
# CONCEPTUAL WILDLIFE EFFECTS MONITORING PLAN FOR THE JAY PROJECT

## DRAFT

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## Version History

| Version | DATE | COMMENTS |
|---|---|---|
| 1 | February 2000 | Original document. |
| 2 | May 2015 | Updated to include changes in monitoring, and the Jay Project. |
| 3 | July 2015 | Updated to include changes following WEMP workshop on June 25, 2015. |

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# Abbreviations

| Abbreviation | Definition |
|---|---|
| AEMP | Aquatic Effects Monitoring Program |
| AQEMMP | Air Quality and Emissions Monitoring and Management Plan |
| AQMMP | Air Quality Management and Monitoring Program |
| ARD | acid rock drainage |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| CWS | Canadian Wildlife Service |
| DAR | Developer's Assessment Report |
| DDMI | Diavik Diamond Mines (2012) Inc. |
| DNA | deoxyribonucleic acid |
| Dominion Diamond | Dominion Diamond Ekati Corporation |
| EAR | Environmental Assessment Review |
| EIR | Environmental Impact Review |
| EIS | Environmental Impact Statement |
| ENR | Environment and Natural Resources, Government of the Northwest Territories |
| GNWT | Government of the Northwest Territories |
| ICRP | Interim Closure and Reclamation Plan |
| IEMA | Independent Environmental Monitoring Agency |
| KIA | Kitikmeot Inuit Association |
| LLCF | Long Lake Containment Facility |
| LKDFN | Łutselk'e Dene First Nation |
| NABBS | North American Breeding Bird Survey |
| NSMA | North Slave Métis Alliance |
| NWT | Northwest Territories |
| PM | particulate matter |
| TK | Traditional Knowledge |
| VEC | Valued Ecosystem Component |
| WEMP | Wildlife Effects Monitoring Plan |
| WPKMP | Wastewater and Processed Kimberlite Management Plan |
| WROMP | Waste Rock and Ore Storage Management Plan |
| WRSA | waste rock storage area |
| YKDFN | Yellowknives Dene First Nation |

# Units of Measure

| Unit | Definition |
|---|---|
| % | percent |
| °C | degrees Celsius |
| cm | centimetre |
| km | kilometre |
| km/h | kilometres per hour |
| $km^2$ | square kilometre |
| m | metre |
| mm | millimetre |

# 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 (Dominion Diamond), is located in the Slave Geological Province of the Northwest Territories (NWT), approximately 300 kilometres (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 two pits under development (Pigeon and Lynx). The current Mine plan predicts a further four years of production to 2019. Dominion Diamond 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 10 years. In this document, the Ekati Mine refers to the main Ekati complex including the Long Lake Containment Facility, 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 in the Ekati Mine, 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 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 Dominion Diamond 2014 and Appendix A) and the associated changes to the WEMP proposed as a result. This document is also intended to engage interested parties and solicit feedback for these changes through the Jay environmental assessment process. Subsequent versions may be issued for the Jay land use permit process. Further, the WEMP is a living document that is 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, and Beartooth) and the Lynx Project and 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, Dominion Diamond 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).

Dominion Diamond 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 engagement.

Because the Ekati Mine has been operating for 17 years, multiple environmental monitoring programs and management plans are in place, and have been effectively improved over time through adaptive management (Figure 1.3-1). 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 monitoring and lichen tissue monitoring are conducted on a widespread basis. Results are publicly reported annually and an interpretive report is prepared every third year.

A conceptual Air Quality and Emissions Monitoring and Management Plan (AQEMMP) has been completed for the Jay Project, which includes an adaptive management approach. This draft plan will allow for comment and feedback through the Environmental Assessment review process and 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 initial conceptual design has been developed for feedback and comment.

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'èezhìı 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 B.

## 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, Aboriginal people, and 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 following completion of the EA review process. 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 Dominion Diamond 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 and measures 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 issuance process following completion of the EAR 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 issuance process following completion of the Jay Project EA review process.

## Waste Management Plan

The Water Licence requires a Waste Management Plan to describe how Dominion Diamond 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 Dominion Diamond staff, contractors and stakeholders 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 issuance process following completion of the EA review 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. An interpretive report is required every three years, as part of the Waste Rock and Ore Storage Management Plan (WROMP).

A conceptual amendment to the WROMP for the Jay Project is currently being completed. However, the Waste Rock and WRSA Seepage Monitoring Program will be expanded to incorporate the Jay Project as part of the Water Licence issuance process following completion of the EA review process.

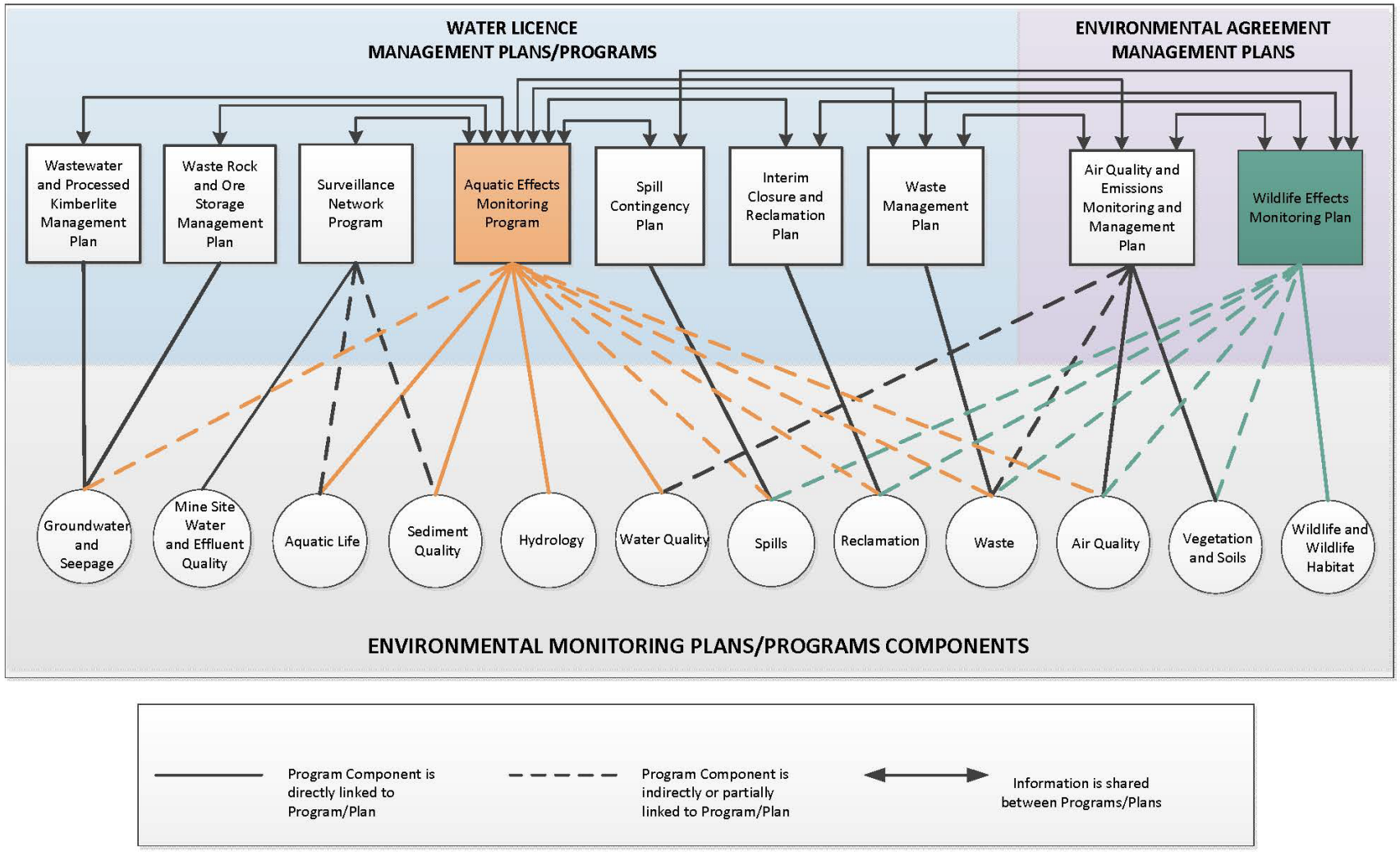
## Wastewater and Processed Kimberlite Management Plan

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 Long Lake Containment Facility (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 and Acid/Alkaline Rock Drainage (ARD) monitoring component.

A conceptual amendment to the WPKMP to for the Jay Project is currently being completed. However, the WPKMP will be expanded to incorporate the Jay Project as part of the Water Licence issuance process following completion of the EA review process.

**Figure 1.3-1 Ekati Environmental Management Framework**



## 1.4 Objectives

The WEMP describes how Dominion Diamond intends to contribute to regional monitoring initiatives and monitor the  effects to wildlife that may occur beyond the Mine footprint. The WEMP will also outline the policies, practices, designs, and mitigation 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 pathways identified in the Jay Project DAR (Dominion Diamond 2014; Appendix A) and include the following:

- 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 accuracy of key predictions made in the Jay Project environmental assessment regarding the effects of the Mine directly on wildlife and wildlife habitat and adjust environmental management practices accordingly;
- incorporate Traditional Knowledge (TK) and provide opportunities for the involvement and active participation by communities in the implementation of the WEMP; and,
- design studies and data collection techniques that are consistent with, and will contribute to, understanding and managing regional 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 | | Objective(s) |
|---|---|---|
| Direct Wildlife Habitat Loss | | • determine the amount of direct habitat loss due to Ekati Mine activities. |
| Waste Management | Landfill Monitoring | • determine whether the Ekati and Misery landfills contain potential wildlife attractants or evidence of wildlife visitation and habituation. |
| | Waste Bin Monitoring | • 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<br><br>Incidents<br><br>Vehicle and Aircraft Interactions | • document and mitigate potential effects of Mine activities on wildlife; and,<br>• reduce risks to both wildlife and people.<br>• determine if any wildlife are killed or injured as a result of vehicle and aircraft interactions.<br>• determine the effectiveness of mitigation for minimizing the risks of wildlife injury and mortality from vehicles and aircraft. |
| Caribou | Incidental Observations<br><br>Road Surveys | • identify the composition of caribou groups moving through the study area;<br>• document the annual timing of caribou movement through the study area to compare temporal trends in migration patterns; and,<br>• track any trends in the number of caribou moving through the study area among years. |
| | Collared Caribou Monitoring | • 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 | • determine if caribou distribution changes relative to the Mine. |
| | Behaviour: Activity Budgets and Response to Stressors | • determine if caribou behaviour changes with distance from the Mine. |
| | Camera Trapping | • determine the level of caribou (and other wildlife) activity and traffic along Misery and Jay roads;<br>• determine caribou (and other wildlife) responses to the road (i.e., crossing and deflecting);<br>• determine caribou (and other wildlife) activity at other Mine infrastructure and along historic movement corridors; and,<br>• have holders of TK document indicators of caribou condition and health during site visits. |
| | Long Lake Containment Facility | • determine if any caribou injuries can be attributed to the LLCF;<br>• determine the frequency that caribou use the LLCF; and,<br>• determine the group size, group composition, and dominant group behaviours of caribou observed within the LLCF. |
| Grizzly Bear | Incidental Observations | • avoid and minimize bear-human interactions;<br>• determine the level of grizzly bear activity within the Ekati study area; and,<br>• document and determine the cause of direct Mine-related mortality of grizzly bears. |
| | Hair Snagging Study | • provide estimates of grizzly bear abundance and distribution in the study area over time. |

