected in specific bins for transport directly to the incinerator storage area for incineration;
- incinerator is enclosed and camp waste is burned regularly;
- littering and feeding of wildlife is prohibited;
- raised, heated buildings will be skirted to prevent wildlife access to shelter under the buildings, and monitored regularly;
- wildlife activity will continue to be monitored at waste management areas, and provide feedback into adaptive management;
- landfill sites and waste storage areas will be inspected;
- the efficiency of the waste management program will be reviewed as needed and improved through adaptive management;
- education and reinforcement of proper waste management practices and issues surrounding wildlife habituation is provided to all workers and visitors to the site; and,
- a chain-link fence is maintained around Misery Camp to prevent wildlife from entering.

4.3.4 Deterring Wildlife

The goal of wildlife deterrent action is to respond to situations using humane methods that keep both humans and wildlife safe. Wildlife will only be deterred when there is a risk to either humans or wildlife, as judged by the environment staff. All deterrent actions start with the least intrusive method, and then increase in intensity as needed. Each deterrent action will stop as soon as the animal moves away from the potentially hazardous site and no longer poses a threat to humans. Deterrents may be used to remove wildlife from the airstrip and potentially hazardous sites and activities. All deterrent actions will be documented and reported to ENR. Specific deterrent actions for caribou consider the following:

- all incidents involving interactions, use of deterrents or potential injury of caribou will be documented and evaluated;
- caribou will only be moved away from roads or the airstrip under specific circumstances, such as when there are incoming flights or if there is an emergency; and,

- caribou will be deterred from the airstrip by driving a truck down the strip, getting out of the vehicle, and making noise by yelling and, if required, firing bear bangers (this will only be done when there is an imminent flight scheduled to land at the airstrip and an immediate need to mitigate risk to human or wildlife safety).

4.4 Education

Environmental education is part of every employee's mandatory training upon starting at the Ekati mine. Environmental education training includes:

- review of Corporate Sustainability Policy;
- wildlife awareness;
- spill reporting;
- wildlife reporting policy;
- Workplace Hazardous Materials Information System (WHMIS); and,
- waste management.

The environment department also provides role and department-specific training and presentations based on seasonal environmental issues. For instance, haul truck drivers will be given presentations prior to the Bathurst herd spring migration reminding them of mitigation and alerting them to the increased likelihood of caribou presence.

4.5 Mitigation Review

The mitigation in the WEMP stems from current practices at Ekati and existing mines; however, an annual review system is required to evaluate the mitigation. A review will be undertaken to evaluate the following:

- which mitigation has been implemented;
- which mitigation is perceived to be or shown to be successful;
- if new mitigation has been implemented in response to new issues; and,
- if some mitigation has become redundant or ineffective.

The mitigation review will be provided in the annual monitoring report.

5 MONITORING

5.1 Direct Wildlife Habitat Loss

DDEC has monitored the cumulative annual amount of direct habitat loss accrued from the construction and operation phases of the Ekati mine since 1998. These losses were anticipated and approved through the Environmental Impact Assessment process (i.e., the Environmental Assessment Review Panel and the environmental assessment conducted for Sable, Pigeon, and Beartooth pits in 2000).

Past Scope and Improvements

In 1997, an Ecological Land Classification (ELC) system for the Lac de Gras area was developed as part of the original Ekati Environmental Impact Statement. This system identified 11 ELC units or habitat associations and was used to model predicted habitat loss at Ekati. A subsequent study conducted by Epp and Matthews (1998) and Matthews et al. (2001) classified the entire Slave Geological Province into 15 units or habitat associations. Since 2000, this 15 unit ELC system has been used to assess the amount of habitat loss per habitat association at Ekati.

Objectives

The objective for this component of the WEMP is to:

- determine the amount of direct habitat loss due to Ekati activities.

Methods

The cumulative area of direct habitat loss is determined by superimposing the current Mine footprint on the pre-development (i.e., baseline) habitat map of the study area using GIS software. Both the Mine footprint and the baseline habitat map were developed from LANDSAT Thematic Mapper satellite imagery. Direct habitat loss is measured by classifying pre-disturbance land cover into 15 habitat types (Table 5.1-1) that represent an association of vegetation, soil, and moisture characteristics, using the ELC system. Direct habitat loss is measured in hectares (ha) and determined from cumulative annual changes in the Mine footprint. Disturbed areas that are under reclamation will be included in tabulated results.

Table 5.1-1 Description of Habitat Types within the Ekati Study Area

Habitat Type	Description
Bedrock complex (>80% rock)	Exposed bedrock with very little vegetative cover.
Birch seep/riparian shrub	Vegetation in areas of active water seepage through boulder fields and boulder streams. Moist and well drained areas of low shrub with continuous vegetation cover. Birch and willow species dominate these areas.
Boulder complex (>80% rock)	Large areas of boulder fields including boulder outcrops, boulder streams, and drainages. This land cover type supports very little plant growth.
Deep water (>2 m)	Deep, clear lakes and major river systems with water depths greater than 2 m.
Esker complex	Linear structures of sand and gravel, formed by glacial rivers that provide significant topographic relief. Eskers support a number of plant communities and are important to wildlife. Esker tops are wind-swept and accumulate very little snow during winter.

Table 5.1-1 Description of Habitat Types within the Ekati Study Area

Habitat Type	Description
Heath tundra (<30% rock)	Closed mat plant community that grows on moderate to well drained soils, covering most of the upland areas. Plants generally belong to the heath family (<i>Ericaceae</i>) and vegetation covers at least 70% of the ground surface.
Heath tundra (30-80% bedrock)	Sparse heath tundra and bedrock outcrops are exposed; vegetation is discontinuous and described as open mat heath tundra.
Heath tundra (30-80% boulder)	Open mat plant community with heath tundra and boulder fields.
Lichen veneer	Flat islands, low peninsulas, and esker tops are covered with a continuous mat of lichen that appears as "veneer." Sites are windswept and dry, allowing very little plant growth.
Riparian tall shrub	Linear plant associations of birch, willow, and alder that follow active stream courses, usually with a cobble or boulder substrate. Under-storey plant species may include dwarf raspberry, dwarf marsh violet, cloudberry, grasses, sedges, club mosses, and common horsetail.
Sedge wetland	Wet sedge meadows and other sedge associations of non-tussock plant species. Sedge species such as <i>Carex aquatilis</i> and <i>C. bigelowii</i> , and cotton grass (<i>Eriophorum angustifolium</i>) are dominant vegetation types within wet, low lying sites where standing water is present throughout much of the growing season.
Shallow water (<2 m)	Waterbodies that contain submergent or emergent vegetation with water depths less than 2 m.
Spruce forest	Spruce-lichen woodland in lowland, sheltered areas such as river valleys. Typically clumped forest in a predominantly tundra landscape.
Tussock/hummock	Plants belonging to the sedge family (<i>Cyperaceae</i> spp.) are dominant, and tussock cotton grasses such as <i>Eriophorum vaginatum</i> and <i>E. russeolum</i> are common. These sites are drier and less frequently flooded than sedge wetlands.
Unclassified	Pixels (the smallest sub-division of the mapped area) that could not be successfully assigned to one of the above classes are considered to be unclassified.

Source: Matthews et al. (2001).

> = greater than; < = less than; spp = multiple species.

Frequency

Mine footprint updates will be provided annually and will include the construction of the Jay Project.

Data Analyses

Analyses will be completed in a GIS platform to compare predicted and observed cumulative area of ELC units altered due to Mine activities, including revegetated areas. The area and percent area of each habitat type directly disturbed by the Ekati mine will be included in the annual monitoring report.

5.2 Waste Management

Waste is managed to minimize the presence of attractants and toxins in the Ekati and Misery landfills. Unlike a municipal landfill (which contain batteries, various chemical wastes, and food wastes), no reactive products or food waste products are permitted in the Ekati and Misery landfills. Waste is sorted by using specific garbage containers for each type of waste (e.g., oil rags, used absorbent pads, oil and fuel filters, used grease, aerosol cans, incinerator waste, and inert waste). Hazardous materials such as

oil filters, paint, and batteries are transported off the Mine site for recycling. Food-contaminated wastes (such as lunch bags) and most wood products are segregated and incinerated, with the remnant ash deposited into landfills. Beginning in 2011, wooden pallets and heavy cardboard containers are being segregated for recycling. Inert wastes (such as treated wood and metal) are placed directly in the landfills, and recyclable materials are segregated at the landfill. Attractants and hazardous materials are sometimes misdirected to landfills, where they may be available to wildlife. Therefore, as part of the WEMP, DDEC monitors the waste in the landfills.

As part of the Waste Management Plan, waste is collected at source waste bins on a regular basis for redirection to final disposal. Waste bins destined for landfills are monitored regularly.

This component of the WEMP is designed to address the following residual risk identified in the 2012 EIR (BHP Billiton 2012):

- at Ekati, the habituation of carnivores to the presence of humans is managed; however, there is still a safety risk for humans that can lead to the destruction of an animal.

5.2.1 Landfill Monitoring

Past Scope and Improvements

Surveys of the Ekati Landfill site have been conducted since 1999. The Misery Landfill survey was initiated in 2001, after Misery Road was completed in 2000. From 1999 to 2001, surveys were conducted only during summer months. In 2002, winter surveys from October to mid-April were added to monitor both Ekati and Misery landfills.

In 2002, further improvements were made to reduce the attractiveness of landfill sites to wildlife. Modifications included enclosing the landfill with a large berm and a single entrance. The dumping area was clearly marked and the added garbage was covered with 30 cm of rock. From 2004 onward, photographs and descriptions of wildlife behaviour were included in landfill surveys to identify habituated animals.

Due to a temporary suspension of Misery Pit operations, Misery Camp was officially closed on April 29, 2008, and had limited activity through 2010. Operations in Misery Camp recommenced in 2011 in preparation for the reactivation of Misery Pit in 2012. The Misery incinerator was not active in 2009, 2010, or 2011; however, the Misery Landfill was open for disposal of any inert materials from exploration activities and inspections were conducted by DDEC staff until September 2011 when the landfill access was closed.

Objectives

The objective of this component of the WEMP is to:

- determine whether the Ekati landfill contains potential wildlife attractants or evidence of wildlife visitation and habituation.

Methods

The survey involves visual investigations of the Ekati landfill on foot. The amounts and types of animal attractants (e.g., food, food packaging, oil products, and oil-contaminated wastes) and other misdirected wastes (e.g., batteries and aerosol cans) will be recorded. The availability of attractants will be categorized as none, low (1 piece), medium (2 to 5 pieces), high (6 to 10 pieces), and very high (>10 pieces). All attractants and other misdirected wastes will be safely removed and properly discarded.

The presence of wildlife and wildlife signs (such as tracks and scats) will be recorded during surveys. Photographs will be taken of most wildlife sighted, and behaviour of animals will be observed and recorded to determine if animals are habituated.

Frequency

Surveys will be conducted at least twice per week throughout the year. More inspections may be undertaken if required.

Data Analyses

Data analyses will be completed to identify trends over time in the number of wildlife attractants observed at the landfill. Analyses will also attempt to identify any further mitigation that would improve the effectiveness of the Waste Management plans with respect to wildlife.

5.2.2 Waste Bin Monitoring

Past Scope and Improvements

Since 2001, waste bins have been monitored for misdirected waste. In 2004 and 2005, improvements were made to the waste bin monitoring that included colour coding waste bins, and updating waste bin labelling for better tracking and recording. Since 2006, site departments responsible for specific waste bins are required to remove attractants if found.

Due to temporary suspension of Misery Pit operations, waste bins were removed from site after the Misery Camp was officially closed on April 29, 2008; therefore, in 2009 and 2010, waste bin surveys were only conducted at Ekati main camp. Expansion of Misery Camp began in 2011 in preparation for the reactivation of Misery Pit in 2012, and waste bins at Misery Camp were once again surveyed in 2011.

Objectives

The objective of this component of the WEMP is to:

- monitor the misdirection of wildlife attractants and hazardous wastes to waste bins to avoid and minimize possible wildlife incidents at these locations.

Methods

The amount and type of animal attractants (e.g., food, food packaging, oil products, and oil-contaminated wastes) and other misdirected wastes (e.g., batteries and aerosol cans) within the bins will be counted, recorded, and removed if possible. All attractants and misdirected waste will be reported to environmental

staff. The supervisor of the area served by the contaminated waste bin will be contacted regarding the removal of all misdirected wastes from waste bins prior to disposal in landfills.

Frequency

The waste bins will be surveyed approximately three times every two weeks. The survey involves a visual investigation of up to 47 waste bins.

Data Analyses

Data analyses will be completed to identify trends over time in the amount of misdirected waste and the type of animal attractants. Analyses will also attempt to identify any further mitigation that would improve the effectiveness of the Waste Management plans with respect to wildlife.

5.3 Wildlife Mortalities

At the Ekati mine, natural and human-caused wildlife mortalities are monitored within the study area. Wildlife mortality is monitored to maximize wildlife and human safety. Wildlife carcasses can attract carnivores to the Ekati study area, creating risks for both carnivores (e.g., if carnivores are attracted to the road by carrion and subsequently get hit by a vehicle) and people who encounter them. Mitigation, such as removing carcasses, is used to avoid any potential negative interactions between wildlife and humans. As part of the WEMP, all wildlife mortalities are recorded and descriptions are reviewed to determine if Mine operations contributed to a mortality event. Documenting mortalities also provides feedback for adaptive management.

Past Scope and Improvements

From 1998 to 2001, only Mine-related mortalities for wolverine, fox, and grizzly bear were provided in the annual monitoring reports. Improvements in the reporting procedures were made in 2002 to include more detail and comprehensive reporting for all wildlife mortalities, including both Mine-related wildlife mortalities and natural deaths. Mortalities of VEC and non-VEC species (e.g., hare, ground squirrel, and ptarmigan) were recorded. During the 2010 reporting period, DDEC Environment staff reviewed, communicated, and followed a "Mortality Reporting" protocol developed in consultation with ENR that includes mortality reporting procedures required by ENR and Environment and Climate Change Canada.

Objectives

The objectives for this component of the WEMP are to:

- document and mitigate potential effects of Mine activities on wildlife; and,
- reduce risks to both wildlife and people.

Methods

Wildlife mortalities observed by DDEC staff will be reported immediately to the Environment Department, and an inspection by Environment staff will be made to determine the probable cause of death. Obvious injuries, the position of the animal, and anything considered unusual is photographed and recorded. Further information such as time, date, location, estimated time of death, and any sightings of other wildlife in the area are also recorded.

Wildlife mortality details will be reported to either ENR or Environment and Climate Change Canada each time an animal is found dead anywhere in the Ekati study area, including the area near the Jay Project. In all of the above circumstances, the regulating organization will be consulted regarding carcass disposal. Unless otherwise directed by government, carcasses found close to the Mine will be incinerated or moved away from any work areas (i.e., further out onto the tundra) to prevent attraction of carnivores and other scavengers to the Mine site. Carcasses found in an area where they do not pose any threat to wildlife or human safety will be left on the tundra.

Frequency

Wildlife mortality monitoring will be undertaken as required, continuously throughout the life of the Ekati mine. All mortalities will require follow-up to determine if anything can be done to prevent similar mortalities from occurring in the future. All wildlife mortalities will be reported to either ENR or Environment and Climate Change Canada as soon as possible, depending on the applicable regulatory authority.

Data Analyses

Data analyses will be completed to identify trends over time in the number of Mine-related mortalities. Analyses will also attempt to determine the cause of mortalities, and identify any further mitigation that would improve the effectiveness of wildlife safety.

5.4 Wildlife Incidents

An “incident” is defined as an interaction between animal(s) and human(s) that may compromise the safety of the animal(s) and/or human(s). Incidents also include any action where deterrents are deemed necessary. Incidents involving wildlife in close proximity to the Mine and infrastructure, such as roads, open pits, waste rock storage areas, and mine-altered waterbodies must be managed to minimize risk to wildlife and staff.

Incidents may arise from use of the Mine site by wildlife. For example, mine-altered waterbodies can freeze later in the autumn and open earlier in the spring relative to natural lakes and streams, which has the potential to be attractive for migratory birds (e.g., waterfowl and shorebirds). Other wildlife may also drink from these waterbodies. Mine-altered waterbodies include the LLCF Cells A, B, C, D, and E, King Pong, and water collection sumps. These waterbodies will be surveyed as part of the regular site surveillance program for the Ekati mine, but limited to the open-water period. Data on the use of mine-altered waterbodies by migratory birds (and other wildlife) will provide feedback for mitigation and adaptive management, if required.

Esker material removed for the construction of the Jay Road will be stored for use during closure and reclamation. Caribou may use the esker stockpile for insect relief and foxes and ground squirrels may excavate dens and burrows. Similar to monitoring other infrastructure and components of the Ekati mine, surveys of the esker stockpile for wildlife use can be used to inform mitigation and adaptive management, if required.

The purpose of managing wildlife incidents is to reduce the potential for wildlife-related safety concerns for employees, and to minimize potential effects on wildlife. Natural wildlife activity and ecological processes are left undisturbed unless there is risk of harm to people.

DDEC practices successive levels of deterrents, starting with avoidance (removing crews from the area), visual monitoring, truck deterrence (including horn), bear bangers, rubber bullets, and helicopters (Section 4.6.4). Relocation or killing of an animal is only done after successive levels of deterrents do not deter an animal from site and only after consultation and approval from ENR.

Past Scope and Improvements

Incident recording began in 2001 with the reporting of carnivore incidents, mostly involving wolverine and fox encounters at Misery and Ekati camps. Improvements to incident reporting procedures were made:

- In 2002, included observations of all wildlife species and Mine interactions.
- In 2002, included the development of a formal reporting system to ENR to provide details of wildlife incidents where deterrents were used.
- In 2004, the reporting system became more specific as to what qualified as an incident.

Skirting and fencing inspections began in 2005. The fencing investigations were completed in response to caribou mortalities resulting from entanglement with the fencing surrounding the airport. All barrier fences were regularly monitored for their effectiveness at deterring wildlife from Mine infrastructure and to protect wildlife. Fencing structures around Misery Camp (chain link erected in 2011), the airport (plastic barrier fence erected in 2010), Pigeon Pit (plastic barrier fence erected in 2010), and Beartooth Pit (plastic barrier fencing erected in 2006) are included in the survey and any wildlife signs are noted and damage is reported. The results are provided in the annual monitoring report.

In 2006, inspections were initiated to monitor whether skirting was successful in restricting wildlife access under buildings and to look for the presence of animal tracks around buildings. Areas underneath buildings were skirted using a chain-link fence at the Ekati camp, and later at the Misery camp to prevent wildlife access.

Objectives

The objectives for this component of the WEMP are to:

- document and mitigate potential effects of Mine activities and infrastructure on wildlife; and,
- reduce risks to both wildlife and people.

Methods

Wildlife incidents will be reported to the Environment Department, recorded on an Incident/Accident Form, and entered into a database. Incidents include observations of wildlife-Mine and wildlife-human interactions where there is a potential risk of harm to people, wildlife, and/or Mine infrastructure. A description of management responses will be recorded for all incidents. The ENR will be contacted to inform them of the use of deterrents and to seek advice when necessary.

A helicopter is typically used to remove personnel from an unsafe situation. However, some wildlife incidents require the use of a helicopter to deter bears away from areas where personnel are working. During these instances, Environment staff will be in the helicopter whenever possible and able to direct

the deterrent actions of the helicopter. The well-being of the animals is monitored at all times during deterrent efforts. The intent is to guide bears away from personnel and infrastructure without over-exerting them. For example, the animal is allowed to rest and recover when approaching difficult terrain. In addition, the helicopter will back off when the animal is cooperating (i.e., continuing to travel in the direction of the move without further prompting). At all times, the animal's energy, the terrain, and the air temperature will be considered during a move.

Detailed skirting surveys of Ekati and Misery Camp buildings will be conducted a minimum of once per week in order to determine if wildlife are accessing structures from underneath, and to observe any wildlife sign occurring around camp. Specifically, surveyors will walk around both Ekati and Misery buildings, recording any sign of wildlife (e.g., scats, tracks, digs), as well as evidence of damage (e.g., holes, tears) to the skirting or access points leading to underneath the buildings.

Detailed inspections of fencing structures at Misery, around the Ekati airport, and around Pigeon and Beartooth pits will be conducted once per week to monitor wildlife activity along the fencing and detect any damage to the fencing. Specifically, surveyors will walk around the fences, recording any sign of wildlife (e.g., scats, tracks, digs), as well as evidence of damage (e.g. holes, tears).

Frequency

Wildlife incident monitoring will be undertaken as required, continuously throughout the life of the Ekati mine. All incidents will require follow-up to determine if anything can be done to prevent similar incidents from occurring in the future.

Data Analyses

Data analyses will be completed to identify trends over time in the number of Mine-related incidents. Analyses will also attempt to determine the cause of incidents, and identify any further mitigation that would improve the effectiveness of wildlife safety.

5.5 Wildlife-Vehicle and Aircraft Interactions

This component of the WEMP is designed to address the following residual risks identified in the 2012 EIR (BHP Billiton 2012) and the Jay Project (DDEC 2014):

- caribou injuries and mortalities as a result of vehicle interactions; and,
- caribou mortalities and injuries as a result of Mine infrastructure and/or Mine activities can have further impacts to regional populations.

Past Scope and Improvements

Vehicle and aircraft-related wildlife interactions for VECs (e.g., caribou, grizzly bear, wolverine, wolf, raptors) have been reported since 1997. Reporting of vehicle-related wildlife mortalities and injuries for non-VEC wildlife species (e.g., ptarmigan, Arctic hare, fox, and Arctic ground squirrel) was first conducted in 2002. A summary of changes to mitigation for avoiding and limiting the risk to wildlife from collisions with vehicles and aircraft was provided in Section 4.1.2 and Section 4.1.3.

Objectives

As a baseline against which to measure potential effects of the Ekati development, it was predicted that no caribou, carnivores or raptors will be killed or injured by vehicles or aircraft collisions each year. The objectives for this component of the WEMP are to:

- determine if any wildlife are killed or injured as a result of vehicle and aircraft interactions; and,
- determine the effectiveness of mitigation for minimizing the risks of wildlife injury and mortality from vehicles and aircraft.

Methods

Vehicle and aircraft interactions with wildlife will be reported to the Environment Department. Reported incidents will focus on VEC wildlife species (i.e., caribou, grizzly bear, wolf, wolverine, and raptors) on roads or the airstrip; however, fox interactions are also reported. In cases where safety is a concern, Environment Department staff will actively deter carnivores (mostly bears and foxes) from the Mine area using bear bangers, trucks, air horns, and helicopters.

Frequency

Vehicle and aircraft interaction monitoring will be undertaken as required, continuously throughout the life of the Ekati mine. All interactions will require follow-up to determine if anything can be done to prevent similar incidents from occurring in the future.

Data Analyses

Data analyses will be completed to identify trends over time in the number of vehicle and aircraft interactions with wildlife. Analyses will also attempt to determine the cause of interactions, and identify any further mitigation that would improve the effectiveness of wildlife safety.

5.6 Caribou

Bathurst caribou movements through the area surrounding the Ekati mine have historically occurred from July through October annually, but the timing has varied by year. Results from aerial surveys indicate that Bathurst caribou tend to move through the Ekati mine area in pulses where large numbers of caribou are present for approximately two weeks (Appendix C, Figure 2-1). From 1998 to 2005, when herd size was likely greater than 100,000 individuals (Adamczewski et al. 2009), peak numbers of caribou were typically observed during July (Appendix C, Figure 2-2). Since then, peak caribou movements have occurred later from September to mid-October.

Caribou in the Ekati mine area are typically from the Bathurst herd, and some seasonal patterns are evident in their behaviour and distribution. The first caribou arrivals of the year are typically cows on their way from the wintering grounds south of the treeline to the calving grounds near Bathurst Inlet. These caribou travel quickly, feed little, and have a clear directional movement northward regardless of lakes and topography. Their presence in the Ekati mine study area is typically confined to a few weeks in May. Bulls begin to arrive from the wintering grounds in July. The bulls typically move less, feed frequently, and are solitary or in small groups.

Nursery groups (cows with calves) begin to arrive in July. They usually travel in groups and frequently stop for feeding, but development, large lakes, insect abundance, and other environmental factors influence their movement and behaviour. As the rut begins in late September, and as the caribou begin to leave the barren lands for the forest for winter, groups become mixed with cows and bulls. Caribou are not typically present in the Ekati study area during winter.

The Bathurst caribou herd is one of six barren-ground caribou herds in the NWT, previously considered the only herd with a range that included the Ekati study area. Information from satellite collared cows collected by ENR indicates that both the Bathurst herd, and to a lesser extent the Ahiak herd, have seasonal home ranges that overlap with the Ekati study area including during winter. The most recent population survey, conducted in June 2015, estimated the Bathurst herd to be 16,000 to 22,000 individuals (GNWT-ENR 2015a). The last census for the Ahiak herd was in June of 2011 and estimated 71,000 individuals (GNWT-ENR 2017). Both traditional and scientific knowledge indicate that caribou herd size cycles relatively regularly with climate patterns (GNWT-ENR 2005, 2006). Caribou herds also exhibit periodic changes in seasonal migration routes and in calving and winter ranges (Gunn et al. 1997; Gunn and D'Hont 2002; Boulanger et al. 2004; Bathurst Caribou Management Planning Committee 2004).

5.6.1 Barren-ground Caribou Management Strategy

The NWT Barren-ground Caribou Management Strategy 2011-2015 (GNWT-ENR 2011), outlined several action items including research priorities, development of best management practices, education, stewardship, and population and habitat modelling. There has been growing interest in the development of collaborative regional partnerships amongst industry to contribute to herd-wide research and monitoring initiatives as an effective and consistent means to participate in caribou management and recovery. Furthermore, this approach has broad support from communities. The Caribou Management Strategy focused on five key components:

- to engage co-management partners in monitoring and management of caribou;
- to ensure appropriate, up-to-date information is available for management decisions;
- to manage impacts of key factors affecting caribou that are within our control;
- to inform the public about the status of caribou and their role in management; and,
- to maximize benefits from caribou for NWT residents.

Each of the components had two or three associated strategies.

Engaging all Partners

- Strategy #1: Complete and implement management plans and agreements to promote recovery of herds and conserve habitat.
- Strategy #2: Complete inter-jurisdictional agreements, where needed, to ensure a coordinated and cooperative approach to the management monitoring of shared herds.

- Strategy #3: Enhance and promote the exchange of TK and scientific information on the status and use of caribou across the circumpolar north.

Information for Herd Management

- Strategy #4: Continue to monitor all NWT caribou herds and update or develop caribou population models using current information.
- Strategy #5: Continue to identify, support, and implement studies necessary to understand the effect of environmental conditions on caribou populations.

Managing Impacts of Key Factors

- Strategy #6: Monitor the effectiveness of management actions to reduce harvest and predation of caribou.
- Strategy #7: Assess cumulative impacts of land use activities and natural factors on caribou habitat and develop best management practices to mitigate and minimize these impacts in the NWT.

Public Education and Compliance

- Strategy #8: Develop and implement a public information and hunter education program to share information on caribou herds and promote hunter excellence.
- Strategy #9: Document and support community-based hunting rules and traditional laws and practices to promote respect for caribou.
- Strategy #10: Continue to enhance compliance actions, including collaborative programs with Aboriginal governments.

Maximizing Benefits

- Strategy #11: Continue to work with Department of Industry, Tourism, and Investment and Aboriginal governments to support access to alternate country foods (fish, moose, bison, musk ox) and meat sources and to promote alternate harvesting opportunities.
- Strategy #12: Work with the Department of Industry, Tourism, and Investment and commercial ventures to address impacts to businesses.

Strategy 5 is supported by DDEC's monitoring of incidental observations (Section 5.6.2) and monitoring of caribou behaviour and distribution (Sections 5.6.3 to 5.6.6). The monitoring framework (Section 2.2) incorporates results from monitoring to develop best management practices (Strategy 7) through adaptive mitigation (Section 4.5). The design of caribou crossings for the Jay Road and pipeline and the development of the CRMP (Appendix C) represent additional contributions to the development of best management practices. Results from this work have been and will be reported annually, supporting Strategy 3.

Recent work by DDEC in support of Strategies 3 and 4 includes contributing to the Zone of Influence Technical Task Group, work on detecting zones of influence (ERM 2015), and population modelling for the Jay Project environmental assessment. During the Jay Project EA review process, DDEC also committed to analyzing the 2009 and 2012 aerial survey data from the combined Ekati-Diavik study area using the new R-code model to estimate the distance and magnitude of the ZOI (Section 5.6.5). Collaborative work on the ZOI is related to one of the standardized caribou monitoring objectives for the diamond mines, which is determining whether the ZOI changes in relation to mine activity (Handley 2010). As well, information from the caribou assessment of the Jay Project contributed to the Bathurst Caribou Range Plan. As part of the CMP for the Jay Project, DDEC committed to provide financial support (\$500,000) for studies to identify the key factors limiting the Bathurst herd, which supports Strategy 5.

In addition, DDEC will maintain its commitment throughout the life of the Jay Project to doing what it reasonably can to contribute to and support GNWT-led regional programs to improve the state of the Bathurst caribou herd. This will include working with the GNWT towards identifying and undertaking mutually acceptable actions that will support regional processes and programs such as those outlined in the Cumulative Effects Assessment Mitigation and Management Framework, and revising its WEMP to include this commitment and resulting activities. By definition, the WEMP is focused on Ekati mine-specific (including the Jay Project) mitigation and monitoring, and any collaboration with the GNWT (and other agencies, communities, and mines) on regional programs for the assessment and management of cumulative effects is outside the scope of analysis and reporting in the WEMP.

5.6.2 Incidental Caribou Observations

Incidental caribou observations in the study area are monitored and recorded to minimize potential risks associated with human and wildlife interactions, and to identify Mine structures that are acting as potential barriers to caribou movement. Furthermore, recording incidental caribou observations helps determine the composition (e.g., age and sex) of caribou moving through the study area.

Past Scope and Improvements

Since 2006, incidental caribou sightings of individuals and groups have been recorded by DDEC staff. Prior to 2006, aerial surveys were the only method used to record caribou sightings within a broader regional study area. In 2006, it was recognized that information regarding caribou presence and herd size should be recorded on an ongoing basis at the Ekati mine to better assess caribou habitat use in and around the Mine site.

Objectives

The objectives of this component of the WEMP are to:

- identify the composition of caribou groups moving through the study area;
- document the annual timing of caribou movement through the study area to compare temporal trends in migration patterns; and,
- track any trends in the number of caribou moving through the study area among years.

Methods

Incidental caribou observations in and near the Ekati study area will be reported by helicopter operators, ground-based field workers, other Mine personnel, and people from visiting communities. Other information recorded with caribou observations will include location, group size and composition, dominant behaviour, and distance to Mine infrastructure.

Caribou observations reported on the Mine site in close proximity to roads, personnel, or Mine structures will be investigated and the caribou visually monitored, as these are a potential concern to human and wildlife safety.

Frequency

Incidental sightings logs will be maintained at site throughout the life of the Ekati mine. Environment staff will review the logs weekly and respond to wildlife sightings or trends of concern when they occur.

Data Analyses

As incidental data are biased by observer effort and location (i.e., no standardized sampling design) no formal analysis of these data are proposed. Instead results will inform where and when additional monitoring or mitigation may be required, and trends in the occurrence of caribou in the area.

5.6.3 Caribou Road Surveys

Road surveys will be completed by truck along the Jay and Misery roads to determine the location and numbers of caribou as they approach the Ekati mine. Environment personnel surveying the roads will be able to implement additional mitigation, such as, signs identifying the presence of caribou or the need for road closures.

Past Scope and Improvements

The road surveys proposed as part of the Jay Project represent a new type of monitoring. Data on the location, number, and group composition of caribou near and on roads will be collected to provide feedback for mitigation and adaptive management. The volume of vehicle traffic, particularly heavy haul trucks, will also be collected for the Misery and Jay roads.

Objectives

The objective of this component of the WEMP is to:

- determine the location, numbers, and proximity of caribou relative to Mine roads.

Methods

One to two observers will travel by light vehicle along Mine roads to record the location, number, and proximity of caribou adjacent to roads. Observers will also record group composition and behaviour. The volume of vehicle traffic (e.g., vehicles per day), particularly for heavy haul trucks, will be collected for the Misery and Jay roads.

Frequency

Road surveys will be implemented once per week outside of the northern and post-calving migrations. The number of surveys completed during these caribou migrations will be determined by the number of caribou in the regional study area and the proximity to Mine roads. The frequency of surveys will begin at one per week and will become more frequent as higher action levels are met as outlined in the CRMP (Appendix C).

Data Analyses

The results will be assessed on the days that surveys are conducted so that appropriate mitigation can be implemented immediately. This includes the appropriate location and type of traffic mitigation to be used to reduce the risk of vehicle collisions and barrier effects associated with road traffic. The results will also be summarized in the annual monitoring report.

5.6.4 Collared Caribou Monitoring

Monitoring the location of collared caribou cows is useful for predicting the overall movements of the Bathurst herd. Recent analyses completed for the Diavik Mine found a significant negative correlation between the number of caribou counted during aerial surveys and the mean distance of collared caribou locations from the study area during both migration periods (Golder 2011). This relationship indicates that when more caribou were observed during a survey, the mean distance of collar locations to the study area decreased (i.e., the collared animals were closer to the Mine on average when higher numbers of caribou were counted during aerial surveys).

The location of collared caribou provided by ENR will be monitored to determine the proximity of caribou relative to the Ekati mine. This monitoring will occur year-round and will be used to inform the Environment Department if a change in mitigation level or local monitoring is necessary.

Past Scope and Improvements

Collared caribou monitoring as proposed as part of the Jay Project represents a new type of monitoring. Previous collar data were used to delineate seasonal distribution of the Bathurst herd (e.g. ERM Rescan 2014b). During the Jay Project EA review process, DDEC has agreed to develop a CMP, which will provide financial support (\$300,000) for the installation of 50 geo-fenced collars to provide Ekati-specific information on caribou movement.

Objectives

The objective of this component of the WEMP is to:

- provide advance detection of caribou approaching the study area.

Methods

Pending a data sharing agreement with ENR, the locations of collared Bathurst caribou will be obtained and mapped in relation to the Ekati mine study area.

Frequency

Maps will be generated and reviewed by the Ekati mine Environment Department. The frequency will depend on the collar duty cycle and receipt of data from ENR.

Data Analyses

Data will be analyzed to determine the distance of individual collared caribou from the study area boundary and Mine site. Analyses will also determine temporal and spatial trends in the movement of collared animals through the Lac de Gras area. Collar data will also be compared against the results of the other monitoring programs that evaluate caribou presence (e.g., road surveys). This will be used to determine if triggers based on collar distances are appropriate for increasing caribou road surveys as outlined in the CRMP (Appendix C).

5.6.5 Caribou Zone of Influence Monitoring

DDEC has participated or contributed to regional wildlife monitoring initiatives intended for conservation and management including the GNWT's Barren-ground Caribou Management Strategy (GNWT-ENR 2011) and the Bathurst Range Plan Working Group. One initiative that is supported in part by DDEC is the Bathurst caribou census surveys used to determine herd composition, cow:calf ratios and population estimates. DDEC is also involved in the Zone Of Influence Technical Task Group, which is tasked with determining the most effective methods for future monitoring of caribou distribution near mine sites. As part of the CMP, DDEC has agreed to provide funding (\$250,000) for studies to determine the key drivers of the magnitude and spatial extent of the ZOI, with the goal of reducing the ZOI. Furthermore, the current pilot study on dust suppressants will be expanded to include the Misery Road with the objective to determine the most effective product for mitigating dust, which could be applied to other mine sites. These programs are intended to provide data to support cumulative effects assessment and management by the GNWT.

Past Scope and Improvements

Information on the distribution of caribou around the Ekati mine has been collected since 1998. A number of alterations in the design of aerial surveys for monitoring changes in the distribution of caribou have occurred (Golder 2011). Changes include increasing the aerial survey transect spacing from 4 km to the current design of 8 km and expanding the size of the study area. In addition, continued monitoring of the northern migration was no longer required as a component as agreed at the 2010 Wildlife Monitoring Workshop (Handley 2010).

The most recent ZOI estimate for the combined Ekati-Diavik mine footprint is 14 km and is based on aerial survey results from 1998 to 2008 (Boulanger et al. 2012). Additional aerial survey data were collected in 2009 and 2012, but no analysis was completed. As part of the EA review process for the Jay Project, DDEC committed to analyzing the 2009 and 2012 aerial survey using the new R-code statistical model to provide estimates of the distance and magnitude of the ZOI for the combined Ekati-Diavik study area. For future data collection and analyses, DDEC will continue with the aerial survey monitoring design last completed in 2012. However, guidelines on standardized caribou ZOI monitoring are expected to be developed by a Zone of Influence Technical Task Group administered by the GNWT (GNWT-ENR 2015b), so WEMP ZOI monitoring and analysis for caribou may be altered in the future. Changes to ZOI monitoring and results from additional analyses will be provided in the annual monitoring report. DDEC plans to complete aerial surveys for caribou during the operational phase of the Jay Project and using the

recognition methods outlined in the Zone of Influence Technical Task Group guidance document, as directed by ENR.

Objectives

The objective of this component of the WEMP is to:

- determine whether the ZOI changes in relation to Mine activity.

Methods

Changes in caribou distribution around the Ekati mine (including Jay and Sable development areas) resulting from direct and indirect effects will be monitored using aerial surveys. Past surveys were completed from mid-July through to October to collect information on caribou numbers, habitat type associated with the caribou groups, and distance from the Ekati mine site. This survey period focuses on the southern (post-calving) migration period. The northern migration was not included due to low probability of animals being within the study area, as well as the animals' tendency to move rapidly through the mine study areas on their way to the calving grounds. A helicopter is used to conduct the survey at 120 to 180 m above ground level at a speed of 145 to 160 km/h. The reconnaissance survey approach proposed in the draft guidelines developed by a Zone of Influence Technical Task Group will be used to determine whether a full aerial survey is triggered (GNWT-ENR 2015b). Details of the aerial survey methods are provided in Appendix F.

The aerial survey area covers approximately 6,300 km². Twelve transects were spaced 8 km apart, and the observation width along transects was 1,200 m, which generated 15% coverage (887 km²) of the study area. This area covers a distance of approximately 30 km in each direction from mine infrastructure associated with the Ekati and Diavik mines. This distance allows for monitoring within the new estimates of a 14 km ZOI.

Frequency

This monitoring will be completed every year and DDEC will implement this program when caribou are detected in the study area. The goal will be to obtain as many observations annually as required to statistically analyze the data at various distances from the Mine footprint.

Data Analyses

Depending on the amount of data available, analyses will be performed to test for the effects of year (Mine activity), habitat, group composition, and distance from the Mine on the probability of caribou occurrence. DDEC will work with the Zone of Influence Technical Task Group on the appropriate data analyses for measuring the spatial extent and magnitude the caribou ZOI.

5.6.6 Caribou Behaviour: Activity Budgets and Response to Stressors

Caribou behaviour can be influenced by industrial development (Bradshaw et al. 1997). Adult female caribou with calves are more sensitive to disturbances than other caribou groups (Spence and Gratton 2005). Roads and traffic may affect caribou behaviour, as roads can act as visual barriers or breaks in habitat. In response to traffic, caribou may run, move away, and/or increase vigilance behaviour (Wolfe et al. 2000). In some

situations, the Mine and associated activities can inhibit normal caribou behaviours such as feeding and resting (Nellemann and Cameron 1996).

Mine-related stressors expected to potentially influence caribou behaviour include aircraft activity, vehicle traffic, blasting, dust, lights and smells. The WEMP provides results of monitoring initiatives aimed at documenting such influences on caribou in the Ekati study area.

Past Scope and Improvements

Information on the activity budgets of caribou has been collected since 1998. Since this time, observations of caribou groups at various distances from Mine infrastructure have been made and group behaviours at specified time intervals have been recorded (scan sampling methods, as in Altmann 1974). In 2001, the study was expanded to collect information on the responses of caribou groups to stressors. From 2001 to 2009, the scope of the behaviour work had remained the same, including data collection on both the stressor and activity budget studies.

In 2004 and 2005, increased effort was made to collect samples greater than 7 km from the Mine. This effort was maintained through 2008. In 2009, Environment Department staff at the Ekati mine and Diavik Mine worked collaboratively to increase the effort at sites farther away from the two mines. Diavik focused their effort in areas greater than 14 km from either mine (outside of the estimated ZOI), and Ekati focused effort at distances close to the Mine. The data were shared between DDEC and DDMI. These analyses are provided in the 2009 annual monitoring report.

In 2010, Ekati opted to record caribou behaviours using focal sampling where a single animal is observed for a minimum period of time, and changes in behaviour over that time period are analyzed. Scan sampling is ideal for identifying the frequency of dominant behaviours in a group over a period of time. Focal observations are more useful for obtaining information on activity budgets (Altmann 1974; Martin and Bateson 1993), that is, for calculating the proportion of time an animal is engaged in a particular behaviour and the length of time it takes an animal to return to a non-alert state following a stressor event.

Objectives

The standardized objective of caribou behaviour studies (Handley 2010) is to:

- determine if caribou behaviour changes with distance from the mines.

Methods

Both focal and scan sampling (Altmann 1974) will be used to record the behaviour of individual caribou and groups of caribou, respectively. For both focal and scan sampling, when first arriving on site, the observers will wait five minutes before commencing the surveys. During that time, information on group location and insect harassment will be recorded, and a composition count conducted. In the event that caribou do not remain on site for sufficient periods of time, or additional personnel are not available, priority will be given to focal sampling over scan sampling. This program is completed in collaboration with Diavik Mine, where Ekati is responsible to observe caribou adjacent to the Ekati mine.

Focal Sampling

An individual caribou is randomly selected from a group of caribou. Observations will be conducted on, in order of priority, cows with calves, lone cows, bulls, and juveniles for a minimum of 30 minutes. Depending on the size of the group, observations on several individuals may occur, time permitting. Data may be supplemented with the use of video recordings.

Observations will be conducted during the northward migration/calving (May/June), post-calving (July/August), and autumn/rut (September/October) periods. For each individual, the following behaviours will be recorded: bedding, feeding, standing, alert, walking, trotting, and running. The majority of observations will be on individuals from groups of animals passing through site, as opposed to solitary animals.

In the event that a stressor occurs during a focal observation, the observers will record the immediate response of caribou to stressors as either exhibiting no reaction, or a reaction (caribou look towards disturbance; caribou walk away; caribou trot or run away). Estimated distance from the stressor will also be recorded. Stressors include aircraft (helicopter and airplane), three categories of vehicles (light [e.g., pick-up truck], medium [e.g., water truck], and heavy truck [e.g., haul truck]), blasts from pits, and human presence. Observers will watch the animal for at least 15 minutes following a stressor event to record the time it took to return to a non-alert behaviour (bedding or feeding), if this was the behaviour prior to being stressed.

Scan Sampling

Scan samples will distinguish between nursery and non-nursery groups as they pass through site. Observations will be conducted during the northward migration/calving (May/June), post-calving (July/August), and autumn/rut (September/October) periods. For groups of up to 30 animals, all individuals will be included in the scan. For larger groups, a sub-sample of 20 to 30 animals will be observed. There may be multiple observations from a single large group, consisting of several consecutive scans on different sub-groups. If additional personnel are available, focal and scan observations may proceed concurrently. Data may be supplemented with the use of video recordings. The length of a scan survey is 32 minutes, and a scan observation will be conducted every four minutes. Similar to focal surveys, in the event that a stressor occurs during a scan observation, the observers will record the immediate response of caribou to stressors as either exhibiting no reaction, or a reaction (caribou look towards disturbance; caribou walk away; caribou trot or run away). Estimated distance from the stressor is also recorded. Stressors include aircraft (helicopter and airplane), three categories of vehicles (light [e.g., pick-up truck], medium [e.g., water truck], and heavy truck [e.g., haul truck]), blasts from pits, and human presence.

Frequency

This monitoring will be completed every year, depending on the presence of caribou observed at site. Large numbers of observations are required to detect differences in caribou behaviour, which is strongly affected by environmental conditions such as wind, temperature, and insect abundance (BHP Billiton 2004). Ekati will implement this program when caribou are detected in the study area. The goal will be to obtain as many observations annually as required to statistically analyze the data at various distances from the Mine footprint.

Data Analyses

Depending on the amount of data available, analyses will be performed to test for the effects of year (Mine activity), habitat, group composition, and distance from the Mine on the proportion of time caribou spend feeding, resting, and moving. Environmental variables such as wind speed, rainfall, and level of insect activity may be included as factors in the statistical models.

5.6.7 Camera Trapping

A substantial addition to the caribou monitoring is the use of wildlife cameras (Reconyx PC800 HyperFire™ Professional Semi-Covert Infrared) to document caribou (and other wildlife) activity along roads, fencing structures, and on the tundra. Camera trapping refers to the use of remotely triggered cameras that automatically take images of whatever moves in front of them (Rovero and Marshall 2009). Most cameras are triggered by a passive infrared sensor detecting a moving object warmer than the ambient temperature such as animals, people, and vehicles. Camera trapping is most often used to capture images of medium to large sized terrestrial mammals and birds (Rovero and Marshall 2009). Camera trapping methods have undergone substantial advances and have been increasingly used in the last decade (O'Connell et al. 2010). Besides their use for carrying out animal inventories and obtaining information on activity pattern and habitat preference, scientifically robust, inferential sampling studies using camera traps can estimate occupancy and density (Rovero and Marshall 2009).

Automated cameras have been used to estimate bear density (Mace et al. 1994; Bowman et al. 1996; Martorello et al. 2001), deer abundance (Dougherty 2010; McKinley et al. 2006), and as a non-invasive method to document community composition of carnivores (Kelly and Holub 2008; Grompper et al. 2006), as well as to evaluate activity patterns for a variety of small (Cutler and Swann 1999) and large (Bridges et al. 2004a; Lucherini et al. 2009) mammal species. Recently researchers have used remote cameras to examine behaviour (Bridges et al. 2004b). Automated remote camera systems are also being used extensively to monitor wildlife crossing structures along highways (Ford et al. 2009; Van Manen et al. 2001).

The costs of a sampling method are commonly a limiting factor for surveying large areas (Silveira et al. 2003). Despite the high initial costs of camera trapping, this method, compared with track censuses and line-transects, can be handled more easily and with relatively low costs in the long term.

The advantages of camera trapping include:

- non-invasive (Grompper et al. 2006);
- effective tool for rapidly detecting species richness and relative abundance (Silveira et al. 2003);
- accuracy of species determinations (Seydack 1984; Kelly et al. 1998);
- possibility of evaluating age, sex, population structure, and density (Mace et al. 1994);
- low environmental disturbance (Silveira et al. 2003);
- similar efficiency in the detection of nocturnal and diurnal species, and the possibility of studying activity patterns (Silveira et al. 2003);
- ease of handling by non-trained personnel (Silveira et al. 2003); and,
- large area extent that can be simultaneously sampled (Silveira et al. 2003).

Past Scope and Improvements

Camera-based monitoring was initiated in 2011 with the deployment of 49 cameras along mine roads, and continued in 2012 and 2013 with the implementation of 90 cameras in each year. Data collected were used to make improvements in each subsequent year, such as:

- management, processing and analysis of data;
- identifying and correcting for observer bias;
- understanding that the area in each photo is variable, which influences the ability for comparison among photos taken in different habitat types, particularly as distance from the camera to caribou increases; hence cameras were positioned to control for field of view; and,
- position of the camera relative to the road has a strong effect on the ability to accurately classify the type of truck involved in the reaction of caribou; thus cameras were positioned to increase correct classification of vehicle types.

Objectives

The objectives for this component of the WEMP are to:

- determine the level of caribou (and other wildlife) activity and traffic along Misery and Jay roads;
- determine caribou (and other wildlife) responses to the road (i.e., crossing or deflecting);
- determine caribou (and other wildlife) activity at other Mine infrastructure and along historic movement corridors; and,
- have holders of TK document indicators of caribou condition and health during site visits.

Methods

Cameras will be used to monitor Misery and Jay roads, as well as other strategic locations where wildlife may be observed (e.g., Sable Road extension and culvert, Jay Road esker crossing, and airstrip and Beartooth Pit fences, and locations recommended by TK Holders). The cameras will be programmed to take photographs at 10 minute intervals as well as triggered by motion infrared sensor. The cameras have trigger speeds of 1/5s, can record at near video speeds (2 frames/s), and have an effective trigger range of approximately 30 m.

Frequency

This monitoring will be completed annually from May to November.

Data Analyses

Data analyses will be completed to identify patterns associated with caribou behaviour and traffic, roads and other Ekati mine infrastructure. Camera-specific crossing success will be determined as (1 – the deflection rate). The physical attributes of camera locations that indicate less than 90% crossing success will be reviewed for improvement, including with the Traditional Knowledge Elders Group.

5.6.8 Long Lake Containment Facility Monitoring

The LLCF is monitored as part of the WEMP. Small particle processed kimberlite (sand sized and smaller) from the processing plant is deposited in the LLCF. The processed kimberlite enters the LLCF suspended in water and settles out and dries, taking on the consistency of hard, fine sand. Concern has been expressed that caribou may become trapped in the processed kimberlite slurry before it has dried, which could potentially lead to injury or death.

Ingestion of processed kimberlite within the LLCF is of further potential concern. An important consideration is that the processed kimberlite at the Ekati mine does not contain the same amount of metals and processing chemicals typical of gold and other metal mines. Environmental studies have shown that the risk to caribou from processed kimberlite is very low. In 2006, a Tier 1 wildlife and human health risk assessment was completed on the potential risks to wildlife and human receptors exposed to metals from the LLCF. The objectives of this risk assessment were to identify and assess metals that could pose a potential risk to wildlife grazing on vegetation at the LLCF and to humans that consumed the wildlife. Acceptable risks were predicted for wildlife receptors at the individual and population level from exposure to all metals evaluated except aluminum and magnesium. The assumptions made throughout the risk assessment process were conservative and likely caused potential risks to be overestimated (Rescan 2006b).

Past Scope and Improvements

In 1999, monitoring for caribou in processed kimberlite containment areas, specifically the LLCF, was initiated. The amount of processed kimberlite deposited in the LLCF has consistently increased and, correspondingly, the area of monitoring has expanded from 2000 to 2011. Since 2000, monitoring of the LLCF included data collection for presence of caribou, group size, group composition, and dominant group behaviour.

Previous objectives of this study (1998 to 2003) were to determine if caribou were injured due to the LLCF. In 2004 and subsequent years, two additional objectives were included to examine frequency of caribou use and caribou group composition within the LLCF. In addition, wildlife and wildlife sign observed during the surveys were recorded to document use of the LLCF by other wildlife.

Objectives

The objectives for this component of the WEMP are to:

- determine if any caribou injuries can be attributed to the LLCF;
- determine the frequency that caribou use the LLCF; and,
- determine the group size, group composition, and dominant group behaviours of caribou observed within the LLCF.

Methods

The LLCF survey will proceed as in previous years. The survey involves a visual scan of the LLCF to observe and record caribou presence. Incidental sightings of caribou in the LLCF outside of the formal survey are reported to the Environment Department and recorded as incidental observations. Camera trapping is included in LLCF monitoring.

The group size, composition, dominant behaviour, and signs of caribou stress will be recorded. Behavioural categories include bedding, feeding, standing, standing-alert, walking, trotting, and running. Temperature and wind speed will also be recorded.