**Table 1.4-1 Specific Wildlife Monitoring Program Objectives**

| Monitoring Program | | Objective(s) |
|---|---|---|
| Wolf | Incidental Observations | • minimize wolf-human interactions and identify the presence and composition of incidental wolf den and wolf pack observations in the study area; and,<br>• document and determine the cause of direct Mine-related mortality of wolves. |
| | Den Occupancy and Productivity | • determine the presence, distribution, and productivity of active wolf dens throughout the study area. |
| Wolverine | Incidental Observations | • avoid and minimize wolverine-human interactions;<br>• determine the level of wolverine activity within the Ekati study area; and,<br>• document and determine the cause of direct Mine-related mortality of wolverines. |
| | Hair Snagging Study | • provide estimates of wolverine abundance and distribution in the study area over time. |
| Raptors | Pit Wall Nest Monitoring and Incidental Observations | • determine if pit walls or other infrastructure are utilized as nesting sites for raptors;<br>• determine nest success in areas of development and document effectiveness of deterrent efforts that may be employed; and,<br>• document and determine the cause of direct Mine-related mortalities of raptors. |
| | Regional Falcon Surveys | • determine site occupancy and productivity of historic peregrine falcon nest sites in the study area to contribute to the Canadian Peregrine Falcon Survey, which monitors recover of species and long-term population trends. |
| Fox | Incidental Observations | • avoid and minimize fox-human interactions;<br>• document the level of fox activity in the Ekati study area; and,<br>• document abnormal behaviour in foxes to identify possible cases of rabies. |
| Upland Breeding Birds | Incidental Observations | • document the presence of breeding birds at the Ekati Mine; and,<br>• document sightings of uncommon birds or species of conservation concern in the area. |
| | North American Breeding Bird Surveys | • contribute data to a continental bird monitoring program, coordinated in Canada by the CWS. |
| Rare or Uncommon Species | Incidental Observations | • document trends in the detection of rare or uncommon species in the study area. |

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

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 Dominion Diamond 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 Dominion Diamond's obligations to a range of authorities. This includes various Acts and regulations relevant to wildlife in the NWT (Table 1.5-1). Table 1.5-1 also indicates where these requirements are met within the document. 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 this document that pertain to each of these guidelines 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 |
|---|---|---|---|
| *Environmental Agreement* | • measure compliance with regulatory requirements<br>• determine the environmental effects of the Mine<br>• test impact predictions<br>• measure the performance of operations and effectiveness of impact mitigation | Entire Document | Dominion Diamond, Government of Canada, GNWT |
| *Migratory Birds Convention Act*, Migratory Bird Regulations | 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 |
| *NWT Wildlife Act* | A wildlife management and monitoring plan must include:<br>(a) a description of potential disturbance to big game and other prescribed wildlife, potential harm to wildlife and potential impacts on habitat;<br>(b) a description of measures to be implemented for the mitigation of potential impacts;<br>(c) the process for monitoring impacts and assessing whether mitigative measures are effective; and,<br>(d) other prescribed requirements. | Entire Document | GNWT |
| *Species at Risk Act* and *Species at Risk (NWT) Act* | Dominion Diamond 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<br>GNWT |
| | Draft guidelines for the preparation of wildlife monitoring documents, dated May 2013: *Wildlife and Wildlife Habitat Protection Plan (WWHPP)* | Section 4.1.1 - Non-Vehicle Wildlife Incidents and Mortalities<br>Section 4.1.2 – Airstrip Deterrents<br>Section 4.1.3 – Vehicle-Wildlife Collisions<br>Section 4.1.4 – Waste Management<br>Section 4.1.5 – Open Pits<br>Section 4.1.6 – Dust<br>Section 4.1.7 – Health Effects from Contaminants<br>Section 4.2.1 – Direct Habitat Alteration and Loss<br>Section 4.2.3 – Barrier Effects from Roads<br>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<br>Section 4.3.3 – Management of Attractants<br>Section 4.3.4 – Deterring Wildlife<br>Section 4.4 – Education<br>Section 5.1 – Direct Wildlife Habitat Loss<br>Section 5.2 – Waste Management<br>Section 5.3 – Wildlife Mortalities<br>Section 5.4 - Wildlife Incidents<br>Section 5.5 - Wildlife-Vehicle and Aircraft Interactions<br>Section 5.6.2 – Incidental Caribou Observations<br>Section 5.6.3 – Caribou Road Surveys<br>Section 5.6.4 – Collard Caribou Monitoring<br>Section 5.6.6 – Caribou Behaviour: Activity Budgets and Response to Stressors<br>Section 5.6.7 – Camera Trapping<br>Section 5.6.8 - Long Lake Containment Facility Monitoring<br>Section 5.7.1 – Incidental Observations<br>Section 5.8.1 – Incidental Observations<br>Section 5.9.1 – Incidental Observations<br>Section 5.10.1 – Pitt Wall Nest Monitoring and Incidental Observations<br>Section 5.11.1 Incidental Observations<br>Section 5.12.1 – Incidental Observations<br>Section 5.13 – Rare or New Species | |
| | Draft guidelines for the preparation of wildlife monitoring documents, dated May 2013: *Wildlife Effects Monitoring Program (WEMP)* | Section 4.1.6 – Dust<br>Section 5.6.1 – Barren-ground Caribou Management Strategy<br>Section 5.6.5 – Caribou Zone of Influence Monitoring<br>Section 5.7.2 – Hair Snagging Study (Grizzly Bear)<br>Section 5.8.2 – Wolf Den Occupancy and Productivity<br>Section 5.9.2 Hair Snagging Study (Wolverine)<br>Section 5.10.2 – Regional Falcon Surveys<br>Section 5.12.2 – North American Breeding Bird Survey | |

GNWT = Government of Northwest Territories; CWS = Canadian Wildlife Service; WEMP = Wildlife Effects Monitoring Plan.

# 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 square kilometres ($km^2$) surrounding the Ekati Mine, which expanded to an area of 2,800 $km^2$ by 2006. In 2006, the caribou aerial survey study area was expanded to 6,300 $km^2$, referred to as the Ekati study area, which included a 30 km buffer around the Mine site (Map 2.1-1).

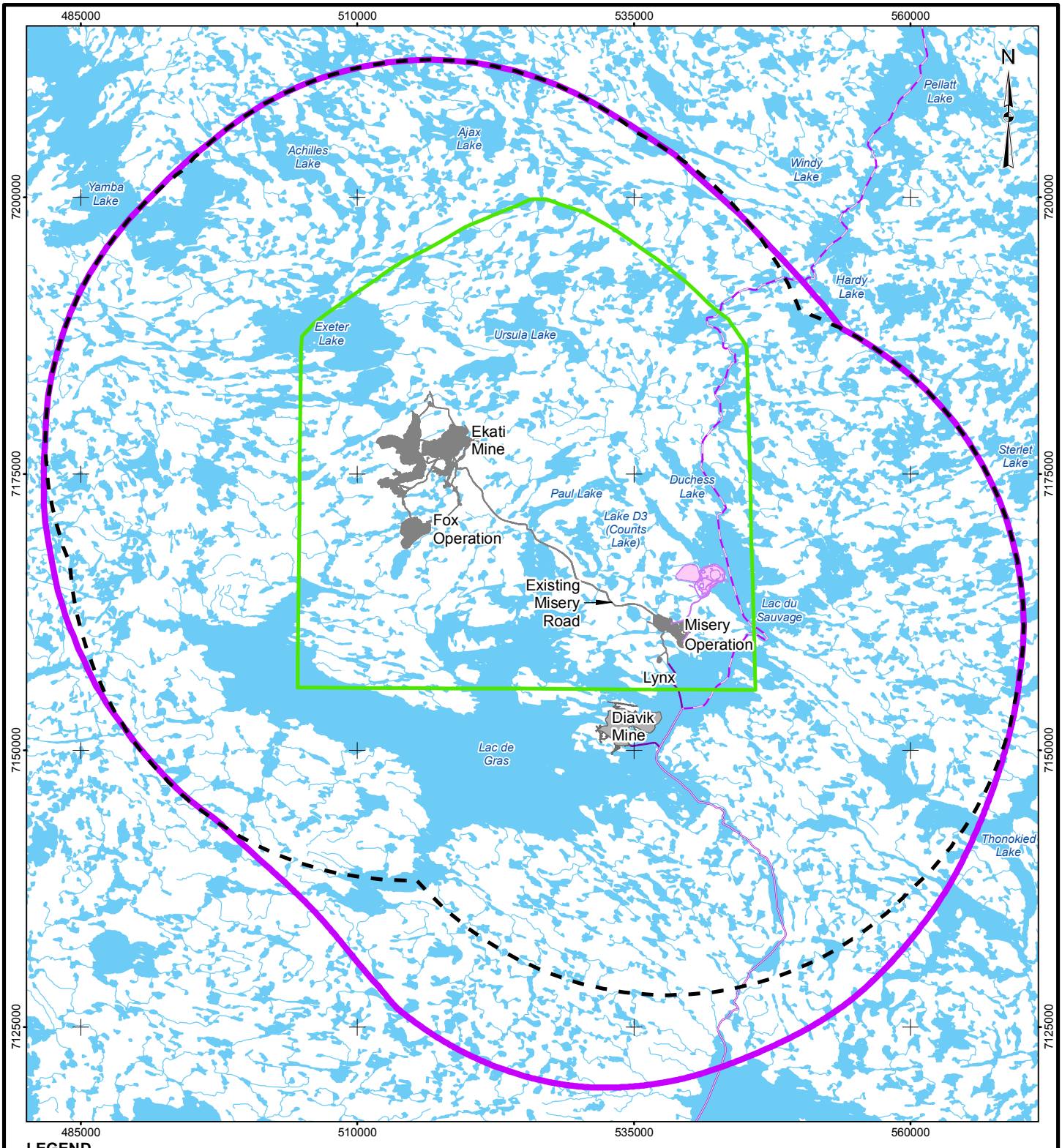
In August 2009, the Ekati and Diavik mines collaboratively expanded the aerial survey study area after consultation with regulators and permission from the ENR. The study area was expanded south so that an effective buffer around Diavik Mine was surveyed to accurately assess caribou distribution relative 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 degrees Celsius (°C), ranging from +10°C to +12°C in July to -30°C in January. Average annual precipitation is from 200 to 300 millimetres (mm) with approximately 60 percent (%) 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 metres (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 (Dominion Diamond 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 (Dominion Diamond 2014).




## LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- WATERCOURSE
- WATERBODY
- WIDLIFE STUDY AREA, 1998 - 2005
- WILDLIFE STUDY AREA, 2006 - 2008
- WILDLIFE STUDY AREA,

10 0 10

SCALE 1:500,000 KILOMETRES

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

# EKATI WILDLIFE AREAS, 1997-2009

DRAFT

## 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

Golder Associates

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| PROJECT 1419751.4100.30 | | | FILE No. | |
| DESIGN | TM | 13/05/15 | SCALE AS SHOWN | REV. 0 |
| GIS | ANK | 25/05/15 | MAP 2.1-1 | |
| CHECK | | | | |
| REVIEW | | | | |

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\1419751 Jay Project Stage 3\4100_Licencing and Permitting\30_Wildlife Effects Monitoring Program\Ekati and Diavik Study Areas.mxd

## 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 in order 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 indictor 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).

Dominion Diamond 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 and three-year EIR reports and meetings are ways that Dominion Diamond 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.

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). 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.

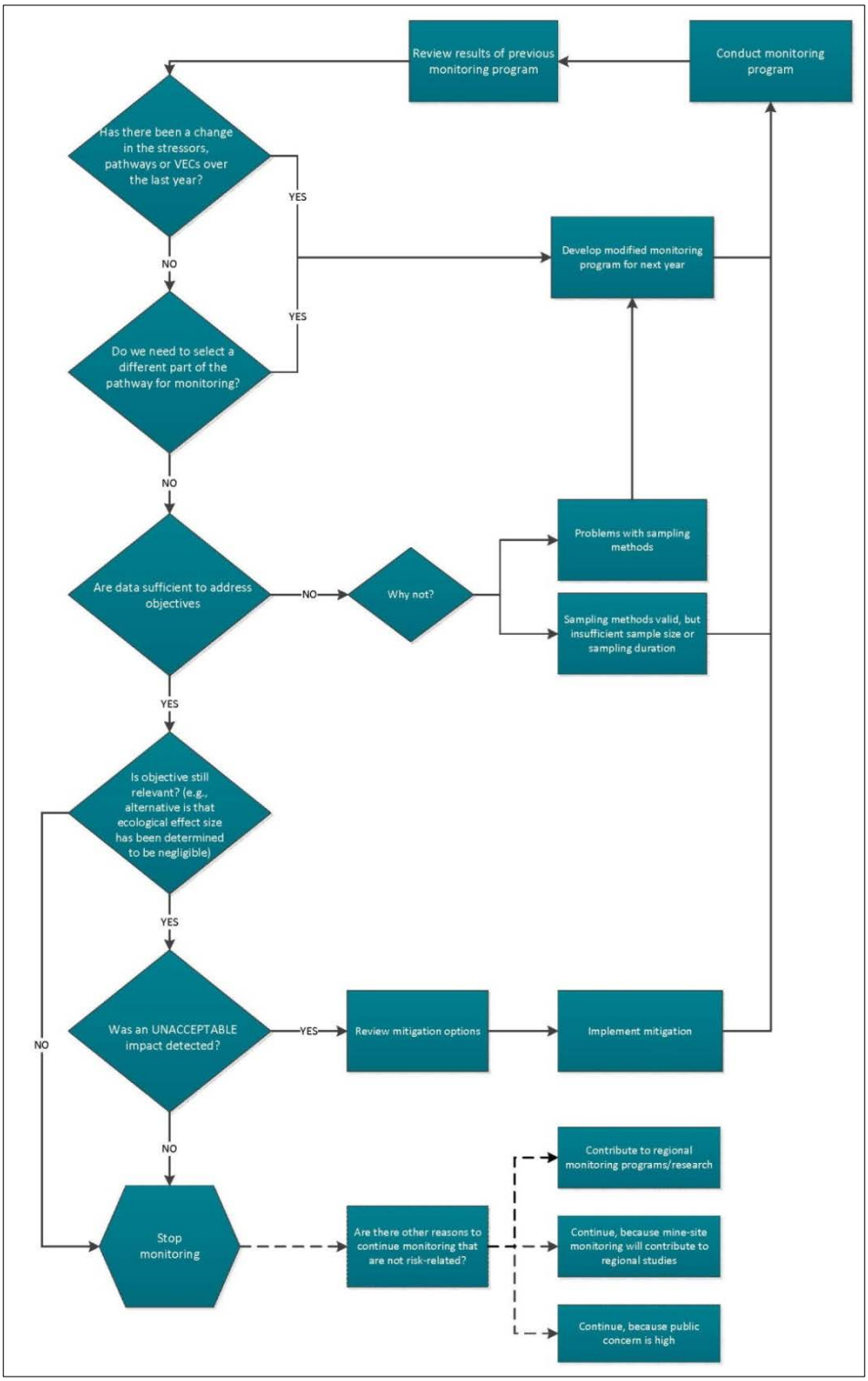
Monitoring programs must be flexible enough to incorporate comments, suggestions, and information based both on science and local and TK. There are no regulator established guidelines for wildlife critical values, threshold conditions, or action levels. If changes to the receiving environment are determined to be greater than the predictions in the DAR, then the most suitable course of action will be determined by Dominion Diamond, 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 C.

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 Dominion Diamond include the following:

- increase monitoring effort;
- implement special studies to further understand the effects; 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, every three years, the EIR compares the results of environmental monitoring activities conducted by Dominion Diamond at Ekati 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 (Dominion Diamond 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 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 Dominion Diamond 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. Dominion Diamond's participation in DNA studies has produced useful results, and it is anticipated that future work will provide improvements in the ability to detect 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 Dominion Diamond 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 Dominion Diamond 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 Dominion Diamond 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, and Dominion Diamond contributes to regional monitoring. |

NWT = Northwest Territories; NABBS = North American Breeding Bird Survey.

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. 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 *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.

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

**Table 2.5-1 Species of Concern at the Ekati Mine**

| Species | *Species at Risk (NWT) Act* | COSEWIC Assessment | Federal *Species at Risk Act* | Potential Mine Impacts | WEMP |
|---|---|---|---|---|---|
| Grizzly bear (western population) | no status | Special Concern | under consideration | • may be attracted to developments if food is available<br>• sensitive to disturbance particularly when accompanied by young or during denning<br>• long generation time means one individual may be affected by disturbance seasonally over multiple years, resulting in potential regional population effects | hair-snagging surveys;<br>habitat loss; and<br>site monitoring |
| Wolverine (western population) | not at risk | Special Concern | under consideration | • may be attracted to developments if food or shelter are available | hair-snagging surveys;<br>habitat loss; and<br>site monitoring |
| Peregrine falcon (anatum-tundrius complex) | no status | Special Concern | Special Concern | • 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<br>habitat loss; and<br>site/pit monitoring (particularly for nesting activity) |
| Red-necked phalarope | not applicable | Special Concern | under consideration | • loss of shoreline habitat for breeding<br>• 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 | • may nest on Mine infrastructure<br>• 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 | • may be affected by habitat loss<br>• 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, Dominion Diamond 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 Dominion Diamond explores further options to improve the program through community and regulatory workshops, community assistant participation, and site visits.

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

The overall intent of Dominion Diamond'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 (Dominion Diamond 2014).

Dominion Diamond 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. Dominion Diamond 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, Dominion Diamond 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 Dominion Diamond'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 Tłı̨chǫ 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 (WKSS) (completed) (WKSS 2001).
- the preservation and digitization of older, analogue TK records with the Tłı̨chǫ Government, the Goyatiko Language Society (Yellowknives Dene First Nation [YKDFN]) and the Łutselk'e Dene First Nation (LKDFN);
- support of heritage research and database compilation with the North Slave Métis Alliance (NSMA); and,
- the Caribou and Roads Project (KIA);
- the TK Research Project with the Yellowknives Dene First Nation 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 Tłı̨chǫ (Dominion Diamond 2014).

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 Tłı̨chǫ, 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 participates 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).

### 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, and 2011, 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, Dominion Diamond 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 Northwest Territories (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, Łutselk'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). 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 inokhok (stone markers) be built and made more visible by adding flagging tape, making them larger or painting "hats" on them. They also suggested that inokhok be rebuilt and moved each year. Inokhoks 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 metre (m) high plastic orange fence with a 5 centimetre (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 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.

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# 4 MITIGATION

The environmental design features and mitigation policies, practices, and procedures that Dominion Diamond 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 D). 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 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., valued component) 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 (Dominion Diamond 2014) indicate that there are no significant adverse environmental effects. The results of the Jay Project DAR indicate that there are no significant adverse effects from the Jay Project, and no offset mitigation has been proposed.

Mitigation at the Ekati Mine is applied and intensified or reduced within an adaptive management framework (Appendix D). 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 further 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 17 years. Various mitigation policies, practices, procedures and designs 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, inokhok (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 inokhok 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.

Dominion Diamond 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*.

Dominion Diamond has implemented several mitigation practices to minimize potential interactions between Mine-related traffic and wildlife, listed below:

- 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 kilometers per hour (km/h) along haul roads, 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;
- inokhoks 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 in order to reduce misdirected waste and other inappropriate animal interactions. Changes over operations in 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 another 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 have been less successful in the past, include propane cannons, noise makers, and bear bangers. Dominion Diamond 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 effects from the Project could include dust affecting 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). Avoidance of the Project by local game due to dust was raised as a potential effect of the Project, as was accumulation or deposition of dust in water. Dominion Diamond 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 non-frozen season.

However, dust is predicted to settle in the area near and around the Mine. Dustfall is currently monitored and managed at the Ekati Mine as part of 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. More detail regarding dust monitoring can be found in the AQMMP (Section 1.3 and 3.5 of ERM 2015), and the Conceptual Air Quality and Emissions Monitoring and Management Plan for the Jay Project (Section 2.4 Dominion Diamond 2015).