Observations of other wildlife and wildlife sign within the LLCF are also recorded during each survey, particularly the presence, abundance, and nesting activity of waterfowl. Information from surveys may support direction in reclamation research and planning.

Frequency

The LLCF will be surveyed three times per week during the period of May 1 to November 30. During these surveys, the focus will be on the containment cells (i.e., A, B, and C). At other times of the year, these cells will be surveyed twice per week. The non-deposition cells (i.e., cells D and E) will be surveyed approximately once per week year-round to document wildlife activity. As the use of the LLCF will change during the life of the Jay Project, monitoring frequency of the LLCF may be adjusted accordingly.

Data Analyses

Data analyses will be completed to identify the presence, group size, composition, behaviour, tracks and injuries of caribou at the LLCF.

5.7 Grizzly Bear

All populations of grizzly bears in Canada are classified as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2015) and have no status in the NWT (NWT SAR 2015).

Waste from Mine sites may potentially act as wildlife attractants, increasing the likeliness of human-wildlife interactions and wildlife habituation. Bears moving through the Mine site area are a concern from the perspective of both human and wildlife safety. In response to these concerns, barren-ground grizzly bears are included in the WEMP.

5.7.1 Incidental Observations

The recording of incidental grizzly bear observations in the study area allows bear activity to be identified and monitored, which can help locate and eliminate bear attractants and minimize human-bear interactions. Incidental observations can also be used to monitor changes in bear activity near the Mine over time and to assess potential attraction or avoidance of the Mine area by different demographic (e.g., age, sex) groups.

Past Scope and Improvements

A previous study design sampled seasonally preferred habitats in spring and autumn for grizzly bear sign (e.g., tracks, scat, and digs). This survey attempted to address the possibility that bears were avoiding the Mine. The results of the surveys showed that there was a high degree of variability in the frequency of grizzly bear sign among years, which may represent varying habitat preferences, or may correspond to a change in the number of bears moving through and using the study area during each season. The sign survey design did not distinguish between these two possibilities. After engagement with and approval from ENR and communities, the grizzly bear sign survey was discontinued, and was replaced with a DNA hair snagging study that commenced in 2012, in collaboration with other diamond mines in the region.

Objectives

The objectives of this component of the WEMP are to:

- avoid and minimize bear-human interactions; and,
- determine the level of grizzly bear activity within the Ekati study area.

Methods

Incidental observations of grizzly bears in the vicinity of the Ekati study area will be reported to the Environment Department. This includes all grizzly bear observations from helicopter, field workers, and by other DDEC staff. Each bear observation includes the date, number of individuals, location, behaviour, and presence or absence of a collar.

All grizzly bear observations reported in close proximity to roads, personnel, and Mine structures will be investigated, as these incidents pose a threat to human and wildlife safety. When necessary, grizzly bears will be deterred from the Mine site area through the use of vehicles, helicopter, bear bangers, screamers, bean bags, and rubber bullets. During helicopter deterrent efforts, the health and safety of the grizzly bear is of primary concern. Bears observed within the Mine site that do not pose an immediate potential threat to human and bear safety will be visually monitored until the bear moves out of the area.

Grizzly bear activity that is a potential concern for human and wildlife safety, or that requires deterrent efforts, will be documented and recorded as incidents (Section 5.4). All deterrent activities will be reported to ENR.

Frequency

Incidental sightings logs will be maintained at site throughout the life of the Ekati mine. Environment staff will review the logs weekly and respond to wildlife sightings or trends of concern when they occur.

Data Analyses

Data analyses will be completed to identify trends over time in the number of Mine-related incidents and occurrence of grizzly bears in the study area. Analyses will also attempt to determine the cause of incidents, and identify any further mitigation that would improve the effectiveness of wildlife safety.

5.7.2 Hair Snagging Study

The DNA from hair samples can be used to confirm sex (Taberlet et al. 1993), species, genetic population structure (Proctor et al. 2005), and individual genealogies (Haig 1998). Roots of mammalian hair contain sufficient DNA for analysis (Higuchi et al. 1988). Because bears are readily attracted by scent lures, methods to obtain hair samples from free-ranging bears permits systematic sampling (Woods et al. 1999). This method avoids live capture of bears, allows individuals to be identified with a small risk of error, and hair removal sites are faster to set up and are checked less often than live-capture sites (Mowat and Strobeck 2000). Simpler logistics allow a study design that comes closer to meeting the assumptions and sample size requirements of current mark-recapture techniques (Mowat and Strobeck 2000).

Past Scope and Improvements

In February and September, 2009, and again in June and October, 2010, technical meetings were held with communities, the IEMA, and government and it was determined that an important objective for grizzly bear monitoring was to determine the abundance and distribution of grizzly bears relative to mine sites (Handley 2010). A DNA approach is required to meet this objective, and a pilot study was conducted at Ekati that spanned 2010 and 2011.

On November 2, 2011, ENR hosted a workshop on grizzly bear monitoring in Yellowknife. The purpose of this workshop was to discuss the potential for the four diamond mines to collaborate on regional scale grizzly bear monitoring based on DNA mark-recapture techniques. Attending this workshop were representatives from the three operating diamond mines (Ekati mine, Diavik Mine, Snap Lake Mine), the Gahcho Kué Project, and monitoring agencies (IEMA, Environmental Monitoring Advisory Board, Snap Lake Environmental Monitoring Agency). Each mine provided a brief presentation on their current grizzly bear monitoring. Various study designs were presented for a regional grizzly bear DNA monitoring program.

Objectives

The standardized objective of caribou behaviour studies (Handley 2010) is:

- to provide estimates of grizzly bear abundance and distribution in the study area over time.

Methods

Grizzly bear monitoring will follow the standardized methods described in Rescan (2013).

Frequency

The initial 2-year program was completed in 2013, and the study is anticipated to be repeated in four years (next scheduled for 2017), subject to discussion with regulators, monitoring agencies, and communities.

Data Analyses

Hair samples collected during the program will undergo DNA analyses to identify individual grizzly bears for use in mark-recapture modelling. Analyses will identify any trends over time in the abundance and distribution of grizzly bears in the study area, and the effects of year and distance from the Mine, which may provide an estimate of the ZOI from the Mine. Year effects comprise both potential Mine-related influences and the temporal changes in the local abundance of grizzly bears from natural factors.

5.8 Wolf

Wolves are considered a wildlife VEC within the Ekati study area. Wolves in this area depend on the Bathurst caribou herd as their main source of prey, particularly during the winter (Kuyt 1972; Walton et al. 2001). During the spring, wolves follow the Bathurst caribou herds north of the treeline and choose den sites south of the Bathurst calving grounds. This strategy likely optimizes the availability of food resources for rearing pups (Heard and Williams 1992). Wolf pups usually leave the natal den in early August, but do not leave the summer range until October.

Wolves are considered not at risk by COSEWIC (2015). However, potential risks for the local population may arise from habitat removal and human disturbance (Clarke et al. 1996). Human development can result in wolves avoiding certain areas (Johnson et al. 2005). Conversely, certain features of human developments (such as landfills and infrastructure) can act as wildlife attractants, increasing the likelihood of wildlife attraction and habituation.

5.8.1 Incidental Observations

Reporting incidental wolf sightings at Ekati is one component of the WEMP. Monitoring and recording incidental wolf observations in the study area can avoid and minimize potential risks associated with human and wildlife interactions. Once a wolf is sighted within the Mine site, people or workers that may be at risk of encountering the wolf will be notified and work actions will be adjusted accordingly.

Recording incidental wolf observations helps determine the presence, timing, and family composition of wolf packs moving through the study area.

Past Scope and Improvements

Wildlife sightings have been documented by Mine staff and consultants since 1995. However, the majority of these early logs were not provided in annual monitoring reports. Since 2001, a formal incidental wolf sighting log has been filled out by observers. As of 2004, family group observations have been consistently reported.

Objectives

The standardized objectives of this component of wolf monitoring at diamond mines (Handley 2010) are to:

- minimize wolf-human interactions;
- identify the presence and composition of incidental wolf observations in the study area; and,
- document and determine the cause of direct Mine-related mortality of wolves.

Methods

Incidental wolf observations in and near the Ekati study area will continue to be reported to the Environment Department. Incidental observations include those made from helicopter surveys and ground-based field work, and DDEC staff. Each wolf observation includes the date, location, number of individuals sighted, dominant behaviour, and the presence or absence of a radio collar.

Wolf observations reported in close proximity to roads, personnel, or Mine structures will be investigated, as these are a potential concern to human and wildlife safety (Section 5.4). Wolves will be deterred from the Mine site area with the use of vehicles and/or bear bangers when necessary. Wolves observed within close proximity to the Mine and not an immediate potential threat to safety will be monitored visually until the wolves move out of the area.

Frequency

Incidental sightings logs will be maintained at site throughout the life of the Ekati mine. Environment staff will review the logs weekly and respond to wildlife sightings or trends of concern when they occur.

Data Analyses

Data analyses will be completed to identify trends over time in the number of Mine-related incidents and occurrence of wolves in the study area. Analyses will also attempt to determine the cause of incidents, and identify any further mitigation that would improve the effectiveness of wildlife safety.

5.8.2 Wolf Den Occupancy and Productivity

Wolves require specific habitat features that allow them to dig denning structures. In a landscape that is dominated by Precambrian Shield bedrock, eskers and other glacial deposits provide the best habitat for den sites (Cluff et al. 2002). Denning habitat is potentially a limited resource for wolves, as eskers comprise a small fraction (2% to 3%) of the Arctic tundra ecosystem (McLoughlin et al. 2004).

There is evidence that wolves exhibit fidelity to den sites (Cluff et al. 2002). The quantity of available den sites may be functionally reduced as a result of disturbances, as wolves tend to avoid human activity (Johnson et al. 2005). Therefore, the preservation of existing habitat with suitable dens may be important, as the loss of den sites due to disturbance could have a negative effect on wolves.

The quality of a den site may potentially affect the reproductive success of wolves. Wolves may be most sensitive to human disturbance when they are caring for and feeding young pups, as they are less mobile and less able to evade human activity (Walton et al. 2001).

Past Scope and Improvements

The methods for wolf den monitoring have been refined since studies began in 1995. An intensive aerial and ground survey of eskers and glacial fluvial deposits was conducted in 1995 and 1996 to document baseline numbers of wolf and fox dens. These surveys identified five wolf dens within the Ekati study area. Ground surveys of all major esker systems were conducted in 1997 and two additional dens were located. From 1998 through 2001, all major esker systems (on either side of each esker) were surveyed from the air in late May. No new wolf dens were identified during these surveys. One wolf den was located in 2000 during surveys for grizzly bear activity. Another den containing a radio-collared wolf was located in 2001 by ENR. As the number of new wolf dens discovered along esker systems was negligible, this survey technique was discontinued in May 2001, following consultation with ENR. In 2002 and 2003, the survey for active or occupied dens was restricted to all known historic den sites.

In 2004, a survey of radio-collared wolves was also introduced in order improve the tracking of wolf movements (with a focus on breeding activity), wolf interaction between packs, and wolf interactions with Ekati (Rescan 2005).

In 2005, the wolf den survey again included all known historic dens and new dens (identified by aerial surveys) in the Ekati study area. In 2006, 2007 and 2008, ENR completed a targeted survey of select den locations. Surveys that included all known historic and new den locations were repeated from 2009 to 2014.

Objectives

The standardized objective of wolf monitoring at diamond mines (Handley 2010) is to:

- determine the presence, distribution and productivity of active wolf dens throughout the study area.

Methods

It is anticipated that aerial surveys for wolf den occupancy will continue to be conducted by ENR staff. Dens will be classified as active if wolves are observed at the den. Active dens will be subsequently re-surveyed by ENR during late August to determine the presence of pups. It is anticipated that ENR will continue to provide the information from aerial surveys to DDEC. Locations of any satellite-collared wolves within the Ekati study area will also be provided by ENR. The Environment Department at Ekati will continue working in conjunction with ENR, and to share information from incidental observations to assist wolf studies conducted by ENR.

Frequency

DDEC will continue to support ENR in the future to complete these regional monitoring surveys. However, if these surveys are no longer completed by ENR, DDEC plans to continue to survey the historic den sites that are found within the Ekati study area and will update the WEMP methods accordingly.

Data Analyses

Data analyses will identify trends in the use (occupancy) and productivity of wolf dens.

5.9 Wolverine

The western population of wolverine, including those in the NWT, are listed as a species of Special Concern by COSEWIC (2015). The status of wolverine in the NWT is not at risk (NWT SAR 2015).

Wolverine are curious animals and will investigate human-made structures and food caches when humans are not present (COSEWIC 2015). Wolverine prefer undisturbed areas, but home ranges may overlap with human-caused disturbances (COSEWIC 2015). However, human activity, including mining, hunting, trapping, and major transportation routes, may displace or alter wolverine travel routes and lead to increased human-caused mortalities (Weir 2004).

Wolverines moving through human occupied areas are a potential cause for concern with regards to wildlife and human safety. Food and food waste may potentially act as wolverine attractants, increasing the possibility of wolverine habituation.

5.9.1 Incidental Observations

Monitoring and recording incidental wolverine observations in the Ekati study area may minimize the potential risks associated with human-wolverine interactions. Once a wolverine is sighted within the Mine site area, DDEC staff that are potentially at risk of encountering the wolverine will be notified, and work activities will be adjusted accordingly.

Past Scope and Improvements

Incidental wolverine observations have been formally recorded by DDEC staff since 2003.

Objectives

The objectives of this component of the WEMP are to:

- avoid and minimize wolverine-human interactions; and,

- determine the level of wolverine activity within the Ekati study area.

Methods

Incidental observations of wolverines will continue to be reported to the Environment Department. This includes all wolverine observations made from helicopter, field workers, and other DDEC staff. Each wolverine observation will include the date, number of individuals, location, and behaviour.

All wolverine observations reported in close proximity to roads, personnel, and Mine structures will be investigated, as these are of particular concern with regard to human and wildlife safety. When necessary, wolverines will be deterred from the Mine site through the use of vehicles and/or bear bangers.

Wolverine activity will be recorded as an incident if it is of potential concern to human or wolverine safety, could cause damage to Mine infrastructure, or requires deterrent efforts (Section 5.4). Wolverine observed within the Mine site that do not pose an immediate potential threat to human and wildlife safety will be visually monitored until the wolverine moves out of the area.

Frequency

Incidental sightings logs will be maintained at site throughout the life of the Ekati mine. Environment staff will review the logs weekly and respond to wildlife sightings or trends of concern when they occur.

Data Analyses

Data analyses will be completed to identify trends over time in the number of Mine-related incidents and occurrence of wolverine in the study area. Analyses will also attempt to determine the cause of incidents, and identify any further mitigation that would improve the effectiveness of wildlife safety.

5.9.2 Hair Snagging Study

The use of genetic markers (maternal DNA and allozymes) to study wolverine populations in the NWT has provided insight into the distribution and connectivity of these populations (Wilson et al. 2000; Kyle and Strobeck 2002).

Past Scope and Improvements

To obtain reliable information on wolverine population size and distribution at Ekati, a DNA-based population assessment was conducted in 2005 and 2006 in conjunction with ENR and DDMI. This study was repeated in 2010, 2011, and 2015.

The wolverine DNA-based study within the Ekati mine study area was carried out to obtain reliable population and range estimates, so that wolverine density and activity relative to mines could be tracked. The regional DNA-based study replaced the wolverine snow track survey that was conducted at Ekati mine from 1997 to 2004. The wolverine DNA study covers four sampling grids, including Daring Lake, Ekati, Diavik, and Gahcho Kué mines. The Ekati mine sampling grid encompasses an area of approximately 1,200 km², and includes the Mine site.

The standardized monitoring objective for wolverines at the diamond mines (Handley 2010) is to:

- provide estimates of wolverine abundance and distribution in the study area over time.

Methods

DDEC will implement monitoring that supports cumulative effects assessment and management by the GNWT. The hair snagging methods follow those outlined in the document *Draft Monitoring Protocol for Wolverine DNA Hair Snagging* (GNWT-ENR 2013b).

Frequency

There are currently no formalized protocols on the frequency at which these surveys should be completed. DDEC will continue to evaluate its participation in the program.

Data Analyses

Hair samples collected during the program will undergo DNA analyses to identify individual wolverine for use in mark-recapture modelling. Data from the Ekati mine program and other programs (i.e., Snap Lake Mine, Gahcho Kué Mine, Diavik Mine, and Daring Lake) will be provided to ENR for analysis and reporting. It is assumed the analyses will identify any trends over time in the abundance and distribution of wolverine in the study area, and support similar information for the North Slave Geological Province. No analyses of these data are anticipated to be completed by DDEC.

5.10 Raptors

Raptors are birds of prey, such as, falcons, eagles, hawks, and owls. Raptor species observed frequently nesting with the Mine study area include peregrine falcon, gyrfalcon, and rough-legged hawk. Short-eared owls, snowy owls, and northern harriers have been observed in the study area (DDEC 2014). The peregrine falcon and the short-eared owl are classified as species of Special Concern by COSEWIC (2015) and the federal *Species at Risk Act*. Both species have no status in the NWT (NWT SAR 2015). Two subspecies of peregrine falcon, *anatum* (boreal) and *tundrius* (tundra) occur in the NWT. The *tundrius* subspecies breeds mainly on the tundra and is likely the subspecies that is observed nesting near Ekati.

5.10.1 Pit Wall Nest Monitoring and Incidental Observations

In northern environments, raptor species such as peregrine falcons, rough-legged hawks, gyrfalcons, and common ravens nest on ledges and cliff faces. In landscapes with human-made structures, cliff-nesting birds have been observed to nest on human-built ledge structures such as cairns, buildings, towers, mining dredges, and bridges (Kessel 1989). Open pit walls at Ekati resemble steep-sided ledges and offer attractive nesting locations for falcons and other cliff-nesting birds.

The monitoring of cliff-nesting birds on pit walls is a priority at Ekati. The eggs, nests, and individuals of gyrfalcon, peregrine falcon, and other raptor species (e.g., rough-legged hawk, golden eagle) are legally protected under the NWT *Wildlife Act, Section 38*. Potential pit wall nesting species likely to be found at Ekati include peregrine falcon, gyrfalcon, rough-legged hawk, and common raven.

Past Scope and Improvements

A formal monitoring and reporting program for bird nesting activity along pit walls was initiated in 2004. Pit walls were monitored on an informal and largely incident-based capacity in years prior to 2004. Beginning

in 2006, the Fox Fuel Farm and Long Lake Road power poles were also monitored for bird nesting activity.

Objectives

The standardized monitoring objectives for raptors at diamond mines (Handley 2010) are to:

- determine if pit walls or other infrastructure are utilized as nesting sites for raptors;
- determine nest success in areas of development and document effectiveness of deterrent efforts that may be employed; and,
- document and determine the cause of direct Mine-related mortalities of raptors.

Methods

Pit walls will continue to be monitored at Ekati. Visual surveys for nesting activity will occur at all open pits at Ekati between April and August, and include Beartooth, Misery, Fox, Koala North, Panda, Koala, Lynx and Jay pits, as well as power poles and fuel farm. Observations of birds, nests, and nesting activity (i.e., nest construction, perching, and incubation) will be recorded by Environment staff. If nests are observed in an active pit, ENR will be contacted immediately for advice on mitigation.

Incidental raptor observations in the Ekati study area will be reported by helicopter operators, ground-based field workers, and other Mine personnel. Each raptor observation will include the date, number of individuals, location, and behaviour. Raptor interactions and mortalities at the Mine will also be documented and reported to ENR.

Frequency

Nests detected on pit-walls and on other Ekati mine infrastructure will be monitored annually. Incidental sightings logs will be maintained at site throughout the life of the Ekati mine. Environment staff will review the logs weekly and respond to wildlife sightings or trends of concern when they occur.

Data Analyses

Data analyses will be completed to identify trends over time in the number of Mine-related incidents. Analyses will also attempt to determine the cause of incidents, and identify any further mitigation that would improve the effectiveness of wildlife safety. Nests detected on infrastructure will be analysed for trends in use and productivity.

5.10.2 Regional Falcon Surveys

Gyrfalcon and peregrine falcon breeding activity is monitored as part of the WEMP because falcon species are legally protected under the NWT *Wildlife Act* (GNWT-ENR 2013a), and because they are valuable indicators of environmental change (Holroyd and Banasch 2003). For example, the population trends and breeding success of peregrine falcon have been used as indicators of pollution loads because of the recognized effects of pesticides and contaminants on eggshell thinning in falcons (White et al. 2002; Wegner et al. 2005). Moreover, because falcons are top predators, their population dynamics may also reflect changes in prey populations (Nystrom et al. 2005).

Past Scope and Improvements

Gyrfalcon and peregrine falcon nest monitoring began in 1995 with visual surveys conducted by ENR at least once during the summer to determine falcon species occupancy at identified breeding sites. Starting in 1998, methods were formalized to include a spring and summer survey. For all years after 1998 (except 1999), two surveys were conducted; the first generally occurring in late May or early June and the second in late July. Timing of the surveys has varied between years; 1998 was the most atypical year for timing of surveys, as both the spring and summer surveys were conducted much later in the season (on June 28 and August 13, respectively) relative to other years. Since 2000, spring surveys have been conducted between May and June. The timing of summer surveys has generally ranged from July 22 to July 28.

Over a decade of sampling showed little effects from the Ekati mine on nesting raptors relative to natural factors operating on a regional scale (Handley 2010; DDMI 2011; Coulton et al. 2013). Through discussions and engagement with communities, monitoring agencies, and government, the decision was made to remove this VEC from Mine-specific objectives of the monitoring program and contribute to regional data through the Canadian Peregrine Falcon Survey (Marshall 2009; Handley 2010). Currently, the Canadian Peregrine Falcon Survey is no longer completed. Instead, regional falcon (and other raptors) data are contributed to support ongoing monitoring by ENR and other researchers.

Objectives

The standardized monitoring objective for raptors include is to:

- determine site occupancy and productivity of historic peregrine falcon nest sites in the study area to contribute to the regional falcon data for monitoring long-term population trends.

Methods

Falcon nest sites are monitored at least twice during the breeding season. Sites accessed by helicopter are monitored once during the spring and once during the summer. The spring occupancy survey (June) assesses occupation of historically occupied gyrfalcon and peregrine falcon territories. The summer productivity survey (July) determines the number of chicks produced at each site. Nest productivity is evaluated on the basis of a single site visit; therefore, reported productivity may not reflect the final status of each site.

Frequency

Following recommendations from technical sessions held in 2010, the regional falcon survey will occur every 5 years. The last survey was conducted in in 2015, and the next scheduled survey is in 2020.

Data Analyses

Data from raptor nest monitoring will be provided to ENR to support regional monitoring initiatives. It is assumed the ENR or other wildlife managers will assess the spatial and temporal trends in raptor nest use and productivity across the NWT. As raptor monitoring is no longer required to test impact predictions (Handley 2010), no analyses on these data are anticipated to be completed by DDEC.

5.11 Fox

Two species of fox inhabit the Slave Geological Province of the NWT: the red (or “coloured”) fox, and the Arctic fox. Foxes (especially Arctic fox) are considered important furbearers in the north.

Foxes are opportunistic foragers. As human activities in the Arctic increase, fox populations occasionally thrive near landfills and other artificial food sources. Along with increased fox populations near mining camps and areas with other human activities, the risk of disease transmission also increases. Of particular concern is the transmission of rabies to humans. The Arctic fox is the primary animal vector of rabies in the NWT (Walker and Elkin 2005).

5.11.1 Incidental Observations

Monitoring and recording incidental fox observations in the study area may help avoid and minimize risks associated with human and wildlife interactions. Once a fox is sighted within the Mine site area, people and workers that are at risk of encountering the fox are notified, and work activities are adjusted accordingly.

Past Scope and Improvements

Incidents involving fox have been formally recorded since 2004. Since 2008, incidental fox observations have also been formally recorded by the Environment Department, and the WEMP has included a section dedicated to fox observations. These additional data will help DDEC in mitigating fox interactions around the Ekati mine site.

Objectives

The objectives for this component of the WEMP are to:

- avoid and minimize fox-human interactions;
- document the level of fox activity in the Ekati study area; and,
- document abnormal behaviour in foxes to identify possible cases of rabies.

Methods

Incidental observations of foxes will continue to be reported to the Environment Department. These observations include those made by staff from helicopters or by field workers and other DDEC staff. Each fox observation will include the number of animals, sex, age, location, and behaviour.

All observations of persistent foxes reported in close proximity to roads, personnel, and Mine structures at Ekati will be investigated as these are of particular concern with regards to human and wildlife safety. Where necessary, foxes will be deterred from these areas through the use of vehicles, air horns, screamers, bear bangers, and/or bean bags.

Fox activity will be recorded as an incident if it poses a potential threat to human or fox safety, damage to Mine infrastructure, or requires deterrent efforts (Section 5.4). Foxes observed within the Mine site that do not pose an immediate potential threat to human and wildlife safety will be monitored visually until they move out of the area.

Frequency

Incidental sightings logs will be maintained at site throughout the life of the Ekati mine. Environment staff will review the logs weekly and respond to wildlife sightings or trends of concern when they occur.

Data Analyses

Data analyses will be completed to identify trends over time in the number of Mine-related incidents and occurrence of fox in the study area. Analyses will also attempt to determine the cause of incidents, and identify any further mitigation that would improve the effectiveness of wildlife safety.

5.12 Upland Breeding Birds

The period in which upland birds lay eggs in the Ekati Diamond Mine study area typically begins the first week of June and extends until the third week of June (BHP 1998). Small perching birds and shorebirds are the most common breeders in the Ekati mine study area, including the American tree sparrow, Harris's sparrow, Lapland longspur, least sandpiper, and savannah sparrow. Some other species that are present but less common in the study area include lesser yellowlegs, pectoral sandpiper and yellow-rumped warbler. The rusty blackbird has been infrequently observed in the Ekati study area and is listed as species of Special Concern by COSEWIC (2015) and the federal *Species at Risk Act*. The species has no status in the NWT (NWT SAR 2015).

Natural and human-induced disturbances that occur during the breeding period can correlate with changes in breeding bird density, species richness, and diversity (Rottenborn 1999; Debinsky and Holt 2000; Hennings and Edge 2003; Jokimaki and Kaisanlahti-Jokimaki 2003; Thorington and Bowman 2003). Consequently, upland breeding birds within the Ekati mine study area have been monitored annually from 1996 to 2009. Over a decade of sampling showed little effects from the Ekati mine on upland breeding birds (Male and Nol 2005; Smith et al. 2005; BHP Billiton 2011). Through discussions and engagement with communities, monitoring agencies, and government, the decision was made to remove this VEC from Mine-specific objectives of the monitoring program and contribute to regional data through the North American Breeding Bird Survey (Marshall 2009; Handley 2010).

5.12.1 Incidental Observations

Bird monitoring can provide information on the availability of prey for larger animals that rely on birds as a food source. Changes in the upland bird community, for instance, may influence raptor species that utilize this food source. Incidental observations of breeding birds in the study area are monitored and recorded to document any signs of breeding activity in the area and to identify Mine structures that provide potential nesting platforms. Bird species of special concern or uncommon in the region are also documented when observed.

Past Scope and Improvements

Although the formal breeding bird survey was stopped in 2009, DDEC continues to monitor upland breeding birds through the North American Breeding Bird Survey and incidental observations.

Objectives

The objectives for this component of the WEMP are to:

- document the presence of breeding birds at the Ekati mine; and,
- document sightings of uncommon birds or species of conservation concern in the area.

Methods

Incidental breeding bird observations around the Ekati mine are recorded by Environment Department staff. For each bird observation, the species, number of individuals, date, location (UTM coordinates, where possible), breeding evidence, and behaviour is recorded.

Frequency

Incidental sightings logs will be maintained at site throughout the life of the Ekati mine. Environment staff will review the logs weekly and respond to wildlife sightings or trends of concern when they occur.

Data Analyses

Data analyses will be completed to identify trends over time in the number of Mine-related incidents and occurrence of uncommon and listed birds in the study area. Analyses will also attempt to determine the cause of incidents, and identify any further mitigation that would improve the effectiveness of wildlife safety.

5.12.2 North American Breeding Bird Survey

The North American Breeding Bird Survey (NABBS) is an avian survey designed to collect long-term data on the population status and trends of breeding birds throughout North America. The NABBS was initiated in 1996 and is now conducted at approximately 500 locations across Canada each year. These data are managed by the Canadian Wildlife Service and are used to monitor the status and trends of North American bird populations. The survey at Ekati provides an important contribution to this program since northern regions are under-represented in most continental-scale monitoring programs.

Past Scope and Improvements

In 2003, a NABBS route was established along Misery Road, the land portion of the Lac de Gras winter road, and the LLCF road.

Objectives

The objective of this component of the WEMP is to:

- contribute data to a regional or national bird monitoring program.

Methods

Surveys will be completed by two observers performing point counts along Misery Road and the LLCF road, stopping at 0.8 km intervals. The survey will begin at 3:15 a.m. (30 minutes before official sunrise) and the required 50 stops are completed within five hours. At each of the 50 identified stop points along the survey route, the observers conduct three-minute point counts, where all birds seen and heard within 400 m are recorded. Start and finish times, as well as weather conditions, are also recorded. The data from the survey will be submitted to eBird (www.eBird.org).

Frequency

The NABBS will be completed annually in June.

Data Analyses

The data will be reported in the annual monitoring report to track annual variation in breeding bird densities and diversity within the Ekati study area.

5.13 Rare or Uncommon Species

DDEC will record all incidental observations of rare or uncommon species (e.g., species that have expanded or shifted their range so that they occur more frequently in the study area) that are observed within the Ekati mine study area. These observations will be reported in the annual monitoring report. The WEMP may be expanded to include rare or uncommon species depending on the frequency of observations and likelihood and severity of potential effects from the Mine. DDEC will make the final decision whether or not to include a rare or uncommon species based on discussions with communities and relevant government agencies.

6 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality assurance (QA) refers to plans or programs encompassing internal and external management and technical practices designed so that data of known quality are collected, and that such collections match the intended use of those data (Environment Canada 2012). Quality control (QC) is an internal aspect of quality assurance. It includes the techniques used to measure and assess data quality and the remedial actions to be taken when QC assessment criteria are not met. The QA/QC procedures are implemented so that field sampling, laboratory analyses, data entry, data analysis, and report preparation produce technically sound and scientifically defensible results.

All components of the WEMP, study designs, field methods, and data collection techniques will be reviewed on an ongoing basis by DDEC and their environmental consultant. These QA/QC procedures will provide consistency and integrity of study designs, field protocols, and data collection techniques. Furthermore, continuous evaluation of study methods and results will be used to identify elements for modification or implementation of new techniques. In addition, raw data will be available for review by IEMA, community organizations and government. This approach is intended to provide a WEMP that generates feedback for adaptive management and which concurrently complies with the terms and conditions in the Environmental Agreement for the Ekati mine.

7 REPORTING

Data analysis and reporting will continue to focus on the analysis and meeting of objectives, and providing results that can be used in a timely manner to adjust mitigation as necessary. The use of adaptive management as a scientific backdrop for the WEMP is integral to its effectiveness as a monitoring and mitigation tool. Adaptive management enables mitigation to be properly focused on those areas where the greatest potential for impacts exist and where the greatest reduction in risk can be achieved. Adaptive management is an ongoing process based on a consistent and well-founded framework that continually adjusts according to new information. In this way, the success of mitigation can be reliably monitored.

Accordingly any necessary changes to mitigation procedures will be instituted should monitoring results indicate there is a need. Throughout the field season, progressive analysis of data will be performed wherever possible. At the conclusion of the monitoring season, all data will be analyzed in preparation of reporting. The annual monitoring report will be produced and distributed to communities to provide feedback. The annual report will summarize monitoring results for the previous season and make comparisons to previous years. It will briefly describe methods and related objectives. A discussion and interpretation of results will be presented. The report will use plain English and make effective use of graphics and photographs.

The annual monitoring report will include, but will not be limited to the following information:

- any updates or recommended changes to mitigation, environmental design features, or other strategies required to meet the WEMP objectives;
- occurrences of human-wildlife interactions, incidents, accidents, injuries or mortalities involving wildlife;
- records of disturbances to wildlife habitat that were not predicted; and,
- documentation of all monitoring activities that occurred during the previous calendar year.

8 REFERENCES

- Adamczewski J, Boulanger J, Croft B, Cluff D, Elkin B, Nishi J, Kelly A, D'Hont A, Nicolson C. 2009. Decline in the Bathurst Caribou Herd 2006-2009: A Technical Evaluation Of Field Data And Modeling. Department of Environment and Natural Resources, Government of Northwest Territories, Yellowknife, NWT, Canada.
- Altmann J. 1974. Observational study of behavior: Sampling methods. *Behaviour* 49: 227-267.
- Banci V, Hanks CC, Spicker R, Atatahak G (Eds). 2006. Walking in the Path of the Caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver, BC, Canada.
- Banci V, Hanak J, Ovilok J, Engoaloak H. 2007. Caribou and Roads: Implementing Traditional Knowledge in Wildlife Monitoring at the Ekati Diamond Mine 2006 Annual Report. Yellowknife, NWT, Canada.
- Bathurst Caribou Management Planning Committee. 2004. A Management Plan for the Bathurst Caribou Herd. Bathurst Caribou Management Planning Committee. Yellowknife, NWT, Canada.
- BBOP (Business and Biodiversity Offset Programme). 2015. Mitigation Hierarchy. Available at: http://bbop.forest-trends.org/pages/mitigation_hierarchy. Accessed: February 4, 2015.
- BHP (Broken Hill Proprietary Company/BHP Diamonds Inc.). 1995a. NWT Diamonds Project: Environmental Impact Statement. Rescan Environmental Services Ltd. and BHP Minerals Ltd. Yellowknife, NWT, and Vancouver, BC, Canada.
- BHP. 1995b. Eskers, Carnivores and Dens. Baseline Study Update. Prepared by Rescan Environmental Services Ltd. for BHP Diamonds Inc., Vancouver, BC, Canada.
- BHP. 1995c. Bird inventory and habitat assessment. Baseline Study Updates. Prepared by Rescan Environmental Services Ltd. for BHP Diamonds Inc., Vancouver, BC, Canada.
- BHP. 1995d. Caribou assessment. Baseline Study Updates. Prepared by Rescan Environmental Services Ltd. for BHP Diamonds Inc., Vancouver, BC, Canada.
- BHP. 1995e. Ecological mapping. Baseline Study Updates. Prepared by Rescan Environmental Services Ltd. for BHP Diamonds Inc., Vancouver, BC Canada.
- BHP. 1995f. Métis Elder Perceptions of the Project: Individual Responses. Traditional Knowledge and Environmental Impact Assessment Study Agreement interview compilation results, Appendix 1-A7. NWT Diamonds Project: Environmental Impact Statement Project Description, Volume I, Yellowknife, NWT, Canada.
- BHP. 1996. Baseline Study Updates. Prepared by Rescan Environmental Services Ltd. for BHP Diamonds Inc., Vancouver BC, Canada.
- BHP. 1998. EKATI Diamond Mine Wildlife Effects Monitoring Plan. Prepared by Golder Associates Ltd. for BHP Diamonds Inc., Yellowknife, NWT, Canada.

- BHP. 1999. EKATI Diamond Mine 1998 Wildlife Effects Monitoring Program. Prepared by Golder Associates Ltd. for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- BHP. 2000a. EKATI Diamond Mine Wildlife Effects Monitoring Plan. Support Document H. Prepared by BHP Diamonds Inc., Yellowknife, NWT, Canada.
- BHP. 2000b. 1999 Wildlife Effects Monitoring Program. Prepared by Golder Associated Ltd. for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- BHP. 2000c. Environmental Assessment Report for Sable, Pigeon and Beartooth Kimberlite Pipes. Prepared by BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- BHP Billiton (BHP Billiton Canada Inc. including subsidiary BHP Billiton Diamonds Inc.). 2002. 2001 Wildlife Effects Monitoring Program. Prepared by Golder Associated Ltd. for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- BHP Billiton. 2004. 2003 Wildlife Effects Monitoring Program. Prepared by Golder Associated Ltd. for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- BHP Billiton. 2011. 2010 Wildlife Effects Monitoring Program. Prepared by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada.
- BHP Billiton. 2012. Ekati Diamond Mine 2012 Environmental Impact Report. Prepared by BHP Billiton Canada Inc., Yellowknife, NWT, Canada.
- Boulanger J, Poole K, Fournier B, Wierzchowski J, Gaines T, Gunn A. 2004. Assessment of Bathurst Caribou Movements and Distribution in the Slave Geological Province. Department of Resources, Wildlife, and Economic Development, Government of the Northwest Territories. Yellowknife, NT. Manuscript Report No. 158.
- Boulanger J, Poole KG, Gunn A, Wierzchowski J. 2012. Estimating the zone of influence of industrial developments on wildlife: A migratory caribou Rangifer tarandus groenlandicus and diamond mine case study. *Wildlife Bio* 18: 164-179.
- Bowman JL, Chamberlain MJ, Leopold BD, Jacobson HA. 1996. An evaluation of two censusing techniques to estimate black bear population size on White River National Wildlife Refuge, Arkansas. *Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies* 50: 614-621.
- Bradshaw CJA., Boutin S, Hebert DM. 1997. Effects of petroleum exploration on woodland caribou in northeastern Alberta. *J Wildlife Manage* 61: 1127–1133.
- Bridges AS, Vaughan MR, Klenzendorf S. 2004a Seasonal variation in American black bear *Ursus americanus* activity patterns: quantification via remote photography. *Wildlife Biol* 10:277-284.
- Bridges AS, Fox JA, Olfenbittel C, Vaughan MR. 2004b. American black bear denning behavior: observations and applications using remote photography. *Wildlife Soc. B* 32: 188-193.

- Clarke CHD, Paquet PC, Curlee AP. 1996. Large carnivore conservation in the Rocky Mountains of the United States and Canada. *Conserv Biol* 10: 936-939.
- Cluff D, Walton LR, Paquet PC. 2002. Movements and Habitat Use of Wolves Denning in the Central Canadian Arctic, Northwest Territories and Nunavut, Canada. Final Report to West Kitikmeot Slave Study (WKSS). NWT and Nunavut, Canada.
- COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2015. Wildlife Species Search. Available at: http://www.cosewic.gc.ca/eng/sct1/index_e.cfm. Accessed: May 30, 2015.
- Coulton DW, Virgl JA, English C. 2013. Falcon Nest Occupancy and Hatch Success Near Two Diamond Mines in the Southern Arctic, Northwest Territories. *Avian Conserv and Ecol* 8: 14.
- Cutler TL, Swann DE. 1999. Using remote photography in wildlife ecology: A review. *Wildlife Soc B* 27: 571-581.
- DDMI (Diavik Diamond Mines Inc.). 2012. Wildlife Monitoring Program Report – 2011. Yellowknife, NWT, Canada.
- Debinsky DM, Holt RD. 2000. A survey and overview of habitat fragmentation experiments. *Conserv Biol* 14: 342-355.
- Dene Cultural Institute. 1995. Traditional Methods Used by the Dogrib to Redirect Caribou. A report for the Dogrib Renewable Resources Committee, Dogrib Treaty 11 Council and the Department of Renewable Resources, GNWT, Yellowknife, NWT, Canada.
- Dogrib Treaty 11 Council. 2000. A Tłı̄ch̄q Perspective on Biodiversity. Dogrib Treaty 11 Council, Behchok̄, NWT, Canada.
- DDEC (Dominion Diamond Ekati Corporation). 2014. Developer's Assessment Report for the Jay Project. Prepared by Golder Associates Ltd., October 2014. Yellowknife, NWT, Canada.
- DDEC. 2017. Air Quality and Emissions Monitoring and Management Plan for the Jay Project. January 2017.
- Dougherty SQ. 2010. Estimating Sika Deer Abundance using Camera Surveys. A thesis submitted to the Faculty of the University of Delaware, Newark, DE, United States.
- ECG (Ecosystem Classification Group). 2012. Ecological Regions of the Northwest Territories – Southern Arctic. Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NWT, Canada.
- Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring (EEM). National EEM Office, Ottawa, ON, Canada.
- Environment Canada. 2015. Technical Report, Jay Project, EA1314-01. Submitted to the Mackenzie Valley Environmental Impact Review Board, July 2015. Yellowknife, NWT, Canada.

- Epp H, Matthews S. 1998. Habitat and Vegetation Classification for the West Kitikmeot / Slave Study Region. Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NWT, Canada.
- ERM (ERM Consultants Ltd.). 2015. Ekati Diamond Mine 2014 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation, Yellowknife, NWT, Canada.
- ERM Rescan (ERM Rescan Environmental Services Ltd.). 2014a. Ekati and Diavik Diamond Mines: 2014 Final Lac de Gras Regional Grizzly Bear DNA Report. Prepared for Dominion Diamond Ekati Corporation and Diavik Diamond Mines (2012) Inc., Yellowknife, NWT, Canada.
- ERM Rescan 2014b. Ekati Diamond Mine: 2013 Wildlife Effects Monitoring Program. Prepared for Dominion Diamond Ekati Corporation, Yellowknife, NWT, Canada.
- Ford AF, Clevenger AP, Bennett A. 2009. Comparison of non-invasive methods for monitoring wildlife crossing structures on highways. *J Wildlife Manage* 73: 1213–1222.
- GNWT-ENR (Government of the Northwest Territories, Department of Environment and Natural Resources). 2005. NWT Species 2000: General Status Ranks of Wild Species in the Northwest Territories. 5. Status Ranks – What did we find? Environment and Natural Resources, Yellowknife, NWT, Canada.
- GNWT-ENR. 2006. Caribou Forever - Our Heritage, Our Responsibility: A Barren-ground Caribou Management Strategy for the Northwest Territories 2006-2010. Environment and Natural Resources, Yellowknife, NWT, Canada.
- GNWT-ENR. 2011. Caribou Forever – Our Heritage, Our Responsibility: A Barren-Ground Caribou Management Strategy for the Northwest Territories 2011-2015. Environment and Natural Resources, Yellowknife, NWT, Canada.
- GNWT-ENR. 2013a. Draft Wildlife and Wildlife Habitat Protection Plan and Wildlife Effects Monitoring Program Guidelines. Prepared by the Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NWT, Canada.
- GNWT-ENR. 2013b. Draft Monitoring Protocol: Wolverine Hair Snagging. Prepared by the Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NWT, Canada.
- GNWT-ENR. 2015a. GNWT website <http://www.enr.gov.nt.ca/node/2977>. Accessed December 11, 2015.
- GNWT-ENR. 2015b. Guidance for Monitoring the Zone of Influence (ZOI) of Anthropogenic Disturbance on Barren-ground Caribou. Prepared by the Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NWT, Canada.
- GNWT-ENR. 2017. Barren-ground Caribou - Ahiak, Beverly and Qamanirjuaq Herds. Available at: <http://www.enr.gov.nt.ca/node/2976> Accessed: March 7, 2017.

- Government of Canada, GNWT, BHP (Government of Canada, Government of the Northwest Territories, Broken Hill Proprietary Company). 1997. Environmental Agreement. BHP Diamonds Inc., Government of the Northwest Territories and Department of Indian Affairs and Northern Development Canada, Yellowknife, NWT, Canada.
- Greig L, Marmorek D, Murray C. 2008. Guide for Preparation of Adaptive Management Plans. Prepared by ESSA Technologies Ltd., Richmond Hill, ON for Fisheries and Oceans Canada, Western Arctic Area, Central and Arctic Region, Yellowknife, NWT, Canada.
- Golder (Golder Associates, Ltd.). 2011. Analysis of Environmental Effects from the Diavik Diamond Mine on Wildlife in the Lac De Gras Region. Prepared by Golder Associates, Ltd. for Diavik Diamond Mines Inc., Yellowknife, NWT, Canada.
- Grompper ME, Kays RW, Ray JC, LaPoint SD, Bogan DA, Cryan JA. 2006. A comparison of non-invasive techniques to survey carnivore communities in Northeastern North America. *Wildlife Soc B* 34: 1142-1151.
- Gunn A, Dragon J, Nishi J. 1997. Bathurst calving ground survey, 1996. File Report No. 119. Department of Renewable Resources, Yellowknife, NWT, Canada.
- Gunn A, D'Hont A. 2002. Extent of Calving for the Bathurst and Ahlak Caribou Herds June 2002. Department of Resources, Wildlife and Economic Development, Yellowknife, NWT, Canada. Manuscript Report No. 149.
- Haig SM. 1998. Molecular contributions to conservation. *Ecology* 79: 413-425.
- Handley J. 2010. Report on Diamond Mine Wildlife Monitoring Technical Workshop,, Yellowknife, NWT, Canada.
- Heard DC, Williams MT. 1992. Distribution of wolf dens on migratory caribou ranges in the Northwest Territories, Canada. *Can J Zool* 70:1504-1510.
- Hennings LA, Edge DW. 2003. Riparian bird community structure in Portland, Oregon: Habitat, urbanization, and spatial scale patterns. *Condor* 105: 288-302.
- Higuchi R, von Beroldingen CJ, Sensabaugh GF, Erlich, HA. 1988. DNA typing from single hairs. *Nature* 332:543-546.
- Holroyd GL, Banasch U. 2003. The 2000 Canadian Peregrine Falcon survey. *J Raptor Res* 37: 98-116.
- IFC (International Finance Corporation). 2012. Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. January 12, 2012.
- Johnson CJ, Boyce MS, Case RL, Cluff HD, Gau RJ, Gunn A, Mulders R. 2005. Cumulative effects of human developments on Arctic wildlife. *Wildlife Monogr* 160 (July):1-36.
- Jokimaki J, Kaisanlahti-Jokimaki M. 2003. Spatial similarity of urban bird communities: A multiscale approach. *J Biogeogr* 30:1183-1193.

- Kelly MJ, Laurenson MK, FitzGibbon CD, Collins DA, Durant SM, Frame GW, Bertram BCR, Caro TM, 1998. Demography of the Serengeti cheetah (*Acinonyx jubatus*) population: the first 25 years. *J Zool* 244:473-488.
- Kelly MJ, Holub EL. 2008. Camera trapping of carnivores: Trap success among camera types and across species, and habitat selection by species, on Salt Pond Mountain, Giles County, Virginia. *Northeast Nat* 15: 249-262.
- Kessel B. 1989. Birds of the Seward Peninsula, Alaska: Their Biogeography, Seasonality, and Natural History. University of Alaska Press, Fairbanks, AL, United States.
- Kuyt E. 1972. Food Habits and Ecology of Wolves on Barren-Ground Caribou Range in the Northwest Territories. Canadian Wildlife Service Report Series Number 21. Information Canada, Ottawa, ON, Canada.
- Kyle CJ, Strobeck C. 2002. Connectivity of peripheral and core populations of North American wolverines. *J Mammal* 83: 1141-1150.
- Lucherini M, Lovari S, Crema G. 2009. Habitat use and ranging behaviour of the red fox (*Vulpes vulpes*) in a Mediterranean rural area: Is shelter availability a key factor? *J Zool.* 237: 577-591.
- Mace RD, Manley TL, Aune KE. 1994. Factors affecting the photographic detection rate of grizzly bears in the Swan Mountains, Montana. *International Conference Bear Resource and Management* 9: 245-251.
- Male SK, Nol E. 2005. Impacts of roads associated with the Ekati Diamond Mine, Northwest Territories, Canada, on reproductive success and breeding habitat of Lapland Longspurs. *Canadian J Zool* 83: 1286-1296.
- Marshall R. 2009. Diamond Mine Wildlife Monitoring Workshop Report. Prepared for Diavik Diamond Mines Inc., Yellowknife, NWT, Canada.
- Martin P, Bateson P. 1993. *Measuring Behaviour: An Introductory Guide*, 2nd ed. Cambridge University Press. Cambridge, United Kingdom.
- Martorello DA, Eason TH, Pelton MR. 2001. A sighting technique using cameras to estimate population size of black bears. *Wildlife Soc B* 29: 560-567.
- Matthews S, Epp H, Smith G. 2001. *Vegetation Classification for the West Kitikmeot Slave Study Region. Final Report to WKSS.* NWT and Nunavut, Canada.
- McKinley WT, Demarais S, Gee KL, Jacobson HA. 2006. Accuracy of the camera technique for estimating White-tailed deer population characteristics. *Proceedings of the Annual Conference of Southeaster Fish and Wildlife Agencies*:83-88.
- McLoughlin PD, Walton LR, Cluff D, Paquet PC, Ramsay MA. 2004. Hierarchical habitat selection by tundra wolves. *J Mammal* 85: 576-580.

- Mowat G, Strobeck C. 2000. Estimating population size of grizzly bears using hair capture, DNA profiling, and mark-recapture analysis. *J Wildlife Manage* 64: 183-193.
- Nellemann C, Cameron RD. 1996. Effects of petroleum development on terrain preferences of calving caribou. *Arctic* 49: 23-28.
- NWT SAR (Northwest Territories Species at Risk). 2015. NWT Species at Risk. Available at: <http://nwt-speciesatrisk.ca>. Accessed: May 1, 2015.
- Nystrom J, Ekenstedt J, Engstrom J, Angerbjorn A. 2005. Gyrfalcons, ptarmigan and microtine rodents in northern Sweden. *Ibis* 147: 587-597.
- O'Connell AF, Nichols JD, Karanth KU. 2010. *Camera Traps in Animal Ecology: Methods and Analysis*. Springer Science & Business Media, New York, NY, United States.
- Proctor, MF, Servheen C, Miller SD, Kasworm W F, Wakkinen W L. 2005. Genetic analysis reveals demographic fragmentation of grizzly bears yielding vulnerably small populations. *Proc Royal Soc B* 272: 2409-2416.
- Rescan (Rescan Environmental Services Ltd.). 2005. Ekati Diamond Mine 2004 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- Rescan. 2006a. Ekati Diamond Mine 2005 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- Rescan. 2006b. Ekati Diamond Mine Wildlife and Human Health Risk Assessment. Prepared for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- Rescan. 2008. Ekati Diamond Mine 2007 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- Rescan. 2010. Ekati Diamond Mine 2009 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- Rescan. 2011. Ekati Diamond Mine 2010 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc., Yellowknife, NWT, Canada.
- Rescan. 2012. Ekati Diamond Mine 2011 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc., Yellowknife, NWT, Canada.
- Rescan. 2013. Ekati Diamond Mine 2012 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc., Yellowknife, NWT, Canada.
- Rottenborn SC. 1999. Predicting the impacts of urbanization on riparian bird communities. *Biol Conserv* 88: 289-299.
- Rovero F, Marshall AR. 2009. Camera trapping photographic rate as an index of density in forest ungulates. *J App Ecol* 46: 1011-1017.