### 4.1.7 Health Effects from Contaminants

Further research on metals bioaccumulation related to caribou interaction with processed kimberlite (PK) deposited in the LLCF will be conducted as part of Dominion Diamond's Reclamation Research Plan (Rescan 2006b). In addition to the reclamation research, an increase to 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 (Dominion Diamond 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 physical 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 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, to the extent practicable;
- 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;
- 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; 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 zone of influence), 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 indirect habitat alteration and loss for caribou (zone of influence) will be monitored through regional programs in collaboration with ENR, potentially through the Barren-ground Caribou Management Strategy (Section 5.4). Potential mechanisms for the zone of the influence will be monitored through the WEMP and other plans such as the Air Quality Management and Monitoring Plan.

Mitigation is intended to reduce the changes to less than the zone of influence predicted in the DAR (15 km; Dominion Diamond 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;
- 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 Dominion Diamond, communities, IEMA, ENR, and the public. In the DAR for the Jay Project, Dominion Diamond proposed to construct caribou crossings at appropriate discrete locations along the Jay Road (Dominion Diamond 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, Dominion Diamond 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 B).

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. The pipelines will be covered over with crushed rock along this section of road, except where there are valves or joints that require visual inspection for safe operation. Dominion Diamond 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 (i.e., approximately between King Pond Dam and the approach to the active operations area at Lac du Sauvage) 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.

This main section of the Jay Road will be constructed with frequent and wide caribou crossings. Caribou crossings will not be built in areas where raised safety berms are required by the Mines Inspector, or at locations where there are necessary joints and valves in the pipelines that require visual inspection for safe operation as required by the NWT *Mine Health and Safety Act*. The pipelines will be strategically designed to reduce the number of locations that cannot be constructed as caribou crossings due to joints and valves. This approach also makes beneficial use of 'lessons-learned' from the original Misery Road, where caribou crossings were only installed after construction of the road. 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 easier walking for caribou than the large roadfill rock. In the caribou crossing areas, the pipelines will also be covered with crushed rock.

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 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 B);
- speed limits will be reduced, and short and long-term road closures may be implemented according to action levels in the CRMP; and,
- Dominion Diamond 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 should 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) and destruction of migratory bird nests includes the following:

- implementation of the CRMP (Appendix B);
- 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;
- caribou and other wildlife will be deterred from areas of risk;

- 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. Dominion Diamond will not deter birds from nesting in inactive pits;
- if a bird successfully nests in an active pit, ENR will be contact to discuss a buffer zone that will be applied to the nest where no work can be undertaken;
- 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;
- inokhoks (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; and,
- if vegetation clearing is required, activities will be managed to comply with the *Species at Risk Act* and the *Migratory Birds Convention Act*.

### 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;
- Mine water 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, 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 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 in order 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 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 should 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 reported in the annual monitoring report.

DOMINION DIAMOND

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# 5 MONITORING

## 5.1 Direct Wildlife Habitat Loss

Dominion Diamond has monitored the amount of direct habitat loss accrued to the construction and operation phases of the Ekati Mine annually 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 (EIS). 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 (SGP) 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 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 Geographic Information System (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. Habitat loss from mine footprint expansion will continue to be monitored and reported in the annual monitoring report.

**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 (*Ericaceae*) 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 *Carex aquatilis* and *C. bigelowii*, and cotton grass (*Eriophorum angustifolium*) 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 (*Cyperaceae* spp.) are dominant, and tussock cotton grasses such as *Eriophorum vaginatum* and *E. russeolum* 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. |

Data from Matthews et al. (2001).

m = metre; % = percent; > = greater than; < = less than; spp = multiple species.

### Frequency

Mine footprint updates will be provided annually in the WEMP and will include the construction of the Jay Projects.

### 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 WEMP 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, Dominion Diamond 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 with 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 Dominion Diamond 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

### 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 all recorded. During the 2010 reporting period, Dominion Diamond 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 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 Dominion Diamond 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 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 Canada as soon as possible, depending on 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

At Ekati, 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 allows for the incorporation of adaptive management of mitigation.

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 (e.g., roads) must be managed to minimize risk to wildlife and staff.

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.

Dominion Diamond 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), around the airport (plastic barrier fence erected in 2010), around 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 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 bi-weekly 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 bi-weekly 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 (Dominion Diamond 2014):

- caribou avoidance of the Mine;
- the roads may act as a barrier to caribou movement and as a result deflect caribou and change their movement and migration patterns;
- 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 B, 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 B, 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. The most recent population survey, conducted in June 2009, estimated the Bathurst herd to be 31,900 ± 11,000 individuals (Adamczewski et

al. 2009). 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. 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 (CMS) 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 CMS 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 Dominion Diamond's monitoring of incidental observations (Section 5.4.2) and monitoring of caribou behaviour and distribution (Sections 5.4.3 to 5.4.5). The monitoring framework (Section 2.2) incorporates results from monitoring to development 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 B) represent additional contributions to the development of best management practices. Results from this work are reported annually, supporting Strategy 3.

Recent work by Dominion Diamond 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. Collaborative work on the zone of influence is related to one of the standardized caribou monitoring objectives for the diamond mines, which is determining whether the zone of influence changes in relation to mine activity (Handley 2010). As well, information from the caribou assessment of the Jay Project contributed to the Caribou Range Management Plan.

## 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 Dominion Diamond 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 in order 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); therefore, 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 allow for more proactive implementation of 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.

### 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.

### Frequency

Road surveys will be implemented once per week outside of the  northern and post-calving migrations. The number of surveys completed at 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 B)

### Data Analyses

The results of road surveys will be assessed daily at the Mine site to determine 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.

## 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 broad-scale 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 use of collar data was used to delineate seasonal distribution of the Bathurst herd (e.g. ERM Rescan 2014b).

### 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 uused to determine if triggers based on collar distances are appropriate for increasing caribou road surveys as outlined in the CRMP (Appendix B).

## 5.6.5 Caribou Zone of Influence Monitoring

The most recent zone of influence (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). Dominion Diamond 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 Dominion Diamond is the Bathurst caribou census surveys used to determine herd composition, cow:calf ratios and population estimates. Dominion Diamond is also involved in the ZOI Technical Task Group, which is tasked with determining the most effective methods for future monitoring of caribou distribution near mine sites. These programs provide data to support cumulative effects assessment 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 been noted (Golder 2011). These include changes in the aerial survey transect spacing from 4 km to the current design of 8 km and study area size. Continued monitoring of the northern migration was no longer required as a component as agreed at the 2010 Wildlife Monitoring Workshop (Handley 2010). Guidelines on standardized caribou ZOI monitoring are being developed by a Zone of Influence Technical Task Group administered by the GNWT (GNWT-ENR 2015).

### Objectives

The objective of this component of the WEMP is to:

- determine whether the zone of influence changes in relation to mine activity.

### Methods

Dominion Diamond will work with the ZOI Technical Task Group administered by the GNWT, regulators and communities on appropriate methods for monitoring the caribou ZOI.

### Frequency

Dominion Diamond will work with the ZOI Technical Task Group administered by the GNWT, regulators and communities on appropriate frequency for monitoring the caribou ZOI.

### Data Analyses

Dominion Diamond will work with the ZOI Technical Task Group administered by the GNWT, regulators and communities on appropriate data analyses for monitoring 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, Mine and Mine-related 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 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 zone of influence), and Ekati focused effort at distances close to the Mine. The data were shared between Dominion Diamond 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 time stamped. 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 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. 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 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 as appropriate and necessary.

## 5.6.7 Camera Trapping

A significant 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 underwent 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).

## 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 Airport 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.

## 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 Ekati 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 in order to document use of the LLCF by wildlife other than caribou.

### 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

This monitoring will be completed annually. 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 Dominion Diamond 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 wildlife 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. 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. 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, 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 likeliness 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 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.

#### 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 Dominion Diamond 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. 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. 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 Dominion Diamond. 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

Dominion Diamond will continue to support ENR in the future to complete these regional monitoring surveys. However, if these surveys are no longer completed by ENR, Dominion Diamond 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, Dominion Diamond 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 Dominion Diamond 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 Dominion Diamond 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. 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. 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 $km^2$, 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

Dominion Diamond 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. Dominion Diamond 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 Dominion Diamond.

## 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 (Dominion Diamond 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. 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).

### Objectives

The standardized monitoring objective for raptors include (Handley 2010) is to:

- determine site occupancy and productivity of historic peregrine falcon nest sites in the study area to contribute to the Canadian Peregrine Falcon Survey, which monitors recover of species and 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, to coincide with the Canadian Peregrine Falcon Survey. The last survey was conducted in 2010, and the next scheduled survey is in 2015.

### 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 Dominion Diamond.

## 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 Dominion Diamond 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 Dominion Diamond 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. 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. 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. 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 surveys (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, Dominion Diamond continues to monitor upland breeding birds through the North American Breeding Bird Surveys 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. 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 (CWS) 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 North American Breeding Bird survey 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 results of the survey will be submitted to CWS for inclusion in the Canadian Bird Trends database.

### Frequency

The NABBS will be completed annually in June.

### Data Analyses

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

## 5.13 Rare or Uncommon Species

Dominion Diamond 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 WEMP report. The WEMP may be expanded to included rare or uncommon species depending on the frequency of observations and likelihood and severity of potential effects from the Mine. Dominion Diamond 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 Dominion Diamond 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.

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# 7 REPORTING

Data analysis and reporting will continue to focus on testing 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 WEMP 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 should 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.

A comprehensive EIR will be prepared every 3 years. The comprehensive report will include an analyses of all previous data to the most recent monitoring year and assess trends from the Ekati Mine.