- Seydack AHW. 1984. Application of a photo recording device in the census of larger rainforest mammals. *S Afr J Wildl Res* 14: 10-14.
- Silveira L, Jácomo ATA, Diniz-Filho JAF. 2003. Camera trap, line transect census and track surveys: a comprehensive evaluation. *Biol Conserv* 114: 351-355.
- Smith AC, Virgl JA, Panayi D, Armstrong AR. 2005. Effects of a Diamond Mine on Tundra-Breeding Birds. *Arctic* 58:295-304.
- Spence CE, Gratton P. 2005. Defining a National Park Boundary – Lessons Learned from Stakeholder Involvement. Available at: <http://www.miningnorth.com/ministersConference/2003/MAC.pdf>. Accessed: July, 27, 2015.
- Taberlet P, Mattock H, Dubois-Paganon C, Bouvet J. 1993. Sexing free-ranging brown bears, *Ursos arctos*, using hairs collected in the field. *Mol Ecol* 2: 399-403.
- Thorington KK, Bowman R. 2003. Predation on artificial nests increases with human housing density in suburban habitats. *Ecography* 26: 188-196.
- Van Manen FT, Jones MD, Scheick BK. 2001. Determining the potential mitigation effects of wildlife passageways on black bears. International Conference on Ecology and Transportation 2001 Proceedings. Available at: <http://repositories.cdlib.org/jmie/roadeco/>. Accessed: July, 27, 2015.
- Walker J, Elkin B. 2005. Rabies in the Northwest Territories Part 1: A Historical Overview of Rabies in NWT. EPI, the Northwest Territories epidemiology newsletter 17(1). Yellowknife, NWT, Canada.
- Walton LR, Cluff HD, Paquet PC, Ramsay MA. 2001. Movement patterns of barren-ground wolves in the central Canadian Arctic. *J Mammal* 82: 867-876.
- Wegner, P., G. Kleinstaubler, F. Baum, and F. Schilling. 2005. Long-term investigation of the degree of exposure of German peregrine falcons (*Falco peregrinus*) to damaging chemicals from the environment. *J Ornithol* 146: 34-54.
- Weir RD. 2004. Wolverine: *Gulo gulo*. Accounts and Measures for Managing Identified Wildlife, Accounts V. 2004. Ministry of Environment, BC, Canada.
- Weledeh Yellowknives Dene. 1997. Weledeh Yellowknives Dene: A Traditional Knowledge Study of Ek'ati. Yellowknives Dene First Nation Council, Dettah, NWT, Canada.
- White CM, Clum NJ, Cade TJ, Hunt WG. 2002. Peregrine Falcon (*Falco peregrinus*). The Birds of North America, No. 660. Ed. A. Poole and F. Gill. Philadelphia, Pennsylvania, USA.
- Wilson GM, Van Den Bussche RA, Kennedy PK, Gunn A, Poole K. 2000. Genetic variability of wolverines (*Gulo gulo*) from the Northwest Territories, Canada: Conservation implications. *J Mammal*. 81: 189-196.
- WKSS (West Kitikmeot Slave Study). 2001. Final Report West Kitikmeot Slave Study. West Kitikmeot Slave Study Society. Yellowknife, NWT, Canada.

- WLWB (Wek'èezhìi Land and Water Board). 2010. Guidelines for Adaptive Management - a Response Framework for Aquatic Effects Monitoring (Draft). Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.
- WLWB. 2014. Water Licence W2012L2-0001. Wek'èezhìi Land and Water Board. Yellowknife, NWT, Canada.
- Wolfe SA, Griffith B, Wolfe CAG. 2000. Response of reindeer and caribou to human activities. *Polar Res* 19: 63-73.
- Woods JG, Paetkau D, Lewis D, McLellan BN, Proctor AM, Strobeck C. 1999. Genetic tagging of free-ranging black and brown bears. *Wildlife Soc B* 27: 616-627.



APPENDIX A

EFFECTS PATHWAYS

Table A-1 Effects Pathways, Effects Assumptions, Predictions, and Relevant Monitoring Programs and Management Plans for Wildlife and Wildlife Habitat

DAR Effects Pathways	General Pathway	DAR Pathway Assessment	DAR Assumptions	Effect Prediction Summary	Magnitude of the Incremental Effect	Relevant Monitoring Programs
Direct loss and fragmentation of habitat from the Project footprint may cause changes in abundance and distribution of grizzly bear, wolverine, water birds, and raptors	Direct and indirect habitat loss	Primary	<ul style="list-style-type: none"> Modelling of direct effects to habitat accurately reflected the level of disturbance to herd range Best practices will limit effects to vegetation 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Air Quality Management and Monitoring Program Aquatic Effects Monitoring Program Closure and Reclamation Plan Dewatering Plan Mine Water Management Plan Waste Rock and Ore Storage Management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program
Direct loss and fragmentation of habitat from the Project footprint may cause changes in abundance and distribution of wolves and upland breeding birds	Direct and indirect habitat loss	Secondary	<ul style="list-style-type: none"> Best practices will limit effects to vegetation 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Air Quality Management and Monitoring Program Aquatic Effects Monitoring Program Closure and Reclamation Plan Dewatering Plan Mine Water Management Plan Waste Rock and Ore Storage Management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program
Physical hazards (open pit, blasting, buildings, WRSAs) may result in increased risk of injury or mortality to individual animals	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Frequency of mine-related mortalities at diamond mines in the NWT, including the Ekati Mine, is extremely low 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Engagement Plan Wildlife Effects Monitoring Program
The Misery and Jay power lines may cause increased risk of injury or mortality to birds	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Distribution lines are anticipated to result in few bird mortalities 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Engagement Plan Wildlife Effects Monitoring Program
Site preparation and construction may result in the destruction of nests, eggs, and individuals of migratory birds (incidental take)	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Best practices will limit incidental take 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Wildlife Effects Monitoring Program
Air and dust emissions and subsequent deposition can change the quantity or quality of plant forage, and subsequently prey abundance	Dust deposition	Secondary	<ul style="list-style-type: none"> Dust modelling predicts that dust will be largely confined to the Project footprint 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Air Quality Management and Monitoring Program Wildlife Effects Monitoring Program
Ingestion of water, soil, and vegetation, or inhalation of air that has been chemically altered by air emissions or dust deposition may affect wildlife health	Dust deposition	Secondary	<ul style="list-style-type: none"> Dust modelling is accurate, indicating that dust will be largely confined to the Project footprint 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Air Quality Management and Monitoring Program Wildlife Effects Monitoring Program
Sensory disturbance (lights, smells, noise, dust, human activity, viewscape) may cause changes in habitat quality, movement and behaviour for grizzly bear, wolverine, water birds, and raptors	Sensory disturbance	Primary	<ul style="list-style-type: none"> Habitat suitability modelling incorporated numerous conservative assumptions, and accurately reflects impacts to wildlife 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Engagement Plan Wildlife Effects Monitoring Program
Sensory disturbance (lights, smells, noise, dust, human activity, viewscape) may cause changes in habitat quality, movement and behaviour for gray wolf and upland breeding birds	Sensory disturbance	Secondary	<ul style="list-style-type: none"> Effects to upland breeding bird and gray wolf were assessed using conservative assumptions 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Engagement Plan Wildlife Effects Monitoring Program
Increased traffic on the Misery Road and Jay Road, and the above-ground power line along these roads, may create barriers to carnivore and caribou movement, which may affect grizzly bear and wolverine population connectivity, abundance, and distribution	Traffic and power lines	Primary	<ul style="list-style-type: none"> Caribou energetics modelling incorporated numerous conservative assumptions, and accurately reflects impacts to caribou, grizzly bear, and wolverine 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Engagement Plan Waste Rock and Ore Storage Management Plan Wildlife Effects Monitoring Program
Increased traffic on the Misery Road and Jay Road, and the above-ground power line along these roads, may create barriers to carnivore and caribou movement, which may affect wolf population connectivity, abundance, and distribution	Traffic and power lines	Secondary	<ul style="list-style-type: none"> Wolf abundance and distribution is more affected by prey abundance than human disturbance 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Engagement Plan Waste Rock and Ore Storage Management Plan Wildlife Effects Monitoring Program
Collisions between caribou and vehicles or aircraft causes injury or mortality of animals	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Frequency of mine-related mortalities at diamond mines in the NWT, including the Ekati Mine, is extremely low 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Engagement Plan Wildlife Effects Monitoring Program
Attractants to site (food, shelter) may result in problem wildlife or disruption to predator-prey relationships	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Local increases in bears or wolves have not been observed at other mines Waste management will limit the availability of food to wildlife 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Hazardous Waste Management Plan Hydrocarbon-Impacted Materials Management Plan Incinerator Management Plan Landfill Management Plan Spill Contingency Plan Waste Management Plan Wildlife Effects Monitoring Program

Table A-1 Effects Pathways, Effects Assumptions, Predictions, and Relevant Monitoring Programs and Management Plans for Wildlife and Wildlife Habitat

DAR Effects Pathways	General Pathway	DAR Pathway Assessment	DAR Assumptions	Effect Prediction Summary	Magnitude of the Incremental Effect	Relevant Monitoring Programs
Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the dewatering of diked area of Lac du Sauvage leading to change in riparian habitat and caribou distribution	Direct and indirect habitat loss	No Linkage	<ul style="list-style-type: none"> Dewatering will not cause water levels to exceed the high water mark 	Limited change to movement and behaviour	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Dewatering Plan Wildlife Effects Monitoring Program
Dewatering of diked area of Lac du Sauvage may result in newly established vegetation on exposed lakebed sediments, and may change caribou habitat quantity	Direct and indirect habitat loss	Secondary	<ul style="list-style-type: none"> Colonization of lakebed sediments will be slow, patchy and limited area within the mine footprint 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Wildlife Effects Monitoring Program
Ingestion of seepage and surface runoff from WRSAs and kimberlite stockpiles or ingestion of water, soil, and vegetation that has been chemically altered by seepage and surface runoff may affect wildlife health	Physical and chemical hazards	No Linkage	<ul style="list-style-type: none"> Seepage and runoff will be contained and managed where appropriate Sequestering of acid generating rock will limit leaching Ecological risk assessment results predicts negligible risk 	No caribou mortality	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Waste Rock and Ore Storage management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program
Surface run-off and seepage from the WRSAs and kimberlite stockpiles may change habitat quality	Direct and indirect habitat loss	No Linkage	<ul style="list-style-type: none"> Seepage and runoff will be contained and managed where appropriate Sequestering of acid generating rock will limit leaching 	Movement and behaviour will not be affected	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Waste Rock and Ore Storage management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program
Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the back-flooding of diked area of Lac du Sauvage alters riparian habitat and caribou distribution	Direct and indirect habitat loss	No Linkage	<ul style="list-style-type: none"> Changes to water levels will be within the range of natural variation 	Limited change to movement and behaviour	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Dewatering Plan Wildlife Effects Monitoring Program
Ingestion of seepage and surface runoff from WRSAs after closure, or ingestion of water, soil, and vegetation that has been chemically altered by long-term seepage and surface runoff may affect caribou health	Physical and chemical hazards	No Linkage	<ul style="list-style-type: none"> Seepage and runoff will be contained and managed Sequestering of acid generating rock will limit leaching Ecological risk assessment results were accurate, indicating negligible risk 	No caribou mortality	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Waste Rock and Ore Storage management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program
Long-term seepage from the WRSAs may change habitat quality	Direct and indirect habitat loss	No Linkage	<ul style="list-style-type: none"> Seepage and runoff will be contained and managed where appropriate Sequestering of acid generating rock will limit leaching 	Movement and behaviour will not be affected	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Waste Rock and Ore Storage management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program
Ingestion of soil, vegetation, or water that has been altered by chemical spills (i.e., fuels, petroleum products, reagents, pipelines) on site affecting caribou health	Physical and chemical hazards	No Linkage	<ul style="list-style-type: none"> Spill response and clean-up will mitigate effects to wildlife 	No caribou mortality	Nil	<ul style="list-style-type: none"> Spill Contingency Plan Wildlife Effects Monitoring Program

DAR = Developer's Assessment Report; WRSA = waste rock storage area; NWT = Northwest Territories.

Table A-2 Effects Pathways, Effects Assumptions, Predictions, and Relevant Monitoring Programs and Management Plans for Barren-Ground Caribou

DAR Effects Pathways	General Pathway	DAR Pathway Assessment	DAR Assumptions	Effect Prediction Summary	Magnitude of the Incremental Effect	Relevant Monitoring Programs
Direct loss and fragmentation of habitat from the Project footprint causes changes in caribou abundance and distribution	Direct and indirect habitat loss	Primary	<ul style="list-style-type: none"> Modelling of direct effects to caribou habitat accurately reflected the level of disturbance to herd range Best practices will limit effects to vegetation 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Air Quality Management and Monitoring Program Aquatic Effects Monitoring Program Closure and Reclamation Plan Dewatering Plan Mine Water Management Plan Waste Rock and Ore Storage Management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program
Physical hazards leading to increased risk of injury or mortality to individual caribou	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Frequency of mine-related mortalities at diamond mines in the NWT, including the Ekati Mine, is extremely low 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Engagement Plan Wildlife Effects Monitoring Program
Air and dust emissions and subsequent deposition can change the quantity or quality of plant forage and alter caribou distribution and behaviour.	Dust deposition	Secondary	<ul style="list-style-type: none"> Dust modelling is accurate, indicating that dust will be largely confined to the Project footprint 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Air Quality Management and Monitoring Program Wildlife Effects Monitoring Program
Ingestion of water, soil, and vegetation, or inhalation of air that has been chemically altered by air emissions or dust deposition may affect wildlife health	Dust deposition	Secondary	<ul style="list-style-type: none"> Dust modelling is accurate, indicating that dust will be largely confined to the Project footprint 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Air Quality Management and Monitoring Program Wildlife Effects Monitoring Program
Sensory disturbance (lights, smells, noise, dust, viewscape) and barriers to movement causes changes to caribou movement and behaviour, and changes to energetics and reproduction	Sensory disturbance	Primary	<ul style="list-style-type: none"> Energetics modelling incorporated numerous conservative assumptions, and accurately reflects impacts to caribou Population modelling conclusions are correct 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Engagement Plan Wildlife Effects Monitoring Program Caribou Road Mitigation Plan
Increased traffic on the Misery Road and Jay Road, the above-ground power line along these roads, and the pipelines along the Jay Road may create barriers to caribou movement, change migration routes, and reduce population connectivity.	Traffic and power lines	Primary	<ul style="list-style-type: none"> Energetics modelling incorporated numerous conservative assumptions, and accurately reflects impacts to caribou Caribou crossing design for the Jay Road is implemented and effective at facilitating crossings Implementation of Wildlife Road Mitigation Plan will reduce barrier effect 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Engagement Plan Waste Rock and Ore Storage Management Plan Wildlife Effects Monitoring Program Caribou Road Mitigation Plan
Collisions between caribou and vehicles or aircraft causes injury or mortality of animals	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Frequency of mine-related mortalities at diamond mines in the NWT, including the Ekati Mine, is extremely low Addition of Wildlife Road Mitigation Plan will further reduce likelihood of road-related mortalities 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Engagement Plan Wildlife Effects Monitoring Program Caribou Road Mitigation Plan
Attractants at site (food, shelter) leading to problem wildlife or increases in predator densities and predation on caribou	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Local increases in bears or wolves have not been observed at other mines Waste management will limit the availability of food to wildlife 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Hazardous Waste Management Plan Hydrocarbon-Impacted Materials Management Plan Incinerator Management Plan Landfill Management Plan Spill Contingency Plan Waste Management Plan Wildlife Effects Monitoring Program
Continued operation of the Tibbitt to Contwoyto Winter Road results in continued opportunities for harvesting caribou, which can alter caribou movement and behaviour, and survival and reproduction	Physical and chemical hazards	Secondary	<ul style="list-style-type: none"> Harvest by Non-Aboriginal and Resident hunters is currently not permitted along the Tibbitt to Contwoyto Winter Road or around the Lac de Gras area 	Mortality will be negligible	Low	<ul style="list-style-type: none"> Wildlife Effects Monitoring Program
Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the dewatering of diked area of Lac du Sauvage leading to change in riparian habitat and caribou distribution	Direct and indirect habitat loss	No Linkage	<ul style="list-style-type: none"> Dewatering will not cause water levels downstream in Lac du Sauvage and the Narrows to exceed the high water mark 	Limited change to movement and behaviour	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Dewatering Plan Wildlife Effects Monitoring Program
Dewatering of diked area of Lac du Sauvage may result in newly established vegetation on exposed lakebed sediments, and may change caribou habitat quantity	Direct and indirect habitat loss	Secondary	<ul style="list-style-type: none"> Colonization of lakebed sediments will be slow, patchy and limited area within the mine footprint Caribou will avoid area due to limited access and proximity to human activity 	Movement and behaviour will be affected	Low	<ul style="list-style-type: none"> Wildlife Effects Monitoring Program
Ingestion of seepage and surface runoff from WRSAs and kimberlite stockpiles, or ingestion of water, soil, and vegetation that has been chemically altered by seepage and surface runoff may affect caribou health	Physical and chemical hazards	No Linkage	<ul style="list-style-type: none"> Seepage and runoff will be contained and managed where appropriate Sequestering of acid generating rock will limit leaching Ecological risk assessment results were accurate, indicating negligible risk 	No caribou mortality	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Waste Rock and Ore Storage management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program Interim Closure and Reclamation Plan

Table A-2 Effects Pathways, Effects Assumptions, Predictions, and Relevant Monitoring Programs and Management Plans for Barren-Ground Caribou

DAR Effects Pathways	General Pathway	DAR Pathway Assessment	DAR Assumptions	Effect Prediction Summary	Magnitude of the Incremental Effect	Relevant Monitoring Programs
Surface runoff and seepage from the WRSAs and kimberlite stockpiles may change habitat quality	Direct and indirect habitat loss	No Linkage	<ul style="list-style-type: none"> Seepage and runoff will be contained and managed where appropriate Sequestering of acid generating rock will limit leaching 	Movement and behaviour will not be affected	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Waste Rock and Ore Storage management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program
Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the back-flooding of diked area of Lac du Sauvage alters riparian habitat and caribou distribution	Direct and indirect habitat loss	No Linkage	<ul style="list-style-type: none"> Changes to water levels will be within the range of natural variation 	Limited change to movement and behaviour	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Dewatering Plan Wildlife Effects Monitoring Program
Ingestion of seepage and surface runoff from WRSAs after closure, or ingestion of water, soil, and vegetation that has been chemically altered by long-term seepage and surface runoff may affect caribou health	Physical and chemical hazards	No Linkage	<ul style="list-style-type: none"> Seepage and runoff will be contained and managed where appropriate Sequestering of acid generating rock will limit leaching Ecological risk assessment results were accurate, indicating negligible risk 	No caribou mortality	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Waste Rock and Ore Storage management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program Interim Closure and Reclamation Plan
Long-term seepage from the WRSAs may change habitat quality	Direct and indirect habitat loss	No Linkage	<ul style="list-style-type: none"> Seepage and runoff will be contained and managed where appropriate Sequestering of acid generating rock will limit leaching 	Movement and behaviour will not be affected	Nil	<ul style="list-style-type: none"> Aquatic Effects Monitoring Program Waste Rock and Ore Storage management Plan Wastewater and Processed Kimberlite Management Plan Wildlife Effects Monitoring Program Interim Closure and Reclamation Plan
Ingestion of soil, vegetation, or water that has been altered by chemical spills (i.e., fuels, petroleum products, reagents, pipelines) on site affecting caribou health	Accidents and Malfunctions Physical and chemical hazards	No Linkage	<ul style="list-style-type: none"> Spill response and clean-up will mitigate effects to wildlife 	No caribou mortality	Nil	<ul style="list-style-type: none"> Spill Contingency Plan Wildlife Effects Monitoring Program

DAR = Developer's Assessment Report; NWT = Northwest Territories; WRSA = waste rock storage area.



APPENDIX B

REVIEWER RECOMMENDATIONS AND PROONENT RESPONSES

March 2017

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
The CRMP should be incorporated into the WEMP.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Chuck Hubert (MVEIRB)	Incorporated into the WEMP as an Appendix.	Entire document
The information in the wolf section ends at 2010 and should be updated to 2015.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Andrea Patenaude (ENR)	Section was updated.	Section 5.8.2
Clarification is needed on the difference between complete and partial wolf den surveys.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Dean Cluff (ENR)	Clarification was added. Partial surveys was changed to targeted surveys.	Section 5.8.2
Clarify which sections pertain to the WWHPP and which to the WEMP in the concordance table.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Andrea Patenaude (ENR)	Concordance Table was updated.	Table 1.5-1, Section 1.5
Quality Assurance and Quality Control (QA/QC) sections and analyses sections should be added to the WEMP (similar to the AEMP).	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Mark d'Entremont (DKFN)	Quality assurance and quality control section added to WEMP.	Section 6
The objectives of the WEMP should be clarified and there should be species-specific objectives.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Mark d'Entremont (DKFN)	Added a table of objectives (including species-specific objectives).	Table 1.4-1, Section 1.4
Muskox should be included in the WEMP because they are important to Aboriginal communities.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Fred Sangris (YKDFN)	Reporting incidental observations of muskox and other rare or uncommon species within the study area will be reported in the annual monitoring report. Section 5.13 Rare or Uncommon Species was added to the WEMP.	Section 5.13
The WEMP states "There are indications that improved and continual employee education has resulted in a decrease in the presence of scavengers and food waste items at landfills (Rescan 2010)" (pg 4-3). This statement is outdated and incorrect given results from the past 2-3 years. DDEC noted in the 2015 WEMP that adherence by employees to effective waste management disposal practices at the mine site remains a challenge. Overall occurrence of wildlife attractants or misdirected wastes based upon surveys was relatively high in 2015 and similar to 2014. DDEC should update and correct this statement regarding waste management.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Since the redesign of the landfill in 2002, monitoring results indicate that less food waste is misdirected to the landfill. DDEC has recently implemented additional changes to internal procedures to further reduce misdirected food waste and will monitor whether these changes are effective. A revision for this comment was not required.	n/a
The WEMP states "Currently, it is expected that indirect habitat alteration and loss for caribou (Zone of Influence; ZOI) will be monitored through regional programs in collaboration with ENR, potentially through the Barren-ground Caribou Management Strategy (Section 5.8.1). Potential mechanisms for the ZOI will be monitored through the WEMP" (pg 4-7). Sensory disturbance at the mine site level is the responsibility of the developer, and cannot be shunted off to regional programs. Monitoring and mitigation of sensory disturbance, not just for identifying potential mechanisms, must occur. DDEC to update this section to provide methods for monitoring and mitigation of sensory disturbance.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Sections 4.2. and 5.6.5 provide descriptions of caribou ZOI monitoring and mitigation of indirect effects from Ekati mine.	Section 4.2.2 and Section 5.6.5
DDEC should clarify what is considered as the "current Mine footprint" for calculation of direct wildlife habitat loss.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Reclaimed areas that meet reclamation objectives will no longer be considered disturbed. The area disturbed and reclaimed will be tabulated in future reports. A revision for this comment was not required.	n/a
The Wildlife-Vehicle and Aircraft Interaction section is designed to address a number of residual risks including "caribou avoidance of the Mine" and changes in movement patterns (pg 5-8). However, the 2 objectives focus on risk of injury or death, and have little bearing on reducing caribou avoidance (sensory disturbance). DDEC should align these sections to address the appropriate objectives.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Reference to the residual risks of mine avoidance and barrier effects of roads has been removed from Section 5.5 of the WEMP as suggested by IEMA.	Section 5.5
The WEMP section on the Ahiak herd (pg 5-10) is dated and does not align with herd designations presented in the EIR 2016.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	There is the potential for interaction between the Ekati mine and Ahiak caribou, based on this herd's historical range. DDEC will continue to monitor location maps provided by GNWT ENR for the protection of caribou	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
DDEC should update this section.				that may interact with the Ekati mine. A revision for this comment was not required.	
DDEC states that it will work with the ZOI Technical Task Group on appropriate methods for monitoring the caribou ZOI (pg 5-15). The Task Group has drafted methods, but is slow to make firm recommendations on which project (especially established projects) should be conducting ZOI monitoring. The Agency re-iterates that aerial surveys to monitor relative caribou distribution and abundance should be conducted to monitor the impact of the Ekati Mine and measure the effectiveness of mitigation measures for caribou, including enhanced traffic management and dust suppression. The aerial survey study area should be enlarged to include the extensions related to the Jay and Sable developments.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	DDEC will work with the ZOI Technical Task Group on the appropriate methods for monitoring the caribou ZOI. The current regional study area for the Ekati mine includes the Sable and Jay development areas and does not require expansion. A revision for this comment was not required.	n/a
One of the objectives for the camera is to "determine caribou (and other wildlife) responses to the road (i.e., crossing or deflecting)" (pg 5-18). No details on how this will be conducted are provided. Since this issue has been discussed at length in previous forums, DDEC should provide appropriate methodology to examine crossing success.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Approach is to assume that caribou on roads or at edge of roads intend to cross, which is reasonable. Mitigation will be applied under this assumption and whether caribou cross when mitigation is applied will be monitored (e.g., installing caribou crossings, and reducing vehicle speeds, and stopping vehicles as caribou approach road). Crossing success determination and mitigation effectiveness was updated in Section 5.6.7. A revision for this comment was not required.	Section 5.6.7
DDEC states "It is anticipated that aerial surveys for wolf den occupancy will continue to be conducted by ENR staff" (pg 5-26). If the objective is to "determine the presence, distribution and productivity of active wolf dens throughout the study area", then DDEC should conduct these surveys if ENR does not do them. No surveys were conducted by either ENR or DDEC in 2015). DDEC should provide appropriate methodology to examine wolf den occupancy independent of ENR.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Wolf den monitoring is no longer a required component of the WEMP based on consensus at Wildlife Monitoring Workshops in 2009 and 2010. DDEC continues to support the GNWT-ENR wolf monitoring programs. A revision for this comment was not required.	n/a
The North Slave Métis Alliance agreed with the suggestions made by IEMA in their July 5, 2016 letter to DDEC.	Letter	08-Jul-16	Shin Shiga (NSMA)	See responses to IEMA recommendations. A revision for this comment was not required.	n/a
<u>Objectives</u> Overall this section has improved from previous WEMP versions	Letter	29-Aug-16	Andrea Pateneau (GNWT)	A revision for this comment was not required.	n/a
<u>Objectives: P. 1-6</u> The changes to the objective section to include the overarching global objectives provides solid grounding for the WEMP for the most part; however one global objective that does not appear to be captured is testing the effectiveness of mitigation and operation practices, Recommend that this should be added as a global objective.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Testing the effectiveness of mitigation has been included as a global objective.	Section 1.4
<u>Objectives: Table 1.4-1</u> We like this table. It is helpful to have an overview of the specific program objectives and how they fit in with the global objectives. Do not the results of the Incidental Observations (and Road Surveys for caribou) also inform the need for mitigation (as does the Collared Caribou monitoring as stated below)? ENR recommends adding such an objective to the objectives for the incidental observation for all monitored species	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Incidental observations can lead to the use of mitigation (e.g., bear deterrence from site). This has been included as an objective where applicable.	Section 1.4
<u>Section 1.5 Concordance: Table 1.5-1</u> Concordance of Legislation/Regulation Requirements and WEMP - updated to include Measure 6-1: Road Mitigations for Caribou.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	A revision for this comment was not required.	n/a
<u>Section 1.5 Concordance: Recommendation</u> Add Measure 6-2(a) to the concordance table given that it is to be enforced under Section 95 of the <i>Wildlife Act</i> and will contain relevant content. It can also be noted that this requirement has a different timeline. Also, add Measure 6-5 related to Traditional Knowledge in developing caribou monitoring programs since they are to be reported as part of the annual WEMP.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Measure 6-2(a) and Measure 6-5 are now included in the concordance table.	Table 1.5-1

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
<u>Section 2.4 Valued Ecosystem Components: Table 2.4-1</u> Valued Ecosystem Components for the WEMP - ENR notes that DDEC has removed falcons as a VEC from mine-specific monitoring. Can DDEC detail specifically when it was decided that raptors be dropped as a VEC (i.e., provide meeting notes or correspondence detailing this decision? Can DDEC explain how this will change their treatment of raptors? While it is ENR's understanding that project level effects monitoring was dropped in favour of regional monitoring, ENR expects regional raptor monitoring and appropriate mitigation and mitigation monitoring for pit-wall nesting species to continue and that it is not inappropriate to include them as a VEC. The pit wall monitoring continues presumably because raptors are valued, and listed as a species of concern in Section 2.5-1.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Monitoring of raptors is included in Table 1.4. Raptors are no longer considered a VEC (Table 2.4-1) based on consensus at Wildlife Monitoring Workshops in 2009 and 2010 but because they are important to the ecosystem and Peregrine falcon is listed under SARA, raptors are included in site-surveillance and regional monitoring (Section 5.10). A revision for this comment was not required.	n/a
<u>Section 3.0 Engagement and Incorporation of Traditional Knowledge</u> ENR recommends to include some information specifically how DDEC is meeting Measure 6-5 i.e., outline the process and timeline for the elders group, participants etc.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Section 3 describes how Traditional Knowledge has been and will continue to be incorporated into wildlife monitoring. The Jay Project Road Construction Plan posted to the WLWB public registry in November provides details about the process and timeline for the Traditional Knowledge Elders Group. A revision for this comment was not required.	n/a
<u>Section 4.0 Mitigation P. 4-1</u> ENR notes the update on the results of the environmental assessment	Letter	29-Aug-16	Andrea Pateneau (GNWT)	A revision for this comment was not required.	n/a
<u>Section 4.0 Mitigation</u> ENR notes that Section 4.1.6 on dust was updated to make reference to the AQEMMP, the CRMP and pilot study on dust suppression, however, ENR recommends that DDEC refer to where dust suppression procedures including management triggers are found	Letter	29-Aug-16	Andrea Pateneau (GNWT)	All procedures and management actions related to dust are found in the AQEMMP. A revision for this comment was not required.	n/a
<u>Section 4.0 Mitigation</u> Question: Section 4.2.2 Indirect Habitat. What is meant by "Currently it is expected that indirect habitat alteration and loss for caribou will be monitored through regional programs in collaboration with ENR, potentially through the Barren-ground Caribou Management Strategy"? This reads as though DDEC expects ENR will be monitoring Jay/Ekati's ZOI.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	DDEC will work with the ZOI Technical Task Group on the appropriate methods for monitoring the caribou ZOI. A revision for this comment was not required.	Section 4
<u>Section 4.0 Mitigation P. 4-7 "</u> Potential mechanisms for the ZOI will be monitored through the WEMP and other plans such as the AQEMMP." Are they listed elsewhere? If so, refer to where. If not, please list them and identify how they will be monitored.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	To clarify, any potential ZOI mechanism that is monitored will be completed through the WEMP or other plans. For example, dust has been proposed as a potential mechanism for a caribou ZOI and is monitored through the existing AQEMMP. This will be clarified in a future revision.	n/a
<u>Section 4.2.3 Barrier Effects from Road P. 4-8</u> "The road design allows for approximately 1.8 km of caribou crossings over a total length of 2.5 km between JR1+100 (close to King Pond) and JR3+560 close to the intersection with the Jay North Road (i.e., 72% of the road will be built with caribou crossings). This includes a 1.3 km stretch of road through the esker. Two additional caribou crossings will be added to the Jay North Road and one crossing will be added to the eastern section of the Jay Road towards the dike (Appendix B; Section 4.1.1)." Please update this section to be in accordance with the Road Construction Plan (condition 41 of the Land Use Permit W2016F007) that DDEC is required to submit to the WLWB prior to starting construction associated with the Jay Early Works permit.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	The text provided in Section 4.2.3 regarding caribou crossings for the Jay Project is consistent with the Jay Project Road Construction Plan, which was submitted to WLWB in November 2016. A revision for this comment was not required.	n/a
<u>Section 4.2.3 Barrier Effects from Road P. 4-8</u> DDEC indicated that "snow berm height will be managed during winter to below 1.7 m;" but does not provide further detail to evaluate the effectiveness of this mitigation reducing the barrier effect of the road. ENR requires DDEC to provide further description of how snow berms will be managed.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Snow berms along the Misery and Jay roads will be maintained at a height less than 1.6 m, where practicable. However, the grader used to manage snow will likely clear snow closer to a height of 1 m. A revision for this comment was not required.	n/a
<u>Section 4.3.1 Direct Mine-related Mortality and Injury</u> Noted, addition or revision of 9 new mitigations.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	A revision for this comment was not required.	n/a
<u>Section 4.3.1 Direct Mine-related Mortality and Injury</u> Question: an addition to this section is the idea that a blasting plan will be implemented to protect caribou and other wildlife from fly-rock during early stages of pit development. Where will this be housed? What to protect caribou from disturbance from blasting? What are protocols around this currently? Not clear from WEMP.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	A blasting plan is an internal operational document much like the CRMP but is not submitted externally. The same protocols are used for caribou safety during blasting as for humans. Blasts will not take place if there are people or caribou within the blast exclusion area. The blast exclusion area is determined by the blast supervisor prior to blasting based on the requirements of the Northwest Territories <i>Mine Health and Safety Act</i> and	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
				<p>other related Acts and Regulations. Blasting will continue to be conducted in accordance with the requirements of the relevant Acts and Regulations, procedures in place at the Ekati mine, and supervised by the Ekati mine blasting team. This will ensure the safety of caribou as it does people.</p> <p>A response to disturbance to caribou from blasting was provided for Information Request MVEIRB-IR-98.</p> <p>A revision for this comment was not required.</p>	
<p><u>Section 4.3.4 Deterring Wildlife</u> ENR notes that section 4.3.4 Deterring Wildlife only addresses caribou.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Section 4.3.4 refers to wildlife, meaning wildlife are included, and provides some examples specific to caribou.</p> <p>A revision for this comment was not required.</p>	n/a
<p><u>Section 4.3.4 Deterring Wildlife</u> What about operational procedures, training, protocols etc. for deterring nesting raptors, bears and other species? Section 95(1) of the Wildlife Act requires that wildlife management and monitoring plans include "a description of measures to be implemented for mitigation of potential impacts" ENR requires that DDEC include operational procedures for deterrence activities that describe how the health and safety of animals and humans are take into account in such activities.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Standard Operating Procedures for deterring wildlife will be included with a future revision.</p>	n/a
<p><u>Section 5.1 Direct Wildlife Habitat Loss</u> ENR recommends that DDEC include reporting on the area of habitat reclaimed or recovered, if applicable.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>The area disturbed and reclaimed will be tabulated in future reports as part of Section 5.1.</p> <p>A revision for this comment was not required.</p>	Section 5.1
<p><u>Section 5.2.1 Landfill Monitoring</u> There do not appear to be triggers for levels of wildlife and wildlife sign. Please identify what levels of animal sign detections would trigger and action.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Indices of wildlife and wildlife sign are reviewed annually to determine if there is pattern that suggests a problem at site that requires further follow-up.</p>	n/a
<p><u>Section 5.2.1 Landfill Monitoring P. 5-4</u> ENR notes that this section contains thresholds for waste detection but actions. Please identify what actions will be taken based on these results.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Actions would depend on the location of the problem, and would be provided in the annual WEMP report.</p> <p>A revision for this comment was not required.</p>	n/a
<p><u>Section 5.2.2 Waste Bin Monitoring P. 5-4</u> ENR notes that while actions are identified, the thresholds for triggering such actions are not stated. Please include these.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Section 5.2.2 indicates actions are taken if misdirected waste is found.</p> <p>A revision for this comment was not required.</p>	n/a
<p><u>Section 5.3 Wildlife Mortalities</u> "During the 2010 reporting period, DDEC Environment Staff reviewed, communicated and followed a "Mortality Reporting protocol developed in consultation with ENR that includes mortality reporting procedures required by ENR and EC." Please include operational procedures for mortality reporting.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Standard Operating Procedures for mortality reporting be included with a future revision.</p>	n/a
<p><u>Section 5.3 Wildlife Mortalities</u> All references in the document to "Environment Canada" should be changed to "Environment and Climate Change Canada".</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Reference to Environment Canada will be changed to Environment and Climate Change Canada in a future revision.</p>	Whole WEMP document
<p><u>Section 5.5 Wildlife-Vehicle and Aircraft Interactions</u> This section does not appear to address impact of caribou avoidance or barrier effects. Recommend removing these objectives from this section or identify where else in the document this is addressed.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Reference to the residual risks of mine avoidance and barrier effects of roads has been removed from Section 5.5 of the WEMP as suggested by IEMA.</p>	Section 5.5
<p><u>Section 5.6 Caribou</u> Please replace "Caribou Range Management Plan" with "Bathurst Caribou Range Plan"</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Reference to the Bathurst Caribou Range Plan will be changed in a future revision.</p>	Section 5.6
<p><u>Section 5.6 Caribou</u> "By definition the WEMP is focussed on Ekati mine-specific mitigation and monitoring and any collaboration with the GNWT (and other agencies, communities and mines) on regional programs for the assessment and management of cumulative effects is outside the scope of reporting in the WEMP". ENR wishes to clarify that while project specific results of collaborative programs is not mandatory, it is nonetheless recommended DDEC describe within the WEMP how DDEC is contributing to such programs or make reference to any summary reports that have been provided or compiled on regional programs.</p>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	<p>Section 5.7.2 for grizzly bear, 5.8.2 for wolf, 5.9.2 for wolverine, 5.10.2 for raptors and 5.12.2 on North American Breeding Bird Survey all describe how DDEC supports collaborative regional monitoring programs.</p> <p>A revision for this comment was not required.</p>	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
<u>Section 5.6.3 Caribou Road Surveys P. 5-13</u> ENR recommends that DDEC identify the method by which traffic will be recorded or reference where this information is otherwise provided	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Haul traffic is monitored at site using a Wenco system (WEMP, Appendix C, Section 4.1.1). A revision for this comment was not required.	n/a
<u>Section 5.6.5 Caribou Zone of Influence Monitoring</u> DDEC states that they will "work with the Zone Of Influence Technical Task Group administered by the GNWT, regulators and communities on appropriate methods for monitoring the caribou ZOI." Based on the draft ZOI guidance document so far, ENR recommends that DDEC expand its study area to accommodate Jay and Sable pits and consider modifying the design to have graduated spacing. ZOI Guidance Document says "Project for which ZOI monitoring is deemed appropriate are advised to produce an initial estimate of ZOI during the operations phase of their project. Repeat monitoring should be conducted when the project is expected to change due to a major shift in the project (e.g. mine phase change, expansion), a change in mitigation practices or other cause." ENR recommends that DDEC resume reconnaissance surveys for possible completion of full-scale ZOI surveys to generate a ZOI estimate associated with Jay within the first year of operations of Jay	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Since 1998, the regional study area has included the Jay and Sable development areas (WEMP; Map 2.1-1). The Guidance Document has remained a draft since March 2013, so there is uncertainty about what is required. Aerial surveys for caribou were discontinued after communities expressed concerns over disturbance by caribou caused by aerial surveys. A revision for this comment was not required.	n/a
<u>Section 5.6.6 Caribou Behaviour P. 5-17</u> While there is probably good logistical reasons why DDMI monitors far away and DDEC closer to the mines, ENR recommends that DDEC and DDMI consider collaborating on sending out mixed survey crews to avoid bias in comparisons of close and distant observations. ENR requires that DDEC add feeding intensity surveys to their behavioural observations to help detect nutritional implications of disturbance and feed into cumulative effects modeling being used by the GNWT. ENR looks forward to continued collaboration with DDEC and the other mines towards coordinating and improving behaviour monitoring.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Ekati and Diavik mine staff use the same behaviour monitoring methods and protocols so there is no reason to expect site-specific bias that might occur if different methods were used. The behaviour monitoring completed at Ekati and Diavik includes recording feeding activity, which also has nutritional implications. In addition, DDEC uses focal sampling, which provides greater level of detail on feeding time for potential input into energetic models. A revision for this comment was not required.	n/a
<u>Section 5.6.7 Camera Trapping</u> In the past, this method was used to test the effectiveness of caribou crossing structures, which is noted as a requirement of the CRMP in Measure 6-1. ENR notes that this could be added as an objective of this program with respect to meeting requirement (m) of Measure 6-1. ENR suggests that modifications to past methodologies for testing of caribou crossing/deflection rates is required to properly quantify impacts to caribou, ENR recommends that paired sets of cameras be established to also detect possible deflections that occur beyond the 25-30 m trigger range of the cameras to get a more complete picture of caribou responses to the road. ENR notes that improvements to traffic monitoring noted elsewhere in the WEMP may also help with interpreting results of camera trapping studies.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Approach is to assume that caribou on roads or at edge of roads intend to cross, which is reasonable. Mitigation will be applied under this assumption and whether caribou cross when mitigation is applied will be monitored (e.g., installing caribou crossings, and reducing vehicle speeds, and stopping vehicles as caribou approach road). DDEC is also exploring a number of different options for detecting and monitoring caribou before caribou would be detected by specific road surveys or drivers. This includes scans for caribou using thermal imaging technology at high probability of encounter points along roads identified from incidental caribou observations, camera trapping data, and TK. DDEC will provide additional detail on methods for determining crossing success and mitigation effectiveness in future documentation. A revision for this comment was not required.	n/a
<u>Section 5.7.2 Grizzly Bear P. 5-22</u> Given the objective of recording incidental observations for the purpose of monitoring "changes in bear activity near the mine over time and assess potential attraction or avoidance of the mine by different demographic groups (emphasis added), ENR recommends that DDEC ensure that detail on bear size, cub size (COYS, yearlings, 2 year olds) and gender be included as an option on the observation forms and recommends that observers take pictures in their protocols.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Section 5.7.1 provides age and sex as examples of the level of demographic reported. Most incidental observations are reported by mine staff other than Environment Technicians, and whom would not be expected to have the technical skill to determine bear weight, cub-of-year, yearling, or two year olds. For this reason, monitoring of bear demographic records is limited to male or female (sex) and cubs (age). Mine staff are not supplied with cameras as regular work equipment. Environment Technicians routinely take photos when following up on incidental observations when animals are present. A revision for this comment was not required.	n/a
<u>Section 5.7.2 Grizzly Bear P. 5-23</u>	Letter	29-Aug-16	Andrea Pateneau (GNWT)	The reported error is no longer present in the current version of the WEMP.	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
Re: objectives for the grizzly bear hair snagging study: there is a copy and paste error referring to caribou studies.				A revision for this comment was not required.	
<u>Section 5.7.2 Grizzly Bear</u> Frequency for the Grizzly Bear hair snagging study: Add "the next round of grizzly bear hair snagging will be in 2017".	Letter	29-Aug-16	Andrea Pateneau (GNWT)	The WEMP reflects that the program was last completed in 2013 and is anticipated to be repeated in four years, which would be 2017. The year of the next scheduled program will be provided in future revisions	Section 5.7.2
<u>Section 5.7.2 Grizzly Bear P. 5-24</u> Re analysis. ENR recommends that DDEC use Spatial Explicit Capture-Recapture method to analysis subsequent rounds of grizzly bear hair snagging to compensate for study area closure issues and thereby provide more robust population size and density estimates that will be more comparable to other density estimates.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	This regional monitoring program is completed by DDEC to support cumulative effects assessment and management by the GNWT. It is up to the GNWT to determine how they will analyze these data. Section 5.7.2 no longer references any particular analysis method. As has been reviewed at Wildlife Monitoring Workshops, the study design intended the use of the Pradel reverse-time capture-recapture model, which is an open population model and does not include a closure assumption. It also estimates population growth rate, which matches the monitoring objective of the program and without the need for deriving population size. A spatially explicit capture-recapture model includes an assumption of population closure. A revision for this comment was not required.	n/a
<u>Section 5.7.2 Grizzly Bear</u> It is recommended that raw data from this program be submitted to WMIS	Letter	29-Aug-16	Andrea Pateneau (GNWT)	The regional grizzly bear hair snagging program is completed collaboratively with other mine operators and the decision to submit data to WMIS requires agreement by all collaborators. A revision for this comment was not required.	n/a
<u>Section 5.8 Wolf P. 5-24</u> Objectives: ENR notes that the wording of the first bullet could be clearer. Identifying the presence of composition of observations is not quite what you are trying to do. This could also made into a new bullet.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	DDEC will consider clarifying the objective in a future revision.	Section 5.8
<u>Section 5.8 Wolf</u> ENR acknowledges and appreciates DDEC's contributions to regional wolf monitoring. While ENR is reviewing wolf monitoring options on the Bathurst range; currently it's still uncertain if and when ENR will resume monitoring wolf dens on a regional scale. However, in the meantime, ENR encourages DDEC to continue with and perhaps enhance any ground and aerial efforts to monitor all historic den sites as well as search for new dens, in order to monitor occupancy within the study area. Periodic monitoring of active den sites during summer would likely provide insight into if or when packs are moving to alternate den sites, and better information on the productivity and survival of pups.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Wolf den monitoring is no longer a required component of the WEMP based on consensus at Wildlife Monitoring Workshops in 2009 and 2010. DDEC continues to support the GNWT-ENR wolf monitoring programs. Section 5.8.2 (Frequency) explicitly states "However, if these surveys are no longer completed by ENR, DDEC plans to continue to survey the historic den sites that are found within the Ekati study area and will update the WEMP methods accordingly." A revision for this comment was not required.	n/a
<u>Section 5.10.1 Pit Wall Nest Monitoring and Incidental Observations</u> Objectives. This section identified that an objective of this monitoring is to document the effectiveness of deterrent efforts that may be employed for nest relocations yet ENR is not aware of where or when such information has been reported in the past. ENR notes that the mitigations that are used to deter nesting in pits are not documented or reported elsewhere in this document. Please include operational procedures for these activities.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Standard Operating Procedures for deterring pit wall nesting by raptors will be included with a future revision.	n/a
<u>Section 5.10.2 Regional Falcon Surveys P. 5-30</u> Please cite the report or source of the statement "Over a decade of sampling showed little effects from the Ekati mine on nesting raptors relative to natural factors operating on a regional scale".	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Regional raptor nest monitoring is no longer a required component of the WEMP based on consensus at Wildlife Monitoring Workshops in 2009 and 2010. Reasons for this decision included that results were highly variable annually and had not identified significant adverse effects. The monitoring data set was formally analyzed and reported by the Diavik Mine (DDMI 2011) and subsequently published in the Journal of Avian Conservation and Ecology (Coulton et al. 2013). These citations will be included in a future revision.	Section 5.10.2

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
<u>Section 5.10.2 Regional Falcon Surveys</u> The statement that "the Canadian Peregrine Falcon Survey is not be conducted from Yellowknife" gives the impression that at one point it was. This is not the case. The Canadian Peregrine Falcon Survey was a federally coordinated national survey in which ENR provided territorial data. That survey is no longer running but independent researchers and provincial/territorial representative are working to continue reporting on a five year basis. ENR continues to monitor raptors every five years in cooperation with the mines, stores these data in the NWT/NU Raptor Database, reports on certain results in GNWT's <i>State of the Environment Report</i> and collaborates on these independent efforts to maintain peregrine surveys. Please revise this section to reflect this.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	A future revision will clarify that the Peregrine Falcon Survey is no longer completed and that nest monitoring will be contributed to support on-going monitoring by ENR and other researchers.	Section 5.10.2
<u>Section 5.12 Upland Breeding Birds</u> ENR recommends that DDEC solicit commentary from ECCC on this section.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	As has been the practice historically, all regulators and communities are welcome to submit comments at any time. A revision for this comment was not required.	n/a
<u>Section 5.12 Upland Breeding Birds P. 5-24-25</u> ENR recommends that although short-eared owl is a raptor, it is more appropriately mentioned in this section rather than the raptor section given the monitoring methods in this section are more applicable (i.e. SEOW is not a cliff-nester) for monitoring this species.	Letter	29-Aug-16	Andrea Pateneau (GNWT)	Section 5.10 identifies which raptor species have been observed in the study area, which includes short-eared owl. Section 5.10.2 indicates that regional monitoring of nests used by peregrine falcon and gyrfalcon although other species using nests are also monitored. Observations of short-eared owl have been reported with the North American Breeding Bird Survey results annual Ekati mine WEMP reports. A revision for this comment was not required.	n/a
<u>Section 5.12 Upland Breeding Birds P. 5-25</u> Please provide a citation for the statement that "over a decade of sampling showed little effects from the Ekati Mine on upland breeding birds".	Letter	29-Aug-16	Andrea Pateneau (GNWT)	A study at Ekati mine from 1996 to 2003 of upland breeding bird density and diversity found no adverse effects and was published in the journal Arctic (Smith et al. 2005). From 2002 to 2003, a study on habitat use and success found no adverse effects to Lapland longspurs, which was published in the Canadian Journal of Zoology (Male and Nol 2005). Appendix A of the 2010 Ekati mine WEMP report includes a 13 year (1996 to 2008) analysis of the breeding bird monitoring data and the results indicate no adverse effects to upland breeding bird density, diversity, richness, and evenness. These citations will be included in a future revision.	Section 5.12
The area that is reclaimed should also be reported along with the current mine footprint in the Annual WEMP Report	Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	13-Sep-16	Marc Casas (IEMA)	The area disturbed and reclaimed will be tabulated in future reports. A revision for this comment was not required.	n/a
It should be clarified when the wildlife study area was expanded (Map 2.1-1)	Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	13-Sep-16	Shawn McKay	Map 2.1-1 was updated to clarify when the wildlife study area was expanded.	Map 2.1-1
The recommendations given through engagement and actions or responses should be documented in the WEMP and CRMP.	Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	13-Sep-16	Marc Casas (IEMA)	A revision table summarizing engagement recommendations and actions or responses has been added as an Appendix to the WEMP and CRMP.	WEMP Appendix B and CRMP Attachment I.
GNWT-ENR will need to see the following revisions to the WEMP (including CRMP) before it can be approved by the Minister of ENR: a) Inclusion of Standard Operating Procedures for common mitigation and monitoring procedures including: a) Deterrence procedures for bears, wolverine, caribou, and nesting raptors. b) Mortality reporting c) Wildlife incident reporting d) Bear safety protocols e) Protection of wildlife from blasting	Letter	4-Jan-17	Lynda Yonge (GNWT)	Standard Operating Procedures are provided in WEMP Appendix F.	Appendix F Standard Operating Procedures
d) Inclusion of the methods that DDEC will be using to test the predictions made regarding indirect habitat loss caused by the Jay Project. Monitoring and mitigation of sensory disturbance, and related indirect habitat loss, is the responsibility of the developer. Monitoring of the zone of influence is not a government-led monitoring program, and the statement in Section 4.2.2 that suggests it is should be removed. GNWT notes that the level of detail provided in the WEMP on monitoring ZOI currently will	Letter	4-Jan-17	Lynda Yonge (GNWT)	DDEC is committed to monitoring the effects of the Ekati mine (and its components) that contribute to regional cumulative effects. Section 4.2.2 has been revised to clarify this. DDEC has revised Section 5.6.5 to include aerial survey monitoring methods and analyses. As committed to in the WEMP, DDEC will follow the	Section 4.2.2 and 5.6.5

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
not satisfy the requirement of the Act for: "95 2(c) the process for monitoring impacts and assessing whether mitigative measures are effective". The guidance contained in the ZOI guidance document represents the most current and up to date guidance developed collaboratively among government, industry and other caribou experts. ENR requires that DDEC resume reconnaissance surveys for possible completion of full-scale ZOI surveys to generate a ZOI estimate associated with Jay within the first year of operations. DDEC is advised to specify its methods within the text of the WEMP according to that document; which should include a study area which extends 35 km beyond Sable and Jay. It is understood that future revisions to the methods may arise with any changes collectively made to the guidance document.				<p>guidelines set forth by the Zone of Influence Technical Task Group, recognizing that monitoring and analysis methods may change in the future. However, whether ZOI monitoring is sensitive enough to evaluate mitigation effectiveness has not been demonstrated. DDEC believes that evaluating mitigation effectiveness is best completed by monitoring of effects directly (e.g., fugitive dust) and use the process of adaptive management to determine if mitigation is effective (Section 2.2). This is a process that is consistent with the draft WWHPP and WEMP guidelines developed by ENR for compliance with the <i>Wildlife Act</i>.</p> <p>DDEC is opposed to increasing the size of the study area because it will introduce two sources of bias in the analysis of aerial survey data. First, it will add information from areas that have not been surveyed previously, which will confound the effects of space and time. Secondly, it has already been demonstrated that sampling effort increases with distance from development infrastructure, which violates the uniform sampling assumed in the analysis proposed by the guidance document. Expanding the study may make violation of this assumption worse and is counter to the goal of the graduated spacing sampling design in the guidance document. Non-uniform sampling can be expected to bias a ZOI estimate toward areas where survey effort is higher. Finally, the aerial survey study area is large enough to detect a 14 km ZOI with the addition of the Sable and Jay developments (Map I-1).</p> <p>DDEC will resume reconnaissance surveys for caribou ZOI monitoring during the operational phase of the Jay Project as directed by ENR.</p>	
e) Further details on how the risks of physical injury and sensory disturbance to caribou and other wildlife from blasting are mitigated and monitored is required to satisfy subsection 95(2) paragraph of the Wildlife Act.	Letter	4-Jan-17	Lynda Yonge (GNWT)	DDEC has included a SOP for surface blasting (EKA WI 1702.06), which indicates a pre-blast survey within 750 m is completed and if caribou are present, the Environment Department will be notified and blasting will be suspended until the area is clear.	Appendix F Standard Operating Procedures and Datasheets
f) GNWT-ENR notes several instances in Appendix B and Attachment 1 in which DDEC's response to comments on relatively minor issues or of an editorial nature indicates that those revisions will be included in the next version of the WMMP. GNWT recommends that those revisions be included in the version to be submitted to the Minister of ENR for approval.	Letter	4-Jan-17	Lynda Yonge (GNWT)	All commitments for revisions to the December 9, 2016 submission have been completed in the most current versions of the WEMP and CRMP..	WEMP and CRMP documents
h) ENR notes that while the minutes from the 2009 and 2010 regional diamond mine monitoring workshops outlines changes to monitoring objectives for raptors, they do not show a record of a decision to drop Raptors as a VEC, and GNWT is not aware of any other official records that document this. GNWT recommends that raptors remain a VEC in the document.	Letter	4-Jan-17	Lynda Yonge (GNWT)	Table 2.4-1 shows that DDEC considers raptors as a VEC and site interactions by raptors are still monitored (Section 5.10.1) but that nests off-site are no longer monitored for mine-related effects, and are conducted every 5 years to support ongoing monitoring by ENR and other researchers. Table 2.4-1 has been revised to clarify this.	WEMP Table 2.4-1
i) ENR is interested in deriving a density estimate for grizzly bears in the central barrens to support management of cumulative effects on grizzly bears. DDEC and other collaborators should seek to sign a data sharing agreement for provision of the raw data from regional grizzly bear monitoring to GNWT to support this objective.	Letter	4-Jan-17	Lynda Yonge (GNWT)	DDEC is willing to develop a data sharing agreement with ENR.	n/a
General Comments - 1. State of the Bathurst caribou herd: The Ekati mine is located within the range of the Bathurst caribou herd. The Agency's concerns regarding the WEMP/CRMP are intensified given the strong message from the communities about the perilous state of the Bathurst herd as expressed in the Mackenzie Valley Environmental Impact Review Board (MVEIRB) 2016 Reasons for Decision report (Sections 6.3.1 and 6.4.2). In reviewing the WEMP the Agency is highly conscious of MVEIRB's (2016) conclusion "that a comprehensive and innovative combination of mitigation measures is required to reduce the risks of serious harm to the Bathurst herd to the lowest level possible" (pg 115). The Agency is also concerned that DDEC has not, with this December 2016 WEMP and CRMP, met MVEIRB's requirement that DDEC "finalize amendments for construction in a manner that considers and addresses feedback received" (pg 121).	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>WEMP Appendix E includes a comprehensive list of hierarchical mitigation that will be applied for the protection of caribou and other wildlife and Appendix C (CRMP) includes mitigation that will be adaptively managed based on the presence of caribou, which reflects a novel management plan, mitigation and feedback from communities, regulators, and IEMA.</p> <p>WEMP Appendix B and CRMP Attachment I provide tables that include feedback received from regulators, IEMA, and communities, which DDEC has considered in the revision of these two management plans for the Jay Project. Many recommendations have been incorporated into these management plans.</p> <p>All commitments for revisions to the December 9, 2016 submission have been completed.</p>	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
				A revision for this comment was not required.	
<p>General Comments - 2. Lack of response to previous comments: Appendix Table B-1 to the WEMP provides the "Revision to WEMP or Rationale if Revision Not Made" for comments on the May 2016 version of these reports received by DDEC. Of the 62 recommendations made post-2015 by the Agency and other parties (mainly GNWT- ENR), "A revision for this comment was not required" was the response from DDEC 60% of the time, with a further 23% responses "This will be clarified in a future revision" and only 18% of recommendations addressed or acknowledged in some form. Similar figures for the CRMP portion of the WEMP (32 recommendations) are 63%, 9%, and 28%, respectively (Attachment I: Reviewer Recommendations and Proponent Responses). In a number of recommendations the answer/clarification to the recommendation or query was provided in Table B-1 or Attachment I, but not carried through to the text of the WEMP/CRMP.</p> <p>Therefore, it is apparent that the majority of recommendations on the May 2016 version of the WEMP/CRMP were ignored or deferred to some later version. Since most comments were received by the end of August 2016, and this version of the WEMP/CRMP is dated December 2016, we have to wonder why these promised "future revisions" were not incorporated into the current draft.</p> <p>DDEC to:</p> <ul style="list-style-type: none"> • Provide a clear rationale for rejecting or deferring each of the suggestions; • Commit to a date for responses to outstanding recommendations; and • Include a document control table at the front of these plans outlining dates and points made during major revisions. 	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	Appendix B for the WEMP and Attachment I of the CRMP provide tables of plan comments received through engagement with regulators, IEMA, and communities as part of the Jay Project, beginning with the WEMP and CRMP workshops hosted by DDEC in 2015. These tables provide a summary of the comments received and the revision completed or a revision commitment. When a revision was not completed, an explanation was provided. Pending revisions from the December 2016 submission have been completed in the most current version of the WEMP and CRMP.	n/a
<p>General Comments - 4. Adaptive management: The Agency noted concerns about adaptive management during the Jay EA (Agency closing submission, October 2015). Although the WEMP has a section on adaptive management the examples are vague and in the case of fencing around the Beartooth pit, the efficacy of the fence was contradicted by camera monitoring. The section on adaptive management should be revised to make use of the proposed thresholds (CRMP Table 4.1; although the thresholds in Table 4.1 need to be refined).</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>In addition to Section 2.2 Monitoring Framework and Adaptive Management of the WEMP, Appendix D Summary of Changes to Wildlife Monitoring, 1997 to 2014, includes changes that have resulted through adaptive management. It is also important to recognize no change is a result that can arise through the adaptive management process.</p> <p>A revision for this comment was not required.</p>	n/a
<p>Map 2.1-1: Ekati wildlife study areas, 1997 to 2009: The "wildlife study area" up to 2009 is presented in this map. Aerial surveys for caribou distribution and abundance were flown in 2012 in conjunction with Diavik (see Table D-2).</p> <p>The 2012 Wildlife Study Area should be presented in this map.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	The wildlife study area has remained unchanged since 2009. The legend and title of Map 2.1-1 has been revised to make reference to 2012.	Section 2.1, Map 2.1-1
<p>Table 2.5-1: Species of Concern at the Ekati mine: The table refers to "Wolverine (western population)": In May 2014 COSEWIC de-activated the Western and Eastern population designation, and the Eastern and Western populations were considered as a single unit across the Canadian range. If you wish, you should refer to the western "sub-population". (COSEWIC. 2014. COSEWIC assessment and status report on the Wolverine Gulo gulo in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 76 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm.)</p> <p>DDEC should update this table and the statement in section 5.9 (pg 5-26) to correctly reflect the national designation for wolverine, and that the "western population" is not in itself listed by COSEWIC.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	Reference to "western population" for wolverine has been removed from Table 2.5-1.	Section 2.5, Table 2.5-1
<p>Section 4.1.4 Waste Management: The WEMP states "There are indications that improved and continual employee education has resulted in a decrease in the presence of scavengers and food waste items at landfills (Rescan 2010)" (pg 4-4). This statement is outdated and incorrect given results from the past four years. DDEC noted in the 2015 WEMP that adherence by employees to effective waste management disposal practices at the mine site remains a challenge. Overall occurrence of wildlife attractants or misdirected wastes based upon surveys was relatively high in 2015 and similar to 2014. In their response in Table B-1, DDEC states that "Since the redesign of the landfill in 2002, monitoring results indicate that less food</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	Figure 4.1-2 of the 2015 WEMP report illustrates the percent of landfill surveys where food or food packaging (among other items) were detected relative to different food waste abundance categories (low [light yellow] to very high [dark red]). Observations were categorized as low (1 item), medium (2 to 5 items), high (6 to 10 items), and very high (>10 items), so the very high category reflects at least 10 times the amount of items as the low category.	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

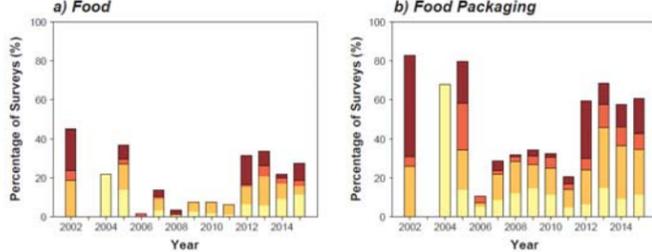
WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
<p>waste is misdirected to the landfill" and made no revision to the text. The figure below from the 2015 WEMP technical report hardly supports that claim, and clearly shows that since 2012 food and food packaging has greatly increased at the landfill to close to 2002 levels (2015 WEMP, Fig. 4.1- 2).</p>  <p>The Agency again recommends that DDEC should update and correct this statement regarding waste management at Ekati.</p>				<p>DDEC agrees that the cumulative percent of surveys since 2012 where any amount food waste was detected (i.e., across all categories) is less than 2002 levels but has increased after 2012. However, when considering the different food waste abundance categories, it is evident that the amount of misdirected food or food packaging that is in the landfill has decreased since 2002. This is because the proportion of the very high observations has been half or less than half than it was in 2002, when it represented approximately 50% of observations. The medium level observations have increased since 2012 and are driving the higher cumulative percent of surveys detecting any food waste amount.</p> <p>DDEC recognizes that improvements are still needed. In 2016, DDEC segregated areas of the landfill to help identify sources of misdirected waste for corrective action.</p> <p>A revision for this comment was not required.</p>	
<p>Section 4.2.2 Indirect Habitat Alteration and Loss The WEMP states "Currently, it is expected that indirect habitat alteration and loss for caribou (Zone of Influence; ZOI) will be monitored through regional programs in collaboration with ENR, potentially through the Barren-ground Caribou Management Strategy (Section 5.6.1). Potential mechanisms for the ZOI will be monitored through the WEMP..." (pg 4-7). Sensory disturbance at the mine site level, including the monitoring and mitigation of the ZOI, is the responsibility of the developer, and cannot be delegated to regional programs. Monitoring and mitigation of sensory disturbance, not just for identifying potential mechanisms, must occur. In Table B-1, DDEC offered that "Sections 4.2 and 5.6.5 provide descriptions of caribou ZOI monitoring and mitigation of indirect effects from Ekati mine", but actually these sections do not provide methodologies that examine the extent or magnitude of the ZOI.</p> <p>DDEC to update this section to provide methods for monitoring and mitigation of sensory disturbance, especially as it relates to the caribou ZOI.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>DDEC is committed to monitoring the Ekati mine (and its components) effects that contribute to regional cumulative effects. Monitoring of cumulative effects in Section 4.2.2 has been revised to clarify this commitment, including initiating aerial reconnaissance surveys as directed by ENR</p> <p>Mitigation at the Ekati mine (including Lynx, Sable, and Jay developments) has been provided in Section 4 and Appendix E of the WEMP.</p> <p>Section 5.6.5 indicates that DDEC will work with the Zone of Influence Technical Task Group administered by the GNWT, regulators, and communities on appropriate methods for monitoring the caribou ZOI. To date, methods for ZOI monitoring guidelines have been circulated among members of the Zone of Influence Technical Task Group but have not undergone community review or been distributed to operators.</p>	Section 4.2.2
<p>Section 5 Monitoring: The WEMP states that direct wildlife habitat loss is calculated annually by superimposing the current Mine footprint on the predevelopment (i.e., baseline) habitat map (pg 5-1). Up until 2009 the footprint of the LLCF was not included in this calculation. The WEMP should clarify what it considered as the "current Mine footprint" in this context. E.g., all disturbed habitat? If an area is "reclaimed" is it still considered the "current Mine footprint"? In Table B-1 DDEC clarifies that "Reclaimed areas that meet reclamation objectives will no longer be considered disturbed. The area disturbed and reclaimed will be tabulated in future reports" but did not revise the text. This information should be provided in the WEMP.</p> <p>DDEC should clarify within the WEMP what is considered as the "current Mine footprint" for calculation of direct wildlife habitat loss.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>Figure 1.1-2 of the 2015 WEMP report shows the satellite imagery of the Ekati mine and the mine footprint polygon, which includes the Long Lake Containment Facility (LLCF).</p> <p>The current mine footprint includes the cumulative area disturbed from the development of the Ekati mine to date as Figure 1.1-2 of the 2015 WEMP report demonstrates. DDEC has been clear throughout the Jay Project DAR that the Jay Project will become part of the Ekati mine and included in the Ekati mine WEMP. The methods described in the Wildlife Effects Monitoring Plan are the same as provided in the Ekati mine WEMP report.</p> <p>DDEC has committed previously to tabulate the amount of area under reclamation, which is included in Section 5.1</p>	Section 5.1
<p>Section 5.6 Caribou: The section on population size of the Ahiak herd (pg 5-10) is dated and does not align with herd designations presented in the EIR 2016. Specifically, the statements "The last census for the Ahiak herd was in 1996 and estimated 200,000 individuals (GNWT-ENR 2006). A census was planned in 2010, but was subsequently cancelled due to weather and funding constraints" are dated, as a survey was conducted in 2011 and subsequently published (Campbell et al. 2014. Government of Nunavut Department of Environment Technical Report Series – No: 01-2013). Although in Table B-1 DDEC says they will continue to monitor the Ahiak herd, no changes were made to the text.</p> <p>DDEC should update this section to better reflect recent available survey data. DDEC should also describe recent winter distribution for the past 2 years for both the Bathurst and Ahiak/Beverly herds, as their recent changes in fall migration have affected exposure of caribou to the Ekati mine.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>The text related to the Ahaik herd has been updated to reflect that the herd was most recently surveyed in 2011, with a population estimate of 71,000 animals. The revisions also reference presence near the Ekati mine during winter.</p>	Section 5.6

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
<p>Section 5.6.5 Caribou Zone of Influence Monitoring: DDEC states that it will work with the ZOI Technical Task Group on appropriate methods for monitoring the caribou ZOI (pg 5-15). The Task Group has drafted methods, but is slow to make firm recommendations on which projects (especially established projects) should be conducting ZOI monitoring. In Table B-1 DDEC essentially dismissed our recommendation and provided no revision to the text.</p> <p>The Agency stands by our comments above and re-iterates that aerial surveys to monitor relative caribou distribution and abundance should be conducted to monitor the impact of the Ekati Mine and measure the effectiveness of mitigation measures for caribou, including enhanced traffic management and dust suppression. The aerial survey study area (not the regional study area) should be enlarged to include the extensions related to the Jay and Sable developments.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>DDEC has revised Section 5.6.5 to include aerial survey monitoring methods and analyses. As committed to in the WEMP, DDEC will follow the guidelines set forth by the Zone of Influence Technical Task Group, recognizing that monitoring and analysis methods may change in the future. However, whether ZOI monitoring is sensitive enough to evaluate mitigation effectiveness has not been demonstrated. DDEC believes that evaluating mitigation effectiveness is best completed by monitoring of effects directly (e.g., fugitive dust) and use the process of adaptive management to determine if mitigation is effective (Section 2.2).</p> <p>DDEC is open to discussing the issues of expanding the study area with the ZOI Task Group, and has committed to aerial reconnaissance surveys as directed by ENR.</p>	Section 5.6.5
<p>Section 5.6.7 Camera Trapping: One of the objectives for the camera is to “determine caribou (and other wildlife) responses to the road (i.e., crossing or deflecting)” (pg 5-19). No details on how this will be conducted are provided. In Table B-1 DDEC states that “DDEC will provide additional detail on methods for determining crossing success and mitigation effectiveness in future documentation”.</p> <p>Since this issue has been discussed at length in previous meetings, DDEC should provide appropriate methodology to examine crossing success. This methodology should lead to thresholds for adaptive mitigation.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>Section 5.6.7 has been revised to include methods for determining crossing success. This includes measuring success as (1 – deflection rate for each camera). Crossing locations with less than 90% crossing success will be reviewed by DDEC and the Traditional Knowledge Elders Group to determine ways crossing locations can be improved.</p>	Section 5.6.7
<p>Section 5.8.2 Wolf Den Occupancy and Productivity: DDEC states “It is anticipated that aerial surveys for wolf den occupancy will continue to be conducted by ENR staff” (pg 5-26). If the objective is to “determine the presence, distribution and productivity of active wolf dens throughout the study area”, then DDEC should conduct these surveys if ENR does not do them. The WEMP does indeed state that “if these surveys are no longer completed by ENR, DDEC plans to continue to survey the historic den sites that are found within the Ekati study area and will update the WEMP methods accordingly” (pg 5-26). No surveys were conducted by either ENR or DDEC in 2015. DDEC should provide appropriate methodology to examine wolf den occupancy independent of ENR.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>Consensus among regulators, mine agencies, communities, and the mines at the Wildlife Monitoring Workshops in 2009 (Marshall 2009) and 2010 (Handley 2010) concluded that wolf den monitoring to determine use and success was no longer required as a WEMP program. DDEC will continue to support ENR’s monitoring of wolf dens.</p> <p>A revision for this comment was not required.</p>	n/a
<p><u>1 Text under review (Section 2.3 Environmental Impact Review):</u> Caribou herds are a key concern and DDEC will continue to provide site-specific information relevant to regional cumulative effects studies. <u>Comment:</u> How is site-specific information being used to inform cumulative effects studies? Which studies cumulative effect studies is this information contributing to?</p>	Letter	13-Jan-17	Mark d’Entremont (DKFN)	<p>Communities, regulators, and mine agencies have been asking mine operators to standardize wildlife monitoring methods since 2009 (Marshall 2009, Handley 2010), so that wildlife monitoring information can feed into cumulative effects assessment and management by the GNWT. The methods described in the WEMP are consistent with other mine operators for the purpose of measuring their incremental contribution to regional cumulative effects.</p> <p>WEMP Section 5.6.1 briefly describes the GNWT’s Bathurst Caribou Management Strategy, including Strategy #7 on assessing cumulative impacts of land use activities.</p> <p>A revision for this comment was not required.</p>	n/a
<p><u>2 Text under review (Section 3 Engagement and Incorporation of Traditional Knowledge):</u> With the assistance of community experts, land users, and/or TK holders during wildlife and habitat surveys, TK has been used to help understand monitoring results and provide ways of preventing or reducing impacts to wildlife. <u>Comment:</u> The collection of traditional knowledge requires rigorous, in-depth research carried out by researchers trained in qualitative social science theory and methods, including research ethics, methods design, data collection, analysis and dissemination. Data collection and analysis should be community-driven and based on a strong foundation of informed consent.</p>	Letter	13-Jan-17	Mark d’Entremont (DKFN)	<p>DDEC agrees with this statement and is currently in the process of developing a TK Framework with the Traditional Knowledge Elders Group. This framework will standardize the process by which DDEC can receive, record, and incorporate TK.</p>	Section 3
<p><u>3 Text under review (Section 4.1.2 Airstrip Deterrents):</u> Plans are being developed to heighten the barrier above a caribou’s line of sight to prevent caribou from jumping over it in the future (Rescan 2013). <u>Comment:</u></p>	Letter	13-Jan-17	Mark d’Entremont (DKFN)	<p>DDEC has carried out a small scale review of raising the height of the fencing. Small trials of an increased fence height demonstrated very real concerns with higher snow fencing increasing risk to wildlife. This potential risk was compared to the fact that there have been no incidents involving</p>	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
This statement is based on a 2013 report, which suggest there has been no action over the past three years. Can DDEC provide an update on these plans?				caribou being injured interactive with open pits, DDEC chose to remove fencing except around the Airport. An update of this study will be communicated as part of annual WEMP reporting. A revision for this comment was not required.	
4 Text under review (Section 4.1.6 Dust): If successful, the suppressant would be applied to all roads at the Ekati mine as an off-site offset for the Jay Project. Best practices will be shared with other operators, which if successfully used would also be considered as off-site Comment: Dust suppressant is being used to control dust and to minimize the amount of fugitive dust that enters the environment that could potentially affect the health and behavior of wildlife, particularly caribou. It is unclear how this mitigation could also be used as an offset measure and we ask that DDEC provide further explanation in this regard. Likewise, should it be proven that the use of dust suppressants is an effective mitigation measure, the sharing of this knowledge with other operators and calling this action an off-site offset is questionable. Offset as defined in the WEMP is: "measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimized and/or rehabilitated or restored. Offsets are achieved once compensation is sufficient that the outcome is no net loss or a net gain for the feature (e.g., VEC) for which compensation was developed." So, when DDEC applies an offset, it must clearly show which VEC has benefitted from it.	Letter	13-Jan-17	Mark d'Entremont (DKFN)	In their Technical Report on the Jay Project, IEMA proposed that any mitigation improvements as a result of the Jay Project would represent offsetting mitigation if implemented at existing developments, including the Ekati mine. The basis of IEMA's argument was that if Ekati and other mine sites used mitigation that is more effective, the cumulative reduction of existing effects would offset the residual effect of the Jay Project. If more effective mitigation reduced the cumulative area affected by fugitive dust, then more wildlife habitat would be available. A revision for this comment was not required	n/a
5 Text under review (Section 4.3.1 Direct Mine-Related Mortality and Injury): routine, systematic monitoring of different areas of the Ekati mine will be conducted, including the Jay Project dike, pit area, and WRSA. Information collected will be used for adaptive management; Comment: We recommend that the WEMP include the specific methods for this routine, systematic monitoring.	Letter	13-Jan-17	Mark d'Entremont (DKFN)	Appendix F includes Standard Operating Procedures and Datasheets	Appendix F Standard Operating Procedures and Datasheets
6 Text under review (Section 4.3.1 Direct Mine-Related Mortality and Injury): bird deterrents (e.g., spinning reflectors) will be installed on the power line in identified areas of concern (e.g., near waterbodies known to represent staging areas); additional locations will be identified through monitoring of bird strikes along the power line; Comment: Is the monitoring of bird strikes being conducted in a systematic manner?	Letter	13-Jan-17	Mark d'Entremont (DKFN)	Standard Operating Procedures for power line monitoring are included in Appendix F and includes recording bird carcasses.	Appendix F Standard Operating Procedures and Datasheets
7 Text under review (Section 5.1 Direct Wildlife Habitat Loss): The area and percent area of each habitat type directly disturbed by the Ekati mine will be included in the annual monitoring report. Comment: Is this information being used to direct objectives for land reclamation at closure?	Letter	13-Jan-17	Mark d'Entremont (DKFN)	Objectives for reclamation and closure are developed as part of the Interim Closure and Reclamation Plan. These data are currently being collected to more clearly express the impacts of disturbance.	Section 5.1
8 Text under review (Section 5.2 Waste Management): Therefore, as part of the WEMP, DDEC monitors the waste in the landfills. Comment: What is the extent of this monitoring? The amount of attractants that are mis- directed should be reported back to mine staff so that awareness and education of the waste management plan can be improved in the training, orientation and management components.	Letter	13-Jan-17	Mark d'Entremont (DKFN)	The monitoring includes visual searches, and the results of this monitoring are reported back to not only managers of specific areas but also to their staff. Departments are responsible for removing any misdirected waste found in their areas.	Section 5.2
9 Text under review (Section 5.2.1 Landfill Monitoring): Data analyses will be completed to identify trends over time in the number of wildlife attractants observed at the landfill. Analyses will also attempt to identify any further mitigation that would improve the effectiveness of the Waste Management plans with respect to wildlife. Comment: Data analysis should include the number of attractants recorded at the landfill. This data could be analyzed on a per capita basis (e.g., indexed according to the number of people at camp). Also, a comparison to wildlife use of the area should be made. For example, it would be difficult to say that a decrease in wildlife occurrence at the landfill is attributed to waste management practices if there is no baseline of wildlife use of the area. A reduction of wildlife occurrences at the landfill could just mean there are less wildlife in the region.	Letter	13-Jan-17	Mark d'Entremont (DKFN)	Sections 5.2.1 and 5.2.2 indicate that data analysis include examining the number of attractants at both the landfill and in waste bins. Examples of the results of these analyses are available in the annual WEMP for the Ekati mine. Wildlife presence at the landfill is not used as direct feedback on whether waste management mitigation is effective but whether wildlife continue to interact with waste management areas. Wildlife presence at site is informative to implement mitigation for avoiding wildlife injury and mortality. A revision for this comment was not required	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
<p>10 Text under review (Section 5.4 Wildlife Incidents): At the Ekati mine, natural and human- caused wildlife mortalities are monitored within the study area. Wildlife mortality is monitored to maximize wildlife and human safety. Wildlife carcasses can attract carnivores to the Ekati study area, creating risks for both carnivores (e.g., if carnivores are attracted to the road by carrion and subsequently get hit by a vehicle) and people who encounter them. Mitigation, such as removing carcasses, is used to avoid any potential negative interactions between wildlife and humans. As part of the WEMP, all wildlife mortalities are recorded and descriptions are reviewed to determine if Mine operations contributed to a mortality event (Section 5.3). Documenting mortalities also provides feedback for adaptive management.</p> <p><u>Comment:</u> This information would be better suited under the previous section on wildlife mortalities.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	DDEC agrees and this text has been moved to the previous section on wildlife mortality.	Sections 5.3 and 5.4
<p>11 Text under review (Section 5.4 Wildlife Incidents): the regular site surveillance program for the Ekati mine</p> <p><u>Comment:</u> There are no details on what this site surveillance program is. A lot of what is described in the first few paragraphs of this section is wildlife use of the mine area and infrastructure - these are not necessarily incidents. This section could be outlined better.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>Details on site surveillance monitoring are provided in Appendix F Standard Operating Procedures and Data Sheets.</p> <p>The descriptions are provided to give context as to why wildlife may use areas within site and which areas may provide potential for incidents. Additional text has been included to clarify this.</p>	Section 5.4
<p>12 Text under review (Section 5.4 Wildlife Incidents): Detailed skirting surveys of Ekati and Misery Camp buildings will be conducted bi-weekly in order to determine if wildlife are accessing structures from underneath, and to observe any wildlife sign occurring around camp.</p> <p><u>Comment:</u> Here does bi-weekly mean every two weeks or twice a week? Likewise in the paragraph that follows on this page, does bi-weekly mean every two weeks or twice a week?</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	DDEC agrees and this section has been revised to state that inspections will be completed a minimum of once per week.	Section 5.4
<p>13 Comment: This (Section 5.5 Vehicle and Aircraft Interactions) is really a component of the incident monitoring. We recommend that monitoring components within the WEMP be streamlined.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>Section 5.4 was isolated from Section 5.3 to clearly address the specific residual risks identified in the 2012 EIR (BHP Billiton 2012) and the Jay Project (DDEC 2014) as noted.</p> <p>A revision for this comment cannot be considered</p>	Section 5.5
<p>14 Text under review (Section 5.6.1 Barren-ground Caribou Management Strategy): The monitoring framework (Section 2.2) incorporates results from monitoring to develop best management practices (Strategy 7)</p> <p><u>Comment:</u> Can DDEC confirm that the development of best management practices is effective and is contributing to the assessment of cumulative impacts, as per Strategy #7.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>DDEC believes the monitoring framework at the Ekati mine is working. Section 4.1 Mitigation Effectiveness at the Ekati mine provides some examples of how mitigation has been adaptively managed from monitoring results.</p> <p>DDEC is committed to monitoring the incremental effects of the Ekati mine (and its components) that contribute to regional cumulative effects. However, cumulative effects assessment and management is the responsibility of the GNWT.</p> <p>A revision for this comment was not required.</p>	n/a
<p>15 Text under review (Section 5.6.1 Barren-ground Caribou Management Strategy): any collaboration with the GNWT (and other agencies, communities, and mines) on regional programs for the assessment and management of cumulative effects is outside the scope of analysis and reporting in the WEMP.</p> <p><u>Comment:</u> Can DDEC confirm where the work on cumulative effects is being reported?</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>Cumulative effects assessment and management is the responsibility of the GNWT. A number of cumulative effects studies have been supported by the Ekati mine and other mine operators, such as the grizzly bear (Section 5.7) and wolverine (Section 5.9) hair snagging programs.</p> <p>A revision for this comment was not required</p>	n/a
<p>16 Text under review (Section 5.6.2 Incidental Caribou Observations): Incidental caribou observations in and near the Ekati study area will be reported by helicopter operators, ground-based field workers, other Mine personnel, and people from visiting communities. Other information recorded with caribou observations will include location, group size and composition, dominant behaviour, and distance to Mine infrastructure.</p> <p><u>Comment:</u></p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>All site staff and contractors are required to report incidental observations of wildlife to the DDEC Environment Department. The Environment Department staff are responsible for follow-up to incidental sightings and have appropriate training.</p> <p>A revision for this comment was not required.</p>	n/a

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
Can DDEC confirm that all the personnel listed will be trained to properly collect the data described here.					
<u>17 Text under review (Section 5.6.3 Caribou Road Surveys):</u> Environment personnel surveying the roads will allow for more proactive implementation of mitigation, such as, signs identifying the presence of caribou or the need for road closures. <u>Comment:</u> These last sentences are very passive in description. We recommend they be re-written as: Environment personnel surveying the roads will proactively implement mitigation, such as, signs identifying the presence of caribou or road closures.	Letter	13-Jan-17	Mark d'Entremont (DKFN)	The text was revised to indicate Environment Department personnel surveying the roads will be able to implement additional mitigation, such as, signs identifying the presence of caribou or the need for road closures.	Section 5.6.3
<u>18 Text under review (Section 5.6.3 Caribou Road Surveys):</u> The results of road surveys will be assessed daily... <u>Comment:</u> This section is poorly worded. The results of the road surveys will not actually be assessed daily. The results will be assessed on the days that surveys are conducted so that appropriate mitigation can be implemented immediately.	Letter	13-Jan-17	Mark d'Entremont (DKFN)	This text was revised to provide clarity on when survey results are assessed.	Section 5.6.3
<u>19 Text under review (Section 5.6.4 Collared Caribou Monitoring):</u> 300000 <u>Comment:</u> On page 5-12, \$500,000 was committed for studies to identify the key factors limiting the Bathurst herd. Is this amount in addition to the \$300,000 identified here?	Letter	13-Jan-17	Mark d'Entremont (DKFN)	These are separate financial commitments by DDEC identified in an Undertaking (DAR-MVEIRB-UT-06) from Day 2 of the Jay Project public hearings in September 2015. A revision for this comment was not required.	n/a
<u>20 Text under review (Section 5.6.4 Collared Caribou Monitoring):</u> to provide Ekati-specific information on caribou movement. <u>Comment:</u> Can DDEC clarify what it means by "Ekati-specific information on caribou movements".	Letter	13-Jan-17	Mark d'Entremont (DKFN)	Ekati-specific movements refers to how collared caribou interact with the Ekati mine. The use of collared caribou data (provided by ENR) by DDEC is specific to the Ekati mine. A revision for this comment was not required.	n/a
<u>21 Text under review (Section 5.6.4 Collared Caribou Monitoring):</u> Pending a data sharing agreement with ENR, the locations of collared Bathurst caribou will be obtained and mapped in relation to the Ekati mine study area. <u>Comment:</u> In the CRMP it is stated that these collars are anticipated to provide a location every hour when they are within 14 km of the mine. Since this monitoring is a major component of the Caribou Road Mitigation and Monitoring program we need to know how this data will be collected, the frequency of data collection, whether there is a time lag between acquisition of the data by ENR and receipt by DDEC. Will maps be generated on daily or weekly basis? Also, details on when these collars will be deployed and their expected life should be provided.	Letter	13-Jan-17	Mark d'Entremont (DKFN)	DDEC will acquire GNWT collared caribou locations through a data sharing agreement. At the WEMP and CRMP workshop in September, 2016, DDEC explained the effectiveness of the data sharing using a working example of current year dialogue with ENR Biologists about caribou movements. DDEC has also committed to a collared caribou movement analysis to help inform an appropriate trigger distance for Level 2 Mitigation.	Section 5.6.4, Page 5-14
<u>22 Text under review (Section 5.6.6 Caribou Behavior: Activity Budgets and Response to Stressors):</u> The goal will be to obtain as many observations annually as required to statistically analyze the data at various distances from the Mine footprint. <u>Comment:</u> Has DDEC completed a power analysis to determine an adequate sample size for determining if mine is affecting caribou behaviour?	Letter	13-Jan-17	Mark d'Entremont (DKFN)	A power analysis has not been completed to determine target sample sizes for the program. DDEC's experience with analyzing these data is that there are not enough annual observations to detect significant changes, even in the early years of the program when caribou were much more abundant.	Section 5.6.6, Page 5-18
<u>23 Text under review (Section 5.6.7 Camera Trapping):</u> Frequency This monitoring will be completed annually from May to November. Data Analyses Data analyses will be completed to identify patterns associated with caribou behaviour and traffic, roads and other Ekati mine infrastructure. <u>Comment:</u> Since camera trapping is a major component of monitoring for the CRMP, details on data collection and reporting are required. It is stated in the CRMP that "The information will be used to determine the effectiveness of mitigation (e.g., slowing and stopping traffic) on limiting the barrier effect of roads to caribou movement, and provide feedback for adaptive management." Specific details on the metrics that will be used are requested from DDEC. Also, are cameras being checked daily?	Letter	13-Jan-17	Mark d'Entremont (DKFN)	The analysis of camera data will be the same as provided in the 2013 WEMP Addendum <i>Wildlife Camera Monitoring Summary Report</i> . Metrics presented in this report include caribou abundance, behaviour, deflection, and response to traffic. Section 5.6.7 has been revised to indicate methods for determining crossing success. This includes measuring success as (1 – deflection rate for each camera). Crossing locations with less than 90% crossing success will be reviewed by DDEC and the Traditional Knowledge Elders Group to determine ways crossing locations can be improved. Each camera is checked several times during the survey period to determine battery levels, the available memory on the SD memory card, and ensure that the camera is still operating properly and has not been displaced by wildlife or weather.	Section 5.6.7

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
<p>24 Text under review (Section 5.8.1 Incidental Observations): minimize wolf-human interactions and identify the presence and composition of incidental wolf den and wolf pack observations in the study area; <u>Comment:</u> We recommend that these be split into two separate objectives.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	The first bullet has been revised as two separate bullets.	Section 5.8.1
<p>25 Text under review (Section 5.9.2 Hair Snagging Study): There are currently no formalized protocols on the frequency at which these surveys should be completed. DDEC will continue to evaluate its participation in the program. <u>Comment:</u> Past projects that focused on wolverine hair snagging in the region were operated on a three-year cycle. Will DDEC commit to maintaining this frequency of monitoring? By "continuing to evaluate its participation in the program", sound like DDEC will not commit to continuing the monitoring. Please explain.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>DDEC has contributed hair snagging data on wolverine for the purpose of cumulative effects assessment and management by the GNWT, DDEC believes a three year cycle is appropriate to meet the objectives of this regional monitoring program. However, the long-term frequency of this program has not been determined by consensus among communities, regulators, mine agencies, and the mines. There is also uncertainty about when an assessment will be completed by the GNWT. DDEC will not make a long-term commitment to this program until the scope of the commitment is clarified. Pending the results of each program cycle, DDEC will reassess the program,</p> <p>A revision for this comment was not required.</p>	n/a
<p>General: On page 1-2 of the WEMP, it states that Plan will be updated every three years. It appears the WEMP has not undergone a comprehensive update since 2000. Moving forward the three year schedule should be adhered to.</p>	Letter	13-Jan-17	Lauren King (LKDFN)	<p>DDEC will review the WEMP annually as part of adaptive management. If adaptive management indicates changes are necessary, then the WEMP will be updated within three years. However, if adaptive management indicates that changes to the WEMP are not necessary, then the WEMP may not be updated.</p> <p>A revision for this comment was not required.</p>	n/a
<p>General: LKDFN strongly recommends that DDEC tracks comments received by various Parties in an excel spreadsheet and responds in writing to each comment, and if and where the comments have been incorporated into the Plan(s). If recommendations were not incorporated into the Plan, a rationale should be provided.</p>	Letter	13-Jan-17	Lauren King (LKDFN)	<p>Appendix B of the WEMP and Attachment I of CRMP provide tables of plan comments received through engagement with regulators, IEMA, and communities as part of the Jay Project, beginning with the WEMP and CRMP workshops hosted by DDEC in 2015. These tables provide a summary of the comments received and the revision completed or a revision commitment. When a revision was not completed, an explanation was provided. Pending revisions from the December 2016 submission have been completed in the most recent version.</p> <p>A revision for this comment was not required.</p>	n/a
<p>General: On page 1-6, one of the global objectives is to "incorporate Traditional Knowledge and provide opportunities for the involvement and active participation by communities in the implementation of the WEMP." Overall, LKDFN does not think that Traditional Knowledge has been incorporated into the Plans. Quite contrary, the integration of Traditional Knowledge is missing from both Plans.</p>	Letter	13-Jan-17	Lauren King (LKDFN)	<p>With the formation of a Traditional Knowledge Elders Group and the ongoing development of a TK Framework, DDEC is hopeful that they will be able to improve both the incorporation of TK and the clarity with which they are able to express its incorporation.</p>	n/a
<p>Section 3: The introduction to the "Engagement and Incorporation of Traditional Knowledge" section of the WEMP does not make clear how the Plans are informed by Traditional Knowledge. On page 3-1, it appears that TK is used in specific instances – "TK has been used to understand monitoring results and provide ways of preventing or reducing impacts to wildlife." This implies that TK does not inform the design, development, implementation, and evaluation of these Plans. Instead, TK is used in very specific instances as an add-on to scientific-based aspects of the WEMP.</p>	Letter	13-Jan-17	Lauren King (LKDFN)	<p>DDEC believes that as part of the Jay Project, TK has been incorporated throughout the design and development processes. With the construction of the Jay Project, DDEC will continue to engage with communities to ensure that the shared TK continues to be incorporated throughout the construction and operation of the Jay Project.</p>	Section 3
<p>Section 3: The WEMP states that community workshops are held in the various communities. Although this may be true for other communities, in Lutsel K'e meetings are informational and dominated by one-way communication from DDEC to LKDFN followed by a short Q&A period. LKDFN recommends that DDEC re-design their approach to engagement on the design, development, implementation and evaluation of the WEMP and CRMP by actively engaging communities through workshops that are highly interactive in nature, with clear goals, and more focused. Alternatively, Indigenous consultants or TK holders can be hired to assist in the development of the WEMP and CRMP.</p>	Letter	13-Jan-17	Lauren King (LKDFN)	<p>DDEC plans to work with the Traditional Knowledge Elders Group to improve the process for community engagement, which includes the development of a TK Framework.</p>	Section 3
<p>Section 3:</p>	Letter	13-Jan-17	Lauren King (LKDFN)	<p>Throughout the life of the Ekati mine, DDEC has explored many different methods of engaging with communities and the ways in which TK can be</p>	Section 3

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
The WEMP states that there are various opportunities for community members to gain "hands on experience" at the mine. This is typically once or twice a year for a period of one or two days. Gathering Traditional Knowledge cannot be adequately done by visiting the site of the mine once or twice a year. In addition to brief site visits by community members, LKDFN strongly (and repeatedly) has called for the development of a Traditional Knowledge monitoring program at Ekati, similar to the Ni Hadi Xa (environmental monitoring Traditional Knowledge monitoring program) at Gahcho Kue Diamond Mine. LKDFN specifically requests that DDEC strongly consider developing a similar and equally comprehensive program at Ekati.				incorporated into monitoring programs. As part of the Jay Project, DDEC organized a Traditional Knowledge Elders Group that has recently created and approved their Terms of Reference and are in the process of developing a TK Framework for use at the Ekati mine. DDEC is confident that this approach will significantly improve engagement with communities and the incorporation of TK into monitoring programs. DDEC is willing to work with community groups to review and explore learnings from programs such as Ni Hadi Xa at Gahcho Kué to improve the process.	
Section 3: It is unclear if or how the limited number of Traditional Knowledge- based studies inform the WEMP or CRMP. Based on this section, I assume the findings from these studies do not inform these Plans and, therefore, do not meaningfully contribute to DDECs ability to understand or manage cumulative effects from mining in the Bathurst Caribou herd and Barren-ground Caribou herds more generally. LKDFN strongly recommends that moving forward, findings from these studies should inform the WEMP and CRMP.	Letter	13-Jan-17	Lauren King (LKDFN)	DDEC has committed funds to support community TK studies, and looks forward to receiving the results of these studies and using their findings to inform the evolution of the WEMP and CRMP.	Section 3
Section 3.2.1: It appears that TK holders are invited to participate in scientific data collection and that no TK methods are used. Nor does TK inform the design of the program. LKDFN strongly recommends that TK be much more meaningfully integrated into caribou monitoring at the mine and in the ZOI.	Letter	13-Jan-17	Lauren King (LKDFN)	DDEC will be working closely with the Traditional Knowledge Elders Group to improve the integration of TK into monitoring at Ekati. This includes the development of a TK Framework.	Section 3.2.1
Section 3.2.1: It seems that TK is largely limited to caribou interactions with the road. This is far too narrow of a scope and should be expanded to all aspects of caribou interactions with the mine and ZOI.	Letter	13-Jan-17	Lauren King (LKDFN)	Caribou interactions with the Ekati mine and roads were the main focus of concerns with the Jay Project A revision for this comment was not required.	Section 3.2.1
Section 3.2.2: The method used to monitor wolf and wolverine is hair snag – a scientific method, which replaced the method put forth by the TK holders. It is unclear whether or not the Inuit was informed of the change or why there was a change in data collection. It appears that the extent to which TK was solicited from Indigenous Parties was only twice at meetings with Inuit.	Letter	13-Jan-17	Lauren King (LKDFN)	Standardization and changes to monitoring methods by the mines have been reviewed, discussed, and determined collaboratively by communities, regulators, mine agencies, and the mines at the wildlife workshops hosted by the GNWT. The use of hair snagging methods to monitor wolverine and grizzly bear was discussed and decided at wildlife monitoring workshops in 2009 (Marshall 2009) and 2010 (Handley 2010). A revision for this comment was not required	n/a
Section 3.2.3: Again, a scientific method is being used rather than a TK method. Was this method recommended by Indigenous Parties? If not, why is it in this section?	Letter	13-Jan-17	Lauren King (LKDFN)	Please see previous comment on collaborative decisions about regional monitoring methods, which includes community participation. As Section 3.2.3 notes, community members of Kugluktuk, Łutselk'e Dene, Yellowknives Dene, and the NSMA were involved in the planning phases of the grizzly bear hair snagging program and community participants selected the specific location where hair snagging devices were deployed. A revision for this comment was not required	n/a
Section 3.2.4: The only example of the inclusion of TK in the "Effects mitigation and deterrents" section is limited to caribou interaction with the airstrip and roads. LKDFN strongly recommends that TK be much more meaningfully integrated into caribou monitoring at the mine and in the ZOI.	Letter	13-Jan-17	Lauren King (LKDFN)	As noted in a previous response, the interaction of caribou with roads was a communicated concern with the Jay Project. In addition to the mitigation included in Section 3, DDEC has committed to community monitoring in the Caribou Mitigation Plan (CMP). For example, in 2016 DDEC supported the Boots on the Ground caribou monitoring by community members at Contwoyto Lake. A revision to the comment was not required	n/a
Section 3: Overall, this section is very vague. The lack of a meaning TK monitoring framework for wildlife at the mine and the ZOI is extremely disappointing and needs to be remedied before the WEMP is approved.	Letter	13-Jan-17	Lauren King (LKDFN)	DDEC is working with the Traditional Knowledge Elders Group to develop a TK Framework.	Section 3
Section 4.2.1: There is no mention of progressive reclamation. This should be revised to include this step in mitigating direct habitat loss.	Letter	13-Jan-17	Lauren King (LKDFN)	The Jay Project will become a component of the Ekati mine. As part of the Ekati mine, it will be subject to relevant management plans, which includes the Interim Closure and Reclamation Plan referenced in Section 1.3. This plan includes the use of progressive reclamation.	Section 4.2.1

Table B-1 Wildlife Effects Monitoring Plan Reviewer Recommendations and Proponent Responses

WEMP Workshop Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to WEMP or Rationale if Revision Not Made	WEMP Section
				Reference to progressive reclamation has been added to Section 4.2.1	
Section 4.2.2: This section should be revised to include timing of blasting and caribou presence. LKDFN strongly recommends that blasting is suspended when caribou are within the ZOI.	Letter	13-Jan-17	Lauren King (LKDFN)	DDEC has included a Standard Operating Procedure for surface blasting (EKA WI 1702.06), which indicates a pre-blast survey within 750 m is completed and if caribou are present, the Environment Department will be notified and blasting will be suspended until the area is clear.	Appendix F Standard Operating Procedures and Datasheets
Section 4.2.2: This section should be revised to include the scheduling of construction activities to times when caribou are not traveling in the area or within the ZOI. When caribou are within the ZOI, road construction should halt or take place outside those times.	Letter	13-Jan-17	Lauren King (LKDFN)	All activities will be managed based on the presence and behaviour of caribou. For example, Table 4-1 of the CRMP identifies how mitigation will be adaptively managed with increasing presence of caribou in areas around Ekati mine. A revision for this comment was not required.	n/a
Section 5.6.8: Wildlife deterrents, such as fencing, should be placed around the LLCF. During heavy rain events and spring melt, does the dried slurry become liquid? Is there the possibility for migration to receiving bodies of water? If so, how is this going to be mitigated?	Letter	13-Jan-17	Lauren King (LKDFN)	The LLCF has been monitored for wildlife use since 1999 and results are reported annually. To date, no LLCF-related injuries or mortalities to caribou or other wildlife have been observed. Based on past use of fencing to mitigate caribou interactions with site, and monitoring of the LLCF, DDEC believes use of fencing around the LLCF may have adverse effects on caribou and other wildlife. A revision for this comment was not required.	n/a
Section 5.13: How are rare and uncommon species defined? When does a species that was rare become common? And when that occurs, will the species be monitored? LKDFN is particularly concerned with the increasingly presence of muskox and requests that this species be monitored to provide insight into the cause of their south-ward shift in range and their interactions with the mine.	Letter	13-Jan-17	Lauren King (LKDFN)	Rare and uncommon species are those species whose distribution may overlap with the Ekati mine but are not regularly observed. All species are monitored as part of the WEMP but are not always observed because they are uncommon. As Section 5.13 indicates, the WEMP may be expanded through adaptive management to include programs for rare or uncommon species depending on the frequency of observations and likelihood and severity of potential effects from the Mine. A revision for this comment was not required.	n/a

AEMP = Aquatic Effects Monitoring Program; AQEMMP = Air Quality and Emissions Monitoring and Management Plan; BHP = BHP Billiton; CMP = Caribou Mitigation Plan; COSEWIC = Committee on the Status of Endangered Wildlife in Canada; CRMP = Caribou Road Mitigation Plan; DAR = Developer's Assessment Report; DDEC = Dominion Diamond Ekati Corporation; DDMI = Diavik Diamond Mines (2012) Inc.; DKFN = Deninu Kue First Nation; EA = environmental assessment; EC = Environment Canada; ECCC = Environment and Climate Change Canada; EIR = Environmental Impact Review; ENR = Environment and Natural Resources [for GNWT]; GNWT = Government of the Northwest Territories; IEMA = Independent Environmental Monitoring Agency; IR = Information Request; LKDFN = Łutsel'k'e Dene First Nation; LLCF = Long Lake Containment Facility; MVEIRB = Mackenzie Valley Environmental Impact Review Board; NSMA = North Slave Métis Alliance; NWT = Northwest Territories; NSMA = North Slave Métis Alliance; NWT = Northwest Territories; QA = quality assurance; QC = quality control; SARA = Species at Risk Act; SOP = standard operating procedure; TK = Traditional Knowledge; UT = undertaking; VEC = valued ecosystem component; WEMP = Wildlife Effects Monitoring Plan; WLWB = Wek'èezhìi Land and Water Board; WRSA = waste rock storage area; km = kilometre; m = metre; n/a = not applicable.



APPENDIX C

CARIBOU ROAD MITIGATION PLAN



CARIBOU ROAD MITIGATION PLAN FOR THE JAY PROJECT

Prepared for: Dominion Diamond Ekati Corporation

Prepared by: Golder Associates Ltd.

March 2017

Table of Contents

1	INTRODUCTION	1-1
1.1	Background	1-1
1.2	Objectives	1-1
2	CARIBOU PRESENCE AT EKATI MINE	2-1
3	COMMUNITY ENGAGEMENT AND TRADITIONAL KNOWLEDGE	3-1
4	MITIGATION AND MONITORING	4-1
4.1	Operational Level (Blue)	4-5
4.1.1	Mitigation.....	4-5
4.1.2	Monitoring	4-8
4.2	Level 1 (Yellow).....	4-9
4.2.1	Mitigation.....	4-9
4.2.2	Monitoring	4-10
4.3	Level 2 (Orange)	4-10
4.3.1	Mitigation.....	4-10
4.3.2	Monitoring	4-11
4.4	Level 3 (Red).....	4-11
4.4.1	Mitigation.....	4-12
4.4.2	Monitoring	4-13
4.5	Roles and Responsibilities.....	4-14
5	REPORTING	5-1
6	REFERENCES	6-1

Maps

Map 1-1	Location of Ekati Mine and Jay Project.....	1-2
Map 2-1	Caribou Occurrence Among Ekati Mine Roads, 2011 to 2013.....	2-4
Map 2-2	Caribou Occurrence Within Ekati Mine Roads, 2011 to 2013	2-5
Map 4.1-1	Caribou Crossings along the Jay Road and Jay North Road	4-6

Figures

Figure 2-1	Seasonal Abundance of Bathurst Caribou in the Ekati Mine Regional Study Area from Post-calving Aerial Surveys, 1998 to 2012.....	2-2
Figure 2-2	Dates of Annual Peak Abundance of Bathurst Caribou in the Ekati Mine Regional Study Area during Post-calving Aerial Surveys, 1998 to 2012	2-3
Figure 4-1	Mitigation and Monitoring Intensity for Ekati Mine and Jay Project Roads	4-2
Figure 4-2	Decision Tree for Jay and Misery Roads Traffic Mitigation and Monitoring	4-3

Tables

Table 1-1	Historic Traffic Data for the Tibbitt to Contwoyto Winter Road and the Ekati Mine Misery Road, 1997 to 2015	1-3
Table 4-1	Action Levels (Triggers) and Associated Caribou Road Mitigation and Monitoring for the Jay Project and Ekati Mine	4-4
Table 4.1-1	Caribou Distance Thresholds and Speed Limits.....	4-7
Table 4.5-1	Ekati Mine Employee Caribou Road Mitigation Plan Roles and Responsibilities.....	4-14

Attachments

Attachment I Reviewer Recommendations and Proponent Responses

Abbreviations

Abbreviation	Definition
AQMMP	Air Quality Management and Monitoring Program
AQEMMP	Air Quality and Emissions Monitoring and Management Plan
CMP	Caribou Mitigation Plan
CRMP	Caribou Road Mitigation Plan
DAR	Developer's Assessment Report
DDEC	Dominion Diamond Ekati Corporation
Ekati mine	Ekati Diamond Mine
ENR-GNWT	Environment and Natural Resources, Government of the Northwest Territories
GNWT	Government of the Northwest Territories
IEMA	Independent Environmental Monitoring Agency
Project	Jay Project
RSA	regional study area
TCWR	Tibbitt to Contwoyto Winter Road
WEMP	Wildlife Effects Monitoring Plan
TK	Traditional Knowledge
WRSA	waste rock storage area
ZOI	zone of influence

Units of Measure

Unit	Definition
%	percent
km	kilometre
km ²	square kilometre
km/h	kilometres per hour
m	metre

1 INTRODUCTION

1.1 Background

The Ekati Diamond Mine (Ekati mine), owned and operated by Dominion Diamond Ekati Corporation (DDEC), is located in the Slave Geological Province of the Northwest Territories, approximately 300 km northeast of Yellowknife (Map 1-1). Construction at the Ekati mine began in 1997 and production began in October 1998. DDEC is proposing to develop the Jay kimberlite pipe located beneath Lac du Sauvage. The Jay Project (Project) will be an extension of the Ekati mine, and is expected to extend the life of the mine by 13 years or more.