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# APPENDIX A

# EFFECTS PATHWAYS

# DRAFT

**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 | • Modelling of direct effects to habitat accurately reflected the level of disturbance to herd range<br>• Best practices will limit effects to vegetation | Movement and behaviour will be affected | Low | • Air Quality Management and Monitoring Program<br>• Aquatic Effects Monitoring Program<br>• Closure and Reclamation Plan<br>• Dewatering Plan<br>• Mine Water Management Plan<br>• Waste Rock and Ore Storage Management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• 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 | • Best practices will limit effects to vegetation | Movement and behaviour will be affected | Low | • Air Quality Management and Monitoring Program<br>• Aquatic Effects Monitoring Program<br>• Closure and Reclamation Plan<br>• Dewatering Plan<br>• Mine Water Management Plan<br>• Waste Rock and Ore Storage Management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• 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 | • Frequency of mine-related mortalities at diamond mines in the NWT, including the Ekati Mine, is extremely low | Mortality will be negligible | Low | • Engagement Plan<br>• 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 | • Distribution lines are anticipated to result in few bird mortalities | Mortality will be negligible | Low | • Engagement Plan<br>• 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 | • Best practices will limit incidental take | Mortality will be negligible | Low | • 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 | • Dust modelling predicts that dust will be largely confined to the Project footprint | Movement and behaviour will be affected | Low | • Air Quality Management and Monitoring Program<br>• 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 | • Dust modelling is accurate, indicating that dust will be largely confined to the Project footprint | Movement and behaviour will be affected | Low | • Air Quality Management and Monitoring Program<br>• 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 | • Habitat suitability modelling incorporated numerous conservative assumptions, and accurately reflects impacts to wildlife | Movement and behaviour will be affected | Low | • Engagement Plan<br>• 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 | • Effects to upland breeding bird and gray wolf were assessed using conservative assumptions | Movement and behaviour will be affected | Low | • Engagement Plan<br>• 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 | • Caribou energetics modelling incorporated numerous conservative assumptions, and accurately reflects impacts to caribou, grizzly bear, and wolverine | Movement and behaviour will be affected | Low | • Engagement Plan<br>• Waste Rock and Ore Storage Management Plan<br>• 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 | • Wolf abundance and distribution is more affected by prey abundance than human disturbance | Movement and behaviour will be affected | Low | • Engagement Plan<br>• Waste Rock and Ore Storage Management Plan<br>• Wildlife Effects Monitoring Program |
| Collisions between caribou and vehicles or aircraft causes injury or mortality of animals | Physical and chemical hazards | Secondary | • Frequency of mine-related mortalities at diamond mines in the NWT, including the Ekati Mine, is extremely low | Mortality will be negligible | Low | • Engagement Plan<br>• 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 | • Local increases in bears or wolves have not been observed at other mines<br>• Waste management will limit the availability of food to wildlife | Mortality will be negligible | Low | • Hazardous Waste Management Plan<br>• Hydrocarbon-Impacted Materials Management Plan<br>• Incinerator Management Plan<br>• Landfill Management Plan<br>• Spill Contingency Plan<br>• Waste Management Plan<br>• 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 | • Dewatering will not cause water levels to exceed the high water mark | Limited change to movement and behaviour | Nil | • Aquatic Effects Monitoring Program<br>• Dewatering Plan<br>• 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 | • Colonization of lakebed sediments will be slow, patchy and limited area within the mine footprint | Movement and behaviour will be affected | Low | • 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 | • Seepage and runoff will be contained and managed where appropriate<br>• Sequestering of acid generating rock will limit leaching<br>• Ecological risk assessment results predicts negligible risk | No caribou mortality | Nil | • Aquatic Effects Monitoring Program<br>• Waste Rock and Ore Storage management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• 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 | • Seepage and runoff will be contained and managed where appropriate<br>• Sequestering of acid generating rock will limit leaching | Movement and behaviour will not be affected | Nil | • Aquatic Effects Monitoring Program<br>• Waste Rock and Ore Storage management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• 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 | • Changes to water levels will be within the range of natural variation | Limited change to movement and behaviour | Nil | • Aquatic Effects Monitoring Program<br>• Dewatering Plan<br>• 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 | • Seepage and runoff will be contained and managed<br>• Sequestering of acid generating rock will limit leaching<br>• Ecological risk assessment results were accurate, indicating negligible risk | No caribou mortality | Nil | • Aquatic Effects Monitoring Program<br>• Waste Rock and Ore Storage management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• Wildlife Effects Monitoring Program |
| Long-term seepage from the WRSAs may change habitat quality | Direct and indirect habitat loss | No Linkage | • Seepage and runoff will be contained and managed where appropriate<br>• Sequestering of acid generating rock will limit leaching | Movement and behaviour will not be affected | Nil | • Aquatic Effects Monitoring Program<br>• Waste Rock and Ore Storage management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• 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 | • Spill response and clean-up will mitigate effects to wildlife | No caribou mortality | Nil | • Spill Contingency Plan<br>• 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 | • Modelling of direct effects to caribou habitat accurately reflected the level of disturbance to herd range<br>• Best practices will limit effects to vegetation | Movement and behaviour will be affected | Low | • Air Quality Management and Monitoring Program<br>• Aquatic Effects Monitoring Program<br>• Closure and Reclamation Plan<br>• Dewatering Plan<br>• Mine Water Management Plan<br>• Waste Rock and Ore Storage Management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• Wildlife Effects Monitoring Program |
| Physical hazards leading to increased risk of injury or mortality to individual caribou | Physical and chemical hazards | Secondary | • Frequency of mine-related mortalities at diamond mines in the NWT, including the Ekati Mine, is extremely low | Mortality will be negligible | Low | • Engagement Plan<br>• 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 | • Dust modelling is accurate, indicating that dust will be largely confined to the Project footprint | Movement and behaviour will be affected | Low | • Air Quality Management and Monitoring Program<br>• 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 | • Dust modelling is accurate, indicating that dust will be largely confined to the Project footprint | Movement and behaviour will be affected | Low | • Air Quality Management and Monitoring Program<br>• 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 | • Energetics modelling incorporated numerous conservative assumptions, and accurately reflects impacts to caribou<br>• Population modelling conclusions are correct | Movement and behaviour will be affected | Low | • Engagement Plan<br>• Wildlife Effects Monitoring Program<br>• 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 | • Energetics modelling incorporated numerous conservative assumptions, and accurately reflects impacts to caribou<br>• Caribou crossing design for the Jay Road is implemented and effective at facilitating crossings<br>• Implementation of Wildlife Road Mitigation Plan will reduce barrier effect | Movement and behaviour will be affected | Low | • Engagement Plan<br>• Waste Rock and Ore Storage Management Plan<br>• Wildlife Effects Monitoring Program<br>• Caribou Road Mitigation Plan |
| Collisions between caribou and vehicles or aircraft causes injury or mortality of animals | Physical and chemical hazards | Secondary | • Frequency of mine-related mortalities at diamond mines in the NWT, including the Ekati Mine, is extremely low<br>• Addition of Wildlife Road Mitigation Plan will further reduce likelihood of road-related mortalities | Mortality will be negligible | Low | • Engagement Plan<br>• Wildlife Effects Monitoring Program<br>• 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 | • Local increases in bears or wolves have not been observed at other mines<br>• Waste management will limit the availability of food to wildlife | Mortality will be negligible | Low | • Hazardous Waste Management Plan<br>• Hydrocarbon-Impacted Materials Management Plan<br>• Incinerator Management Plan<br>• Landfill Management Plan<br>• Spill Contingency Plan<br>• Waste Management Plan<br>• 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 | • 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 | • 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 | • 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 | • Aquatic Effects Monitoring Program<br>• Dewatering Plan<br>• 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 | • Colonization of lakebed sediments will be slow, patchy and limited area within the mine footprint<br>• Caribou will avoid area due to limited access and proximity to human activity | Movement and behaviour will be affected | Low | • 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 | • Seepage and runoff will be contained and managed where appropriate<br>• Sequestering of acid generating rock will limit leaching<br>• Ecological risk assessment results were accurate, indicating negligible risk | No caribou mortality | Nil | • Aquatic Effects Monitoring Program<br>• Waste Rock and Ore Storage management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• Wildlife Effects Monitoring Program<br>• 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 | • Seepage and runoff will be contained and managed where appropriate<br>• Sequestering of acid generating rock will limit leaching | Movement and behaviour will not be affected | Nil | • Aquatic Effects Monitoring Program<br>• Waste Rock and Ore Storage management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• 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 | • Changes to water levels will be within the range of natural variation | Limited change to movement and behaviour | Nil | • Aquatic Effects Monitoring Program<br>• Dewatering Plan<br>• 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 | • Seepage and runoff will be contained and managed where appropriate<br>• Sequestering of acid generating rock will limit leaching<br>• Ecological risk assessment results were accurate, indicating negligible risk | No caribou mortality | Nil | • Aquatic Effects Monitoring Program<br>• Waste Rock and Ore Storage management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• Wildlife Effects Monitoring Program<br>• Interim Closure and Reclamation Plan |
| Long-term seepage from the WRSAs may change habitat quality | Direct and indirect habitat loss | No Linkage | • Seepage and runoff will be contained and managed where appropriate<br>• Sequestering of acid generating rock will limit leaching | Movement and behaviour will not be affected | Nil | • Aquatic Effects Monitoring Program<br>• Waste Rock and Ore Storage management Plan<br>• Wastewater and Processed Kimberlite Management Plan<br>• Wildlife Effects Monitoring Program<br>• 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<br>Physical and chemical hazards | No Linkage | • Spill response and clean-up will mitigate effects to wildlife | No caribou mortality | Nil | • Spill Contingency Plan<br>• Wildlife Effects Monitoring Program |

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

# APPENDIX B

# CARIBOU ROAD MITIGATION PLAN

# DRAFT

# CARIBOU ROAD MITIGATION PLAN FOR THE JAY PROJECT

## DRAFT

Prepared for: Dominion Diamond Ekati Corporation

Prepared by: Golder Associates Ltd.

July 2015

# Table of Contents



# Maps



# Figures

# Tables

# Abbreviations

| Abbreviation | Definition |
|---|---|
| AQMMP | Air Quality Management and Monitoring Program |
| CRMP | Caribou Road Mitigation Plan |
| DAR | Developer's Assessment Report |
| Dominion Diamond | Dominion Diamond Ekati Corporation |
| Ekati Mine | Ekati Diamond Mine |
| ENR | Environment and Natural Resources (of the Government of the Northwest Territories) |
| RSA | regional study area |
| TCWR | Tibbitt to Contwoyto Winter Road |
| WEMP | Wildlife Effects Monitoring Program |
| WRSA | waste rock storage area |

# Units of Measure

| Unit | Definition |
|---|---|
| % | percent |
| km | kilometres |
| km/h | kilometres per hour |
| m | metres |

DOMINION DIAMOND

DRAFT

# 1 INTRODUCTION

## 1.1 Background

The Ekati Diamond Mine (Ekati Mine), owned and operated by Dominion Diamond Ekati Corporation (Dominion Diamond), is located in the Slave Geological Province of the Northwest Territories, approximately 300 kilometres (km) northeast of Yellowknife (Map 1-1). Construction at the Ekati Mine began in 1997 and production began in October 1998. The current mine plan predicts a further four years of production to 2019. Dominion Diamond 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 10 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 3.16 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 1.86 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 (Dominion Diamond 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 |

Note:

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 surrounding 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, Dominion Diamond 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, Dominion Diamond hosted a workshop to discuss the CRMP on May 22, 2015 (Dominion Diamond 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. 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.

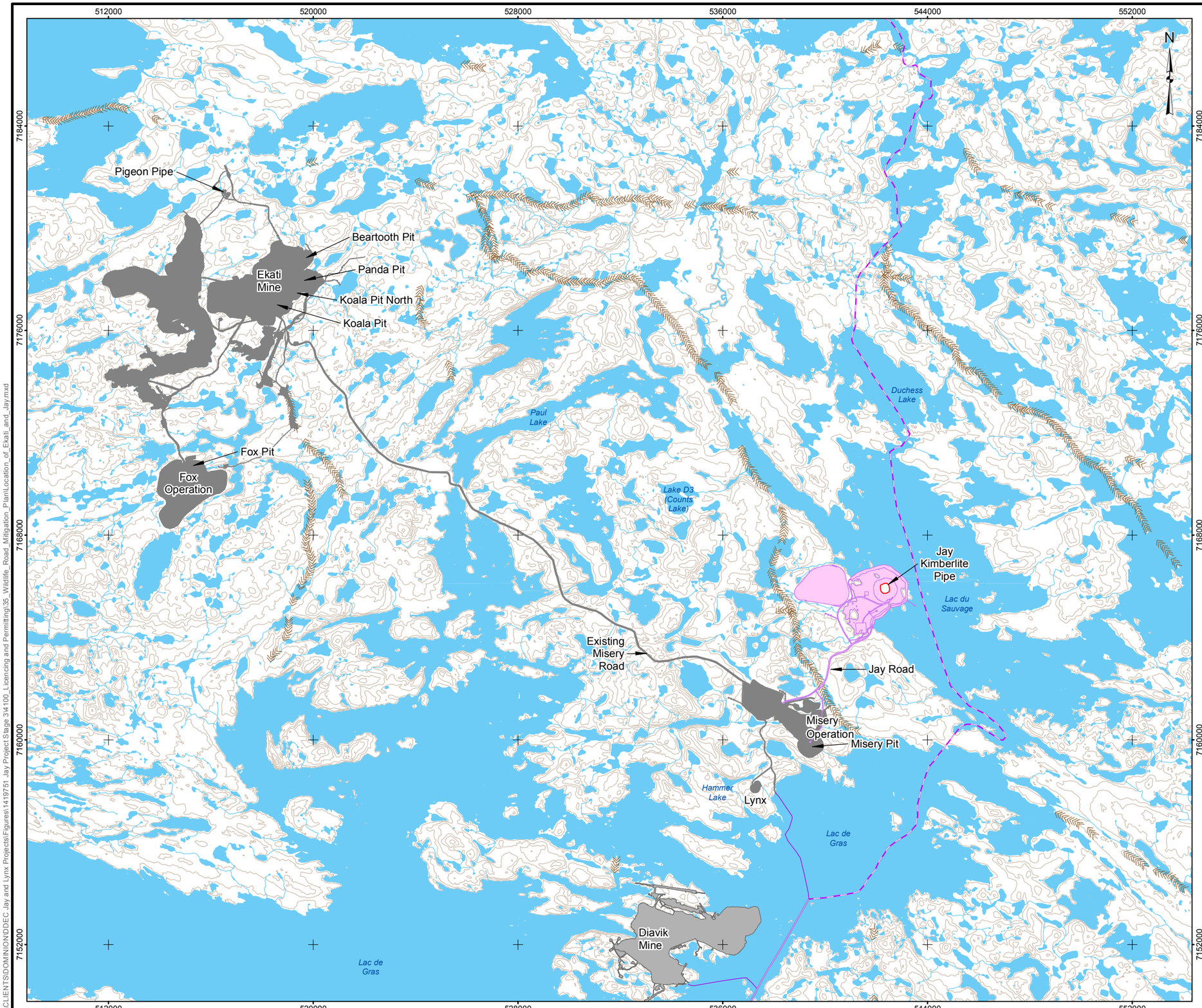
## 1.2 Objective

The CRMP will describe 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 Conceptual Wildlife Effects Monitoring Plan (Dominion Diamond 2015c) and will apply to other roads at Ekati Mine, including the Misery Road and future Sable Road, upon approval of the Project.

The objective of the CRMP is to:

- avoid and minimize (reduce) the risk of caribou and other wildlife mortalities from 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 this Plan. Past mitigation to control dust at the Ekati Mine has included watering and applying dust suppressant to the roads. Dust monitoring at Ekati Mine is completed through the Air Quality Management and Monitoring Program (AQMMP). More detail regarding dust mitigation and monitoring can be found in the AQMMP (Section 1.3 and 3.5 of ERM 2015), the Conceptual Air Quality and Emissions Monitoring and Management Plan for the Jay Project (Section 2.4 Dominion Diamond 2015d), and Section 4.1.6 of the Conceptual Ekati Mine Wildlife Effects Monitoring Program (WEMP).




**LEGEND**

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- PROPOSED JAY FOOTPRINT
- KIMBERLITE PIPE
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY

DRAFT

**REFERENCE**

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

3 0 3
SCALE 1:150,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
**LOCATION OF EKATI MINE AND JAY PROJECT**

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT 1419751.4100.35 | | | FILE No. | |
| DESIGN | EN | 26/05/15 | SCALE AS SHOWN | REV 0 |
| GIS | ANK | 26/05/15 | **MAP 1-1** | |
| CHECK | | | | |
| REVIEW | | | | |

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\1419751 Jay Project Stage 3\4100_Licencing and Permitting\35_Wildlife_Road_Mitigation_Plan\Location_of_Ekati_and_Jay.mxd

# 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, and 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 topography. 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 Annual Temporal Distributions of Bathurst Caribou in the Ekati Mine Regional Study Area from Post-calving Aerial Surveys, 1998 to 2012**

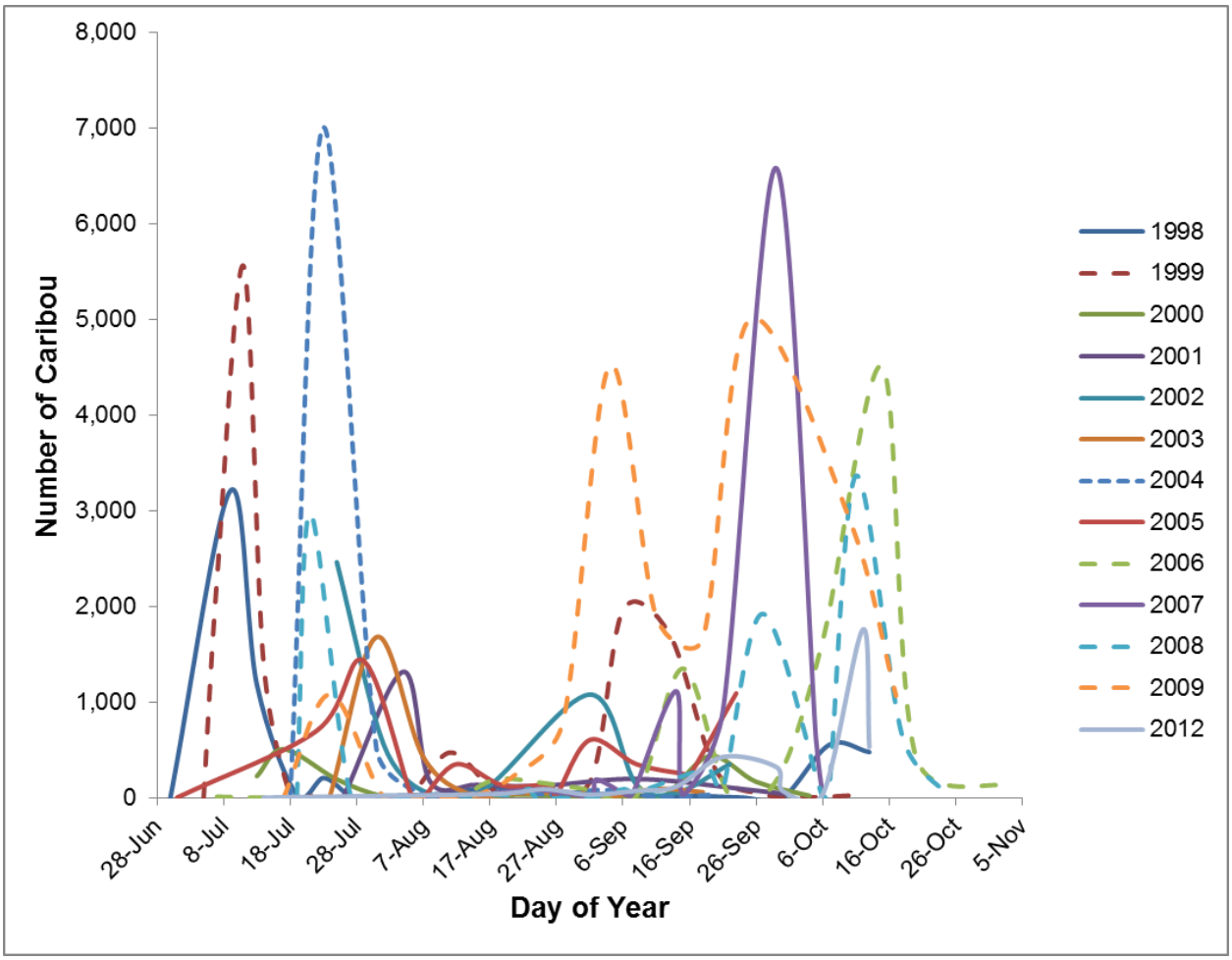
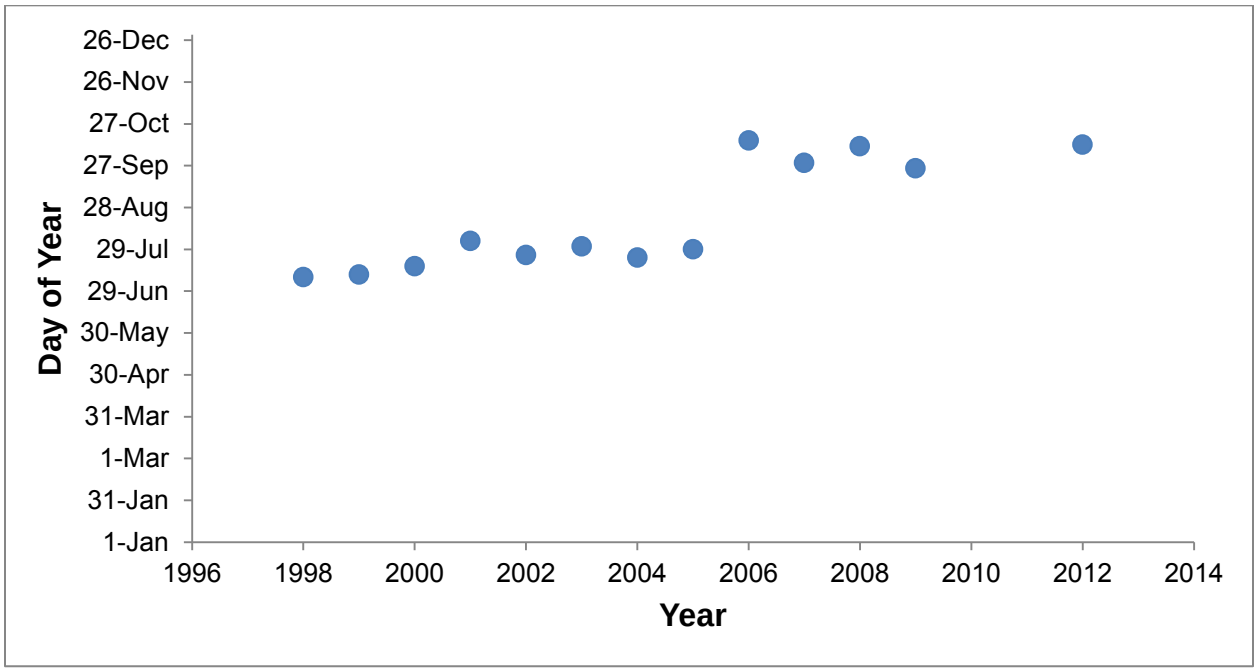