The Project is located in the southeastern portion of the Ekati mine claim block approximately 25 km from the main facilities and 7 km northeast of the Misery Pit (Map 1-1). The Project will also require a haul road, pipelines, and power lines. The following site roads will be constructed for the Project:

- a road from the Misery Road to the south abutment of Jay Dike referred to as the Jay Road, which will be approximately 5.1 km long. The Jay Road will connect the Project to the existing Misery Road and to the Ekati mine camp and processing plant, and will be the only road crossing the Lac du Sauvage esker;
- a road from the Jay Road to the north abutment of the Jay Dike and Jay waste rock storage area (WRSA), which will be approximately 3.2 km long; and,
- a road from the Jay Road to the Misery camp, which will branch off from the Jay Road just north of King Pond and will be approximately 1.9 km long.

The traffic volumes on the Misery and Jay roads associated with hauling kimberlite from the Project to the processing plant will depend on truck size and configuration. As is currently the case for the transport of Misery Pit kimberlite to the processing plant, long-haul trucks will be used, which are different from the short-haul trucks used in the open pits. From 1997 to 2015, the time between haul trucks on the Misery Road has ranged from 5.8 to 24.9 minutes (Table 1-1). The Developer's Assessment Report (DAR) conservatively assumed for the Jay Road an average of 56 round trips per day by long-haul trucks with a fleet of seven trucks making approximately eight trips each per day. Assuming the trucks are evenly spaced, there would be an average of 12 minutes between trucks, not including seasonal traffic from the Tibbitt to Contwoyto Winter Road (TCWR).

Other traffic will include the bulk explosives trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks to transport larger equipment, water trucks, emergency vehicles, and light vehicles. Light vehicle traffic in the January to April session with all other larger trucks and vehicles is approximately 160 to 210 passes per day without the TCWR, and 290 to 340 passes per day with the TCWR, which is about one vehicle every 4 to 5 minutes. The final design of the Jay Road is not yet complete and is subject to further refinement based on ongoing data collection, regulatory and community engagement, and design iteration. More information regarding the traffic predicted for the Jay Road can be found in Appendix C: Traffic Associated with the Jay Project (DDEC 2015a).

Table 1-1 Historic Traffic Data for the Tibbitt to Contwoyto Winter Road and the Ekati Mine Misery Road, 1997 to 2015

Year	Tibbitt to Contwoyto Winter Road Statistics					Ekati Mine Statistics		
	Operating Period	Days	Total Tonnes Hauled (north bound)	Number of Truck Loads (north bound)	Number of Backhauls (south bound)	Ekati Number of Truck Loads (north bound)	Ekati Total Haul Loads on Misery Road	Minutes Between Haul on Misery Road
1997	Jan 21 – Apr 15 ^(a)	84	100,000	3,500	—	3,500	7,000	17.3
1998	Jan 19 – Apr 4 ^(a)	75	82,000	2,543	—	2,543	5,086	21.2
1999	Jan 28 – Mar 31 ^(a)	62	57,000	1,844	—	1,844	3,688	24.2
2000	Feb 1 – Mar 22 ^(b)	50	111,090	3,703	135	3,703	7,406	9.7
2001	Feb 4 – Mar 24 ^(b)	48	245,586	7,981	201	6,000 ^(e)	12,000 ^(e)	5.8
2002	Jan 26 – Apr 16 ^(c)	80	256,915	7,735	433	6,000 ^(e)	12,000 ^(e)	9.6
2003	Feb 1 – Apr 2 ^(c)	60	198,818	5,243	883	4,500 ^(e)	9,000 ^(e)	9.6
2004	Jan 28 – Mar 31 ^(c)	63	179,144	5,091	165	4,000 ^(e)	8,000 ^(e)	11.3
2005	Jan 26 – Apr 5 ^(c)	69	252,533	7,607	243	3,434	6,868 ^(e)	14.5
2006	Feb 5 – Mar 26 ^(c)	49	177,674	6,841	469	3,152	6,304 ^(e)	11.2
2007	Jan 27 – Apr 9 ^(c)	72	330,002	10,922	818	4,200 ^(e)	8,400 ^(e)	12.3
2008	Jan 29 – Mar 31 ^(c)	62	245,585	7,484	890	2,231	4,462	20.0
2009	Feb 1 – Mar 22 ^(c)	49	173,195	4,847	530	1,663	3,326	21.2
2010	Feb 4 – Mar 21 ^(c)	45	120,020	3,508	429	1,460	2,920	22.2
2011	Jan 28 – Mar 31 ^(c)	62	239,000	6,832	530	1,967	3,934	22.7
2012	Feb 1 – Mar 31 ^(c)	59	210,188	6,551	648	2,272	4,544	18.7
2013	Jan 30 – Mar 31 ^(d)	60	223,206	6,071	454	1,737	3,474	24.9
2014	Jan 31 – Apr 1	61	—	—	—	2,385	4,770	18.4
2015	Jan 31 – Apr 1	60	—	—	—	2,197	4,394	19.7

a) Source: TCWR Joint Venture (2009) combined with Mesher et al. (2008).

b) Source: TCWR Joint Venture (2013a), DAR Table 12.3-2.

c) Source: TCWR Joint Venture (2014), DAR Table 16.3-1.

d) Source: TCWR Joint Venture (2013b), DAR Table 12.3-2.

e) Specific traffic volume data for the Ekati operation between 1997 and 2004, and 2007 are not available. Therefore, assumed values are shown, based on an understanding of overall winter road statistics.

— = data not available.

Historically, Bathurst caribou have been observed annually in the area of the Ekati mine during the post-calving to fall-rut period (July until November), and the timing has varied by year and herd size. Caribou may also encounter the Ekati mine and the Project during the northern migration (May) to calving areas. It is during these times when caribou have the potential to interact with the Jay and Misery roads.

During the Project Technical Sessions in April 2015, DDEC made the commitment to provide a Caribou Road Mitigation Plan (CRMP) that gives further details on strategies to reduce the impacts from the Jay and Misery roads to caribou. A draft version of this Plan was submitted to the Mackenzie Valley Environmental Impact Review Board on May 8, 2015. Following a review period, DDEC hosted a workshop to discuss the CRMP on May 22, 2015 (DDEC 2015b). The suggestions made at this workshop were considered and incorporated into a subsequent version of the Plan. A second workshop was convened on June 25, 2015 to discuss further comments and suggestions for the revised version of the Plan. A third workshop was held to discuss the most recent version (published in May 2016) on September 13, 2016. Additional feedback on the Plan was also received during the environmental assessment review process, during the public hearings for the Jay Project DAR and submitted in writing following the most recent version. The recommendations received during engagement and the actions taken or responses from DDEC have been summarized in Attachment I.

DDEC has committed to further engagement with communities, the Independent Environmental Monitoring Agency (IEMA), and Government of the Northwest Territories (GNWT) to advancing the CRMP so that it can be implemented before construction of the Jay Project for the entire Ekati mine site. Based on the framework of adaptive management, it is important to note that the CRMP will likely evolve through time and should not be considered a 'final' plan.

1.2 Objectives

The CRMP describes the mitigation and monitoring for the Jay and Misery roads with respect to caribou. Although this plan is specifically for the Project, the CRMP will be included as an Appendix in the Wildlife Effects Monitoring Plan (WEMP; DDEC 2015c) and will apply to other roads at the Ekati mine, including the Misery Road and future Sable Road, upon approval of the Project.

The objectives of the CRMP are to:

- avoid and minimize (reduce) the risk of caribou and other wildlife mortalities from vehicle traffic;
- avoid and minimize the barrier effect of the Jay and Misery roads (and other Ekati mine roads) to caribou movement and migration; and,
- limit the effect of sensory disturbance from roads and traffic on caribou behaviour.

Although dust is caused by vehicles driving on roads, mitigation and monitoring of dust will not be addressed in the CRMP. Mitigation to control dust at the Ekati mine has included watering and applying dust suppressant to the roads, and monitoring is completed through the Air Quality Management and Monitoring Program (AQMMP). Further studies on the rate and spatial extent of dust deposition, triggers for adaptive management, and the effectiveness of mitigation methods to limit dust generation are part of the Air Quality and Emissions Monitoring and Management Plan (AQEMMP) for the Jay Project (Section 2.4, DDEC 2017). For example, as part of the Caribou Mitigation Plan (CMP) and AQEMMP, DDEC will expand the pilot study on determining the effectiveness of dust suppressants along the Misery Road. If successful, the suppressant would be applied to all haul roads at the Ekati mine as an off-site



offset for the Jay Project. Best practices will be shared with other operators, which if successfully used would also be considered as off-site offsetting. Information from the AQEMMP will be also used to help assess the potential drivers of detected changes in the zone of influence (ZOI) on caribou distribution and behaviour (WEMP; Sections 5.6.5 and 5.6.6).

2 CARIBOU PRESENCE AT EKATI MINE

Caribou in the Ekati mine area are typically from the Bathurst herd, and some seasonal patterns are evident in their behaviour and distribution. Bathurst caribou movements through the area surrounding the Ekati mine have historically occurred from July through October annually, but the timing has varied by year. Sensitivity of caribou to disturbance varies with life history and seasons. Caribou are likely most sensitive to development during the northern migration (May) when females are pregnant and need to get to the calving grounds. Similar sensitivity occurs during the initial post-calving period (June) after calves have been born and are the most vulnerable to environmental stressors (e.g., predators and weather) and highly dependent on the cow for protection and energy. Sensitivity to development likely decreases during the summer (July and August) and fall/rut period (September and October).

Results from aerial surveys indicate that Bathurst caribou tend to move through the Ekati mine area in pulses where large numbers of caribou are present for approximately two weeks (Figure 2-1). From 1998 to 2005, when the Bathurst herd size was likely greater than 100,000 individuals (Adamczewski et al. 2009), peak numbers of caribou were typically observed during July (Figure 2-2). Since then, peak caribou movements have occurred later from September to mid-October.

The first caribou arrivals of the year are typically cows on their way from the wintering grounds south of the treeline to the calving grounds near Bathurst Inlet. These caribou travel quickly, feed little, and have a clear directional movement northward regardless of lakes and most topographic features. Their presence in the Ekati mine regional study area (RSA) is typically confined to a few weeks in May. Bulls begin to arrive from the wintering grounds in July. The bulls typically move less, feed frequently, and are solitary or in small groups. Nursery groups (cows with calves) begin to arrive in July. They usually travel in groups and frequently stop for feeding, but development, large lakes, insect abundance, and other environmental factors influence their movement and behaviour. As the rut begins in late September, and as the caribou begin to leave the barren lands for the forest for winter, groups become mixed with cows and bulls. Caribou are not typically present in the Ekati RSA during winter.

Figure 2-1 Seasonal Abundance of Bathurst Caribou in the Ekati Mine Regional Study Area from Post-calving Aerial Surveys, 1998 to 2012

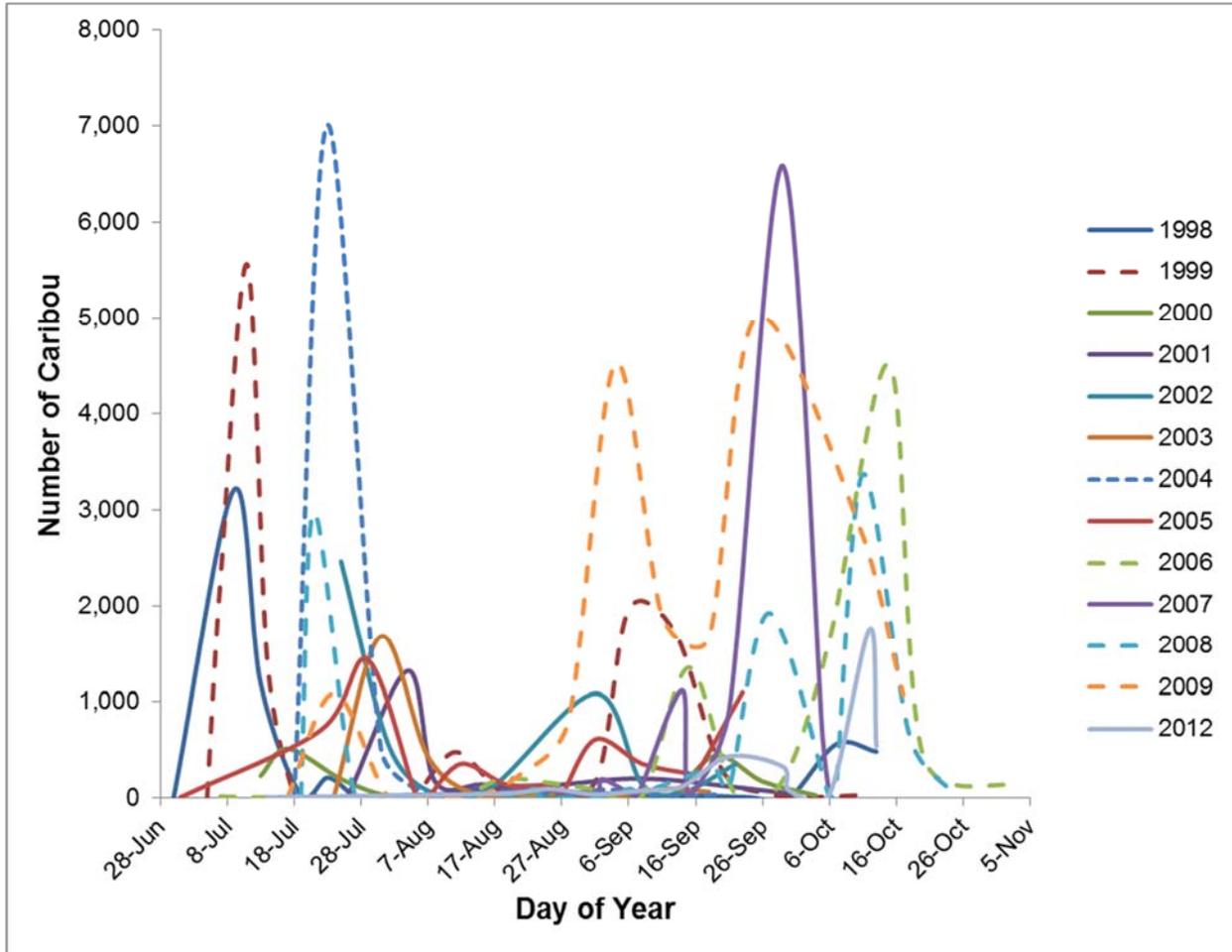
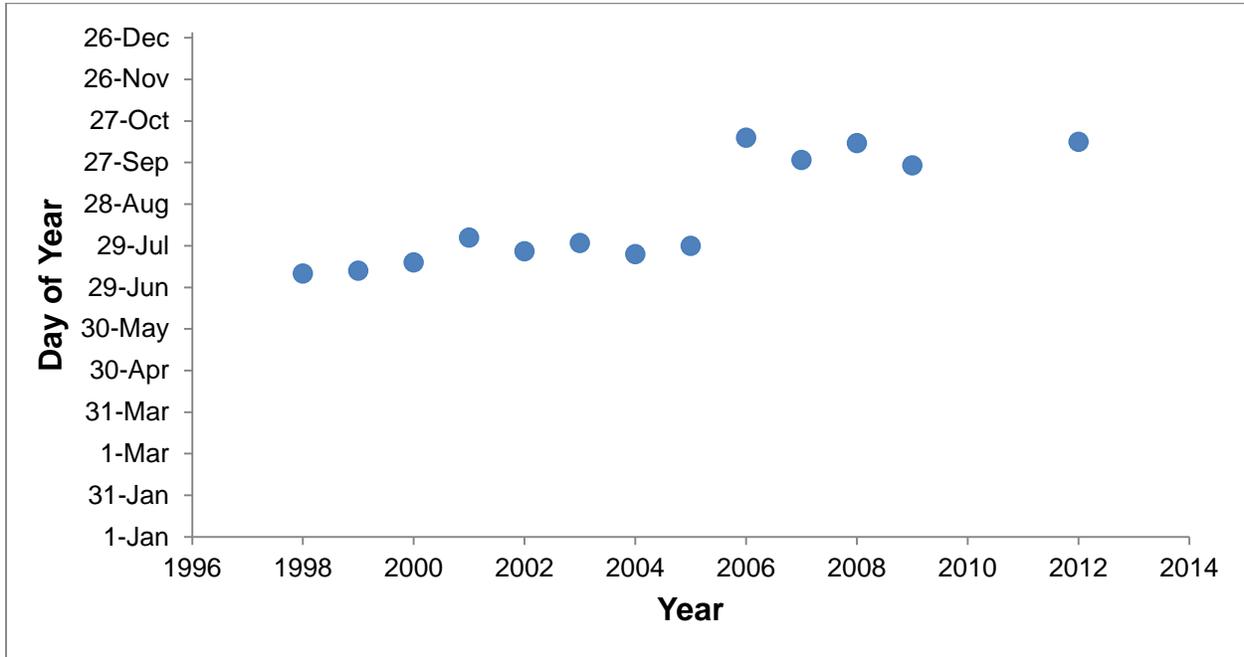


Figure 2-2 Dates of Annual Peak Abundance of Bathurst Caribou in the Ekati Mine Regional Study Area during Post-calving Aerial Surveys, 1998 to 2012



In addition to aerial survey monitoring, the Ekati mine has deployed remote cameras along mine roads to monitor caribou behaviour related to road design and traffic since 2011 (ERM Rescan 2014). Results from the camera data will also be used to inform which mine roads caribou frequently encounter, and more specifically, where on mine roads these encounters are likely to occur.

Data from mine road cameras (corrected for camera effort) from 2011 to 2013 (ERM Rescan 2014) indicate caribou most frequently encounter the existing Sable Road extension relative to other mine roads from March to November, annually (Map 2-1). Based on a 5 km search radius that considers cameras on multiple roads, caribou group densities ranged from 0.0 to 0.07 groups/km², with the highest density occurring approximately 1.7 km from the mine site on the Sable Road. A 500 m search radius was also used for each road to identify locations where caribou are likely to occur. Caribou density for Sable and Misery roads ranged from 0.0 to 1.9 and 0.0 to 0.4 caribou groups/km², respectively. While the Misery Road has lower group densities than the Sable Road, the camera results support the caribou crossing locations identified by Traditional Knowledge (TK) (Map 2-2). Results relative to each road will be used to guide the locations where road-specific monitoring and mitigation should be focused and most effective (Section 4).



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- SABLE ALL-SEASON ROAD
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- CAMERA LOCATION
- ✕ MISERY ROAD CARIBOU CROSSING

CARIBOU GROUP DENSITY

■ MAXIMUM VALUE

■ MINIMUM VALUE

REFERENCE

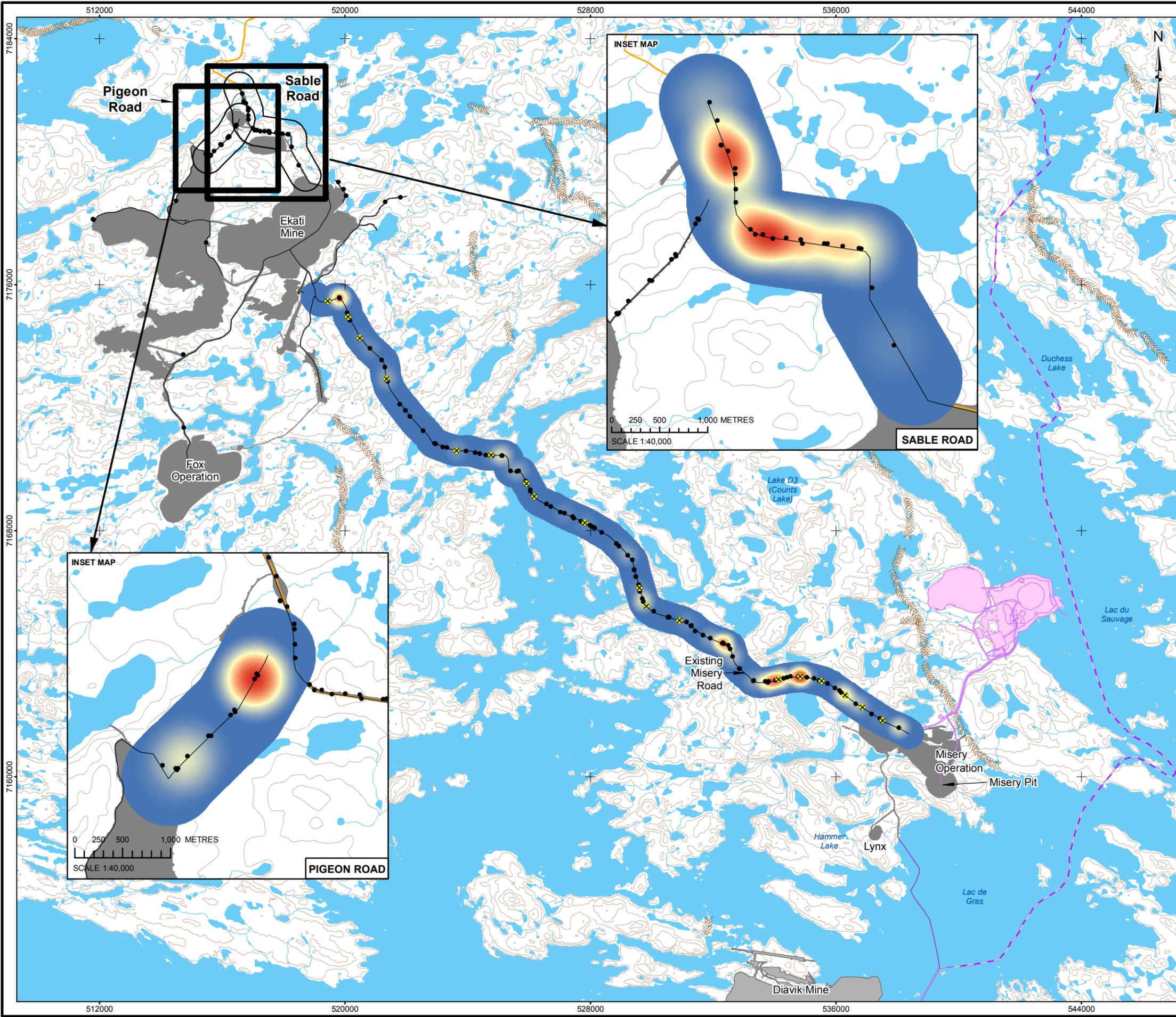
CANVEC © NATURAL RESOURCES CANADA, 2012
 NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
 DATUM: NAD83 PROJECTION: UTM ZONE 12N



		JAY PROJECT NORTHWEST TERRITORIES, CANADA	
CARIBOU GROUP DENSITY AMONG EKATI MINE ROADS			
	PROJECT 1419751.4130A.60		FILE No.
	DESIGN DC	31/03/16	SCALE AS SHOWN
	GIS ANK	29/04/16	REV 0
	CHECK CD	29/04/16	
	REVIEW JV	29/04/16	
			MAP 2-1

G:\CLIENTS\DOMINIONDIAMOND\DEC Jay and Lynx\Projects\Figures\1419751_Jay Project Stage 3\4130A_Permitting_and_Licensing\60_WEMP_revisions\CRMP_update\Map2-1_Caribou_Occurrence_Among_EkatiRds.mxd

G:\CLIENTS\DOMINION\DEC Jay and Lynx\Projects\Figures\1419751_Jay Project Stage 3\4130A_Permitting_and_Licensing\60_WEMP_revisions\CRMP_update\Map2-2_Caribou_Occurrence_Within_EkatiRds - Copy_new.mxd



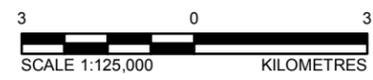
LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- SABLE ALL-SEASON ROAD
- WINTER ROAD
- TIBBITT TO CONTOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- CAMERA LOCATION
- MISERY ROAD CARIBOU CROSSING

CARIBOU GROUP DENSITY

- MAXIMUM VALUE
- MINIMUM VALUE

REFERENCE
 CANVEC © NATURAL RESOURCES CANADA, 2012
 NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
 DATUM: NAD83 PROJECTION: UTM ZONE 12N



PROJECT	JAY PROJECT		
	NORTHWEST TERRITORIES, CANADA		
CARIBOU GROUP DENSITY WITHIN EKATI MINE ROADS			
		PROJECT 1419751.4130A.60	FILE No.
DESIGN	DC	31/03/16	SCALE AS SHOWN
GIS	ANK	29/04/16	REV 0
CHECK	CD	29/04/16	MAP 2-2
REVIEW	JV	29/04/16	

3 COMMUNITY ENGAGEMENT AND TRADITIONAL KNOWLEDGE

DDEC's Community Engagement Plan has indicated that the Jay Road area is important for caribou movement. Increased traffic along the Misery and Jay roads, and associated power lines and pipelines that results in barriers to the movement of caribou and other wildlife the Ekati mine site is a key concern for DDEC and communities. DDEC's Community Engagement Plan will provide opportunities for communities to participate in mitigation and monitoring study designs and programs for the Jay Road, esker crossing, waste rock storage area, and other Ekati mine roads, and provide feedback on the results.

Because of the importance of the Lac du Sauvage esker for caribou movement as identified through community engagement, the portion of the Jay Road that cuts through the esker will be constructed as a caribou crossing. The pipelines will be covered with crushed rock at caribou crossings, except where there are valves or joints that require visual inspection for safe operation. DDEC will strategically construct the pipelines to reduce the number of joints or valves through the esker crossing. Most of the main section of the Jay Road will be constructed as a caribou crossing to enable caribou movement through the area (Section 4.1.1), which was identified as an important migration route by communities and baseline studies on historic trail mapping.

DDEC is committed to further integration of TK into the final design of the road. Once the road is constructed, it is expected that community members would participate in the monitoring of the effectiveness of road mitigation during visits to the Ekati mine or specifically for wildlife monitoring as described in Section 3 of the WEMP. The information from community monitoring would be used to increase road mitigation, if required, as part of adaptive management. Results from the community monitoring programs and changes resulting from adaptive management would be provided in the Ekati mine annual monitoring report.

4 MITIGATION AND MONITORING

DDEC's strategy for managing risks to caribou (and other wildlife) associated with the Jay and Misery roads is to increase mitigation and monitoring as caribou approach the Ekati mine (Figure 4-1). Four levels of mitigation and monitoring are proposed (Figure 4-2), and the intensity of mitigation and monitoring increases when specific action levels (triggers) are met (Table 4-1) including:

- Operational Level (Blue – continually);
- Level 1 (Yellow – low risk);
- Level 2 (Orange – medium risk); and,
- Level 3 (Red – high risk).

This three level approach for managing mitigation and monitoring (above the regular Operational Level) is similar to other Ekati mine operation plans (e.g., cold weather policy). This consistency will allow mine employees to understand the hierarchical structure of increasing and decreasing mitigation and monitoring in the CRMP. For example, at the Ekati mine, the Weather Advisory Procedure (PRO 1838) manages the risks associated with reduced visibility caused by adverse weather conditions, such as fog, low cloud, and blowing snow. When weather conditions have deteriorated to the point that it is difficult to determine the road edge, all non-essential vehicle traffic is restricted. When weather conditions worsen further and a whiteout occurs, all outside travel is prohibited. When visibility is reduced and caribou presence cannot be easily monitored from the ground, this procedure is in place to limit or prevent vehicle traffic in that area and avoid caribou-vehicle collisions.

Operational Level mitigation and monitoring will occur continually throughout the year and the life of the Ekati mine, and higher levels will be implemented when the associated action levels are met (Figure 4-2). For example, if Level 1 mitigation and monitoring is underway when Level 3 is triggered then there will be an immediate escalation from Level 1 to Level 3 mitigation and monitoring, and caribou observations will be compared continuously to the action levels. All mitigation from the previous lower level will be applied to the next higher level. Thus, escalation from Level 1 to Level 3 would include mitigation and monitoring in Level 2. The mitigation and monitoring for each level will continue for the minimum amount of time until the trigger is no longer met, regardless of how long this takes. For example, the mitigation and monitoring for Level 1 will continue until caribou have moved out of the RSA, or the trigger for a higher level has been met.

Pregnant cows migrating to the calving grounds in the spring season and cows with calves during the early post-calving season are considered to be the most sensitive to mine-related impacts. The mitigation in the CRMP has been designed to provide the highest protection for caribou encountering the Ekati mine during these seasons. Most mitigations will be applied to all seasons in the same way so that caribou are given a high level of protection throughout the year. In addition, mitigation may be increased depending on the season and group composition of caribou approaching the Jay and Misery roads (Figure 4-1). The mitigations listed below are based on those that have been used at the Ekati mine over the past 18 years of mine operations. There has never been a caribou mine-related mortality resulting from a vehicle collision at the Ekati mine despite annual interaction of caribou with the mine site, particularly when the Bathurst herd was larger in size in the late 1990s. This result demonstrates that existing mitigation, such

as giving wildlife the right-of-way, signage, and road closures, is effective at avoiding caribou-vehicle collisions and limiting wildlife injury and mortalities.

Monitoring is expected to provide early detection of caribou approaching the Jay and Misery roads and to assist in managing appropriate levels of mitigation to protect caribou and other wildlife. The monitoring techniques discussed below are to be considered in sequence. Monitoring will be completed and assessed by the Environment Department and will be used to manage mitigation levels. Monitoring informs the Environment Department if action levels have been met and whether or not a change in mitigation and monitoring level is necessary through adaptive management (WEMP; Section 2.2).

Figure 4-1 Mitigation and Monitoring Intensity for Ekati Mine and Jay Project Roads

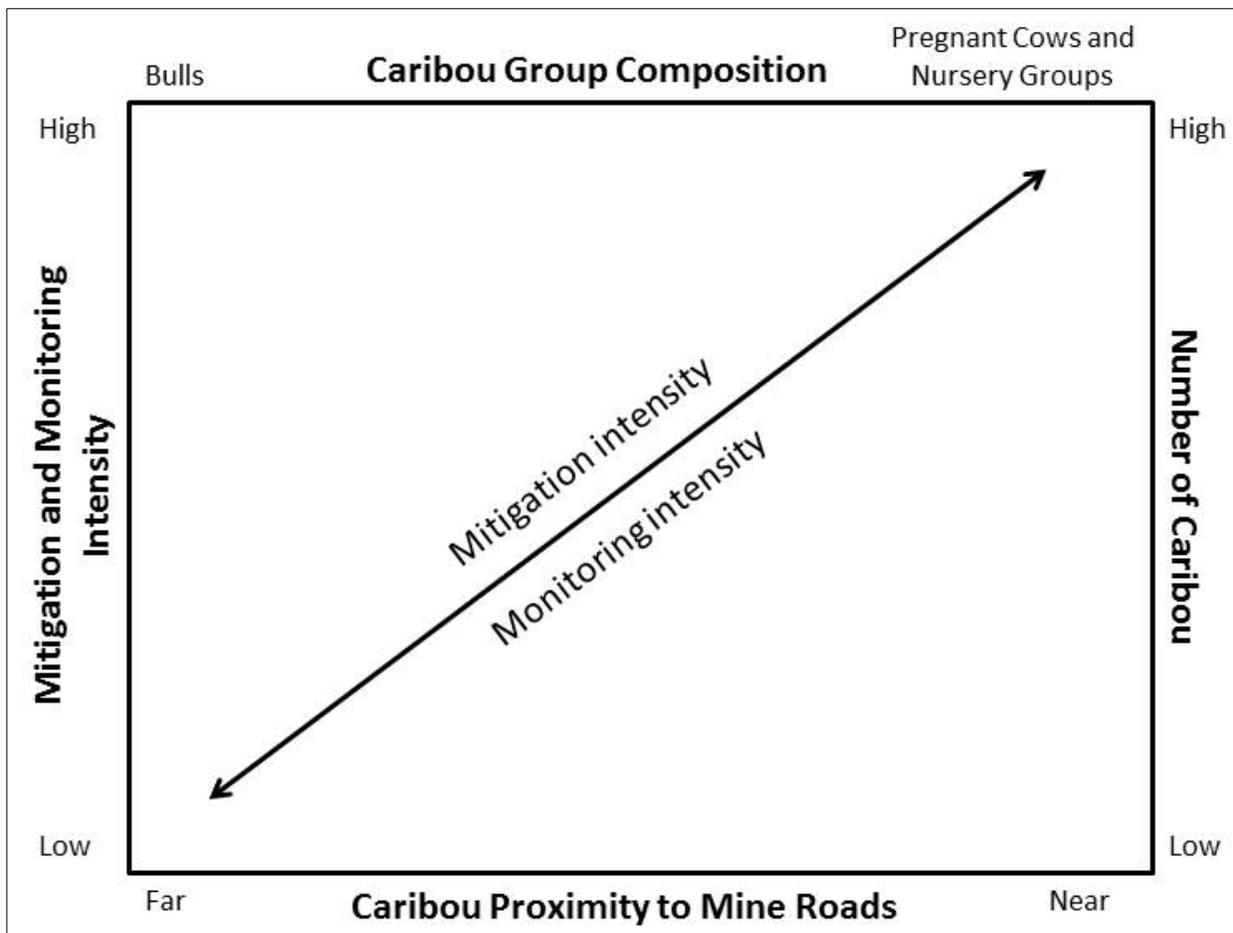


Figure 4-2 Decision Tree for Jay and Misery Roads Traffic Mitigation and Monitoring

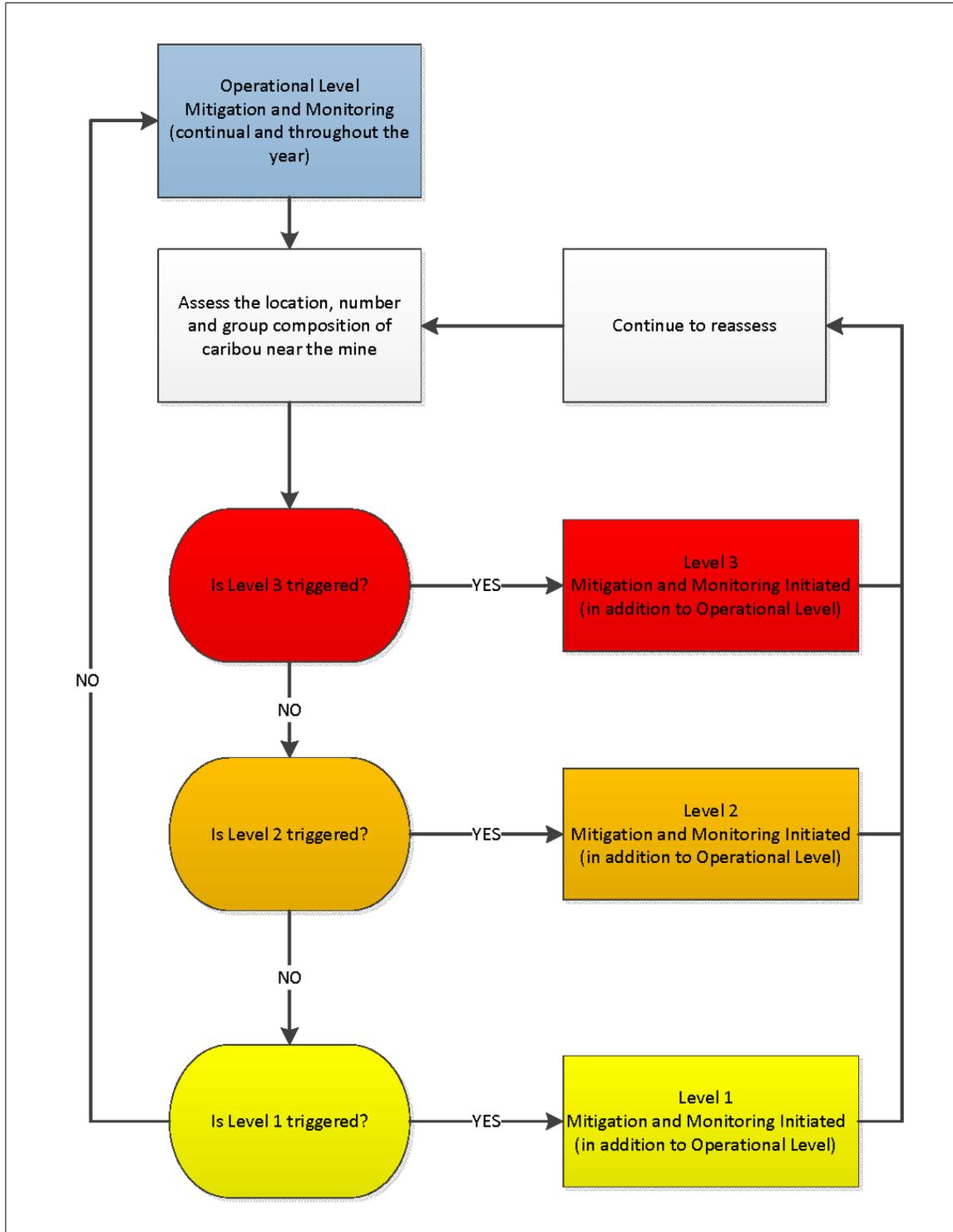


Table 4-1 Action Levels (Triggers) and Associated Caribou Road Mitigation and Monitoring for the Jay Project and Ekati Mine

Level (Alert)	Action Level (Triggers) to Initiate	Wildlife Road Mitigation	Caribou Monitoring
Operational (Blue)	<ul style="list-style-type: none"> Continual and throughout the year 	<ul style="list-style-type: none"> Design road to incorporate caribou crossings Employee education Speed limits are posted Wildlife have right-of-way on all roads Observations of wildlife on roads will be communicated to the Environment Department and other drivers in the area Wildlife carcasses on or near roads will be removed Road snow berm height will be managed during winter 	<ul style="list-style-type: none"> Collared caribou monitoring Incidental wildlife sightings Behavioural observations and motion and infrared cameras at road and esker crossings Weekly road surveys
1 (Yellow)	<ul style="list-style-type: none"> One or more collared caribou or caribou observations within 30 km of the Ekati mine (i.e., RSA) 	<ul style="list-style-type: none"> Site-wide notifications of caribou approach to Ekati mine Signage indicating caribou could be encountered (yellow alert) 	<ul style="list-style-type: none"> Collared caribou monitoring Incidental wildlife sightings Behavioural observations and motion and infrared cameras at road and esker crossings Daily road surveys
2 (Orange)	<ul style="list-style-type: none"> One or more collared caribou within 14 km of the Ekati mine Caribou sightings are reported near the Misery or Jay roads 0.25% of total cows in the Bathurst herd are between 200 to 500 m of the Jay or Misery roads during any season 	<ul style="list-style-type: none"> Site-wide notifications of caribou approach to Ekati mine Increased signage in areas where caribou might encounter the road Signage indicating caribou are likely to be encountered (orange alert) Speed limits will be decreased and posted 	<ul style="list-style-type: none"> Collared caribou monitoring Incidental wildlife sightings Behavioural observations and motion and infrared cameras at road and esker crossings Use of thermal technology Daily road surveys Environment Technicians dispatched to monitor traffic and provide caribou safety
3 (Red)	<ul style="list-style-type: none"> 0.25% of total cows in the Bathurst herd are within 200 m of the Jay or Misery roads during any season One or more cow caribou are observed within 500 m of the Jay or Misery roads during the northern migration (May) One or more caribou crossing or attempting to cross the road during any season 	<ul style="list-style-type: none"> Site-wide notifications of caribou approach to Ekati mine Signage indicating caribou are highly likely to be encountered (red alert) Short-term or long-term road closures 	<ul style="list-style-type: none"> Collared caribou monitoring Incidental wildlife sightings Behavioural observations and motion and infrared cameras at road and esker crossings Daily road surveys Environment Technicians dispatched to monitor traffic and provide caribou safety Behavioural surveys (scan and focal sampling)

RSA = regional study area for the Ekati mine.

4.1 Operational Level (Blue)

This level of mitigation is the baseline for all higher levels, and is continuous throughout the year and life of the mine including when no collared caribou or caribou observations are recorded within the Ekati mine RSA. Many of the mitigations presented below have been applied to the Ekati mine since operations began in 1998 (BHP 2000).

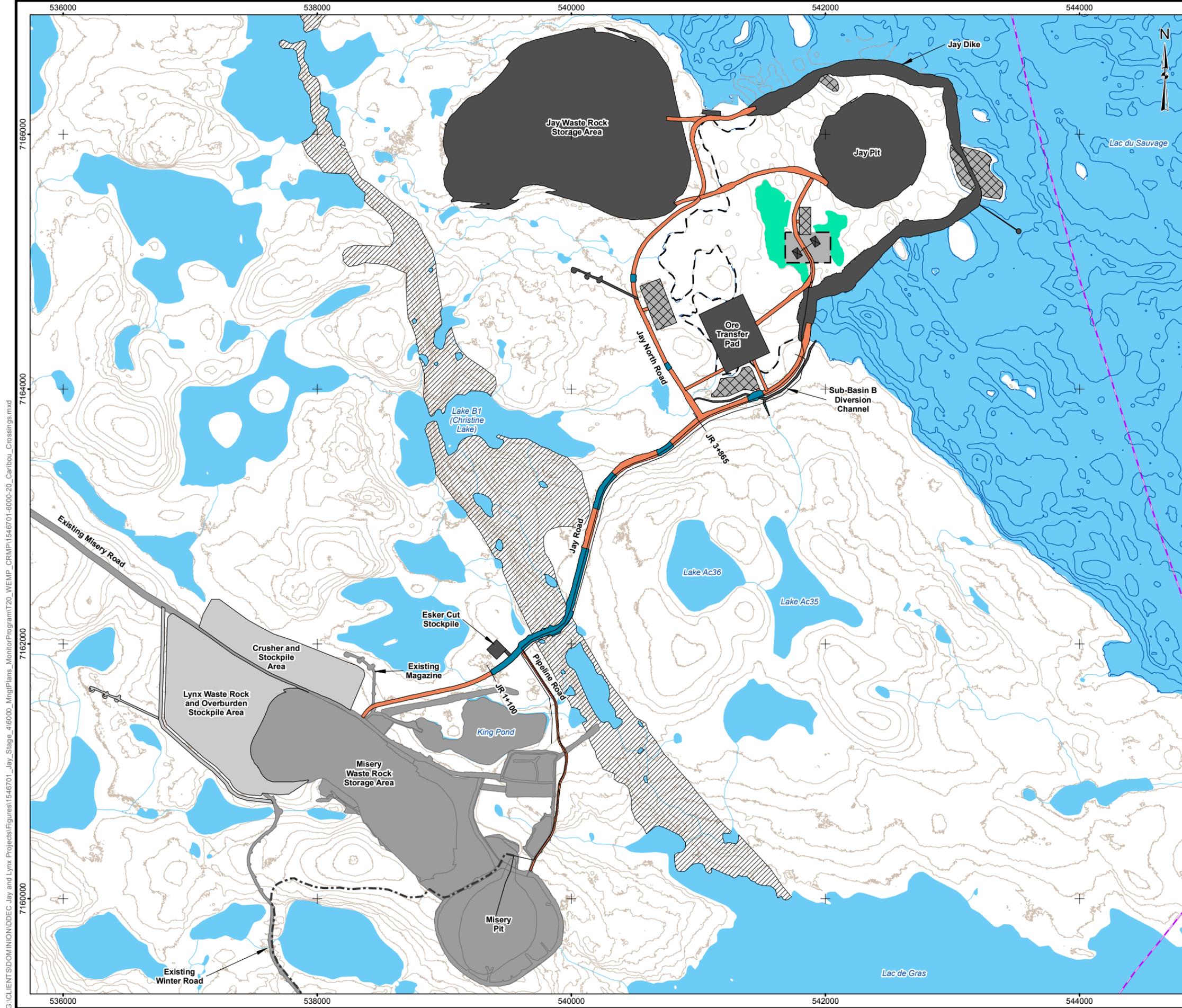
4.1.1 Mitigation

- *Design road to incorporate caribou crossings*

DDEC will construct caribou crossings along the Jay Road that respect the importance of this area for caribou migration and movement as identified by community engagement and TK (Section 3). Details of the Jay Road design are outlined in the Road Construction Plan; the objective is to make the Jay Road as permeable to caribou movement as practicable (WEMP; Section 4.2.3). Caribou crossings will not be built in areas where raised safety berms are required, or at locations where there are necessary joints and valves in the pipelines that must be accessible (DDEC 2015d, Map 1-1).

The road design allows for approximately 2.0 km of caribou crossings over a total length of 2.8 km between JR1+100 (close to King Pond) and JR3+865, close to the intersection with the Jay North Road (i.e., 70.9 percent [%] of the road will be built with caribou crossings) (Map 4.1-1). This includes a 1.3 km stretch of road through the esker. The only two sections of the road that do not have caribou crossings (cumulatively 28% of its length) are those sections where berms are required for safety reasons, due to elevation of the road surface with respect to the adjacent ground. Given that the design accounts for the requirement to have safety berms at the intersection of the Jay and Jay North roads, this last section of the Jay Road near the intersection was not considered as available for caribou crossings. However, two additional caribou crossings will be added to the Jay North Road and one crossing will be added to the eastern section of the Jay Road towards the dike (Map 4.1-1). Caribou crossings will be designed so that the side slopes of the road are flatter and have finer crushed rock particles (6 inches or less). In the caribou crossing areas, the pipelines will also be covered with finer crushed rock. Valves and pipeline joints must be accessible and will not be covered.

DDEC is committed to further integration of TK in the construction of caribou crossings for the Jay Road, which would be incorporated into the final design of the road (Section 3). Once the road is constructed, the effectiveness of the caribou crossings will be monitored by the Environment Department and during community visits to the Ekati mine as part of adaptive management. Monitoring of the interactions between the Jay Road and caribou by communities may also be conducted. Results from this monitoring would be provided in the Ekati mine annual monitoring report.



LEGEND

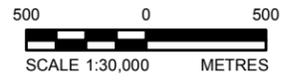
- EKATI MINE FOOTPRINT (MISERY OPERATION)
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- BATHYMETRY CONTOUR (5 m INTERVAL)
- ELEVATION CONTOUR (5 m INTERVAL)
- WATERCOURSE
- WATERBODY
- ESKER
- JAY PROJECT FOOTPRINT**
- CARIBOU CROSSING
- LAYDOWN AREA
- PROPOSED JAY PROJECT INFRASTRUCTURE
- PROPOSED JAY ROAD
- PUMPING SYSTEM AREA
- SUMP
- LYNX PROJECT FOOTPRINT**
- MISERY TO LYNX PIPELINE
- LYNX PROJECT INFRASTRUCTURE

NOTES

1. DESIGNS ARE CURRENTLY A WORK IN PROGRESS

REFERENCES

1. JAY PROJECT DETAILED DESIGN DIKE IFT DRAWING NO. 930-11-1004 ISSUED FOR TENDER ON JANUARY 15, 2016
2. JAY PROJECT DETAILED DESIGN CHANNEL IFT DRAWING NO. 940-11-4002 ISSUED FOR TENDER ON JANUARY 15, 2016
3. JAY PROJECT WASTE ROCK STORAGE AREA DESIGN REPORT DRAWING NO. 1419751-2030-40-03, DATED FEBRUARY 18, 2016
4. LIDAR AND BATHYMETRIC DATA OBTAINED FROM AURORA, 2013
5. WATER OBTAINED FROM CANVEC © NATURAL RESOURCES CANADA, 2012 DATUM: NAD83 PROJECTION: UTM ZONE 12N



	DOMINION DIAMOND NORTHWEST TERRITORIES, CANADA			JAY PROJECT	
	CARIBOU CROSSINGS ALONG THE JAY ROAD AND JAY NORTH ROAD				
	PROJECT	1546701.6000.20	FILE No.		
	DESIGN	JV	30/03/16	SCALE AS SHOWN	REV 0
	GIS	ANK	31/01/17		
	CHECK	DC	31/01/17		
	REVIEW	JV	31/01/17		
MAP 4.1-1					

G:\CLIENT\DOMINION\DEC_Jay and Lynx\Projects\Figures\1546701_Jay_Stage_4\6000_MngtPlans_MonitorProgram\T20_WEIMP_ORMP\1546701-6000-20_Caribou_Crossings.mxd

- *Employee education*

The Environment Department will complete presentations to communicate the importance of mitigation (e.g., wildlife have the right-of-way and incidental sightings reporting) for the protection of caribou and information regarding caribou behaviour. Presentations will be made to the departments that use the Misery and Jay roads (i.e., Site services, Mine Operations, Logistics, Geology and Mine Technical Services, and Aviation) and distributed to other department managers to communicate the information to their employees. These presentations will be in addition to employee mine orientation training and driver training, and will be included as part of the Site Orientation for all new staff, contractors, and visitors.

- *Speed limits are posted*

Speed limits are 60 kilometres per hour (km/h) along haul roads and 20 km/h or 40 km/h on other roads. Driving slowly will give drivers more reaction time and reduces the distance required to stop. Haul truck traffic is monitored at site using Wenco. Wenco is an on-board vehicle electronic tracking system that records vehicle location and can be used to calculate speed.

- *Wildlife have the right-of-way on all roads*

All employees operating vehicles will be responsible for stopping for caribou and other wildlife on the Jay and Misery roads (and other Ekati mine roads). If a driver encounters wildlife or caribou on the road, they must report this to the Environment Department and Dispatch. This will allow the Environment Department to send Environment Technicians to the location to take any necessary actions, and for Dispatch to relay the message to other drivers.

Environment Technicians will proceed to the location that caribou are encountered any time a driver stops to give caribou the right-of-way. The time when the driver can resume driving will be at the discretion of the driver only until an Environment Technician arrives to take over traffic management. In situations where employees stop for wildlife and Environment Technicians are not present, drivers will use the following guidelines to determine when they can resume driving and at what speed (Table 4.1-1).