**Figure 2-2 Dates of Annual Peak Abundance of Bathurst Caribou in the Ekati Mine Regional Study Area during Post-calving Aerial Surveys, 1998 to 2012**



# 3 MITIGATION AND MONITORING

Dominion Diamond'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 3-1). Four levels of mitigation and monitoring are proposed (Figure 3-2), and the intensity of mitigation and monitoring increases when specific action levels (triggers) are met (Table 3-1) 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 mitigation and monitoring of the CRMP.

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 3-2). 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 in Level 2. 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.

Cows migrating to the calving grounds in the spring and cows with calves during the post-calving seasons are considered to be the most sensitive to Mine-related impacts. The mitigation in the CRMP has been designed to protect 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 (and other Ekati Mine roads) (Figure 3-1). The mitigations listed below are based on those that have been used at the Ekati Mine over the past 17 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.

**Figure 3-1 Mitigation and Monitoring Intensity for Ekati Mine and Jay Project Roads**

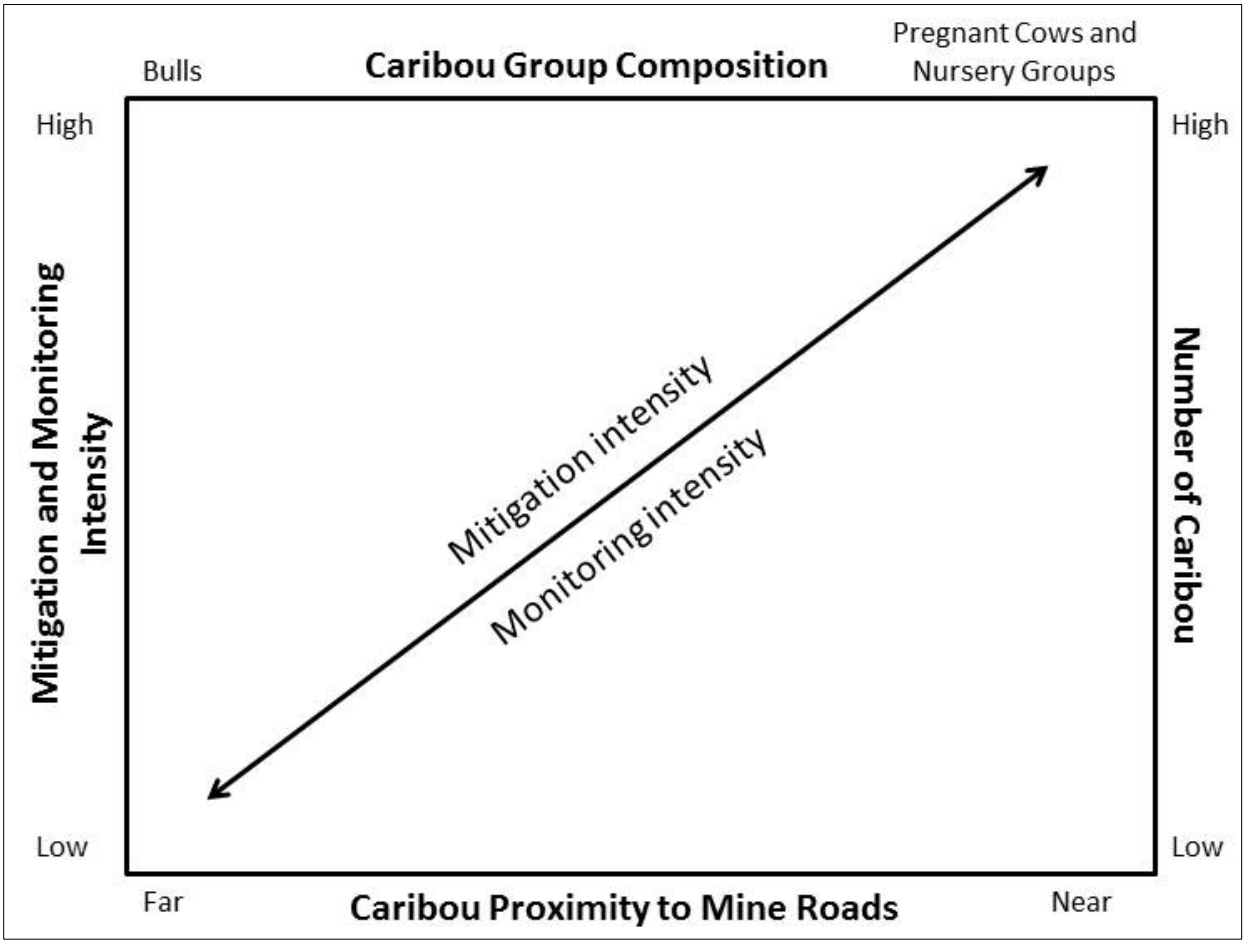


**Figure 3-2 Decision Tree for Jay and Misery Roads Traffic Mitigation and Monitoring**

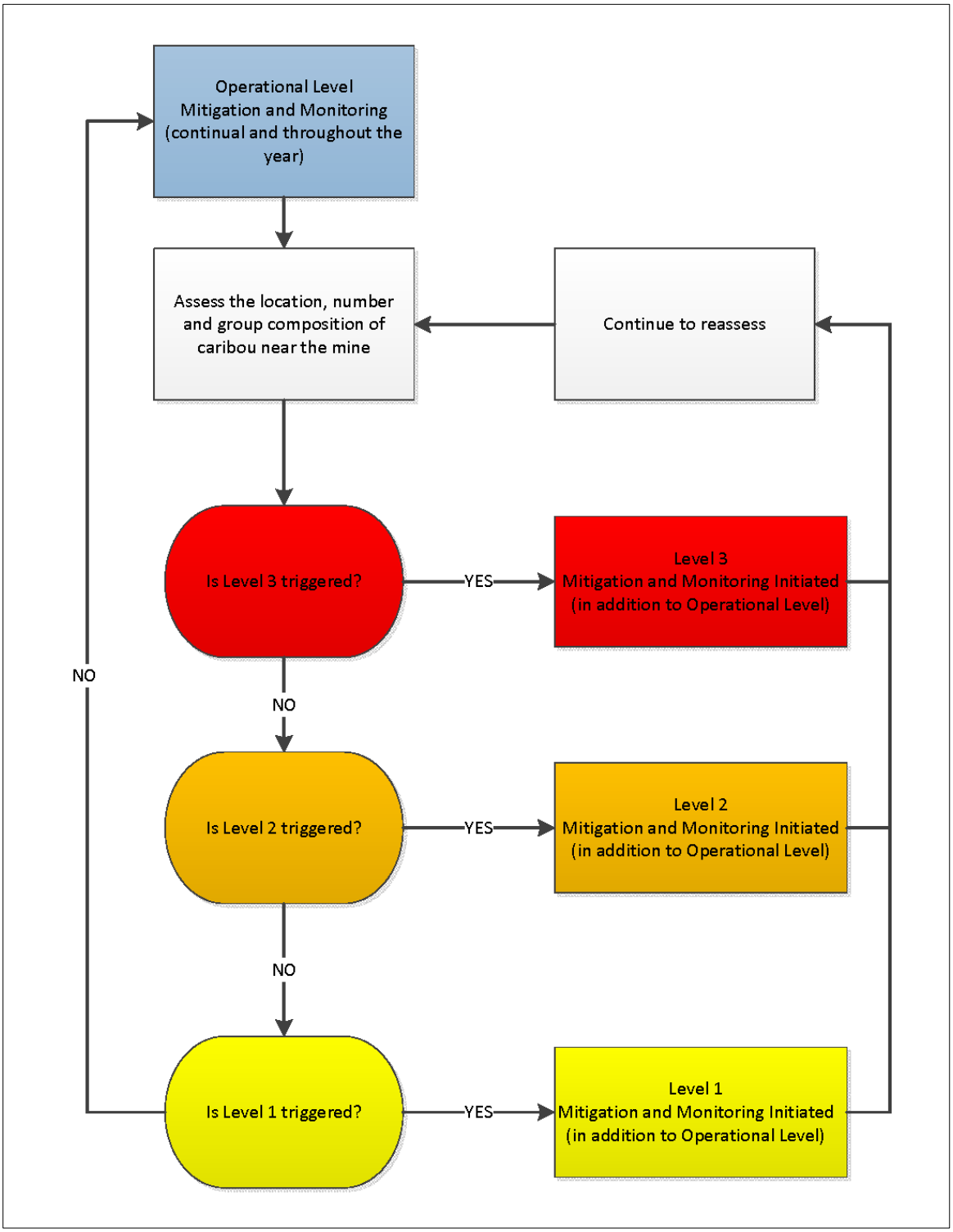


**Table 3-1 Action Levels (Triggers) and Associated Caribou Road Mitigation and Monitoring for the Jay Project and Ekati Mine**