Table 4.1-1 Caribou Distance Thresholds and Speed Limits

Distance of Caribou from the Road	Speed Guideline
less than 100 m	driver to remain stopped
100 to 200 m	driver to proceed at 20 km/h
200 to 500 m	driver to proceed at 40 km/h
500 m or more	driver to proceed at 60 km/h

Employees must wait until caribou move more than 100 m from the road before vehicles can proceed at a reduced speed of 20 km/h to limit disturbing animals. This distance can be estimated accurately and quickly by drivers, and at this speed, drivers are expected to be able to safely come to a complete stop should caribou decide to change direction or behaviour. When the animal has moved more than 200 m from the road, the driver can increase his or her speed to 40 km/h. When the animal has moved more than 500 m from the road the driver can increase his or her speed to 60 km/h. It is important to note that these instructions are used to direct drivers actions until Environment personnel arrive to monitor caribou

and direct the flow or stopping of traffic, which will depend partially on the current alert level (Table 4-1). In other words, once Environment personnel are on site, traffic may be directed to remain stopped at distances greater than 100 m, depending on the behaviour and movement of caribou.

- *Observations of wildlife on roads will be communicated to the Environment Department and other drivers in the area*

This mitigation alerts other drivers and the Environment Department of wildlife presence, and is required by all employees operating a vehicle at all times. The Environment Department can respond according to the perceived threat to human or wildlife safety by issuing site-wide notifications, dispatching Environment Technicians to sections of the road, managing the movement of traffic, and/or closing roads. All incidental wildlife sightings are summarized in the Ekati mine annual monitoring report.

- *Wildlife carcasses on or near roads will be removed*

This mitigation is intended to reduce the presence of predators and scavengers near roads. It is expected that all employees will report wildlife carcasses to the Environment Department for removal. The Environment Department reports all wildlife mortalities at site to the Environment and Natural Resources (ENR) department of the GNWT and receives direction from ENR regarding disposal. DDEC will not chase any wildlife off a kill but will wait for wildlife to finish with the kill before moving the carcass. All wildlife mortalities that occur at the Ekati mine and details regarding carcass removal (e.g., distance carcass was moved from the road) will be provided in the Ekati mine annual monitoring report.

- *Road snow berm height will be managed during winter*

During winter, snow berms present along roads will be reduced to provide safe driving conditions, improve visibility and reduce the berms as obstacles for migrating caribou. Results from monitoring at the Misery Road during the spring migration of Bathurst caribou indicated that snow berm heights may influence movements of caribou (Rescan 2011). The results indicated that caribou crossed roads when berms were 0.5 m high or less and deflected when berms were at least 1.6 m high. Snow berms along the Misery and Jay roads will be maintained at a height less than 1.6 m, where practicable. However, the grader used to manage snow will likely clear snow closer to a height of 1 m.

4.1.2 Monitoring

Operational monitoring will include reviewing the locations of collared Bathurst caribou, incidental sightings of wildlife, and weekly road surveys, behavioural observations and motion and infrared camera traps at road and esker crossing, and the results will be documented in the Ekati mine annual monitoring report.

- *Collared caribou monitoring*

Monitoring the location of collared caribou cows is useful for predicting the overall movements of the Bathurst herd. Recent analyses completed for the Diavik Diamond Mine found a significant negative correlation between the number of caribou counted during aerial surveys and the mean distance of collared caribou locations from the study area during both migration periods (Golder 2011). This relationship indicates that when more caribou were observed during a survey, the mean distance of collar

locations to the study area decreased (i.e., the collared animals were closer to the mine on average when higher numbers of caribou were counted during aerial surveys).

Through the CMP, DDEC is providing funding for 50 geo-fenced collars to provide Ekati-specific information on caribou movement. The location of collared caribou provided by ENR will be monitored to determine the proximity of caribou relative to the Ekati mine. This monitoring will occur year-round and will be used to inform the Environment Department if a change in mitigation level is necessary.

- *Incidental wildlife sightings*

Ekati mine employees are required to report all incidental wildlife sightings to the Environment Department, which are recorded in an Incidental Wildlife Sightings log. Incidental wildlife sightings reported by site staff allows the Environment Department to understand areas where wildlife are present or of high use so that mitigation can be adaptively managed.

- *Behavioural Monitoring*

For all alert levels, the responses of caribou to crossings along the roads and at the esker will be monitored. Scan and focal sampling (Section 4.4.2) will occur at all alert levels, depending on the opportunity to collect data.

- *Camera Trapping*

Camera trapping refers to the use of remotely triggered cameras that automatically record images that move in front of them, up to a maximum distance (Rovero and Marshall 2009). Most cameras are triggered by a passive infrared sensor detecting a moving object warmer than the ambient temperature such as animals, people, and vehicles. Camera traps will be deployed at the esker crossing and other crossings along the Jay and Misery roads. The information will be used to determine the effectiveness of mitigation (e.g., slowing and stopping traffic) on limiting the barrier effect of roads to caribou movement, and provide feedback for adaptive management (WEMP; Section 2.2).

- *Weekly road surveys*

Road surveys will be completed by truck along the Jay and Misery roads to determine the location and numbers of caribou as they approach the Ekati mine. Environment personnel surveying the roads will allow for more proactive implementation of mitigation. The frequency of surveys will begin at one per week and will become more frequent as higher action levels are met.

4.2 Level 1 (Yellow)

This level of mitigation and monitoring is triggered when one or more caribou are observed within 30 km from the Ekati mine (i.e., within the Ekati RSA). Mitigation at this level is to provide a heightened awareness to Ekati mine employees that caribou may be encountered near or on the mine site.

4.2.1 Mitigation

- *Site-wide notifications of caribou approaching the Ekati mine*

Notifications are communicated through site-wide email, during morning safety meetings or department-specific radio channels by the Environment Department. Notification will include signage

alerting drivers departing on the Jay and Misery roads that migrating caribou are approaching the Ekati mine.

- *Signage indicating caribou could be encountered (yellow alert)*

The Environment Department will post yellow (Level 1) alert signs for drivers that caribou could be encountered in the area. This provides drivers with reminders to be vigilant. Signs will be posted at entry points of the Jay and Misery roads. All drivers will be notified at the beginning of their shift the alert level the mine is currently at and provided with maps of any recent incidental caribou sightings. These maps will include recent observations and information of where caribou have historically been encountered along the road. A summary map of these data will be provided to all interested parties (e.g., communities and regulators) in the Ekati mine annual monitoring report.

4.2.2 Monitoring

Level 1 monitoring will include all of the monitoring in the Operational Level; however, the frequency of road surveys will be increased from weekly to daily surveys. The frequency of yellow alert level, and all observations from additional road surveys will be documented in the Ekati mine annual monitoring report.

4.3 Level 2 (Orange)

This level of mitigation occurs when one or more collared caribou or caribou observations occur within 14 km of the Ekati mine (i.e., within the predicted ZOI for changes in caribou distribution) or when 0.25% or more of total cows in the Bathurst herd are observed at 200 to 500 m from the Misery or Jay roads. Mitigations are intended to reduce sensory disturbance from roads and traffic on approaching caribou (i.e., within 14 km of the mine), and the perception by caribou that roads and vehicles are a barrier to movement.

4.3.1 Mitigation

- *Signage indicating caribou are likely to be encountered (orange alert)*

The alert signs posted in Level 1 Mitigation will change from yellow (Level 1) to orange alert (Level 2). All drivers will be notified at the beginning of their shift the level the mine is currently at and provided with maps indicating areas of the road they are most likely to encounter caribou.

- *Increased signage in areas where caribou might encounter the road*

The Environment Department will post alert signs at key sections of the roads to warn drivers that caribou are approaching the mine. This will remind drivers to slow down if caribou are seen 100 m to 500 m from the road (speed reduction depends on the distance interval) or stop if and when required (Table 4.1-1). The location of the signs will be based on incidental caribou observations, camera trapping data (Section 2) and TK. Together these data will be used to update the map distributed to drivers and the location of alert signs along roads. Focusing mitigation efforts near sections of the roads that have a high likelihood of caribou encounters is practical, particularly when visibility is restricted due to darkness and/or poor weather conditions (e.g., fog, blizzards), and monitoring of approaching animals at intermediate distances is difficult (Section 4.3.2).

- *Speed limits will be decreased and posted*

The maximum speed limit on portions of the Misery haul road is 60 km/h. As a general rule for drivers, speed limits will be decreased to 40 km/h along sections of the Jay or Misery roads when 0.25% of total cows in the Bathurst caribou herd are observed at 200 to 500 m from the road (Table 4.1-1). When caribou are observed 100 m to 200 m of the road, the speed limit will be decreased to 20 km/h. Vehicles are to stop and remain stopped when caribou are within 100 m of the road. Importantly, these triggers and actions are guidelines for drivers when Environment personnel are not present. As stated in Section 4.1.1, the length and section of the road, and duration of the speed limit decrease will be determined by the Environment Department, and traffic may be stopped for periods of time at any distance, depending on the behaviour and movement of caribou. Speed limits will apply to all vehicles. Wildlife will continue to have the right-of-way during speed limit reductions.

4.3.2 Monitoring

Level 2 monitoring will include all of the monitoring in Level 1, and additional monitoring listed below. The number of occasions when there was an orange alert level, the road, frequency, duration and length of road segments of speed limit reductions will be documented in the annual monitoring report.

The detection of caribou approaching the Ekati mine at intermediate distances is technically challenging. Through the CRMP, DDEC is providing funding for 50 geo-fenced collars to provide Ekati-specific information on caribou movement, which is anticipated to provide a collar location every hour within 14 km of the mine. In addition to radio-collar monitoring, DDEC is also exploring a number of different options for detecting and monitoring caribou before caribou would be detected by specific road surveys or drivers. This includes scans for caribou using thermal imaging technology at high probability of encounter points along roads identified from incidental caribou observations, camera trapping data, and TK (Section 4.3.1). Thermal imaging technology will facilitate detection of caribou when visibility is reduced (e.g., darkness).

The GNWT (2015) also recognizes that the detection of approaching caribou is a logistical challenge for applying protective measures, and that pilot studies into technologies and approaches (e.g., unmanned aerial vehicles, large animal detection systems and on-the-land monitors) is a legitimate research direction. To fit within the objective of reducing the ZOI, these methods and approaches should result in no sensory disturbance on caribou. Funding from the Caribou Monitoring Strategies/Plan component of the CMP could be directed towards such pilot studies. Selection and implementation of techniques for detecting caribou approaching the Ekati mine at intermediate distances would involve engagement with communities, GNWT, and IEMA.

- *Environment Technicians dispatched to monitor traffic and provide caribou safety*

Environment Technicians will be dispatched to the location of any caribou observations along the roads to monitor and adaptively manage traffic to protect caribou. Technicians will also be present during speed limit reductions to monitor traffic and enforce compliance. Descriptions and photos of locations where caribou crossed or were deflected by roads will be used to provide feedback for adaptive management of mitigations.

4.4 Level 3 (Red)

This level of mitigation and monitoring will be triggered when 0.25% or more of total cows in the Bathurst herd are within 200 m of the Misery or Jay roads (i.e., the maximum stopping distance of a loaded haul

truck travelling 60 km/h), or one or more caribou are crossing or attempting to cross the Misery or Jay roads. The trigger will be calculated based on the abundance estimates provided by ENR following photo census or calf recruitment (reconnaissance) surveys. The trigger for the number of total cows in the Bathurst herd will be set at the lowest number obtained for the most recent photo census survey or calf recruitment survey. The use of a percentage allows the absolute number of caribou representing the trigger to vary with herd size (i.e., this number is more conservative when the herd is at lower abundance). During the northern migration when cows are most sensitive to disturbance and caribou movement is more directional and predictable, short-term closures will occur when a single cow is within 500 m of the Misery or Jay roads and their direction of travel indicates they will encounter a road. Mitigations are intended to avoid and limit the following effects to caribou:

- risk of caribou mortalities from vehicles;
- the barrier to movement and migration from the Jay and Misery roads; and,
- sensory disturbance from roads and traffic on caribou behaviour (and associated adverse changes in energetics and reproduction).

4.4.1 Mitigation

- *Signage indicating caribou are highly likely to be encountered (red alert)*

The alert signs posted in Level 2 Mitigation will be change from orange (Level 2) to red alert (Level 3). All drivers will be notified at the beginning of their shift the level the mine is currently at and provided with maps of any recent incidental caribou sightings.

- *Short-term or long-term road closures*

A road closure will always be initiated in any season if the criterion of 0.25% of total cows in the Bathurst herd is within 200 m of the Jay or Misery roads (as determined by the lowest number between the most recent ENR photo census or calf recruitment survey). Road closures will further reduce sensory disturbance and maximize the time interval between vehicles. Short-term closures will involve closing sections of the road from one minute to six hours. Long-term closures will involve closing the entire Jay and/or Misery roads for at least six hours. Whether a long-term or short-term road closure is required will be determined by the Environment Department and will depend on the number, group composition and behaviour of caribou near the road.

Road closures will also occur at numbers lower than and distances further than the trigger based on the discretion of the Environment Department. This discretion includes but is not limited to the following:

- if the composition of caribou groups is primarily cows with calves;
- if lower numbers of caribou are within 200 m of the Misery or Jay roads;
- if caribou are exhibiting signs of sensory disturbance; and,
- it is anticipated that the caribou intend to cross the road.

During the northern migration (May), when caribou movement is directional, more predictable and cows are most sensitive to disturbance, short-term closures will occur when a single cow is within 500 m of the

roads and their direction of travel indicates they could encounter a road (Table 4-1). Any additional mitigation efforts will focus on increasing the permeability of roads and infrastructure (proactive road closure). Road closures may be required during periods of darkness if road closures or speed limit reductions have been triggered throughout the day. This decision will be at the discretion of the Environment Department. Other caribou monitoring options (e.g., infrared cameras) will be considered during this time.

During the post calving to fall/rut period, caribou tend to be more sedentary, moving to find food, and avoid insects and predators. During this period, mitigation can be applied on a case-by-case basis. For example, mitigation will focus on limiting sensory disturbance (energetic cost) when caribou are observed feeding adjacent to roads. Mitigation would switch to road closure or other traffic modifications should it be anticipated that caribou intend to cross or use the road for other purposes.

DDEC will construct kimberlite stockpile areas so that the Jay Project can continue to operate throughout road closures. If a road closure is triggered for longer than the kimberlite stockpiles can sustain, the road will remain closed to protect caribou.

DDEC has proposed to use long-haul trucks (referred to as road trains) instead of individual haul trucks and in place of using pilot vehicles and convoys. A long-haul road train includes a single cab with three trailers in tow and a capacity of 216 tonnes. Use of a single cab produces less noise and lower emissions than a multi-truck convoy while carrying a similar load. Mitigation includes the use of road closures, which maximize the time interval between vehicles.

4.4.2 Monitoring

Level 3 monitoring will include all of the monitoring in Level 2, with the additional allocation of Environment staff so that behavioural monitoring and mitigation can be appropriately managed. The frequency of red alert level, and all survey data will be documented in the Ekati mine annual monitoring report.

- *Behavioural surveys (scan and focal sampling)*

Ground-based scan and focal sampling from the road will be initiated to document caribou response to stressors (e.g., haul trucks). Behavioural monitoring of caribou will allow the Environment Department to understand how caribou behaviour changes with distance to the road and in response to industrial stressors so that mitigation can be adaptively managed (e.g., modification to distance triggers for vehicle speed reductions and road closures). The allocation of additional Environment staff will increase the likelihood that monitors can complete behavioural surveys, while mitigation actions are still being actively managed. Environment staff will remain with observed caribou until the caribou are no longer visible from the road even if the behaviour monitoring has been completed.

4.5 Roles and Responsibilities

To limit road effects to caribou it is necessary to define all of the mine staff roles and responsibilities with respect to operating vehicles on the mine roads (Table 4.5-1).

Table 4.5-1 Ekati Mine Employee Caribou Road Mitigation Plan Roles and Responsibilities

Job Title	Responsibility
Superintendent Mining	<ul style="list-style-type: none"> • Ensure training is provided for site personnel • Hold all employees accountable for complying with all Environment commitments and policies • Incorporate CRMP components into the site Traffic Management Plan
Superintendent Environment	<ul style="list-style-type: none"> • Owner of the CRMP • Ensure resources are available to establish, implement, execute, and maintain mitigation and monitoring • Responsible for overseeing the review and update of the CRMP
Wildlife Advisor	<ul style="list-style-type: none"> • Design monitoring programs, verify that monitoring and mitigations are planned and executed, review data, and adapt programs as required • Complete annual reporting and engagement • Provide expertise and support to operations teams • Responsible for implementing the CRMP, and completing the review and any updates
Environment Technician	<ul style="list-style-type: none"> • Understand procedures, execute the CRMP action levels and complete monitoring and mitigations as outlined
All Employees	<ul style="list-style-type: none"> • Report all wildlife and act in a manner that will protect all wildlife, except where it could affect personal safety • Obey all posted speed limits and rules of the road and give wildlife the right-of-way on all roads • Understand and follow CRMP procedures and act in accordance with DDEC's Environmental Standards and Policies

CRMP = Caribou Road Mitigation Plan; DDEC = Dominion Diamond Ekati Corporation.

5 REPORTING

In accordance with the principles of adaptive management, changes to the CRMP will likely occur as monitoring results are analyzed and assessed over time (WEMP; Section 2.2). Mitigation and monitoring efforts related to the CRMP will be documented and analyzed in the Ekati mine annual monitoring report and will include the following information:

- incidental sightings of caribou and other wildlife, and results of road surveys;
- number and duration of blue, yellow, orange, and red alert levels, and reasons for triggering change in alert levels;
- the location (road), frequency, duration, and length of road segments of speed limit reductions;
- the location (road), frequency, and duration of road closures; and,
- results from focal and scanning behavioural surveys.

During the October 16, 2015 workshop for the CMP, a request was made to provide interim reporting on the effectiveness of the CRMP following its initial implementation, and would be stand alone from the annual monitoring report. During the first year of implementation of the CRMP, interim reports would likely be available in January following the post-calving to fall/rut period. Subsequently presentation of the results from the CRMP will occur regularly in the annual monitoring report. If negative effects are detected (e.g., caribou-vehicle collisions, failed crossing attempts, inadequate signage), the actions available to DDEC include the following:

- increase monitoring effort;
- implement special studies to further understand the effects; and/or,
- implement additional mitigation to further reduce the effects.

6 REFERENCES

- Adamczewski JZ, Boulanger J, Croft B, Cluff D, Elkin B, Nishi J, Kelly A, D'Hont A, Nicholson C. 2009. Decline of the Bathurst Caribou Herd 2006-2009: A technical evaluation of field data and modeling. Draft technical report December 2009. Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NWT, Canada.
- BHP (BHP Diamonds Inc.). 2000. EKATI Diamond Mine Wildlife Effects Monitoring Plan. Support Document H. Prepared by BHP Diamonds Inc., Yellowknife, NWT, Canada.
- DDEC (Dominion Diamond Ekati Corporation). 2015a. Jay Project Developer's Assessment Report Information Request Responses, April 2015, Appendix C: Traffic Associated with the Jay Project. Submitted to the Mackenzie Valley Environmental Impact Review Board, Yellowknife, NWT, April 7, 2015.
- DDEC. 2015b. Jay Project Wildlife Road Mitigation Plan Workshop, Meeting Notes May 22, 2015. Submitted to the Mackenzie Valley Environmental Impact Review Board, Yellowknife, NWT, June 1, 2015.
- DDEC. 2015c. Conceptual Wildlife Effects Monitoring Plan for the Jay Project. Submitted to the Mackenzie Valley Environmental Impact Review Board, Yellowknife, NWT, June 1, 2015.
- DDEC. 2015d. Jay Project Developer's Assessment Report Undertaking Request Response DAR-MVEIRB-UT-01. Submitted to the Mackenzie Valley Environmental Impact Review Board, Yellowknife, NWT, May 8, 2015.
- DDEC. 2017. Air Quality and Emissions Monitoring and Management Plan for the Jay Project. January 2017.
- ERM Rescan. 2014. Ekati Diamond Mine: 2013 WEMP Addendum — Wildlife Camera Monitoring Summary Report. Prepared for Dominion Diamond Ekati Corporation by ERM Rescan: Yellowknife, Northwest Territories.
- GNWT (Government of Northwest Territories). 2015. Government of Northwest Territories Closing Argument of the Dominion Diamond Ekati Corporation Jay Project (EA1314-01). Submitted to the Mackenzie Valley Environmental Impact Review Board, Yellowknife, NWT, October 23, 2015.
- Golder (Golder Associates Ltd.). 2011. Analysis of Environmental Effects from the Diavik Diamond Mine on Wildlife in the Lac de Gras Region. Prepared for Diavik Diamond Mines (2012) Inc.
- Meshner DE, Proskin SA, Madsen E. 2008. Ice Road Assessment, Modeling and Management. 2008 Annual Conference of the Transportation Association of Canada, Toronto, ON, Canada.
- Rescan (Rescan Environmental Services Ltd). 2011. EKATI Diamond Mine: 2010 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Canada Inc., Yellowknife, NWT, Canada.
- Rovero F, Marshall AR. 2009. Camera trapping photographic rate as an index of density in forest ungulates. *J App Ecol* 46: 1011-1017.



TCWR Joint Venture (Tibbitt to Contwoyto Winter Road Joint Venture). 2009. Questions and Answers related to Caribou and the Winter Road. December 18, 2009 Update.

TCWR Joint Venture. 2013a. Facts. Available at: <http://jvtcwinterroad.ca/jvwr/>. Accessed: January 31, 2014.

TCWR Joint Venture. 2013b. 2013 Winter Road Updates. Available at: <http://jvtcwinterroad.ca/jvwr/>. Accessed: July 15, 2015.

TCWR Joint Venture. 2014. Tibbitt-to-Contwoyto Winter Road Joint Venture. Available at: <http://jvtcwinterroad.ca/>. Accessed: July 15, 2015.



ATTACHMENT I

REVIEWER RECOMMENDATIONS AND PROPONENT RESPONSES

March 2017

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
Wildlife Road Mitigation Plan should be changed to Caribou Road Mitigation Plan.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Chuck Hubert (MVEIRB)	Now titled Caribou Road Mitigation Plan (CRMP).	Entire document
The CRMP should be incorporated into the WEMP.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Chuck Hubert (MVEIRB)	Incorporated into the WEMP as an Appendix.	Entire document
An objective that is related to sensory disturbance should be added.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kim Poole (IEMA)	A sensory disturbance objective was added.	Section 1.2
Non-caribou mitigation should be removed and kept in the WEMP.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kim Poole (IEMA)	Non-caribou mitigation was removed from the CRMP and will be addressed in the WEMP.	Entire document
The colour green should not be used to represent Mitigation Level 1.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Anne Gunn (Technical Advisor, MVEIRB)	Operation Level Mitigation and Monitoring was changed to Blue in the CRMP Decision Tree diagram.	Figure 4-2 and Section 4.1
The plan should have a diagram that shows how all the management plans are linked together	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kevin O'Reilly (IEMA)	A diagram showing linkage between management plans was reviewed at the September 13, 2016 WEMP and CRMP workshop. DDEC is currently revising this diagram, which will be incorporated into the WEMP in a future revision. A revision for this comment was not required.	n/a
The roles and responsibilities of who will be making the decisions about each aspect of the plan should be clarified.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kim Poole (IEMA)	Roles and Responsibilities section was added to the CRMP.	Section 4.5
The signage system should reflect presence of caribou instead of the likelihood of caribou. The most effective traffic management signs are those that give immediate feedback.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kevin O'Reilly (IEMA)	The intent of signage is to make drivers more vigilant of the potential for caribou to be present and to reduce risk of caribou-vehicle interaction. A revision for this comment was not required.	n/a
A map of the road with features such as stockpile locations should be included in the next version.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Chuck Hubert (MVEIRB)	Map 4.1-1 has been updated with Project features and will continue to be updated as new information is available.	Section 4.1.1
Drivers should be educated about caribou.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kim Poole (IEMA)	Employee education is included in the mitigation for Operational Level (blue). This includes presentations to communicate the importance of mitigation for the protection of caribou and information regarding caribou behaviour and is in addition to employee mine orientation and driver training.	Section 4.1.1
There are a lot of distances threshold that need to be justified.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kim Poole (IEMA)	Included basis of distance thresholds.	Section 4.1.1
There should be a better explanation of how this mitigation relates to the WEMP.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kate Mansfield (MVEIRB)	This has been clarified in the objectives of the CRMP. The CRMP will be included as an Appendix to the WEMP.	Section 1.2
Snow berms should be maintained at 0.5 - 1 m (based on wildlife monitoring at Ekati) and should not be above 1 m in height.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kim Poole (IEMA)	Snow berms along the Misery and Jay roads will be maintained at a height less than 1.6 m where practicable. The grader used to manage snow will likely clear snow closer to a 1 m height. Text was added to clarify this.	Section 4.1.1
Mitigation levels 2 and 3 should be combined.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kim Poole (IEMA)	There is now an Operational Level and three additional levels beyond what will be completed at all times of the year.	Section 4
There should not be a distinction between the mitigation and monitoring sections. They should be combined under each of the Levels.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Kevin O'Reilly (IEMA)	The mitigation and monitoring sections have been combined and organized by level.	Section 4
The trigger numbers for caribou to trigger road closure seem very high. With the herd in its current state, the trigger should be adjusted to represent 1% of the current population.	Jay Project Wildlife Road Mitigation Plan Workshop	22-May-15	Mark d'Entremont	Trigger was changed to 0.25% of the herd but may be closed at lower levels. How this trigger will be determined was also added to the report.	Table 4-1, Section 4.4
A map with the current caribou crossing identified should be added to this plan.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Kevin O'Reilly (IEMA)	A map of the most up-to-date caribou crossing designs for the Jay Road has been added to the CRMP.	Map 4.1-1
More information regarding the traffic numbers on the Jay Road should be added to this plan.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Kim Poole (IEMA)	Traffic information was added and reference was made to Appendix C: Traffic Associated with the Jay Project.	Section 1.1
Drivers should be provided with maps showing where caribou have been sighted.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Peter Unger (LKDFN)	This was added to Level 1 (Yellow) mitigation.	Section 4.2.1

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
There is no reference to dust management in this plan and it should be included.	Jay Project Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	25-Jun-15	Anne Gunn (Technical Advisor, MVEIRB)	Reference was made to the Air Quality and Emissions Management and Monitoring Plan (AQEMMP).	Section 1.2
The CRMP states that "(given 56 round trips per day by long-haul trucks) there would be an average of 12 minutes between trucks" (pg. 1-1). This statement does not consider the other traffic (bulk explosives trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks to transport larger equipment, water trucks, emergency vehicles, and light vehicles). Therefore, the non-winter season road truck traffic should be about 160-210 passages (7-9 minute spacing if even distribution). DDEC should clearly provide information on all vehicles and vehicle spacing.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	DDEC provided traffic information including seasonal traffic, vehicle type, spacing and number of round trips in Appendix C, April 2015. A revision for this comment was not required.	n/a
The CRMP states "caribou are likely most sensitive to development during the northern migration (May) when females are pregnant and need to get to the calving grounds" (pg 2-1) Depending on how you define "most sensitive", this statement is likely not true. During migration caribou movement through an area is rapid and directional, and displacement from migration is likely less that would occur when caribou are more sedentary during the summer and fall, and when cows with calves are present during the early postcalving season. This is similar reasoning to why the zone of influence monitoring dropped the northern migration (Handley 2010). DDEC should revise this statement or provide supporting references.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	While post-calving has been identified as a period of sensitivity for caribou exposed to development disturbance, disturbance effects may have a more pronounced effect on caribou recruitment if pregnant cows cannot reach calving grounds to give birth with other females in the herd. The proposed trigger is designed for adaptive management of road mitigation and the protection of caribou. The objective of aerial surveys is to monitor indirect effects of development on caribou distribution and abundance, and the spring survey was discontinued because results were deemed not adequate to detect effects (caribou moved too quickly through the study area). A revision for this comment was not required.	n/a
This is an interesting and informative figure depicting relative distribution/density of caribou sightings from camera data. However, since the Fox road has only 2 cameras on it at widely spaced intervals, how could density be calculated along this road? This comment also refers to other roads on the map with few to no cameras. DDEC should clarify in the methods how roads with few to no camera are assigned relative caribou densities.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Methods describing that a search radius were used to generate caribou group density distributions for Mine roads was provided on CRMP page 2-3. The approach used is appropriate to evaluate likely places where caribou may interact with roads to inform where mitigation may be most effective to protect caribou.	Section 2
The CRMP states that "Once the road is constructed, the effectiveness of the caribou crossings will be monitored by the Environment Department" (pg 4-5), but provides no details on how effectiveness (better termed permeability) will be measured. DDEC should clarify in the methods effectiveness of the caribou crossings will be determined.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Approach is to assume that caribou on roads or at edge of roads intend to cross, which is reasonable. Mitigation will be applied under this assumption and whether caribou cross when mitigation is applied will be monitored (e.g., installing caribou crossings, and reducing vehicle speeds, and stopping vehicles as caribou approach road). A revision for this comment was not required. DDEC will provide additional detail on methods for determining crossing success and mitigation effectiveness in future documentation. A revision for this comment was not required.	n/a
The CRMP states that "Snow berms along the Misery and Jay roads will be maintained at a height less than 1.6 m, where practicable." (pg 4-8). However, since results indicated that caribou crossed roads when berms were 0.5 m high or less and deflected when berms were at least 1.6 m high, why just aim for the 100% deflection level at 1.6 m? DDEC should modify their snow bank criteria to encourage caribou crossings during the snow period.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Snow berms along the Misery and Jay roads will be maintained at a height less than 1.6 m where practicable. The grader used to manage snow will likely clear snow closer to a 1 m height. Text was added to clarify this.	Section 4.1.1
At the Operational level and Levels 1 and 2 there remains a large gap between collar monitoring (with no indication how frequently ENR will be able to provide collar locations to DDEC and how dated those locations will be) and road monitoring, which is effective only out to hundreds of metres, perhaps 600-800 m at most (pg 4-8). Mid-distance monitoring, admittedly technically challenging, is not adequately covered, but this uncertainty should be compensated for by application of more protective mitigation. DDEC should consider a temporal consideration to the collar data for triggering levels. For example, if collared caribou are moving towards the mine and are 35 km away but the location data is 2-3 days old, then there is an increased likelihood that the animals would be	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	A 30 km trigger is consistent with the regional study area boundary, which is larger than predicted indirect effects. A revision for this comment was not required. DDEC will consider a review seasonal movement rates to determine an appropriate distance threshold. A revision for this comment was not required.	n/a

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
<30 or <14 km from site, which would trigger a higher level of mitigation and monitoring beyond waiting for the next (dated) set of collar data.					
Monitoring (pg 4-10) will be increased from weekly to bi-weekly, but this is totally inadequate for meaningful monitoring by Environment staff when caribou collars are known to be within 30 km of the mine. This should be changed to daily at a minimum (as was proposed in the June 2015 version of the CRMP). DDEC should establish at minimum daily road monitoring by Environment staff when caribou are triggered to Level 1.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Road surveys at Level 1 were changed from bi-weekly to daily.	Table 4-1, Section 4.2.2
"Mitigations are intended to reduce sensory disturbance from roads and traffic on approaching caribou (i.e., within 14 km of the mine), and the perception that roads and vehicles are a barrier to movement." Why is the word "perception" given here? Mitigation is intended to reduce real potential impacts to caribou attempting to cross Ekati roads, not to deal with the perception of these impacts. DDEC should reword this section, for example ", and to reduce the semi- permeable barrier effect of the roads and vehicles to movement".	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	DDEC has revised the text to clarify this is in reference to the perception of roads as barriers by caribou and not perception about effects by people.	Section 4.3
This section (pg 4-10) mentions actions will be taken when "caribou nursery groups" are observed at 200-500 m but only when "caribou" are observed at 100-200 m. The reason for the differentiation between nursery groups and all caribou in this sentence is unclear. Given that drivers may be making their own decisions without Environment staff present, and all truck drivers may not be experienced at caribou classification, we suggest that the reference to nursery groups be removed. DDEC should remove the reference to nursery groups in this section.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Reference to nursery groups was removed so the trigger applies to all caribou as suggested by IEMA.	Section 4.3.1
Thirty cows (0.25% of the current approx. 12,000 cow estimate) within 200 m of a road are required to trigger Level 3 outside of the northern migration, but only 1 cow within 500 m of a road is required for northern migration. Given that caribou can cover hundreds of metres in minutes and that cow-calf pairs during post-calving are highly sensitive to disturbance, the reason for the disparity between these 2 triggers is unclear. The focus on this section appears to be on stopping distance and injury/mortality, rather than reductions in sensory disturbance. DDEC should propose enhanced mitigation when 0.25% of the cows are is within 500 m of the road outside of the northern migration.	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	While post-calving has been identified as a period of sensitivity for caribou exposed to development disturbance, disturbance effects may have a more pronounced effect on caribou recruitment if pregnant cows cannot reach calving grounds to give birth with other females in the herd. The proposed trigger is designed for adaptive management of road mitigation and the protection of caribou. The objective of aerial surveys is to monitor indirect effects of development on caribou distribution and abundance, and the spring survey was discontinued because results were deemed not adequate to detect effects (caribou moved too quickly through the study area). A revision for this comment was not required.	n/a
While letting leaders pass is an essential idea repeated many times over the years by Elders, in practice it will be difficult to ensure this occurs when the caribou are not rapidly migrating. The solution may be to ensure predictable breaks in the traffic which will reduce sensory disturbance and allow or encourage those caribou who are trying to cross the road to actually make their move. There are no details on methods to convoy vehicles to allow more breaks in traffic when short or long-term road closures are not imposed. Systematic breaks in traffic or conveying are a means to safeguard caribou and provide a predictable ore flow and rate of mill feed. When more than 10 caribou are known to be present within 500 m of the road alignments, regularly scheduled breaks in all traffic for 20 minutes every 2 hours may be effective. Similarly, when caribou are detected stopping times should be considered to provide an opportunity for caribou to cross, as suggested in the following table (from Agency response to Undertaking #9):	Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	DDEC provided traffic information including seasonal traffic, vehicle type, spacing and number of round trips in Appendix C, April 2015. A revision for this comment was not required.	n/a

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation				Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section																
<p>Table 1. Agency Proposal for caribou distance thresholds, criteria for resuming traffic speed limits and duration of the stop.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Distance of Caribou from the Road</th> <th style="width: 20%;">Calving, Post-calving and Fall (<10 adults in a nursery group)</th> <th style="width: 20%;">Calving, Post-calving and Fall (≥10 adults)</th> <th style="width: 20%;">Northern (spring) migration (any group size)</th> </tr> </thead> <tbody> <tr> <td>Less than 200 m</td> <td>Driver to remain stopped for 30 minutes, then may proceed at 20 km/hr if behaviour is unchanged and caribou are not moving towards the road</td> <td>Driver to remain stopped until caribou are greater than 500 m from the road</td> <td>Driver to remain stopped/short-term closure</td> </tr> <tr> <td>200-500 m</td> <td>Driver to remain stopped for 10 minutes, then may proceed at 20 km/hr if behaviour is unchanged</td> <td>Driver to remain stopped until caribou are greater than 500 m from the road</td> <td>Driver to remain stopped/short-term closure</td> </tr> <tr> <td>In sight and greater than 500 m</td> <td>Driver to proceed at 30 k m /hr</td> <td>Driver to proceed at 30 k m /hr</td> <td>Driver to proceed at 40 k m /hr</td> </tr> </tbody> </table>				Distance of Caribou from the Road	Calving, Post-calving and Fall (<10 adults in a nursery group)	Calving, Post-calving and Fall (≥10 adults)	Northern (spring) migration (any group size)	Less than 200 m	Driver to remain stopped for 30 minutes, then may proceed at 20 km/hr if behaviour is unchanged and caribou are not moving towards the road	Driver to remain stopped until caribou are greater than 500 m from the road	Driver to remain stopped/short-term closure	200-500 m	Driver to remain stopped for 10 minutes, then may proceed at 20 km/hr if behaviour is unchanged	Driver to remain stopped until caribou are greater than 500 m from the road	Driver to remain stopped/short-term closure	In sight and greater than 500 m	Driver to proceed at 30 k m /hr	Driver to proceed at 30 k m /hr	Driver to proceed at 40 k m /hr					
Distance of Caribou from the Road	Calving, Post-calving and Fall (<10 adults in a nursery group)	Calving, Post-calving and Fall (≥10 adults)	Northern (spring) migration (any group size)																					
Less than 200 m	Driver to remain stopped for 30 minutes, then may proceed at 20 km/hr if behaviour is unchanged and caribou are not moving towards the road	Driver to remain stopped until caribou are greater than 500 m from the road	Driver to remain stopped/short-term closure																					
200-500 m	Driver to remain stopped for 10 minutes, then may proceed at 20 km/hr if behaviour is unchanged	Driver to remain stopped until caribou are greater than 500 m from the road	Driver to remain stopped/short-term closure																					
In sight and greater than 500 m	Driver to proceed at 30 k m /hr	Driver to proceed at 30 k m /hr	Driver to proceed at 40 k m /hr																					
DDEC should provide details on convoying and breaks in traffic, and consider instituting stopping times to reduce sensory disturbance.																								
DDEC should consider implementing heightened detection monitoring of caribou along the Jay (and possibly Sable) eskers, with halts in traffic when triggered.				Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	DDEC will include monitoring along key eskers for heightened detection of caribou, which will be determined with input from community engagement. Changes to traffic patterns will follow the triggers outlined in the CRMP. A revision for this comment was not required.	n/a																
The CRMP states "If negative effects are detected (e.g., caribou-vehicle collisions, failed crossing attempts, inadequate signage)..." (pg 5-1). Firstly, inadequate signage is not a negative effect on caribou. Secondly, there is no indication in the document how the proportion of failed crossing attempts will be determined. DDEC should clarify how the proportion of failed crossing attempts will be determined.				Letter	05-Jul-16	Jaida Ohokannoak (IEMA)	Approach is to assume that caribou on roads or at edge of roads intend to cross, which is reasonable. Mitigation will be applied under this assumption and whether caribou cross when mitigation is applied will be monitored (e.g., installing caribou crossings, and reducing vehicle speeds, and stopping vehicles as caribou approach road). A revision for this comment was not required. DDEC will provide additional detail on methods for determining crossing success and mitigation effectiveness in future documentation. A revision for this comment was not required.	n/a																
Recommendations on the adequacy of the CRMP in Addressing the Requirements of Measure 6-1. Pertains to a, b, c, f, g, h, j, k, l, m, and n.				Letter	08-Jul-16	Andrea Patenaude (GNWT)	See individual responses below.																	
a) Measure 6-1 states that Dominion will "Use convoys or other methods to maximize interval between disturbances from vehicles."	Dominion has not identified how this will be completed in the CRMP.			Letter	08-Jul-16	Andrea Patenaude (GNWT)	DDEC proposed to use long-haul trucks (referred to as road trains) instead of individual haul trucks. A long-haul road train includes a single cab with three trailers in tow and a capacity of 216 tonnes. Use of a single cab produces less noise and lower emissions than a multi-truck convoy. Mitigation includes the use of road closures, which maximize the time interval between vehicles. Text was revised to clarify this.	Section 4.4.1																

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
b) Use real-time caribou collar information and other detection systems to enable early detection as trigger for management action	Letter	08-Jul-16	Andrea Patenaude (GNWT)	The decision to move between mitigation and monitoring levels is based on a number of criteria and does not only rely on collar monitoring. Incidental sightings, past behavioural observations, and road surveys will also be used to determine if a Level change should be made. DDEC will consider a movement analysis of collar caribou data to guide appropriate trigger distance.	Section 4
c) Construct caribou crossing features along a minimum 70% of the length of the Jay road	Letter	08-Jul-16	Andrea Patenaude (GNWT)	DDEC committed to having 70% of the Jay Road as caribou crossing, which was defined by the length of road between JR1+100 and JR3+560 locations. These locations were not included in the CRMP Map 4.1-1 but were referenced on page 4-5 and specified in the MVEIRB Record of Decision on Page 120. Map 4.1-1 has since been revised to show locations JR1+100 and JR3+865 and King Pond, which includes an approximate total of 2.0 km of caribou crossings.	Map 4.1-1
f) Describe minimum size of the kimberlite stockpiles t Jay Pit and Misery Pit necessary to enable extended closures of the Jay road?	Letter	08-Jul-16	Andrea Patenaude (GNWT)	DDEC has made the commitment previously that the duration of road closures to allow caribou to cross Mine roads will not depend on the size of the kimberlite stockpile. In other words, once the stockpile is depleted, roads will remain closed as long as necessary to allow caribou to cross roads. Therefore, there is no minimum size required for the kimberlite stockpile for road closures to be implemented. A revision for this comment was not required.	n/a
g) Indicate how long road management responses will be applied	Letter	08-Jul-16	Andrea Patenaude (GNWT)	The spatial triggers for different levels of mitigation define when mitigation will begin and end. Minimum times are not used because mitigation will be continued until no longer required for the protection of caribou. A revision for this comment was not required.	n/a

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
h) Method for monitoring approaching caribou at intermediate distances beyond the line of sight from road, including at night and poor visibility.	Letter	08-Jul-16	Andrea Patenaude (GNWT)	DDEC will use established technologies that will allow caribou to be monitored or detected at night including satellite telemetry and thermal imaging equipment. Thermal imaging will be used at road locations where caribou have a high chance of encounter based on monitoring results and Traditional Knowledge (Section 4.3.2). The effectiveness of all monitoring methods will be evaluated through adaptive management. A revision for this comment was not required. DDEC reviewed the results of recent and frequent communication with the Department of Environment and Natural Resources (ENR) about collared caribou approaching the Ekati study area at the September 13, 2016 WEMP and CRMP workshop. Participants acknowledged this approach can be effective but will require an agreement to ensure it takes place in the future. DDEC has requested more frequent collar notifications from ENR. A revision for this comment was not required.	Section 4.3.2
j) Use TK in designing the CRMP, Jay road, esker crossing and WRSA & monitoring or caribou responses	Letter	08-Jul-16	Andrea Patenaude (GNWT)	DDEC completed a series of community engagement activities specific to the Jay Project, including site visits to the Lac du Sauvage esker to determine where the Jay Road should cross the esker, as part of the Jay Road design process. Past community engagement by Ekati mine for other Mine roads has also facilitated design and location of caribou crossings, which will also be included in the final design of the Jay Road.	n/a
k) Describe specific monitoring and mitigation related to road during construction, operations and closure phases	Letter	08-Jul-16	Andrea Patenaude (GNWT)	As referenced in the title of the CRMP, the CRMP was specifically developed for the Jay Project, which includes all development phases (construction, operation, closure and post-closure). The CRMP will also be applied to all Ekati mine roads. A revision for this comment was not required.	n/a
l) How will habitat disturbance be minimized?	Letter	08-Jul-16	Andrea Patenaude (GNWT)	Section 4.2.1 of the WEMP describes habitat loss mitigation and monitoring for the Ekati mine, including the Jay Project. The WEMP is consistent with the GNWT's draft guidelines on development of WWHPP and WEMP. A revision for this comment was not required.	n/a
m) Response framework that links monitoring results to change in mitigation.	Letter	08-Jul-16	Andrea Patenaude (GNWT)	Approach is to assume that caribou on roads or at edge of roads intend to cross, which is reasonable. A revision for this comment was not required.	n/a

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
referencing the applicable section of the WEMP). Page 5-1 Dominion states that "If negative effects are detected (e.g. caribou-vehicle collisions, failed crossing attempts, inadequate signage (?)), the actions available to Dominion include increased monitoring, special studies to understand the effect and additional mitigation." There does not appear to be a method identified in the CRMP to detect failed crossing attempts. ENR requires that further information be given in the CRMP, or reference to the appropriate section in the WEMP on how permeability of the road will be monitored and managed.					
n) Specify contingency measures if caribou do not cross road at Jay esker.	Letter	08-Jul-16	Andrea Patenaude (GNWT)	Mitigation will be applied under this assumption and whether caribou cross when mitigation is applied will be monitored (e.g., installing caribou crossings, and reducing vehicle speeds, and stopping vehicles as caribou approach road). A revision for this comment was not required.	n/a
ENR appreciates that DDEC has included traffic level predictions and information for both haul traffic and light vehicle traffic categories for both the regular and non-ice-road season; however, it would be helpful to have the light vehicle traffic information for the non-ice road season, as well as the total traffic passes.	Letter	08-Jul-16	Andrea Patenaude (GNWT)	DDEC will provide additional detail on methods for determining crossing success and mitigation effectiveness in future documentation. A revision for this comment was not required.	n/a
ENR notes with interest the additional analysis shown in Maps 2-1 & 2-2 of the highest caribou densities among the roads and within locations along each road. ENR recommends that this information be used to enhance mitigation along Sable Road as well. For example, can caribou crossings be added to the hotspots on Sable? How come the data only goes partway up the Sable road? It is not clear if all or a subset of the caribou crossing locations along the Misery Road were chosen by TK. There are some higher density areas along Misery road with no caribou crossings in close proximity. Can caribou crossings be added?	Letter	08-Jul-16	Andrea Patenaude (GNWT)	Sable Road is currently under construction and maps of the CRMP show the Sable Road alignment. Caribou crossing locations will be added to Sable Road through community engagement. Sable is within the existing scope of WEMP monitoring. Caribou crossings may be added in the future at locations supported by monitoring results. A revision for this comment is not required.	n/a
Page 4-1, end of paragraph 3. "The mitigation and monitoring for each level will continue until the trigger is no longer met. For example, the mitigation and monitoring for Level 1 will continue until caribou have moved out of the RSA, or the trigger for a higher level has been met" This seems contradictory to the previous statement that " All mitigation from the previous lower level will be applied to the next higher level." Map 4.1- King Pond is not labelled so it is unclear where the 70% calculation starts. Page 4-5 Noting the two additional caribou crossings on the Jay North road and one along eastern part of the Road near the dyke, are those included in your calculation of total caribou crossing features along a minimum of 70% of the Jay road? How did DDEC choose the locations of the additional caribou crossing locations along that road? The ring seems to encircle work areas where it might be better to discourage caribou presence. What was the rationale for including caribou crossings here? Re: TK incorporation. When is final design to be finalized? Page 4-8, re snow berm height. Given that 1.6m was the value that was associated with high deflection rates, it would make sense to aim for something smaller. ENR recommends 1 m. Page 4-9. "Camera traps will be deployed at the esker crossing and other crossings along the Jay and Misery Road." More information about study design is requested. What do you mean by "other crossings"? It might make sense to put cameras at both the caribou crossings, and the density hotspots identified in Section 2, as well as some low density areas as controls.	Letter	08-Jul-16	Andrea Patenaude (GNWT)	Mitigation applied at lower levels is continued at higher levels. Map 4.1-1 was revised to show locations JR1+100 and JR3+560 and King Pond.	Map 4.1-1

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
<p>Page 4-12 Re: objective that the mitigations introduced in the red level are meant to avoid sensory disturbance does not seem to be supported by the trigger distances. The mitigations seem to be intended to limit sensory disturbance when caribou are close to the road, but not approaching the road. Since impacts to reproduction and energetics via avoidance of the road, which at this point does not seem to be captured by monitoring, this seems to be only a partial approach.</p> <p>Page 4-12 Re: short and long term closures. It is not clear why it is necessary to distinguish between short and long term closures. Presumably you don't know how long the closure would be in effect until the caribou have left the area. It would make more sense to describe the criteria by which a decision to reopen the road might occur. See comment in Row "g" above.</p>	Letter	08-Jul-16	Andrea Patenaude (GNWT)	<p>Mitigation identified for the Jay Road is expected to limit effects to caribou from traffic. The DAR demonstrated that avoidance of the Misery, Jay or Sable roads would not result in a significant effect to caribou energetics and fecundity.</p> <p>Roads will remain closed as long as necessary for the protection of caribou. Reference to short and long term road closure are necessary for planning by Mine managers. This was reviewed at the September 16, 2016 WEMP and CRMP workshop.</p> <p>A revision for this comment was not required.</p>	n/a
ENR recommends that DDEC include a description of how it is monitoring traffic levels in the CRMP.	Letter	08-Jul-16	Andrea Patenaude (GNWT)	DDEC uses Wenco to monitor traffic. Text describing Wenco has been included.	Section 4.1.1
The North Slave Métis Alliance agreed with the suggestions made by IEMA in their July 5, 2016 letter to Dominion Diamond.	Letter	08-Jul-16	Shin Shiga (NSMA)	See responses to IEMA recommendations.	n/a
The arrangement for collar notifications between Dominion and the GNWT needs to be formalized and referenced in the WEMP.	Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	13-Sep-16	Kim Poole (IEMA)	<p>DDEC reviewed the results of recent and frequent communication with the Department of Environment and Natural Resources (ENR) about collared caribou approaching the Ekati study area at the September 13, 2016 WEMP and CRMP workshop. Participants acknowledged this approach can be effective but will require an agreement to ensure it takes place in the future. DDEC has requested more frequent collar notifications from ENR.</p> <p>A revision for this comment is not required.</p>	n/a
There should be markers along the road so that drivers are aware of what 100 m from the road looks like.	Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	13-Sep-16	Shawn McKay	<p>DDEC will consider the use of distance markers.</p> <p>A revision for this comment is not required.</p>	n/a
Frequency of road surveys in Level 1 (Yellow) should be increased (from bi-weekly to daily).	Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	13-Sep-16	Kim Poole (IEMA)	Road surveys at Level 1 were changed from bi-weekly to daily.	Table 4-1, Section 4.2.2
The recommendations given through engagement and actions or responses should be documented in the WEMP and CRMP.	Wildlife Effects Monitoring Plan and Caribou Road Mitigation Plan Workshop	13-Sep-16	Marc Casas (IEMA)	A revision table summarizing engagement recommendations and actions or responses has been added as an Appendix to the WEMP and CRMP.	WEMP Appendix B and CRMP Attachment I.
<p>GNWT-ENR will need to see the following revisions to the WEMP (including CRMP) before it can be approved by the Minister of ENR:</p> <p>b) Indication of how long road management responses in the CRMP will be applied, either in the form of minimum wait times for drivers, or criteria for how it will be decided that mitigation is no longer required for the protection of caribou (page 4-1 of the CRMP). This information is required to satisfy Measure 6-1.</p>	Letter	4-Jan-17	Lynda Yonge (GNWT)	Table 4.1-1 provides the Operational-level triggers that drivers are required to follow. DDEC will require drivers to wait the minimum amount of time necessary until the trigger that permits them to proceed is met, regardless of how much time is required. Similarly, the duration of all other mitigation that is adaptively managed by the presence and distribution of caribou will be applied for the minimum amount of time necessary until the trigger condition that required it is no longer met as outlined in Table 4-1. For example, if drivers are stopped but may proceed after five minutes, then there is increased risk of disturbance or injury due to the vehicle for a caribou that remains within 100 m of a road. This risk is mitigated by requiring drivers to wait as long as necessary until the caribou is greater than 100 m from the road. The minimum wait time policy used for the CRMP is sufficient to satisfy the requirement of Measure 6-1.	Section 4
<p>c) The process and methods by which permeability of the road will be measured in order to determine the effectiveness of the CRMP. Sensory disturbance and barriers to movement of the Jay and Misery roads have been identified as potential impacts associated with the Jay project, and the CRMP has been developed to manage this potential impact. Dominion Diamond has stated an intention to include more information regarding monitoring the effectiveness of the CRMP using camera trapping in a future version of the WEMP; however, information on the methods that will be used to measure the effectiveness of the CRMP is required to satisfy the Wildlife Act Section 95(2) paragraph c). Please refer to Section 2.2 of GNWT's Draft WWHPP and WEMP Guidelines (Nov 2014) for guidance on the level of detail recommended for fulfilling this requirement.</p>	Letter	4-Jan-17	Lynda Yonge (GNWT)	<p>The Jay Project will become part of the Ekati mine, which has an established WEMP and camera monitoring program. Camera monitoring and analyses will be consistent with those previously reported in the Addendum to the 2013 WEMP report. Briefly, metrics presented in this report include caribou abundance, behaviour, deflection, and response to traffic.</p> <p>Section 5.6.7 of the WEMP has been revised to present methods for determining crossing success. This includes measuring success as (1 – deflection rate for each camera). Crossing locations with less than 90% crossing success will be reviewed by DDEC and the Traditional Knowledge Elders Group to determine ways crossing locations can be improved.</p> <p>No revision to the CRMP was completed but Section 5.6.7 of the WEMP has been revised</p>	WEMP Section 5.6.7
g) GNWT and DDEC should develop a formal data sharing agreement regarding the use of collar data reports for the purposes of monitoring approaching caribou. GNWT is presently	Letter	4-Jan-17	Lynda Yonge (GNWT)	DDEC will develop a data sharing agreement with the GNWT to outline the access to collar data and its use.	n/a

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
investigating the resource implications of providing daily collar reports to Dominion Diamond from July to mid-October to inform development of an MOU to support Dominion Diamond in the implementation of mitigations outlined in its CRMP and as required in Measure 6-1.				A revision for this comment is not required.	
<p>General Comments - 3. Changes from May 2016 version of the CRMP: In comparison with the May 2016 version of the CRMP, the Agency determined that DDEC made the following four changes to monitoring and mitigation for caribou:</p> <ul style="list-style-type: none"> • Road surveys were increased from bi-weekly to daily during Level 1; • Haul traffic is monitored at site using Wenco (although contrary to the response in Attachment I, this does not appear to be explained in the CRMP text); • Reference to "nursery groups" was removed (Pg. 4-10); and • Use of long-haul trucks (road trains) was proposed as an alternative to convoys and to increase spacing between trucks (as noted in MVEIRB 2016 Reasons for Decision Section 6.2.4 (pg 94). <p>While the Agency appreciates these changes, with the exception of the untested road trains we did not observe any substantive changes to further minimize the impact of the existing Ekati mine and the forthcoming Sable and Jay expansions on wildlife in general and Bathurst and Ahiak caribou in particular. The Ahiak herd is included given their recent movements into the Ekati area (GNWT-ENR unpubl. data).</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>DDEC will consider the use of convoys of road trains; however, road closures may be used instead to avoid sensory disturbance from traffic.</p> <p>DDEC has incorporated many revisions to the CRMP based on input from communities, regulators, and IEMA through engagement at three CRMP workshops since 2015. Feedback and associated revisions are reflected in Attachment I of the CRMP.</p> <p>Wenco is an on-board vehicle electronic tracking system that records vehicle location and can be used to calculate speed. Section 4.1 has been revised to include this information.</p> <p>DDEC's approach to protecting caribou is not herd specific. All caribou are treated with the same degree of mitigation and protection.</p>	Section 4.1
<p>General Comments - 5. Integration and calibration of monitoring methods: The different approaches to monitoring caribou need to be integrated to determine how they calibrate to determine most effective and efficient methods. Aerial surveys, GPS collars, cameras and truck surveys all collect information on caribou at different scales of time and space. The Agency recommends that the WEMP include a section on the calibration among these monitoring methods.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>The hierarchical approach to monitoring and mitigating effects to caribou occurs at different spatial and temporal scales (Figure 4-2; Table 4-1). It is unclear what IEMA means by calibrating these methods of mitigation and monitoring. DDEC will organize a meeting with IEMA to receive clarification about this comment.</p> <p>A revision for this comment was not completed.</p>	n/a/
<p>Section 1.1 Background: The CRMP states that "(given 56 round trips per day by long-haul trucks) there would be an average of 12 minutes between trucks" (pg 1-1). This statement does not consider the other traffic (bulk explosives trucks, crew transport vehicles, road maintenance equipment, garbage trucks, low-bed trucks to transport larger equipment, water trucks, emergency vehicles, and light vehicles). Therefore, inclusion of the non-winter season road truck traffic should result in an average of 4-5 minutes between vehicles (MVEIRB Reasons for Decision Report, pg 94). In Attachment I, DDEC states that this information was included in Appendix C, April 2015. We do not understand what this reference means.</p> <p>DDEC should clearly provide within the CRMP information on all predicted vehicle passage rates and vehicle spacing.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>Page 1-1 of the CRMP provides the requested traffic information on different types of vehicles and number of passages. This is the same information from the Developer's Assessment Report; Appendix C Traffic Associated with the Jay Project, which was submitted to the Mackenzie Valley Environmental Impact Review Board public registry in April, 2015.</p> <p>A revision for this comment was not required.</p>	n/a
<p>Section 4.1 Operational Level (Blue): The CRMP states that "Once the road is constructed, the effectiveness of the caribou crossings will be monitored by the Environment Department" (pg 4-5), but provides no details on how effectiveness will be measured. Camera data suggest that caribou are using some sections of the Misery Road where crossing structures are not in place (Map 2-2). In Attachment I, DDEC states additional details will be provided in future documentation.</p> <p>The Agency is unclear why this has been pushed into the future when the recommendation was received in early July 2016. DDEC should clarify in the methods how effectiveness of the caribou crossings will be determined.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>Section 5.6.7 of the WEMP has been revised to provide methods for determining crossing success. This includes measuring success as (1 – deflection rate for each camera). Crossing locations with less than 90% crossing success will be reviewed by DDEC, community governments, and the Traditional Knowledge Elders Group to determine ways crossing locations can be improved.</p> <p>No revision to the CRMP was completed but Section 5.6.7 of the WEMP has been revised.</p>	WEMP Section 5.6.7
<p>Section 4.1.2 Monitoring and Levels 1 and 2: At the Operational level and Levels 1 and 2 there remains a large gap between collar monitoring (with no indication how frequently ENR will be able to provide collar locations to DDEC and how dated those locations will be) and road monitoring, which is effective only out to hundreds of metres, perhaps 600-800 m at most (pg 4-8). Mid-distance monitoring, admittedly technically challenging, is not adequately covered, but this uncertainty should be compensated for by application of more protective mitigation. In their response in Attachment I, DDEC largely ignores our recommendation but states that "Dominion Diamond will consider a review [of] seasonal movement rates to determine an appropriate distance threshold", presumably in some future revision.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>DDEC will complete an analysis of collared caribou movements to help inform an appropriate trigger from mitigation and monitoring from Level 1 to Level 2 Action Levels. This analysis could not be completed in time for submission of the revised WEMP and CRMP documents. The analysis will be reported separately and available for review at a later date. The 30 km trigger associated with collared caribou in the CRMP may be revised pending the results of the collar analysis.</p> <p>During the September, 2016, WEMP and CRMP workshop, DDEC explained about the regular and near daily communication on collared caribou locations from ENR biologists to Ekati mine Environment staff that occurred during 2016. This included communication of collar locations by ENR well before the 30 km trigger identified in the CRMP. During the workshop, IEMA seemed satisfied with how this would work and would be effective for the protection of caribou. Communication from</p>	Section 4.1.2

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
DDEC should consider a temporal consideration to the collar data for triggering levels. For example, if collared caribou are moving towards the mine and are 35 km away but the location data is 2-3 days old, then there is an increased likelihood that the animals would be <30 or <14 km from site, which would trigger a higher level of mitigation and monitoring beyond waiting for the next (dated) set of collar data. The Agency requests that actual experiences on collar data exchange from ENR to DDEC be included to verify that the presence and movement of caribou can be adequately detected by the collar monitoring at distances that can inform mitigation in a timely manner.				ENR to the Ekati mine that begins before the 30 km trigger will reduce uncertainty about where caribou are and the timing of Ekati mine to adaptively manage mitigation as outlined in the CRMP.	
Section 4.4 Level 3 (Red) – number of caribou to trigger: Thirty cows (0.25% of the current approx. 12,000 cow estimate) within 200 m of a road are required to trigger Level 3 outside of the northern migration, but only 1 cow within 500 m of a road is required for northern migration. Given that caribou can cover hundreds of metres in minutes and that cow-calf pairs during post-calving are highly sensitive to disturbance, the reason for the disparity between these 2 triggers is unclear. Also, does this refer to 30 caribou on one or both sides of the road? The focus on this section appears to be on stopping distance and injury/mortality, rather than reductions in sensory disturbance. DDEC responded to our recommendation by restating their un-referenced contention that the increased risk of blocking pregnant cows from reaching the calving ground during northern migration is more of a threat than sensory disturbance during post-calving, followed by an unrelated response about aerial surveys (Attachment I). The Agency reiterates our recommendation below. DDEC should propose enhanced mitigation when 0.25% of the cows are within 500 m of the road outside of the northern migration.	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	An additional enhanced trigger for reduced speeds during the post-calving season has been included for level 2 (orange) in Section 4.4 and Table 4-1. This includes when 0.25% or more of total cows in the Bathurst herd are observed at 200 to 500 m from the Misery or Jay roads. The trigger at 200 m during the post-calving period for level 3 (red) was not altered. It should be noted that the CRMP indicates that Environment staff have the discretion to use more restrictive triggers under the following conditions: <ul style="list-style-type: none"> • if the composition of caribou groups is primarily cows with calves; • if lower numbers of caribou are within 200 m of the Misery or Jay roads; • if caribou are exhibiting signs of sensory disturbance; and, • it is anticipated that the caribou intend to cross the road. The triggers use the word "within" which applies to either side of roads.	CRMP Section 4.3
Section 4.4 Level 3 (Red) – enhanced mitigation: While letting leaders pass is an essential idea repeated many times over the years by Elders, in practice it will be difficult to ensure this occurs when the caribou are not rapidly migrating. Permeability of the road during these periods depends on the frequency and type of monitoring. The solution may be to ensure predictable breaks in the traffic which will reduce sensory disturbance and allow or encourage those caribou who are trying to cross the road to actually make their move (as noted in the MVEIRB Reasons for Decision Report pg 102). There are no details on methods to convoy vehicles to allow more predictable (to the caribou) breaks in traffic when short or long-term road closures are not imposed. Systematic breaks in traffic or convoying are a means to safeguard caribou and provide a predictable ore flow and rate of mill feed. When more than 10 caribou are known to be present within 500 m of the road alignments, regularly scheduled breaks in all traffic for 20 minutes every 2 hours may be effective. Similarly, when caribou are detected stopping times should be considered to provide an opportunity for caribou to cross, as suggested in the following table (from Agency response to Undertaking #9): DDECs response to our recommendation was "Dominion Diamond provided traffic information including seasonal traffic, vehicle type, spacing and number of round trips in Appendix C, April 2015" (Attachment I), which was entirely unhelpful. DDEC has now proposed in the revised CRMP to use long-haul trucks (road trains) instead of individual haul trucks and in place of using pilot vehicles and convoys, but provides no details on how this might be implemented (pg 4-13).	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	DDEC has communicated that instead of minimum wait times, drivers will be directed to wait as long as necessary until the triggered condition is no longer met. This approach will allow for the maximum protection of caribou and other wildlife. DDEC will report on mitigation and effectiveness in the annual WEMP report. A revision for this comment was not required	n/a

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section																
<p>Table 1. Agency proposal for caribou distance thresholds, criteria for resuming traffic speed limits and duration of the stop. Tests of these times and speeds relative to caribou behaviour is required.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Distance of Caribou from the Road</th> <th style="text-align: center;">Calving, Post-calving and Fall (<10 adults in a nursery group)</th> <th style="text-align: center;">Calving, Post-calving and Fall (≥10 adults)</th> <th style="text-align: center;">Northern (spring) migration (any group size)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Less than 200 m</td> <td>Driver to remain stopped for 30 minutes, then may proceed at 20 km/hr if behaviour is unchanged and caribou are not moving towards the road</td> <td>Driver to remain stopped until caribou are greater than 500 m from the road</td> <td>Driver to remain stopped/short-term closure</td> </tr> <tr> <td style="text-align: center;">200-500 m</td> <td>Driver to remain stopped for 10 minutes, then may proceed at 20 km/hr if behaviour is unchanged</td> <td>Driver to remain stopped until caribou are greater than 500 m from the road</td> <td>Driver to remain stopped/short-term closure</td> </tr> <tr> <td style="text-align: center;">In sight and greater than 500</td> <td>Driver to proceed at 30 km/hr</td> <td>Driver to proceed at 30 km/hr</td> <td>Driver to proceed at 40 km/hr</td> </tr> </tbody> </table>						Distance of Caribou from the Road	Calving, Post-calving and Fall (<10 adults in a nursery group)	Calving, Post-calving and Fall (≥10 adults)	Northern (spring) migration (any group size)	Less than 200 m	Driver to remain stopped for 30 minutes, then may proceed at 20 km/hr if behaviour is unchanged and caribou are not moving towards the road	Driver to remain stopped until caribou are greater than 500 m from the road	Driver to remain stopped/short-term closure	200-500 m	Driver to remain stopped for 10 minutes, then may proceed at 20 km/hr if behaviour is unchanged	Driver to remain stopped until caribou are greater than 500 m from the road	Driver to remain stopped/short-term closure	In sight and greater than 500	Driver to proceed at 30 km/hr	Driver to proceed at 30 km/hr	Driver to proceed at 40 km/hr
Distance of Caribou from the Road	Calving, Post-calving and Fall (<10 adults in a nursery group)	Calving, Post-calving and Fall (≥10 adults)	Northern (spring) migration (any group size)																		
Less than 200 m	Driver to remain stopped for 30 minutes, then may proceed at 20 km/hr if behaviour is unchanged and caribou are not moving towards the road	Driver to remain stopped until caribou are greater than 500 m from the road	Driver to remain stopped/short-term closure																		
200-500 m	Driver to remain stopped for 10 minutes, then may proceed at 20 km/hr if behaviour is unchanged	Driver to remain stopped until caribou are greater than 500 m from the road	Driver to remain stopped/short-term closure																		
In sight and greater than 500	Driver to proceed at 30 km/hr	Driver to proceed at 30 km/hr	Driver to proceed at 40 km/hr																		
<p>DDEC should provide details on convoying and breaks in traffic, including details on changes in truck type, and consider instituting stopping times to reduce sensory disturbance.</p>																					
<p>Section 4.4 Level 3 (Red) – Monitoring on the Lac du Sauvage esker: Enabling movement and migration along the Lac du Sauvage esker is of great concern to Aboriginal communities. Detection monitoring on the esker (perhaps remote real-time video feeds or motion sensors stationed 1 or more km north and south of the Jay complex near the esker crossing) could signal when caribou are approaching. Movement of traffic through the Lac du Sauvage esker and up to 300 m on each side of the esker will be halted until caribou on or adjacent to the esker are more than 500 m and moving away from the road. DDEC has stated that heightened detection along key eskers “will be determined with input from community engagement” (Attachment I), again deferring decisions until some future unknown date. The Agency repeats our recommendation.</p> <p>DDEC should consider implementing heightened detection monitoring of caribou along the Lac du Sauvage (and Sable) eskers, with halts in traffic when triggered.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>DDEC will consider current and new monitoring technology as it becomes available and proceed accordingly.</p> <p>A revision for this comment was not required.</p>	n/a																
<p>Section 5 Reporting: The CRMP states “If negative effects are detected (e.g., caribou-vehicle collisions, failed crossing attempts, inadequate signage)...” (pg 5-1). Firstly, inadequate signage is not a negative effect on caribou. Secondly, there is no indication in the document how the proportion of failed crossing attempts will be determined. In their response in Attachment I, DDEC ignores that inadequate signage is not a negative effect, and offers “additional detail on methods for determining crossing success and mitigation effectiveness in future documentation”. We repeat our recommendation.</p> <p>DDEC should clarify how the proportion of failed crossing attempts will be determined.</p>	Letter	9-Jan-17	Jaida Ohokannoak (IEMA)	<p>Section 5.6.7 of the WEMP has been revised to indicate methods for determining crossing success. This includes measuring success as (1 – deflection rate for each camera). Crossing locations with less than 90% crossing success will be reviewed by DDEC and the Traditional Knowledge Elders Group to determine ways crossing locations can be improved.</p> <p>No revision to the CRMP was completed but Section 5.6.7 of the WEMP has been revised.</p>	WEMP Section 5.6.7																
<p><u>26 Text Under Review (Section 1.1 Background):</u> Historically, Bathurst caribou have been observed annually in the area of the Ekati mine during the postcalving to fall-rut period (July until November), and the timing has varied by year and herd size. <u>Comment:</u> This sentence does not make sense. The way it is written sounds like the timing of caribou around the mine has varied by herd size, which is odd.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>Herd size is related to timing and presence because the amount of area required to support a herd is positively correlated with herd size but not the only driver. CRMP Figure 2-1 shows that as the Bathurst caribou herd size has decreased the timing of their presence in the study area has occurred later in the year, based on aerial survey data. DDEC provided a more comprehensive analysis using Bathurst collar data in the response to Information Request DAR-MVEIRB-09, which demonstrates the relationship between herd size and a number of seasonal range attributes</p> <p>A revision for this comment was not required.</p>	n/a																

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
<p><u>27 Text Under Review (Section 1.2 Objectives):</u> If successful, the suppressant would be applied to all haul roads at the Ekati mine as an off-site offset for the Jay Project. Best practices will be shared with other operators, which if successfully used would also be considered as off-site offsetting. <u>Comment:</u> See comment #4 above.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>In their Technical Report on the Jay Project, IEMA proposed that any mitigation improvements as a result of the Jay Project would represent offsetting mitigation if implemented at existing developments, including the Ekati mine.</p> <p>The basis of IEMA's argument was that if Ekati and other mine sites used mitigation that is more effective, the cumulative reduction of existing effects would offset the residual effect of the Jay Project. If more effective mitigation reduced the cumulative area affected by fugitive dust, then more wildlife habitat would be available.</p> <p>A revision for this comment was not required.</p>	n/a
<p><u>28 Text Under Review (Section 2 Caribou Presence at Ekati Mine):</u> Based on a 5 km search radius that considers cameras on multiple roads, caribou group densities ranged from 0.0 to 0.07 groups per square kilometre (km²), with the highest density occurring approximately 1.7 km from the mine site on the Sable Road. <u>Comment:</u> Can DDEC explain why results are presented as caribou groups densities. Also, how many caribou are considered to be in a group? Wouldn't a better measurement be density at an individual level? Since caribou interactions with roads is the concern, why are data reported by area (km²) and not linearly on a per km basis? Finally, it also makes sense to separate the data temporally (e.g., northward movements vs southward movements).</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>Caribou may not act independently when they are part of a group (Body et al. 2014). As a result, the group was regarded as the most appropriate statistical unit for these analyses. A group included one or more caribou. Cameras were deployed from March to November and would include interactions with roads during both the northern and southern migrations. Mitigation, such as caribou crossings, are permanent design features of roads and not applied in a season-specific manner. Additional details about camera trapping methods are presented in the 2013 Ekati Mine WEMP Addendum report.</p> <p>A revision for this comment was not required</p>	n/a
<p><u>29 Text Under Review (Section 4.1.1 Mitigation):</u> Dominion Diamond proposes to construct caribou crossings along the Jay Road... <u>Comment:</u> We recommend that this be written as: "Dominion Diamond will construct caribou crossings along the Jay Road..."</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	This text has been revised to indicate DDEC will construct caribou crossings.	Section 4.1.1
<p><u>30 Text Under Review (Section 4.1.1 Mitigation):</u> While the design of the Jay Road has not been finalized... <u>Comment:</u> Details of the Jay Road design are outlined in the Road Construction Plan, Jay Project - Ekati Mine, NT (November 2016). We recommend that this section be updated to reflect the information presented in the Road Construction Plan.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	This text has been revised to indicate the Jay Road design is provided in the Road Construction Plan.	Section 4.1.1
<p><u>31 Text Under Review (Section 4.1.1 Mitigation):</u> Haul truck traffic is monitored at site using Wenco. <u>Comment:</u> We recommend that additional information on Wenco be provided. Does this system ensure that haul trucks do not exceed posted speed limits? What other features does this system have that will provide mitigation measures?</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>Wenco is an on-board vehicle electronic tracking system that records vehicle location and can be used to calculate speed. Section 4.1 has been revised to include this information.</p> <p>Speed limits are strictly enforced for personnel and wildlife safety.</p>	Section 4.1
<p><u>32 Text Under Review (Section 4.1.1 Mitigation):</u> Together these data will be used to update the map distributed to divers and the location of alert signs along roads. <u>Comment:</u> Spelling mistake: divers vs drivers.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	The spelling of drivers has been corrected.	Section 4.1.1
<p><u>33 Text Under Review (Section 4.3.2 Monitoring):</u> The number of orange alert level... <u>Comment:</u> Orange alert level is level #2. This should be re-worded to mean the number of occasions that there was an orange alert level.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	The text was revised to indicate the number of occasions when there was an orange alert level will be reported.	Section 4.1.2

Table I-1: Caribou Road Mitigation Plan Reviewer Recommendations and Proponent Responses

CRMP Recommendation	Venue	Date	Participant and Organization that Suggested Recommendation	Revision to CRMP or Rationale if Revision Not Made	CRMP Section
<p><u>34 Text Under Review (Section 4.3.2 Monitoring):</u> In addition to radio-collar monitoring, Dominion Diamond is also exploring a number of different options for detecting and monitoring caribou before caribou would be detected by specific road surveys or drivers. This includes scans for caribou using thermal imaging technology at high probability of encounter points along roads identified from incidental caribou observations, camera trapping data, and TK</p> <p><u>Comment:</u> Will this option be implemented as oppose to being explored? Again, details on the technology, how it is used, the number of thermal imaging devices to be used, their proven effectiveness for collecting data on caribou, timing of deployment, frequency of data collection, etc. are requested.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>DDEC has implemented thermal imaging technology through trials. If trials indicate that this technology is reliable and effective than thermal imaging technology will be used during road surveys at high probability of encounter points along roads identified from incidental caribou observations, camera trapping data, and TK as indicated in Section 4.3.2. DDEC will report on whether thermal imaging technology will become a regular tool for detecting caribou and other wildlife in the annual WEMP report.</p> <p>A revision for this comment was not required.</p>	n/a
<p><u>35 Text Under Review (Section 4.4.1 Mitigation):</u> A road closure will always be initiated in any season if the criterion of 0.25% of total cows in the Bathurst herd is within 200 m of the Jay or Misery roads</p> <p><u>Comment:</u> We recommend that the actual number of cows that this 0.25% currently represents, based on the most recent survey, be included in the CRMP.</p>	Letter	13-Jan-17	Mark d'Entremont (DKFN)	<p>The results associated with monitoring and mitigation described by the CRMP will be reported in the WEMP. DDEC will include the numbers associated with this trigger, based on the estimate from ENR's more conservative photo census survey, in annual reporting of the WEMP.</p> <p>A revision for this comment was not required</p>	n/a
<p><u>Section 3:</u> Overall, this section is very vague. The lack of a meaning TK monitoring framework for caribou and the roads is extremely disappointing and needs to be remedied before the CRMP is approved.</p>	Letter	13-Jan-17	Lauren King (LKDFN)	<p>DDEC is in the process of developing a TK Framework with the Traditional Knowledge Elders Group. Once approved, this framework will be incorporated into CRMP and WEMP.</p>	Section 3
<p><u>Table 4:</u> It is unclear how the red level trigger or 0.24% of cows was chosen? What is the basis for this trigger? LKDFN requests that DDEC provide clarification or ENR confirms that this is an adequate trigger threshold.</p>	Letter	13-Jan-17	Lauren King (LKDFN)	<p>At the May 22, 2015, Jay Project Caribou Road Mitigation Plan workshop, DKFN recommended that a 1% trigger be used (included in CRMP Attachment I). DDEC chose to use 0.25% instead to reduce the number of caribou to trigger mitigation. While this is an arbitrary value, it is more conservative and protective of caribou than the 1% recommended by DKFN. By basing the trigger as a percentage of the Bathurst caribou herd, it means that the absolute number of the trigger fluctuates with the size of the herd so that the trigger is lower when the herd may be in a more sensitive state.</p>	Table 4-1, Section 4.4

% = percent; AQEMMP = Air Quality and Emissions Monitoring and Management Plan; CRMP = Caribou Road Mitigation Plan; DAR = Developer's Assessment Report; DDEC = Dominion Diamond Ekati Corporation; DKFN = Deninu K'ue First Nation; ENR = Environment and Natural Resources; GNWT = Government of the Northwest Territories; GPS = global positioning system; IEMA = Independent Environmental Monitoring Agency; km = kilometre; LKDFN = Łutselk'e Dene First Nation; m = metre; MOU = Memorandum of Understanding; MVEIRB = Mackenzie Valley Environmental Impact Review Board; n/a = not applicable; NSMA = North Slave Métis Alliance; RSA = regional study area; TK = Traditional Knowledge; WEMP = Wildlife Effects Monitoring Plan; WRSA = waste rock storage area; WWHPP = Wildlife and Wildlife Habitat Protection Plan.



APPENDIX D

SUMMARY OF CHANGES TO WILDLIFE MONITORING



Table of Contents

D1 SUMMARY OF CHANGES TO WILDLIFE MONITORING, 1997 TO 2014 1

Tables

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem
Component..... 2

D1 SUMMARY OF CHANGES TO WILDLIFE MONITORING, 1997 TO 2014

Wildlife monitoring at the Ekati Diamond Mine (Ekati mine) has changed for all wildlife valued ecosystem components (VECs) since monitoring began in 1997. Most of the changes to monitoring programs resulted from improved understanding of Mine-related effects, or as part of the adaptive management. These changes were implemented to provide more accurate, complete, and relevant information on wildlife VECs. Changes were also implemented in response to comments from communities, the Independent Environmental Monitoring Agency, Government of Northwest Territories Department of Environment and Natural Resources, Environment Canada, and other people interested in the Ekati mine. For example, when it was found that the monitoring for grizzly bear sign within the wildlife study area was not providing effective data to address objectives, a collaborative, regional hair snagging program was implemented. Table D-1 provides a summary of changes to the wildlife monitoring field programs by VEC, from 1997 to 2014. All information was gathered from the Ekati Mine Wildlife Effects Monitoring Program reports.

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem Component

Valued Component	Year Implemented	Monitoring/Mitigation Program	Changes	Objective/Reason for Change
All	1997	Change VECs	Caribou, grizzly bear, wolves, foxes, wolverines, migratory birds, breeding birds (including waterfowl), raptors, special vegetation/habitats (eskers, riparian zones, wetlands, and cliffs)	Focused on wildlife species or areas of study that were previously identified as VECs during the Environmental Impact Assessment
		Study area	Approximately 1,600 km ²	Concentrate on the potential effects of construction activities, plus ongoing exploration activities and sufficient size to allow adequate warning of caribou movements
		Waste management	Landfill monitoring	Determine the potential for the landfill site to attract wildlife which may result in problem animal situations
		Incident reporting	Reporting required	NA
	1998	Change VECs	No furbearers, small mammals, or special habitats	VECs are caribou, grizzly bear, wolf, wolverine, upland breeding birds, loons, and raptors based on Wildlife Effects Monitoring Plan workshop
	2000	Wildlife Effects Monitoring Plan implemented	Approved monitoring plan implemented	Required by the Environmental Agreement
		Traffic monitoring	Roads with 20 km/h and 40 km/h (previously only roads 40 km/h) monitored	Speed limits 20 km/h most likely to be exceeded, and therefore, highest potential for collisions with wildlife
		Deterrent	Rock berms around pits and facilities, skirting placed around buildings	Direct wildlife away from landfill and pits
	2001	Waste management	Waste sorting and monitored for misdirected waste, chain link fence around food waste storage (incinerator), Misery incinerator placed in shipping container	Minimize wildlife attractants
	2002	Waste management	Landfill redesigned; enclosed with large berm with one entrance, waste covered more frequently	Minimize wildlife attractants
			Rope and flagging tape placed over the landfarm	Bird mortalities resulted from contact with oil-contaminated water
		Incident reporting	Development of formal procedure	Provide details of incidents to government, regulatory agencies, and other stakeholders; also allows consultation with GNWT

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem Component

Valued Component	Year Implemented	Monitoring/Mitigation Program	Changes	Objective/Reason for Change
			Change to include any interesting or unusual wildlife-mine interactions	Provide additional data to help improve adaptive management
	2003	Dust suppression	Monitoring the relative use of dust-suppressant treated and untreated roads by wildlife	To confirm that chemical dust suppressants do not attract or deter wildlife animals. Study completed in 2005.
		Deterrent	Ropes with flagging tape on landfill berm	Direct wildlife away from landfill
	2004	Dust suppression	Use of motion sensor cameras and sand track plates to compare wildlife use of treated and untreated roads	To confirm that chemical dust suppressants do not attract or deter wildlife animals. One year study.
		Waste management	Colour coding waste bins and updating waste bin labelling	Improve tracking and recording of waste streams
	2005	Deterrent	Skirting placed around buildings	To reduce access to shelter and attractants
	2006	Waste management	Site departments are required to remove attractants if found, garbage covered with rock on a more frequent basis	To reduce wildlife attractants
		Incident reporting	Record caribou sightings as well as carnivores (previously only carnivores)	Provide additional information for adaptive management
		Study area	Expanded to approximately 2,800 km ²	Response to estimates of the caribou zone of influence
	2011	Deterrent	Erected chain link fence around Misery Camp	To reduce access to shelter and attractants
2014	Power line surveys	Wildlife surveys at the Misery Road power line construction sites	Monitor presence of wildlife during construction and any need for mitigation	
Caribou	1997	Behavioural studies	Monitoring of caribou behaviour in relation to disturbances such as aircraft and vehicle traffic and compared with control sites	Determine the effect of mining activity on caribou behaviour
		Deterrent	Semicircular arrangement of wooden stakes formed into crosses with lengths of yellow and silver metallic tape at Panda Pit; rope fence with red and pink flagging tape around the airstrip	Based on design from GNWT, which was derived from traditional knowledge
		Aerial surveys	Aerial surveys through the spring, summer, and fall using both irregular 'spaghetti' methods and transect lines	Determine the effect of the Ekati mine site on relative abundance and seasonal movements of caribou

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem Component

Valued Component	Year Implemented	Monitoring/Mitigation Program	Changes	Objective/Reason for Change
	1998	Deterrent	Rope fence around airstrip; increased height, and number of strands from one to two strands	Modified based on results of monitoring and traditional knowledge - the deterrent method used at the pit was not successful in deterring caribou from approaching the pit area. Caribou were observed moving freely between the crossbar structures without appearing to notice them. Some employees who worked at the pit felt that the metallic tape used actually attracted caribou rather than made them wary.
		Aerial surveys	Use of aerial survey transects only; spaghetti survey discontinued	Determine the effect of the mine site on relative abundance and seasonal movements of caribou, using a standardized approach
		Snow track surveys	Identify caribou interaction with site roads	Determine the effect of roads on caribou movement
	1999	Aerial surveys	Reduced width from 1 km to 600 m on either side of helicopter (30% coverage)	Reduced survey width to improve accuracy and detection rate
	2000	Deterrent	Electric fence with 4 strands and rope fence around airstrip	Modified based on results of monitoring and consultation with stakeholders
		Behavioural studies	Focal surveys discontinued to focus efforts on group behaviour using scan sampling	To streamline monitoring efforts
	2001	Deterrent	Increased number of strands in electric fence around airstrip from 4 to 6	Reduce possibility of caribou entering airstrip
		Road surveys	Started to recorded caribou distribution within 200 m of roads	To estimate likelihood of vehicle collisions
		Snow track surveys	Identify caribou crossing locations on site roads	Identify locations for ramps to facilitate movement across roads
	2002	Deterrent	Increased number of strands in electric fence around airstrip from 6 to 8	Reduce possibility of caribou entering airstrip
	2003	Aerial surveys	Reduce survey effort in early June and early July; survey only every second transect during period when caribou were primarily at calving grounds	Reducing survey effort when few caribou are present
		Road surveys	Identify caribou crossing locations on Misery Road	Determine locations for ramps to enhance movement across roads
		Deterrent	Use inokhoks to deflect caribou away from open pits and towards road crossings and rock berms constructed around open pits	To guide wildlife away from open pits and high traffic areas towards crossing locations

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem Component

Valued Component	Year Implemented	Monitoring/Mitigation Program	Changes	Objective/Reason for Change
	2004	Aerial surveys	Recorded distance to individuals from transect lines	Used to correct for undetected animals
		Deterrent	Used inokhoks along roads	To guide wildlife away from high traffic areas, based on recommendations from communities
		LLCF surveys	Recorded injuries	Provide additional data to help BHP Billiton manage wildlife
			Record if used as movement corridor and caribou group size, composition, and behaviour	Provide additional data to help BHP Billiton manage wildlife
	2006	Deterrent	Inokhoks placed near airstrip by Elders from Kugluktuk	To deter caribou from the hazardous areas
		Aerial surveys	Aerial study area expanded to encompass a larger study area; spacing between the transect lines was changed from 4 km to 8 km	Based on findings that suggested a larger scale investigation was needed to assess caribou distribution relative to mine development
	2007	Aerial surveys	No surveys completed during northern migration	Reducing survey effort when few caribou are present
		Deterrent	Inokhoks placed at intervals around Beartooth Pit and Fox Pit by Elders from Kugluktuk	To deter caribou from the hazardous areas
	2009	Behavioural studies	Increase survey effort farther from the 2 mine sites; completed in conjunction with the Diavik Mine; Diavik focused on greater than 14 km from mines; Ekati mine focused on less than 14 km from mines	Sharing of monitoring effort between Ekati and Diavik
		Aerial surveys	Increased study area south of the Diavik Mine	Based on recommendations from IEMA
		Deterrent	Painted the tops of fence posts around airstrip a bright colour to provide a greater contrast; initiated a comprehensive fence surveillance program and removed the remainder of the rope fence	In response to the mortalities associated with the fences
	2010	Aerial surveys	Surveys suspended	Very few caribou in the study area; re-allocation of funding
		Deterrent	Erected heavy-weight orange barrier fence around airstrip and Pigeon test pit	In response to 3 mortalities in 2009
		Behavioural studies	Focal surveys re-introduced	Focal studies provide information on activity budget
	2011	Remote cameras	50 motion sensor cameras - primarily on Misery Road	Monitor interaction of wildlife with Ekati mine infrastructure

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem Component

Valued Component	Year Implemented	Monitoring/Mitigation Program	Changes	Objective/Reason for Change
		Deterrent	Planning to extend the height of the airport fence to a height above a caribou's line of sight in order to prevent caribou from jumping over it	NA
	2012	Remote cameras	Camera monitoring expanded to 90 motion sensor cameras	To monitor wildlife activity around the Ekati mine site, including roads and other infrastructure
	2013	Remote cameras	90 motion sensor cameras deployed	Monitor interaction of wildlife with Ekati mine infrastructure
Wolverine	1997	Aerial surveys	Previously documented wolverine den sites flown over as soon as possible in spring	Wolverine dens are constructed in snow; therefore, can only be found while snow cover is still present
		Den surveys	All potential den sites that were located during aerial surveys or opportunistically during other field work were documented for later assessment on the ground	Assess recent occupancy and characteristics of den sites
	2001	Relocation program	Relocation program ineffective	Some relocated animals were later destroyed
	2003	Snow track survey	New survey method using multiple 4 km transects	Provide more reliable estimate of relative annual abundance and activity of wolverine; focus on preferred habitat (identified from discussions with communities and in consultation with GNWT)
		Incidental sightings	Formally recorded	Identify potential risks associated with human – wolverine interactions
	2004	Snow track survey	Went back to original study design	Too much effort for 50, 4 km transects
	2005	Relocation program	New relocation program initiated	NA
		Snow track survey	Survey discontinued	NA
		DNA study	Study initiated on a multi-year cycle	To monitor wolverine density, abundance, and movement on a regional scale
	2006	Deterrent	Monitoring program for skirting initiated	To see if skirting was successful in restricting wildlife access
	2008	Snow track survey	Resumed snow track surveys; used helicopter because staff not trained on snowmobiles	NA
2009	Snow track survey	Discontinued surveys	After consultation with GNWT ENR and IEMA	

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem Component

Valued Component	Year Implemented	Monitoring/Mitigation Program	Changes	Objective/Reason for Change
Birds	1997	Upland breeding bird surveys	Breeding bird monitoring in fixed plots both near the mine and in control areas	Monitor distribution, species abundance, species richness, and productivity that may be affected by increasing development of the mine
	2001	Loon surveys	New survey method (double-observer, flushing birds along shores), survey of control lakes discontinued	Maximize information gathered, based on recommendation from CWS
	2002	Loon surveys	Removed from the monitoring program	Agreement that not enough loons are naturally present in the study area to provide effective monitoring and meet objective
	2003	Upland breeding bird surveys	Standardized method introduced: North American Breeding Bird Survey	Contribution to international monitoring program
	2009	Upland breeding bird surveys	Discontinued North American Breeding Bird Survey	In 2006, IEMA suggested to do surveys every second year; surveys discontinued based on consultation with communities, IEMA, GNWT ENR, and CWS
Wolf	1997	Den surveys	Previously documented wolf den sites flown over as soon as possible in spring; active wolf den sites were revisited several times through the summer and fall	Monitor distribution of carnivore den sites that may be affected by increasing development of the Ekati mine and to obtain information on number of pups and to document pup survival
		Den surveys	All major esker systems were surveyed for additional dens	To identify new dens
	2001	Den surveys	Discontinued	The number of new wolf dens discovered along esker systems was negligible
		Incidental sightings	Formally recorded	Identify potential risks associated with human – wolf interactions
	2004	Den surveys	Full aerial survey completed by GNWT to record any wolf observations and den sites	Improve regional wolf tracking and monitor potential influence of mining operations on the distribution of wolves and their breeding; cooperation with GNWT
		Satellite collar	Increased sample of collared wolves from four dens within the Ekati study area; data collected by GNWT and shared with Ekati	Improve tracking of wolf breeding activity
	2006	Den surveys	Partial survey only	NA
	2009	Den surveys	Complete den surveys re-commenced	NA

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem Component

Valued Component	Year Implemented	Monitoring/Mitigation Program	Changes	Objective/Reason for Change
	2013	Den surveys	Partial survey only	Only intended to be a survey of collar locations to confirm active den location. Productivity was then monitored at each location
	2014	Den surveys	Complete den surveys re-commenced	Loss of collars required a more extensive survey to attempt to identify active den locations. Productivity was then monitored
Raptors	1997	Raptor surveys	Raptor nest sites surveyed	Monitor distribution, species abundance, species richness, and productivity that may be affected by increasing development of the mine
	2002	Nesting on Ekati mine infrastructure	Monitoring for raptors nesting on infrastructure and in open pits	Protection of raptors nesting on mine infrastructure
	2003	Deterrent	Unused nests in pits were removed to deter nesting activity in unsafe areas such as pits	Discourage nesting activity in hazardous areas
	2004	Nesting on Ekati mine infrastructure	Formal monitoring and reporting program	Provide information for adaptive management and to improve early nest attempt deterrence
	2006	Nesting on Ekati mine infrastructure	Monitoring initiated at Fox Fuel Farm and power poles along Long Lake Road	Protection of raptors nesting on Mine infrastructure
	2010	Raptor surveys	Patterns of occupancy and productivity relative to Mine removed from WEMP; monitoring every 5 years to contribute to the Canadian Peregrine Falcon Survey	Negligible effects observed so discontinued; contribute to international monitoring
	2012	Deterrent	Nesting activity in pit deterred by clearing nest material, using mesh netting, bear bangers, screamers, propane cannons, and call playbacks	To minimize conflicts with Misery Pit development
Fox	1997	Aerial surveys	Previously documented fox den sites flown over as soon as possible in spring	To document den occupancy and productivity
		Den surveys	Incidental den monitoring	Monitor distribution of carnivore den sites that may be affected by increasing development of the mine
	2004	Incident reporting	Fox incidents formally recorded	To provide information for adaptive management
Grizzly Bear	1997	Den surveys	Previously documented grizzly den sites flown over as soon as possible in spring	Monitor distribution of carnivore den sites that may be affected by increasing development of the Mine and contribute to regional studies
	1999	Den surveys	Surveyed several different habitats instead of only eskers using aerial survey; ground-based habitat surveys	Low number of dens found during aerial surveys of eskers; focus on seasonal preferred habitats

Table D-1 Changes to Wildlife Monitoring at Ekati Mine, 1997 to 2014 by Valued Ecosystem Component

Valued Component	Year Implemented	Monitoring/Mitigation Program	Changes	Objective/Reason for Change
	2000	Activity surveys	Ground-based surveys for grizzly bear sign focused on wetlands (June) and willow-riparian/birch-seep (August)	To document annual changes in grizzly bear activity
	2009	Activity surveys	Discontinued activity surveys	Due to safety issues and improvements to study design (DNA hair snagging suggested)
	2010	Deterrent	Increased use	Record high of 62 out of 70 recorded grizzly bear occurrences required the use of deterrents
		DNA survey	Pilot study/field trial	Replace the bear sign survey to determine if population has changed around the Mine
	2011	DNA survey	Second and more detailed field trial	Replace the bear sign survey to determine if population has changed around the Mine
	2012	DNA surveys	Initiated in collaboration with other diamond mines in region	Transition to broad-scale regional monitoring initiatives

BHP Billiton = BHP Billiton Canada Inc.; CWS = Canadian Wildlife Service; DNA = deoxyribonucleic acid; GNWT = Government of Northwest Territories; GNWT ENR = Government of Northwest Territories, Environment and Natural Resources; IEMA = Independent Environmental Monitoring Agency; LLCF = Long Lake Containment Facility; VEC = valued ecosystem component; m = metre; km = kilometre; km² = square kilometre; km/h = kilometres per hour; % = percent; NA = not available; WEMP = Wildlife Effects Monitoring Plan.



APPENDIX E

HIERARCHICAL MITIGATION APPLIED TO THE JAY PROJECT FOR CARIBOU AND WILDLIFE

Table E-1 Hierarchical Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
Project Infrastructure and Footprint <ul style="list-style-type: none"> • access roads • power lines • surface infrastructure and support facilities • open pit • waste rock storage areas • accommodations • dikes 	Direct loss and fragmentation of habitat from the Project footprint causes changes in caribou and wildlife abundance and distribution	• The Project maximizes the use of the existing infrastructure to reduce the environmental footprint to the extent practical.	Avoid	Applied at maximum level	Primary for caribou and wildlife
		• The new access roads will be as narrow as feasible, while maintaining safe construction and operation practices.	Avoid	Applied at maximum level	
		• Only one access road crosses the Lac du Sauvage esker.	Avoid	Applied at maximum level	
		• The Jay WRSA is set back 200 m from the Lac du Sauvage esker.	Avoid	Applied at maximum level	
		• Kimberlite stockpile areas have been designed in strategic locations that facilitate continued mine operations through various types of road closures.	Avoid	Applied at maximum level	Primary for caribou
		• Footprints of the WRSAs and other structures will be optimized to limit surface disturbance to the extent practical.	Avoid	Applied at maximum level	Primary for caribou
		• The Jay power line will parallel the haul road to avoid additional fragmentation and reduce the environmental footprint as much as possible.	Avoid	Applied at maximum level	Primary for caribou Secondary for wildlife
		• A pipe bench will be constructed to accommodate the pipelines, which will follow existing and proposed road alignments to the extent practical, to minimize the Project footprint.	Avoid	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Soil disturbance will be limited to only those areas required for construction and operation of the Project.	Avoid	Used as required	Primary for caribou Secondary for wildlife
		• Siting and construction of the Project will be planned to avoid environmentally sensitive areas (e.g., critical wildlife habitat, listed plants and wildlife species, and wetlands) to the extent practical. For example, Jay Road alternative 3 intersects the fewest number of grid cells with historical caribou trails.	Avoid	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Design of the Jay Project minimizes the construction of new buildings, roads, pads, or excavations, which will reduce the area directly disturbed for infrastructure.	Minimize	Applied at maximum level	Primary for caribou Secondary for wildlife
		• The existing Misery and Lynx pits will be used for dewatering and minewater management, limiting the requirement for additional areas to be altered for minewater management.	Avoid	Applied at maximum level	Primary for caribou Secondary for wildlife
		• Management practices already in place at the Ekati mine will be implemented to control erosion and sediment.	Minimize	Management practices will be reviewed and altered through Adaptive Management	Primary for caribou Secondary for wildlife
		• The existing Ekati Mine Interim Closure and Reclamation Plan identifies how and where land will be reclaimed and will be amended to include the Project.	Reclaim	Applied at maximum level	Primary for caribou Secondary for wildlife
	Physical hazards (open pit, blasting, buildings, WRSAs) may result in increased risk of injury or mortality to individual animals	• Site environmental technicians will investigate all wildlife incidents and mortalities, report to government, and recommend follow-up actions to reduce future incidents or mortalities.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Wildlife are deterred (e.g., skirting, fencing) or removed (e.g., herding, noise making devices) from areas of risk.	Avoid/Minimize	Used as required	
		• Mitigation is currently in place to minimize human-wildlife interactions, including awareness training.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		• Pit wall monitoring procedures for raptor nests implemented at the Ekati mine will include the Jay Project. Nesting will be prevented, when possible, in active mining areas by interrupting nest-building activities. Blasting operations may be modified where necessary to protect active nests with eggs/chicks.	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
• Birds showing nesting activity in areas of critical risk will be actively deterred by removing or covering inactive nests with nets.		Minimize	Used as required		
• Animals will be deterred from entering the diked area where most fly rock will occur (until pit is too deep for escape of fly rock) and animals will be removed from active blast zones, when necessary, using herding and noise making devices or other deterrents to safely remove animals.		Avoid	Used as required		
Project Infrastructure and Footprint <ul style="list-style-type: none"> • access roads • power lines • surface infrastructure and support facilities • open pit • waste rock storage areas • accommodations • dikes • exposed lakebed sediments 	Physical hazards leading to increased risk of injury or mortality to individual caribou and wildlife	• The current, effective practices and mitigations for safety of wildlife on roads, airstrip, and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, removing wildlife from or preventing their access to hazardous areas, and control of encounters by Environment staff.	Minimize	Monitoring can be intensified or reduced through Adaptive Management	Secondary
	The Misery and Jay power lines may cause increased risk of injury or mortality to birds	• The power line will incorporate perching deterrents on poles including cone-shaped pole caps and cross arm perch preventers to prevent large birds from perching and nesting on poles or on dangerous areas around phase conductors.	Minimize	Applied at maximum level	Secondary
		• Bird deterrents (e.g., spinning reflectors) will be installed on the power line in areas of concern (e.g., near waterbodies known to represent staging areas) and identified through monitoring of bird activity along the power line.	Minimize	Applied at maximum level	

Table E-1 Hierarchical Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
		<ul style="list-style-type: none"> The current, effective practices and mitigations (e.g., wildlife right-of-way, signage, low speed limits) for safety of wildlife on roads, the airstrip, and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff. 	Minimize	Used as required	Secondary
		<ul style="list-style-type: none"> Modified traffic patterns and road closures will be used as necessary to protect caribou and people. 	Avoid/Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
	Collisions between caribou or wildlife and vehicles or aircraft causes injury or mortality of animals	<ul style="list-style-type: none"> Current mitigation includes deterring and removing wildlife from the airstrip. 	Minimize	Used as required	
		<ul style="list-style-type: none"> Speed limits are in place. 	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Wildlife always have the right-of-way. 	Minimize	Applied at maximum level	
		<ul style="list-style-type: none"> Drivers have standard safety training and are provided with awareness training. 	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Appropriate signage is in place to identify areas of high wildlife use. 	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Vehicles encountering wildlife on roads are required to stop and communicate the presence of wildlife on the roads to the Environment Department and others in the area. 	Minimize	Used as required	
		<ul style="list-style-type: none"> Vehicles are restricted to designated roads and prepared work areas (recreational use of off-road vehicles is prohibited). 	Minimize	Applied at maximum level	
		<ul style="list-style-type: none"> The current, effective practices and mitigations (e.g., wildlife right-of-way, signage, low speed limits) for safety of wildlife on roads, the airstrip, and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff. There have been no incidents of caribou mortality caused by vehicle collisions at the Ekati mine. 	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
General Construction and Operation Activities <ul style="list-style-type: none"> mining of the kimberlite pipes operation of surface infrastructure and support facilities storage of industrial, domestic, hazardous, and contaminated waste vehicle traffic along the access road 	Attractants at site (food, shelter) leading to problem wildlife or disruption to predator-prey relationships, or increases in predator densities and predation on caribou	<ul style="list-style-type: none"> Apply the Waste Management Plan, Landfill Management Plan, and Incinerator Management Plan to manage waste and prevent or reduced wildlife access to attractants (e.g., food waste). 	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
		<ul style="list-style-type: none"> The WEMP is implemented at the Ekati mine and will be amended to incorporate the Jay Project; wildlife activity will be monitored at waste management areas. 	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
		<ul style="list-style-type: none"> The efficiency of the waste management program will be reviewed regularly and improved through adaptive management where practical. 	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
		<ul style="list-style-type: none"> Separate bins will be located throughout the accommodations complex, shops, and other facilities on-site for immediate sorting of domestic wastes. 	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Food wastes will be collected in specific bins before transport directly to the incinerator storage area for incineration. 	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Littering and the feeding of wildlife is prohibited. 	Avoid	Applied at maximum level	
		<ul style="list-style-type: none"> Raised, heated buildings will be skirted to prevent wildlife access to shelter. 	Avoid	Applied at maximum level	
		<ul style="list-style-type: none"> Education and reinforcement about proper waste management practices and issues surrounding wildlife habituation is provided to all workers and visitors to the site. 	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Incinerator is enclosed and camp waste will be burned regularly. 	Minimize	Applied at maximum level	
		<ul style="list-style-type: none"> Landfill sites and waste storage areas will be inspected. 	Minimize	Monitoring can be intensified or reduced through Adaptive Management	
		<ul style="list-style-type: none"> A chain-link fence is maintained around Misery Camp to prevent wildlife from entering. 	Avoid	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Wildlife are prevented (e.g., skirting, fencing) or removed (e.g., herding, noise making devices) from areas of risk. 	Avoid/Minimize	Used as required	
		General Construction and Operation Activities <ul style="list-style-type: none"> operation of surface infrastructure and support facilities vehicle traffic along the access road 	Increased traffic on the Misery Road and Jay Road, and the above-ground power line along these roads, may create barriers to carnivore and caribou movement, which may affect carnivore population connectivity, abundance, and distribution	<ul style="list-style-type: none"> Only one access road crosses the Lac du Sauvage esker. 	Minimize
<ul style="list-style-type: none"> Crossing locations will be built along roads to reduce barrier effects. The number of location of crossings will consider historical caribou trails and recommendations of communities. 	Minimize			Can be intensified or reduced through monitoring and Adaptive Management	
<ul style="list-style-type: none"> Spatially and temporally staged monitoring of Bathurst caribou herd to track migratory movements via (i) satellite radio collars, and (ii) road surveys (i.e., advanced information on approaching caribou). 	Minimize			Can be intensified or reduced through monitoring and Adaptive Management	
<ul style="list-style-type: none"> Kimberlite stockpile areas have been designed in strategic locations that facilitate continued mine operations through various types of road closures. 	Minimize			Applied at maximum level	Secondary

Table E-1 Hierarchical Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
		<ul style="list-style-type: none"> The current, effective practices and mitigations for safety of wildlife on roads, airstrip and other areas of the mine will be continued and expanded as necessary to include the Jay Project. These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff. Modified traffic patterns and road closures will be used as necessary to protect caribou and people. 	Minimize	Applied at maximum level	
			Avoid/Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
Site Water Management <ul style="list-style-type: none"> dewatering of diked area of Lac du Sauvage diversions 	Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the dewatering of diked area of Lac du Sauvage leading to change in riparian habitat and caribou and wildlife distribution	Where practical, natural drainage patterns will be unaltered to reduce the use of ditches or diversion berms.	Minimize	Applied at maximum level	No Linkage
		The Sub-Basin B Diversion Channel design will include caribou crossing locations.	Minimize	Applied at maximum level	
		Culverts will be installed along site access roads, as necessary, to maintain drainage.	Avoid	Applied at maximum level	
		The road route alignment will minimize stream crossings and limit disturbance to sensitive habitat as feasible.	Minimize	Applied at maximum level	
		The Sub-Basin B Diversion Channel will be designed to manage flows and minimize potential for erosion and bank instability.	Minimize	Applied at maximum level	
	Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels may alter water quality (e.g., suspended sediments, metals, and nutrients) and affect the quality of riparian habitat	The Sub-Basin B Diversion Channel will be designed to manage flows and minimize potential for erosion and bank instability.	Minimize	Applied at maximum level	No Linkage
		Dewatering and operational discharges will be monitored for downstream erosion and actions will be taken to prevent erosion in downstream lakes and channels	Avoid	Applied at maximum level	
		Standard erosion and sediment control measures (e.g., silt curtains, runoff management) will also be used during construction around areas to be disturbed, where appropriate.	Minimize	Applied at maximum level	
	Nets set for the fish-out of the diked area of Lac du Sauvage before dewatering may increase risk of injury or mortality to loons and other diving bird species	<ul style="list-style-type: none"> Lessons learned from previous fish-outs will be taken to reduce risk of mortalities of loons from nets based on experience at the Ekati mine and other recent northern fish-out projects. 	Minimize	Applied at maximum level	Secondary
	Injury or mortality to animals from being trapped in exposed lakebed sediments	<ul style="list-style-type: none"> By design, the dewatered portion of Lac du Sauvage will be contained within the Jay Dike, which restrict access to animals. 	Avoid	Applied at maximum level	No Linkage
Waste Rock Management	Ingestion of seepage and surface runoff from WRSAs and kimberlite stockpiles, or ingestion of water, soil, and vegetation that has been chemically altered by seepage and surface runoff may affect caribou and wildlife health	Metasediment rock mined from the Jay open pit will be encapsulated within a thermally protective cover layer of granite such that metasediment is frozen into permafrost; this method continues the approach that was successfully established at the Ekati mine for the Misery WRSA.	Minimize	Applied at maximum level	No Linkage
		Mine rock used to construct the dikes will be non-potentially acid generating (non-PAG).	Avoid	Applied at maximum level	
	Surface runoff and seepage from the WRSAs and kimberlite stockpiles may change habitat quality	<ul style="list-style-type: none"> The WRSA will include a basal layer of non-potentially acid generating (non-PAG) granite that enhances permafrost aggradation and physically separates potentially reactive materials from direct contact with the naturally low pH of natural tundra runoff. 	Avoid	Applied at maximum level	No Linkage
General Closure and Decommissioning Activities <ul style="list-style-type: none"> back-flooding of Jay Pit seepage 	Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the back-flooding of diked area of Lac du Sauvage alters riparian habitat and caribou distribution	The existing Ekati Mine Interim Closure and Reclamation Plan will be expanded to include the Jay Project.	Reclaim	Used as required	No Linkage
		Dike breaching and re-flooding of the dewatered area will be done in a controlled manner so water levels will be equalized on both sides of the dike, and back-flooding will be managed to avoid adverse effects in source waterbodies and downstream.	Avoid	Applied at maximum level	
		The Sub-Basin B Diversion Channel will be reclaimed at closure so that water flows through the natural drainage pattern to Lac du Sauvage.	Reclaim	Used as required	
		The road route alignment will minimize stream crossings and limit disturbance to sensitive habitat as feasible.	Minimize	Applied at maximum level	
		During excavation of dike breaches, silt curtains, and other sediment and turbidity mitigation will be used as appropriate.	Minimize	Applied at maximum level	
		Reclamation of shoreline and shallow areas within the diked area will include localized repair of erosion and revegetation with aquatic and riparian plants, as necessary.	Reclaim	Used as required	

Table E-1 Hierarchical Mitigation applied to the Jay Project for Caribou and Wildlife

Project Component / Activity	Effects Pathway	Mitigation	Hierarchical Classification	How Mitigation Can be Managed	Pathway Assessment
	Ingestion of seepage and surface runoff from WRSAs after closure, or ingestion of water, soil, and vegetation that has been chemically altered by long-term seepage and surface runoff may affect caribou health	<ul style="list-style-type: none"> Following established Ekati mine WRSA practices, PAG metasediment rock will be encapsulated within a thermally protective cover layer of granite to facilitate and maintain permafrost development. 	Avoid	Applied at maximum level	No Linkage
Accidents and Malfunctions	Ingestion of soil, vegetation, or water that has been altered by chemical spills (i.e., fuels, petroleum products, reagents, pipelines) on site affecting caribou and wildlife health	<ul style="list-style-type: none"> The existing Spill Contingency Plan in place for the Ekati mine and will be expanded to include the Jay Project. 	Minimize	Applied at maximum level	No Linkage
		<ul style="list-style-type: none"> Regular equipment maintenance (e.g., regular checks for leaks) will continue. 	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Drip trays and/or absorbent pads are used during servicing and refuelling. 	Avoid	Applied at maximum level	
		<ul style="list-style-type: none"> All hazardous substances are stored and handled on site in accordance with applicable regulations. 	Minimize	Applied at maximum level	
		<ul style="list-style-type: none"> Fuel is stored at a central bulk fuel farm at the Ekati main camp, and at satellite fuel farms located at Misery, Fox, and Koala North. Fuel tanks are contained within berms. 	Minimize	Applied at maximum level	
		<ul style="list-style-type: none"> The Project will follow existing standard policies in the event of a spill; spill response training is provided and updated. 	Minimize	Can be intensified or reduced through monitoring and Adaptive Management	
		<ul style="list-style-type: none"> Soil and snow affected by hydrocarbon spills will continue to be handled in accordance with the existing Hydrocarbon-Impacted Materials Management Plan, and will be remediated in the landfarm or shipped off-site. 	Reclaim	Used as required	
		<ul style="list-style-type: none"> Mine water management in the Wastewater and Processed Kimberlite Management Plan will include the pipelines used for ongoing water management of the Jay Pit. 	Minimize	Applied at maximum level	
		<ul style="list-style-type: none"> Mine water and fine processed kimberlite slurry pipelines will be monitored and inspected throughout construction, operations, and closure to identify areas requiring maintenance and prevent leaks. 	Minimize	Applied at maximum level	
<ul style="list-style-type: none"> Any leaks or spills identified along the pipelines will be addressed immediately, and clean-up, if required, will be implemented following the existing Spill Contingency Plan. 	Minimize	Applied at maximum level			

WRSA = Waste Rock Storage Area; PAG = potentially acid generating; non-PAG = non-potentially acid generating; m = metre; WEMP = Wildlife Effects Monitoring Plan.



APPENDIX F

STANDARD OPERATING PROCEDURES

Surface Mining
Blasting, Guarding and Initiating
EKA WI. 1702.06

Task Description:

Guarding for a Blast, Blast Initiation and Incomplete Initiation of an Explosive.

HSE Information / Safety Risks:

- **No personnel will be within 750 meters of the blast and no equipment should be within 500 meters of the direct line of fire of a blast.**
- **No caribou will be within 750m of the blast**
- **Premature detonation of Blast Holes**
- **Unauthorized access into Blast Area.**

Work Preparation:

Item	Task Description
1	The day before the blast is scheduled the Team leader will ensure that an announcement will be made electronically through email, and on the TV monitors throughout the mine site and Blast sign updated. The information will read where and when a blast is to take place.
2	During a blast, if there is a problem such as a misfire or incomplete detonation the Blaster will inform the Team Leader immediately.
3	During the sweep, if caribou are found inside the blast zone (750m), the Team Leader will notify the Environment Department and wait to blast until all wildlife has left the area.
4	Group JHA will be completed on the morning of blast between Team Leader and Blaster.

Work Execution Steps:

Item	Task Description
1	All drilling and explosives loading will have been completed and all equipment moved off the pattern before the tying in of any blast holes begins.
2	The perimeter of the pattern will be adequately guarded while the surface detonating cord and delays are being prepared.
3	The Production Team Leader and the Blaster will conduct a formal written JHA on where to locate equipment for the blast and for designating the "safe area" for firing the shot.

Surface Mining
 Blasting, Guarding and Initiating
EKA WI. 1702.06

Work Execution Steps:

Item	Task Description
4	Two hours prior to the scheduled blasting time, the Team Leader will announce The Two Hour Warning via radio on the appropriate operations channel. The Team Leader will also advise the Ekati Airport of The Two Hour Warning.
5	Before every blast, the “Blaster” will check the blasting machine
6	Prior to the ten-minute warning, all guards will: <ul style="list-style-type: none"> • Take up their assigned guard positions and ensure that no one enters the danger zone; • Notify the TL when they have completed their sweep and they in their guarding position • Hold their position until the Team Leader authorizes them to leave
7	Ten minutes prior to the scheduled blast time, the Team Leader will announce a ten-minute warning via radio channel. The Team Leader will also advise the Airport Technician of the ten-minute warning.
8	At the end of two minutes, the Team Leader will: <ul style="list-style-type: none"> • Sound the blast-warning siren for 3 short loud soundings • Notify the Blaster that he may take his shot.
9	Airport Technician will announce the two-minute warning on the aircraft radio channels.
10	Two minutes prior to the scheduled blast time, there will be a one minute blast siren and the Team Leader will announce a two-minute blast warning and radio silence.
11	At the end of two minutes, the Team Leader will: <ul style="list-style-type: none"> • Sound the blast-warning siren for 3 short loud soundings • Notify the Blaster that he may take his shot.
12	The Blaster will <ul style="list-style-type: none"> • The blaster will notify the Team Leader once the shot has fired and that he is entering the pit to inspect the blast. • The blaster will inspect the blast for complete detonation. • The blaster will inspect the blast area for blast gases to be safely dissipated. • The blaster will notify the Team Leader that the blast area is “All Clear” after determining the blast has completely detonated and the blast gases have safely dissipated.

Surface Mining
Blasting, Guarding and Initiating
EKA WI. 1702.06

Work Execution Steps:

Item	Task Description
13	Team Leader will contact the Airport Technician on the operations radio channel and announce the "ALL CLEAR".
14	The Team Leader will sound the blast siren for twenty seconds signalling the "All Clear".

EKA WI. 2115.18 Active Pit Monitoring

Version:	1.1
Replaces:	N/A
Creation Date:	2014-03-26
Scheduled Review Date:	2016-12-15
Review Date:	2017-01-09
Document Team Members:	Wildlife Advisor, Environment Operations Superintendent
Document Owner:	Wildlife Advisor
Document Approver:	Environment Superintendent: Operations
Related Documents:	N/A
Key Contacts:	Wildlife Advisor
Change Requests:	Wildlife Advisor
Brief Description:	Monitoring Active Pits to Identify and Prevent Nesting Activity

Table of contents:

Contents

EKA WI. 2115.18 Misery Pit Monitoring 1

 Table of contents: 2

 Task Description 3

 HSE Information / Safety Risks: 3

 Additional Resources Required: 3

 Work Preparation:..... 4

 Task Description: 4

 General Remarks: 5

Task Description

Monitor active pits and the surrounding location to document, track and deter all bird activity including nesting activity, resting or hunting. Every effort must be made to identify and deter any bird investigating active pits and the adjacent area (including a 50m buffer outside the ring road). This region should be made as unwelcoming to ravens and all raptor species as possible. This is done through the use of propane cannons, audio devices, physical barriers to high quality habitats and pyrotechnic devices (flares) and non-pyrotechnic devices (bangers & screamers).

HSE Information / Safety Risks:

- Working in Active Mining Area
 - Working at Heights (on or near the Pit high wall)
 - Wildlife encounters
 - Heavy equipment and other traffic
 - Blasting
 - Operating Deterrent Devices
 - Aggressive birds
 - Poor Communication
 - Fatigue management
 - Hearing or Vision damage
-

Additional Resources Required:

- Binoculars
- Spotting scope and tripod
- SLR camera with zoom lens
- GPS
- Data-sheets, clipboard and pencil
- Birds identification field guide
- PPE
- Audio playback sound system
- Propane cannon (remote controlled and timed)
- Bear bangers and screamers
- Laser gun
- Infrared camera
- Ropes with flagging tape
- Snow fencing
- Radio

Work Preparation:

1. Know the cliff nesting bird species that you may encounter during a survey. Historically, birds found nesting on the pit walls are the: rough-legged hawk (RLHA; *Buteo lagopus*), peregrine falcon (PEFA; *Falco peregrinus tundrius*), gyrfalcon (GYRF; *Falco rusticolus*), and common raven (CORA; *Corvus corax*). Other species that may be encountered are the: golden eagle (GOEA; *Aquila chrysaetos*), bald eagle (BAEA; *Haliaeetus leucocephalus*), merlin (MERL; *Falco columbarius*) and American kestrel (AMKE; *Falco sparverius*).
2. Be aware of the conservation status of the cliff nesting bird species.
 - The Peregrine falcon is listed as “Special Concern” by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) and SARA (Species at Risk Act – Government of Canada). The ENR (Environment and Natural Resources – GNWT) general status rank is “Sensitive”.
 - The gyrfalcon, rough-legged hawk, common raven, merlin, bald and golden eagles, and the American kestrel are “Not at Risk” according to COSEWIC.

Task Description:

1. Be familiar with the locations of the pits and other mining infrastructure that may host nesting birds and the standard protocol on how to access these locations.
2. Travel to the survey locations specified. Stop at vantage points around the top of the pits. Get out of vehicle making sure to keep at least 2 m from the edge of the pit and never cross over berms.
3. Look for bird activity, which encompasses looking for nests on the pit walls. The best way to locate a nest is to look for white wash on the walls or follow a flying bird to their nesting location. Use of a spotting scope is recommended when a potential nest is found. For identification purposes, use a scope when a bird is spotted perched on a pit wall.
4. Record all potential nests and any suspected nesting activity. Potential nesting activity includes a bird that stays around the pit or a nest site. Nesting activity includes defensive behavior, carrying food or sticks, prospecting for sites, and a nesting bird on a nest or a ledge.
5. Take photos of potential nesting sites and any birds. Ensure that there are landmarks in the photograph so that cross-shifts can easily locate where the photograph was taken.
6. Upon return to the office upload nest location photos onto Sharepoint after marking the nest location on the photograph using ‘Paint’ or other similar program. Enter data into the Pit Wall Survey spread sheet on SharePoint and QA/QC entered data. File data sheet in WEMP binder.
7. Report all nesting activity to Environment Advisor – Wildlife and the Environment Team Leader.

General Remarks:

- In natural habitats peregrine falcons, gyrfalcons, rough-legged hawks, and common ravens nest on ledges and precipitous cliff faces. Open pit walls at EKATI resemble steep sided ledges and offer attractive nesting locations. Cliff nesting birds have also been observed nesting on ledge-like structures such as cairns, towers, mining dredges and bridges. Attracting cliff nesting birds to pit walls is a concern, particularly for birds that have conservation status.

EKA WI.2115.22 Caribou Aerial Survey

Version:	2.0
Replaces:	WI.2116.03 – Version 1.0
Creation Date:	Transferred from BHP Template on 2016-10-10
Scheduled Review Date:	15Apr2018
Review Date:	11DEC2016
Document Team Members:	Team Leader – Environment Projects Environment Advisor - Wildlife
Document Owner:	Team Leader – Environment Projects
Document Approver:	Superintendent – Environment
Related Documents:	
Key Contacts:	Team Leader – Environment Operations Environment Advisor - Wildlife
Change Requests:	Team Leader – Environment
Brief Description:	Completion of Aerial Surveys

Table of contents

Contents

EKA WI.2115.22 Caribou Aerial Survey 1

 Table of contents 2

 Task Description 3

 HSE Information / Safety Risks: 3

 Additional Information Required: 3

 Vegetation/Habitat Classifications for the Lac de Gras Area 5

 Work Preparation:..... 7

 Work Execution Steps: 8

 Ekati aerial caribou survey transects: GPS introduction and instructions 11

 References 12

Task Description

Counting caribou on aerial surveys in the Ekati study area address the following objectives:

- Estimate the number of caribou that annually pass through the Ekati study area to examine long-term temporal trends in caribou use of the area
- Document annual timing of caribou use of the study area to compare temporal trends in migration patterns through the study area

The location data of caribou groups collected on aerial surveys are used to test the following:

- Whether the probability of observing caribou is dependent on the distance from mine development
- Whether the probability of observing caribou groups with calves during the post-calving migration is related to the distance from mine development.
- **Hypotheses:** Caribou distribution and seasonal occupation on the claim block does not change over time with mine development. When the habitat variable is controlled, behaviour of caribou does not change with distance to the mine; the relative density of caribou, the dominant group behaviour and the relative abundance of nursery groups does not change with distance to the mine.

HSE Information / Safety Risks:

Helicopter Safety: All helicopter safety procedures protocols must be completed and adhered to at all times.

Wildlife Concern: Aerial surveys provide a technique to estimate the numbers of caribou in the Ekati study area. Bathurst herd caribou may pass near or through the Ekati study area during their northern migration to the calving grounds near Bathurst Inlet, and during their subsequent post-calving migration to the wintering grounds below the tree line.

Mines and associated developments (e.g., roads) may negatively affect caribou movement patterns and behaviour. The potential influence of mining activities is of particular concern for caribou with calves (nursery groups) that pass through the Ekati study area during the southern migration from northern calving grounds to their wintering areas below the tree line. Nursery groups may be more sensitive to the potential effects of mine and other industrial developments in comparison with adult only groups.

Additional Information Required:

Past Study Scope & Rationale For Change: Systematic surveys of 10 transects within a 1,600 km² study area have been conducted on a weekly basis from approximately late April to early October since fall 1997, with some changes to study design over time. For example, survey width was reduced from unbounded (1 km on each side of the helicopter) to 600 m on each side in fall 2000. Also, starting in 2003 every second transect was flown between early June and early July to reduce survey effort when caribou were generally absent from the study area. There were some changes made in the length of the most eastern transects after 2002. In 2004, the perpendicular distance of the transect line to each caribou group was recorded in order to facilitate distance sampling statistics. In 2005 a new habitat code, Snow Covered Tundra (ST), was collected to account for the difficulty in distinguishing between Heath Tundra (HT) and Sedge Wetlands (SW) when they are covered with snow during the spring surveys.

Current Study Scope: Scope changed in 2006. Following the recommendations of an independent review of the caribou survey program, the study area was expanded to include the area within a 30 km buffer around the mine site. The spacing between the transect lines was changed from 4 km to 8 km. The resulting study area actually covered by the survey (*i.e.*,

within transect boundaries) is only slightly larger (960 km² vs. 810 km²). The timing of surveys has also been modified so that surveys begin in early July and end in mid-October. In 2008, surveys include participants from Diavik mine.

Survey Frequency: Once per week between July and October

Annual Timing Window: The first survey should occur when caribou return from the calving grounds to the study area (early to mid-July). The last survey should occur during the end of the post-migration period (late September to early October), or until no significant numbers of animals are being seen. Initial and final dates for the post-southern migration surveys will remain flexible, in order to determine whether there are enough caribou in the vicinity to launch an aerial survey program, an adaptive reconnaissance survey design that covers a representative sample of the survey area should be employed.

Following the draft monitoring guidelines provided by the Department of Environment and Natural Resources (ENR 2015), an initial survey of 100- 200 km of transect can be flown at a wider reconnaissance level transect spacing. There are a variety of tablet computers with GPS interfaces that would allow on-the-fly calculation of the proportion of cells with caribou. Therefore this calculation could be done without having to land the plane. The proportion of cells could then be used to estimate the number of cells expected to have caribou. If this proportion was equal to or higher than the target proportion in survey planning, then the full survey would be flown. For example, for the Ekati/Diavik sampling design it took 7,865 kilometers of transect flying across 6 surveys to achieve the sample size requirement outlined in Section 6 (140 occupied cells). As a starting point in evaluation of survey design, the number of surveys required to meet this sample size could be estimated as 7,865 divided by the kilometers flown per survey. This general statistic could then be used to determine the feasibility of estimating ZOI of similar magnitude to Ekati and Diavik. From this exercise, a target proportion of cells with caribou needed per survey could be set and used as a basis for this adaptive survey design.

Brief Overview of Study design: A helicopter will be used for all aerial surveys. A navigator will record all data, and use a 1:250,000 scale map as a backup to follow transects. The pilot should follow transect tracks on the helicopter's GPS unit. Two rear-seat observers will be present. The navigator will record observation number, GPS location (using the GPS waypoint), distance and direction (generally east or west) of the caribou from the recorded waypoint, group size, direction if moving, general sex and age composition of group, and habitat type (note that GPS location, group size and composition are the critical attributes to record). Surveys will be conducted at approximately 110-130 m (350-400 feet) above ground level (agl) at a speed of 145-160 kilometres per hour, but the survey should be done at the slowest speed and lowest height needed to see caribou. Caribou observed beyond the transect width or outside of the study area during turns at the end of transects can be noted on the sheet but no GPS location/waypoint should be taken. The perpendicular distance of caribou groups to the transect line will be recorded using the aid of markers on the helicopter windows.

Incidental observations of other species will be made, but there will be no excessive deviation from the flight path in connection with such observations. Incidental observations of grizzly bears (and bear dens), wolves (and wolf dens), wolverines, foxes, black bears, raptors or raptor nest sites, muskoxen and moose will be recorded on aerial survey data sheets. These observations will later be recorded in the "incidental observation" worksheet in the caribou aerial survey database.

Survey Time Requirement: 1 to 2 days per survey (preferable to complete in one day); three crew members- two observers (back seat of helicopter), and one navigator. Navigator will record all waypoints and data, and observers will give navigator information regarding animal sightings.

The total flying hours estimated is **6.65 hours**. The following conditions were used:

1. Average speed of 150 km/hour for helicopter flight
2. Line #1 is on far West of Study area, Line 12 is on far East.
3. Travel route is as follows, including distance and hours:

Mine site to start Line #1 (south end), Survey of Lines #1, #2, #3, #4, and #5, and back to Mine site for fuel up and lunch = **368.3 Km = 2.46 hours**

Mine site to start Line #6 (north end), Survey of Lines #6, #7, #8 and back to Diavik/Misery for fuel up = **331.09 Km = 2.21 hours**

Diavik/Misery to start Line #9 (south end), Survey of Lines #9, #10, #11, #12, and back to Diavik/Misery for fuel up, and back to mine site = **298.41 Km = 1.98 hours**

The location where the survey begins will be varied to maximize variation in the time-of-day of observations as practical. This includes starting at either end of Lines #1 or #12 and continuing the survey in sequential order (e.g., #12, #11, #10, #9) to maintain survey efficiency.

Female caribou

- Have a dark vulva fur patch below tail and anus.
- Cow antlers are relatively small and spindly, 9-20 inches long or 23-50 cm tall.
- Females weigh between 150 and 300 pounds
- Females have hard antlers all winter and drop them pre-calving (June) and then start re-growing antlers in June
- Females are about 4 ft to shoulder or 1.2 m
- 2 and 3 year old caribou will be hard to distinguish from adult females without seeing vulva patch

Male caribou

- No dark vulva patch. White fur from tail to underside.
- Males have a vivid white belly (less visible on females) and a pronounced white-ish to gray mane
- Bull antlers are branched, semi-palmated, and have flattened brow tines. They are 20-62 inches or 52-158 cm tall
- Males weight 275 to 600 pounds
- Males drop antlers late October and re-grow them starting in June. They don't have antlers during the spring Northern migration
- Males are about 4.5 ft and taller (140-150 cm)

Calves

- Reddish brown, very small (shoulder height is less than 70 cm around 2 ft). Always with cow in first year

Yearling

- Smaller than full grown cows but larger than calves (shoulder height is approximately 1 meter or 3 ft.)
- Solid light gray colour; adults have more distinct colour with white and beige colouring being more distinct
- Yearling's antlers would be stubs (not over 6 inches)

Vegetation/Habitat Classifications for the Lac de Gras Area

(Adapted from Matthews, Epp and Smith, 2001.)

Heath Tundra (HT)

Heath Tundra (<30% Rock) This class of heath tundra is a closed mat plant community that grows on moderate to well drained soils, covering most of the upland areas. Plants generally belong to the heath family, the Ericaceae. The vegetation layer forms a mat of low shrubs dominated by dwarf birch and Labrador tea. Other common plant species include lingonberry, blueberry, crowberry, alpine milkvetch (*Astragalus alpinus*) and alpine azalea (*Loiseleuria procumbens*). Herb and moss layers are not well developed. Typical lichens include several species of Cetraria, Cladina, Cladonia and others. As a closed mat community, vegetation covers at least 70 percent of the surface of the ground.

Heath/Bedrock (30-80% Bedrock) Where heath tundra thins and bedrock outcrops are exposed, vegetation is discontinuous and is best described as open mat heath tundra. This class of heath tundra is easily distinguished on satellite imagery due to the presence of bedrock, reduced vegetative cover and therefore a distinctive highly reflective spectral signature. Plant species are typical heath species described above.

Heath/Boulders (30-80% Boulders) Heath with boulder fields is also an open mat plant community class. It can be distinguished from the heath/bedrock class because of the spectral differences between bedrock and boulders. Textural differences between boulders and bedrock are significant from an image analysis perspective. Differences in lichen composition and cover on boulders and bedrock outcrops also contribute to the identification of these separate classes.

**Boulder Association
(BO) (>80% Boulders)**

Heath with boulder fields is also an open mat plant community class. It can be distinguished from the heath/bedrock class because of the spectral differences between bedrock and boulders. Textural differences between boulders and bedrock are significant from an image analysis perspective. Differences in lichen composition and cover on boulders and bedrock outcrops also contribute to the identification of these separate classes.

Large areas of boulder fields exist in the central part of the study area and are found to a lesser extent in other areas. Boulder associations include boulder outcrops, boulder streams and drainages, as well as glacial erratics. This land cover type supports very little plant growth. Boulders, however, support a variety of rock lichens. Crustose lichens which are common include *Umbilicaria* spp. (rock tripe), *Xanthoria elegans* (orange rock lichen), *Rizocarpon geographicum* (green map lichen), *Parmeliopsis ambigua* (green starburst lichen), and others.

**Bedrock Association
(BE) (>80% Bedrock)**

Exposed bedrock supports very little vegetative cover. These areas are generally wind swept and moisture free. Early colonisers such as crustose lichens are common, but vegetative coverage is highly variable and favours protected areas, crevices and depressions where growth can be initiated. Cover types having discontinuous vegetation, such as described above, may be confused with other cover types because substrate such as bedrock or boulders dominates the reflectance of the vegetation that is present.

Esker Complex (EC)

Eskers provide significant topographic relief to a gently rolling tundra landscape. These linear structures of sand and gravel, formed by glacial rivers, can run for hundreds of kilometres and reach 30 m in height. Eskers support a number of plant communities and are important habitat for wildlife. They are used as travel corridors by caribou, grizzly bears, wolves and other wildlife. The ice-free substrate of sand and gravel provides excellent den sites where digging is relatively easy. Eskers, being a complex of plant communities, can be difficult to classify using computer classifiers. Esker tops are wind- swept and, therefore, accumulate very little snow during the winter.

Sedge Wetland (SW)

Sedge Wetland Wetland complexes are typically wet sedge meadows and other sedge associations of non-tussock plant species. Sedge species such as *Carex aquatilis* and *C. bigelowii*, and cotton grass (*Eriophorum angustifolium*) are the dominant vegetation types. Plant species occupy wet, low lying sites where standing water is present throughout much of the growing season. The substrate is usually organic or silty soils.

Tussock/Hummock (Sedge Association) Plants belonging to the sedge family (*Cyperaceae*) are also dominant in this vegetation unit. Tussock cotton grasses such as *Eriophorum vaginatum* and *E. russeolum* are common. These sites are drier and less frequently flooded than sedge wetlands. Tussocks produce hummocks or mounds of 0.4 to 1 m in diameter. Hummocks are typically composed of old tussocks invaded by bog rosemary (*Andromeda polifolia*), cloudberry (*Rubus chamaemorus*),

Labrador tea (*Ledum decumbens*), blueberry (*Vaccinium* spp.), and cranberry (*Vaccinium vitis-idaea*). Sphagnum moss typically occupies the troughs between hummocks. Dwarf birch (*Betula* spp.) and willow (*Salix* spp.) tend to become established on the older hummocks (Diavik Diamond Mines Inc. 1998). Sedge wetlands and Tussock/Hummock vegetation provide important foraging areas for barren-ground caribou

Riparian Shrub (RS)	<p><i>Riparian Tall Shrub</i> This riparian association follows active stream courses, usually with a cobble or boulder substrate. Riparian tall shrub appears as linear plant associations of birch, willow and alder. Tall shrubs such as diamond-leaved willow (<i>Salix planifolia</i>) and green alder (<i>Alnus crispa</i>) can reach heights up to 4 m. Black spruce may also be associated with this community, particularly in some southern parts of the study area. Understory plant species include dwarf raspberry, dwarf marsh violet, cloudberry, grasses, sedges, club mosses and common horsetail. This vegetation unit is one of the most productive in the area.</p> <p><i>Birch Seep</i> This vegetation unit occurs in areas of active water seepage through boulder fields and boulder streams. Birch (<i>Betula</i> spp.) is the dominant vegetation, which commonly reaches a height of 1 m. Diamond-leaved willow is also present in smaller amounts. Blue joint (<i>Calamagrostis canadensis</i>) and water sedge (<i>Carex aquatilis</i>) are common plant species occurring in the understory along with crowberry (<i>Empitrum nigrum</i>), Labrador tea (<i>Ledum decumbens</i>), and mosses.</p>
Spruce Forest (SF)	<p>The treeline lies in an area of transition between the tundra and boreal forest to the south. Boreal forest species become more common with the presence of dwarf white spruce (<i>Picea glauca</i>) and black spruce (<i>Picea mariana</i>). The northern limit of black spruce generally falls short of white spruce in this part of the Northwest Territories (Porsild and Cody 1980). Both species grow in lowland, sheltered areas such as river valleys, where soil moisture is abundant. The forest in this region is typically clumped with outliers in this predominantly tundra landscape. In some areas, spruce-lichen woodland exists in more favourable habitats.</p>
Disturbed Site (DS)	<p>A habitat that has been altered by human development. This includes roads, pits airstrips and other portions of the mine footprint</p>
Ice (IC)	<p>Frozen lakes</p>
Lake (LA)	<p>Lake</p>
Snow covered Tundra (ST) (NEW IN 2005)	<p>This vegetation unit only includes Heath Tundra (HT) and Sedge Wetlands (SW) that may be indistinguishable when covered in snow. This code should not be necessary for other habitat types, such as Boulder (BO) and Bedrock (BE) Associations.</p>

Work Preparation:

Tools	<p>Equipment: (note: keep this equipment [not including the GPS] together and ready in the aerial survey clipboard)</p> <p>Helicopter</p> <p>Electricians tape for marking 600m survey boundary on window.</p> <p>Wildlife Tech GPS with Correct Transect Route Uploaded</p>
--------------	--

Helicopter GPS with Correct Transect Routes Uploaded. Make sure this is loaded the day before. Contact Pilot in advance

Spare Batteries for GPS

Maps 1:250,000

Charts of Route

Observer Information Packs (Instructions on marking windows, Sample Datasheet, Habitat Classification Laminated Cards, Sex and Age Classification Cards)

Activity & Group Composition Descriptor Code (on datasheet)

Caribou Aerial Survey Data Sheet

Caribou Aerial Survey SOP

Aerial Survey Clipboard

Pencils

Eraser

Pencil Sharpener

PPE

Radio

Field Safety Kit

Appropriate clothing (winter parkas in winter and coats in summer)

Resources: WEMP Training session, habitat classification information, ENR satellite collar data (see Team Leader – Environment Projects or Environment Advisor - Wildlife).

Requirements

Necessary Technician Skills: Skills attained during the training session that will be necessary for the caribou surveys are: a search image for caribou, ability to identify females, males and calves and direction of movement; attribute perpendicular distances of sightings from the transect line; ability to identify habitat types; ability to use a GPS to follow a route and to record waypoints.

Work Execution Steps:

1. Download the caribou aerial survey transects onto the wildlife technician GPS and helicopter GPS. UTM coordinates for the 12 transects (new as of 2006) are below. See map of Caribou Aerial Transects.

TRANSECT ID and Direction	LENGTH (m) from North to South	ET_X (Easting)	ET_Y (Northing)
1 North	578.49	481824.59833	7178389.02175
1 South	578.49	481824.68109	7177810.53071
2 North	47682.96	489821.71903	7198517.00482
2 South	47682.96	489828.54017	7150834.04520

3 North	62672.76	497820.66703	7205871.49551
3 South	62672.76	497829.63249	7143198.73475
4 North	70930.23	505820.01261	7210447.08540
4 South	70930.23	505830.15924	7139516.85824
5 North	74021.88	513819.74686	7212305.55157
5 South	74021.88	513830.33571	7138283.67417
6 North	79287.20	521819.79537	7211966.95737
6 South	79287.20	521831.13750	7132679.75939
7 North	80300.57	529820.16913	7209354.53573
7 South	80300.57	529831.65624	7129053.96466
8 North	76497.16	537820.87921	7204391.17648
8 South	76497.16	537831.82223	7127894.01366
9 North	68268.71	545821.91173	7197174.24574
9 South	68268.71	545831.67764	7128905.53744
10 North	55719.18	553823.21125	7188090.48296
10 South	55719.18	553831.18192	7132371.29873
11 North	42971.41	561824.06115	7182149.84058
11 South	42971.41	561830.20825	7139178.43466
12 North	9448.04	569826.36089	7166074.13888
12 South	9448.04	569827.71242	7156626.10218

- Technicians will review caribou survey procedures, including habitat characterization, group composition identification (see definitions), GPS operation, etc. Ensure that all equipment is in working order and have spare batteries for the GPS. Book the helicopter with the helicopter logistics personnel. Make sure the pilot has the correct route on the GPS the day before the survey.
- Tape the observer windows on the helicopter so that the observers know what area is within 600 m (2000 ft). To measure out a 600 m transect on each side of the helicopter go to Old Camp Road at Ekati. The three orange traffic cones are 600 m apart. Have the helicopter fly over the centre marker at the correct altitude and put tape on the window where you see the other marker. Only record caribou that are in the space below the tape. That is your 600m transect. Make sure the helicopter is at the altitude to be flown for the whole survey. This can be as low as needed to see caribou. It should be 400 ft or less.
- In a helicopter, fly the designated caribou survey route;

The helicopter has traditionally flown between 100-180 meters (300-600 ft) above ground level, at speeds of 145-160 km/hr (90-100 mph). **BUT SLOWER AND LOWER IS BETTER.** The navigator will work with the pilot to ensure that the route is being followed and a constant altitude is being kept. Circle back if needed, but try to limit this activity to minimise potential stress to the animals.

The same consecutive transects will be followed using a GPS programmed with the caribou survey route, and a 1:250,000 claim block map as backup.

Record which survey you are doing (Expanded 2006 Survey), Date, Start Time, End Time, Duration, Migration Period, and Crew information (name of pilot, navigator and left and right observer), Snow cover. If the flight is aborted, give a reason for the abort and record which transects were completed and which were not.

See GPS cheat sheet at end of this SOP to see how to record waypoints. Each observer will verbally notify the navigator when animals have been sighted and the distance between the animals and the helicopter. All animals within 600 m of each side of the helicopter will be recorded. Animals outside of the survey width, such as during turns at the end of each transect, will not be recorded.

The Navigator should tell the observers when they are and are not “on transect” so they can take a break from searching for caribou.

The navigator will record a waypoint when the observers notify him/her of observed animals. The following information will be relayed by the observer to the navigator:

- Perpendicular Distance from the transect line to sighting
- Direction to sighting
- Species sighted
- Number of individuals in group
- Group composition (Males M, Females F, Calves C, Yearlings Y) ** See cheat sheet at end of this document to ID caribou age and sex
- Calves present (Yes or No)
- Direction that group is traveling; (N NE E SE S SW W NW)
- Habitat in which the animal was observed provided there is no snow cover (Ice IC, Bedrock BE, Boulders BO, Esker Complex EC, Heath Tundra HT, Riparian Shrub RS, Sedge Wetland SW, Spruce Forest SF, Snow Covered Tundra (ST) If you are unsure of the habitat type indicate this as a comment **see habitat definitions above
- NOTE: You do not need to write down UTM coordinates on data sheet unless GPS is malfunctioning. UTM coordinates will be transferred from the GPS to avoid transcription error
- Add comments at the bottom of the datasheet or on reverse side

Data Management After The Survey Is Complete:

Download GPS directly after flight. UTM coordinates for **waypoints** and **tracks** will be downloaded and saved as Mapsource files in the GPS download file in the Caribou Aerial Transect Survey Folder in the Studies Folder of the current WEMP folder. Title the folder with the number and date of the aerial survey (e.g., Caribou Aerial Survey #1 2009MAY02)

Data from the paper datasheet will be entered into the Excel database called “Caribou Aerial Survey Data” no more than 24 hours after the survey. This Excel file is in Documentum in the active WEMP year folder. There are two worksheets in this database that need to be filled out. One is a general survey summary (database part I) and the other is the caribou sighting data (Database part II).

Copy and paste the caribou sighting UTM coordinates from the Mapsource file into “database part II” worksheet of the “Aerial Caribou Transect Survey Data and Forms”. Do not re-type the UTM coordinates to avoid transcription error.

Make sure you transfer all the carnivore sightings to a Carnivore Sighting Form. **Do not** include sightings for other wildlife in the caribou aerial transect survey worksheet. Record other wildlife sightings to the “Non-Carnivore Wildlife Sightings” worksheet to the right of the “Caribou Sightings” worksheet.

QA/QC will be conducted on the entered data and corrections entered into the database.

GPS CHEAT SHEET

Ekati aerial caribou survey transects: GPS introduction and instructions

Day Before Survey

GPS preparation: Set-up parameters on the GPS should be pre-set, including correct Datum (NAD83) and projection (UTM). Ensure **waypoints** and **tracks** are cleared prior to the survey, and that data from the previous survey has been downloaded. The track log should be set to record “Wrap When Full”, by “Distance” method, at 500 m intervals (the “Time” option at 12-15 second intervals will also supply a full day’s track log). More frequent recording of the track log will overflow the allowed track locations.

Upload transect layout to GPS: Upload the aerial survey route from Documentum.

Make sure that the GPS is turned on, and connected to the data cable from the computer. With the route displayed in MapSource, select Transfer/Send to Device to upload the waypoints and route to your GPS.

Make sure the pilots’ GPS also has the correct survey route and a printed paper map of the route:

During Survey

Select Correct Route: Prior to the flight, make sure that the correct route is selected on your GPS unit and the pilots’ unit. This could save costly helicopter time in the field, and will ensure that transect lines are accurately followed. This is conducted by going into the Main Menu, selecting “Routes”, and highlighting the route you are interested in (e.g., 2 North to 2 South). Push toggle button to “Enter” the route of choice, which will show the individual waypoints. Hit “Menu” to select “Reverse Route” if you need to reverse the direction of the route selected. Then get back out to the Routes menu (Hit “Quit” twice), highlight the desired route, hit “Menu” and “Start Navigation” to begin navigation of the route. These routes can be quickly selected in turn during the survey, and reversed if needed.

Help the Pilot Stay on Transect at the Correct Speed & Height: The Map page of the GPS should be used during the flight. When on transect push the “Zoom in” button to 200-300 m scale for tracking the flight path. You can “Zoom Out” to better see the larger picture during flight planning and on transect ends. The 500 m scale is useful for checking whether caribou observations are >600 m from the transect centre-line. The Map page will also show aircraft speed. The navigator should continually check aircraft speed and flight path on the GPS, and aircraft elevation, and adjust accordingly to make sure pilot helicopter height is kept constant and the speed is slow enough to see caribou. The helicopter height should be whatever was agreed on at the beginning of the survey (usually 400ft) when the transect width marker was taped on the windows. Go as low and slow as is needed to see caribou.

Record Waypoints for Caribou (and large carnivores): Press the toggle button on the GPS to record a waypoint. Record the waypoint number on the datasheet. You can record the UTM coordinates for that waypoint by hand on the datasheet as a back-up, but only do this if there are few observations and you have lots of time. Press “OK” after you

have recorded the waypoint information on the datasheet. UTM coordinates for waypoints will be transferred from the downloaded GPS data to avoid transcription errors. MAKE SURE YOU INDICATE ON THE DATASHEET WHEN WAYPOINTS ARE OTHER SPECIES BESIDES CARIBOU. These waypoints need to be entered in the separate worksheet in the caribou aerial survey database.

After the Survey

Download the **waypoints** and **tracks** from the GPS using MapSource (connect GPS to computer using the data cable, and select File/Open From/Serial GPS). See SOP for instructions on where to save data and how to transfer UTM coordinates from Mapsource files to the Excel database.

References

ENR (Department of Environment and Natural Resources). 2015. Draft guidance for monitoring the zone of influence (ZOI) of anthropogenic disturbance on barren-ground caribou. Prepared by the Department of Environment and Natural Resources, Government of the Northwest Territories for the Caribou Zone of Influence Technical Task Group, Yellowknife, NWT.

EKA WI.2116.03 Dangerous Wildlife Response

Version:	2.0
Replaces:	WI.2116.03 – Version 1.0
Creation Date:	Transferred from BHP Template on 2016-10-10
Scheduled Review Date:	11DEC2017
Review Date:	11DEC2016
Document Team Members:	Team Leader – Environment Operations Environment Advisor - Wildlife
Document Owner:	Team Leader – Environment Operations
Document Approver:	Superintendent – Environment
Related Documents:	
Key Contacts:	Team Leader – Environment Operations Environment Advisor - Wildlife
Change Requests:	Team Leader – Environment
Brief Description:	Detailed description of appropriate response to dangerous wildlife.

Table of contents

Contents

EKA WI.2116.03 Dangerous Wildlife Response 1

 Table of contents 2

 Task Description 3

 HSE Information / Safety Risks: 3

 Additional Resources Required: 3

 Work Preparation:..... 3

 Work Execution Steps: 4

 During Dangerous Wildlife Response 4

 After Returning from Field..... 5

Task Description

Response to dangerous wildlife under one of two conditions:

1. Where the person responding is both directing the response as well as the approved firearms handler or
2. Where the person responding is directing the response (main wildlife contact for the Environment Department), but is utilizing an approved firearms handler from the Environment or other department e.g. in the case of an Acting Team Leader for the Team Leader.

HSE Information / Safety Risks:

The Environment Department has the responsibility to respond to incidents where an animal poses a threat to employee safety or where there is a requirement to humanely euthanize an animal. Those persons are tasked with coordinating a response involving dangerous wildlife, the use of wildlife advisories, applying road closures and the use or direction of the use of wildlife deterrent and lethal rounds.

Wildlife Deterrent is classified as *hard deterrent* such as rubber bullets / beanbags fired from a shotgun; and *soft deterrent* such as bear bangers fired from a launcher or scare cartridges fired from the shotgun.

Lethal Rounds consists of *lethal ammunition* such as slug, shot or high powered rifle shells fired from a firearm.

Currently at Ekati, a person who is deemed an “approved weapons handler” is someone that has the following legal documents and training completed:

- Holds a valid Possession and Acquisition Licence (PAL) issued by the federal government which is retained on file by the Environment Department
- The person’s name is on the Ekati Business Firearms Licence
- Completed a predator defense training course
- Reviewed all related Work Instructions
- Preferably, anyone who is deemed an approved weapons handler should have previous weapons experience outside of the predator defense training noted above.

Additional Resources Required:

- Ekati site map with grid overlay.
- Knowledge of site radio channels.

Work Preparation:

1. You must have knowledge of site contacts for Security and Safety i.e. channel 7 and #2201 as well as on site staff from the Safety Department. Also, during weekends, know who the weekend duty manager is.
2. You must have the ability to send (or to coordinate the sending of) site wide emails with specific information on wildlife advisories. The Ekati Diamond Mine Site Map with grid overlay is an effective means of communicating location-based information. Environment staff has authority during a dangerous wildlife response to place site wide announcements via email. If the individual does not have the ability (due to their location), they can relay the information to Security Control via radio channel 7 or 2201, who then can issue the site wide email. Similarly, Environment staff may coordinate through Security, the announcement of road closures or wildlife advisories over all radio channels.
3. Wildlife Deterrent/ Lethal Rounds:
 - In order to use a firearm at Ekati you must be an Approved Ekati Weapons Handler. If you are not an approved Ekati Weapons Handler, then it should be confirmed there are individuals on site who are and are able to assist in a response. You should confirm that the individuals are able to access the weapons. Note: only persons with a PAL are permitted to transport firearms at site.
 - Only an approved weapons handler has the authority to respond to a wildlife callout with a firearm with respect to use of wildlife deterrent and /or lethal rounds,
 - You must be authorized by the Environment Department in order to possess and use a bear banger kit or bear spray at the Ekati Diamond Mine
4. You must be familiar with the Ekati Problem Wildlife and Firearms Handling flow chart in attached Appendix.
5. Natural Resources. Review the Wildlife Mortality Response and Carcass Disposal flow chart in attached Appendix. If unsure, discuss with Wildlife Advisor prior to assuming responsibility for responding to wildlife callouts.
6. You must possess a valid site license and adhere to all the regulations applicable to driving at Ekati.
7. Utilize available signage to restrict traffic from areas as required.
8. In the case of an alternate Team Leader (ATL) it is the responsibility of the Environment Team Leader to notify Security of an alternate contact during their absence as well as ensuring either the ATL or another person capable of a response with a firearm (approved weapons handler) is available during that period.

Work Execution Steps:

1. Have the Ekati site grid map available on your persons at all times so it can be reference and/or emailed (or forwarded to security) as a wildlife advisory indicating the location of an animal.
2. If you are the approved weapons handler review steps in accessing the shotgun and rifle. If you are not a weapons handler, confirm who is and that they are able to access the weapons.

During Dangerous Wildlife Response

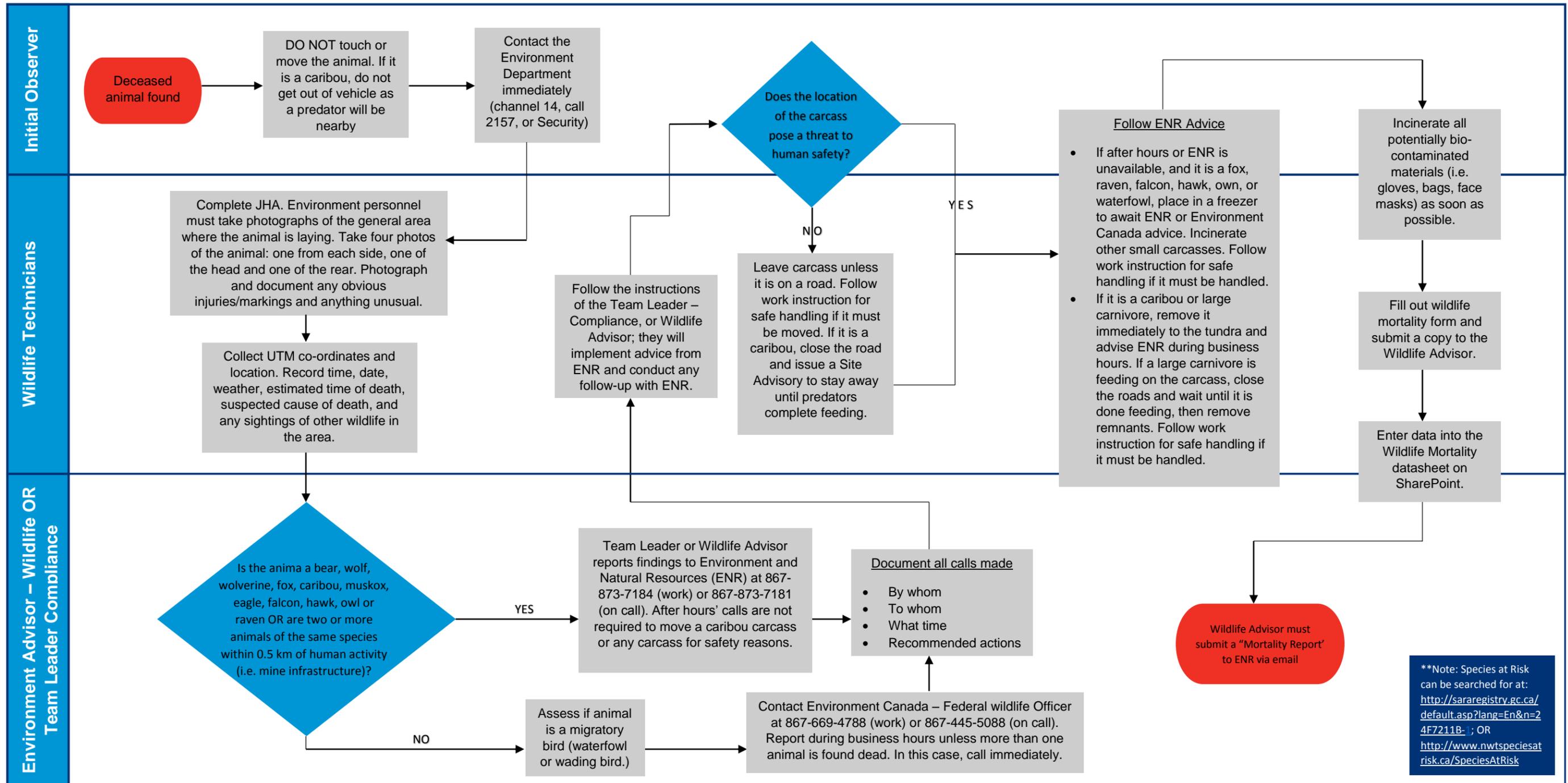
3. Immediately contact Security and notify them of the event. Security can relay the event to the weekend duty manager.
4. Decide whether road closure signs are required and if so, action the placement of signs immediately. Notify Security of any road closures. Security will broadcast the close over the radio channel.
5. Depending on the animal, location, and the nature of the event, you may need to initiate a wildlife advisory to the mine through email; however, send out a Wildlife Advisory for all bear sightings close to camp or other infrastructure where employees may be working.
6. Contact Environment and Natural Resources (ENR) if the animal poses a threat to safety.

After Dangerous Wildlife Response

7. Notify ENR directly or through the Wildlife Advisor if hard deterrent was used or if dangerous wildlife remains in the area.
8. Ensure all deterrent tools (bangers and firearms) are returned to the appropriate location and restocked if necessary.
9. Decide on the need to leave road closures in place or lift them. If lifted, remove all road closure signs and notify Security.
10. Send out an updated wildlife advisory indicating the status of the event. If the event occurs on a weekend, contact the weekend duty manager to inform them of the event.

Appendix

Wildlife Mortality Response and Carcass Removal



****Note: Species at Risk can be searched for at:**
<http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-> ; OR
<http://www.nwtspeciesatrisk.ca/SpeciesAtRisk>

Firearms Response to Problem Wildlife