| Level (Alert) | Action Level (Triggers) to Initiate | Wildlife Road Mitigation | Caribou Monitoring |
|---|---|---|---|
| **Operational (Blue)** | • Continual and throughout the year | • Design road to incorporate caribou crossings<br>• Employee education<br>• Speed limits are posted<br>• Wildlife have right-of-way on all roads<br>• Observations of wildlife on roads will be communicated to the Environment Department and other drivers in the area<br>• Wildlife carcasses on or near roads will be removed<br>• Road snow berm height will be managed during winter | • Collared caribou monitoring<br>• Incidental wildlife sightings<br>• Weekly road surveys |
| **1 (Yellow)** | • One or more collared caribou or caribou observations within 30 km of the Ekati Mine (i.e., RSA) | • Site-wide notifications of caribou approach to Ekati Mine<br>• Signage indicating caribou could be encountered (yellow alert) | • Collared caribou monitoring<br>• Incidental wildlife sightings<br>• Bi-weekly road surveys |
| **2 (Orange)** | • One or more collared caribou within 14 km of the Ekati Mine<br>• Caribou sightings are reported near the Misery or Jay roads | • Site-wide notifications of caribou approach to Ekati Mine<br>• Increased signage in areas where caribou might encounter the road<br>• Signage indicating caribou are likely to be encountered (orange alert)<br>• Speed limits will be decreased and posted | • Collared caribou monitoring<br>• Incidental wildlife sightings<br>• Daily road surveys<br>• Environment Technicians dispatched to monitor traffic and provide caribou safety |
| **3 (Red)** | • 1% of total cows in the Bathurst herd are within 200 m of the Jay or Misery roads<br>• One or more caribou groups observed within 500 m of the Jay or Misery roads during the northern migration (May)<br>• One or more caribou crossing the road | • Site-wide notifications of caribou approach to Ekati Mine<br>• Signage indicating caribou are highly likely to be encountered (red alert)<br>• Short-term or long-term road closures | • Collared caribou monitoring<br>• Incidental wildlife sightings<br>• Daily road surveys<br>• Environment Technicians dispatched to monitor traffic and provide caribou safety<br>• Behavioural surveys (scan and focal sampling) |

RSA = regional study area for the Ekati Mine; km = kilometres; m = metres;% = percent.

## 3.1 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).

### 3.1.1 Mitigation

- *Design road to incorporate caribou crossings*

Dominion Diamond's community engagement program has indicated that the Jay Road area is important for caribou movement. In response to the feedback received through community engagement, Dominion Diamond proposes to construct caribou crossings along the Jay Road that respect the communities' identification of the importance of this area for caribou movement. While the design of the Jay Road has not been finalized, the objective is to make the Jay Road as permeable to caribou movement as practicable. 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 (Dominion Diamond 2015e, Map 1-1). A detailed map of caribou crossing locations on the Jay Road will be provided once the road design has been finalized. 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.

- *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.

- *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 Dispatch to relay the message to other drivers.

Environment Technicians will be dispatched to the location that caribou are encountered any time a driver stops to give caribou the right of way. 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 following guidelines to determine when they can resume driving and at what speed (Table 3.1-1).

**Table 3.1-1 Caribou Distance Thresholds and Speed Limits**

| Distance of Caribou from the Road Following Crossing | 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 |

m = metre; km/h = kilometres per hour.

Employees must wait until caribou or other wildlife move 100 m or more 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 or other wildlife decide to cross the road. When the animal has moved 200 m or more, the driver can increase his or her speed to 40 km/h. When the animal has move 500 m or more from the road the driver can increase his or her speed to 60 km/h.

- *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, or closing roads. All incidental wildlife sightings are summarized in the annual Ekati Mine WEMP 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 Government of the Northwest Territories and receives direction from ENR regarding disposal. Dominion Diamond 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 annual Ekati Mine WEMP 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 of this monitoring indicate 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.

### 3.1.2 Monitoring

Operational monitoring will include reviewing the locations of collared Bathurst caribou, incidental sightings of wildlife, and weekly road surveys, and the results will be documented in the annual Ekati Mine WEMP 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).

The location of collared caribou provided by ENR will be monitored to determine the broad-scale 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.

- *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.

## 3.2 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.

### 3.2.1 Mitigation

- *Site-wide notifications of caribou approach to 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 been observed in the past from camera trapping data. A summary map of these data will be provided to all interested parties (e.g., communities and regulators) in the Ekati Mine annual WEMP report.

### 3.2.2 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 bi-weekly surveys. The frequency of yellow alert level, and all observations from additional road surveys will be documented in the annual Ekati Mine WEMP report.

## 3.3 Level 2 (Orange)

This level of mitigation occurs when one or more collared caribou or caribou observations occur within the 14 km of the Ekati Mine (i.e., within the predicted zone of influence for changes in caribou distribution) or if caribou sightings are reported near 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 that roads and vehicles are a barrier to movement.

### 3.3.1 Mitigation

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

The Environment Department will post orange alert signs for drivers that caribou are present at relevant sections of the road. This will remind drivers to slow down if caribou are seen within 200 m (i.e., the maximum stopping distance of a loaded haul truck travelling 60 km/h) of the road or stop if caribou are on the road. The location of the signs will be based on recent caribou observations.

- *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 of any recent incidental caribou sightings. Signs will be posted at entry points of mine roads.

- *Speed limits will be decreased and posted*

The maximum speed limit on portions of the Misery haul road is 60 km/h. Speed limits will be decreased to 40 km/h along sections of the Jay or Misery roads when caribou nursery groups are observed within 500 m from the road. When caribou are observed within 200 m of the road, the speed limit will be decreased to 20 km/h. The length and section of the road, and duration of the speed limit decrease will be determined by the Environment Department. Speed limits will apply to all vehicles. Wildlife will continue to have the right of way during speed limit reductions.

Dominion Diamond will consider the use of pilot vehicles and convoys where caribou are observed at distances too far from the road to trigger a road closure but close enough that vehicles moving at slow speeds but with high frequency may be disruptive. This decision will be on a case-by-case basis at the discretion of the Environment Department.

### 3.3.2 Monitoring

Level 2 monitoring will include all of the monitoring in Level 1; however, the frequency of road surveys will be increased from bi-weekly to daily surveys and will also include the additional monitoring listed below. The number of orange alert level, and the road, frequency, duration and length of road segments of speed limit reductions will be documented in the annual WEMP report.

In addition to radio collar monitoring, Dominion Diamond is also considering a number of different options for detecting and monitoring caribou in the Ekati Mine area before caribou would be detected by road surveys. The options currently being considered include the use of drones to scan for caribou. Consideration is also being given, jointly with communities and ENR, to support the deployment of high location frequency global positioning system (GPS) collars that are geo-referenced to the Ekati Mine (including the Jay Project).These represent new technologies that are currently not being used for this purpose and Dominion Diamond will complete due diligence to determine whether these or other options are feasible and could provide value-added information for caribou monitoring and mitigation. At this time, Dominion Diamond cannot provide details on either of these monitoring options, as the information is not available.

- *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 caribou safety. Technicians will also be present during speed limit reductions to monitor traffic and enforce compliance. When possible, Aboriginal community members present at site will have an opportunity to participate in this monitoring.

Descriptions and photos of locations where caribou crossed or were deflected by roads will be included in the Ekati Mine annual WEMP report. A map of caribou observations along the Misery and Jay roads will also be included in the Ekati Mine annual WEMP report.

## 3.4 Level 3 (Red)

This level of mitigation and monitoring will be triggered when 1 percent (%) 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 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. This 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 caribou movement is more predictable and cows are most sensitive to disturbance, short-term closures will occur when groups are within 500 m of the roads. 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 other Ekati Mine roads); and,
- sensory disturbance from roads and traffic on caribou behaviour (and associated adverse changes in energetics and reproduction).

### 3.4.1 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. Signs will be posted at entry points of mine roads.

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

A road closure will always be initiated at any time if the criterion of 1% 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). 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 and group composition of caribou near the road.

Road closures will also occur at numbers lower than the trigger based on the discretion of the Environment Department. For example, a road closure may be triggered 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, or it is believed the caribou intend to cross the road. During the northern migration (May), when caribou movement is more predictable and cows are most sensitive to disturbance, short-term closures will occur when groups are within 500 m of the roads. 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 goggles) will be considered during this time.

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

### 3.4.2 Monitoring

Level 3 monitoring will include all of the monitoring in Level 2, with the addition of scan and focal behavioural monitoring. The frequency of red alert level, and all behavioural survey data will be documented in the Ekati Mine annual WEMP 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., modifications of setback distances during road closures). 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.

## 3.5 Roles and Responsibilities

In order to limit road impacts 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 3.5-1).

**Table 3.5-1 Ekati Mine Employee Caribou Road Mitigation Plan Roles and Responsibilities**

| Job Title | Responsibility |
|---|---|
| Superintendent Mining | • Ensure training is provided for site personnel<br>• Hold all employees accountable for upholding all Environment commitments and policies<br>• Incorporate CRMP components into the site Traffic Management Plan |
| Superintendent Environment | • Owner of CRMP<br>• Ensure resources are available to establish, implement, execute, and maintain mitigation and monitoring<br>• Responsible for overseeing the review and update of CRMP |
| Wildlife Advisor | • Design monitoring programs, ensure that monitoring and mitigations are executed and planned, review data, and adapt programs as required<br>• Complete annual reporting and engagement<br>• Provide expertise and support to operations teams<br>• Responsible for implementing the CRMP, and completing the review and any updates |
| Environment Technician | • Reports directly to the Wildlife Advisor<br>• Understand procedures, execute CRMP action levels and complete monitoring and mitigations as outlined |
| All Employees | • Report all wildlife and act in a manner that will protect all wildlife, except where it could affect their personal safety<br>• Obey all posted speed limits and rules of the road and give wildlife the right of way on all roads<br>• Understand and follow CRMP procedures and act in accordance with Dominion Diamond's Environmental Standards and Policies |

CRMP = Caribou Road Mitigation Plan.

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# 4 REPORTING

Changes to the CRMP will occur as monitoring results are analyzed and assessed over time. Mitigation and monitoring efforts related to the CRMP will be documented and analyzed in the Ekati Mine annual WEMP report and will include the following information:

- date;
- alert level triggered and reason for trigger; and,
- any follow up regarding the mitigation that was used.

If negative effects are detected (e.g., caribou-vehicle collisions, failed crossing attempts, inadequate signage), the actions available to Dominion Diamond include the following:

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

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# APPENDIX C

# SUMMARY OF CHANGES TO WILDLIFE MONITORING

## DRAFT

# Table of Contents



# Tables

# C1 SUMMARY OF CHANGES TO WILDLIFE MONITORING, 1997 TO 2014

Wildlife monitoring at the 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. The table below 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 C-1 Changes to Wildlife Monitoring at Ekati, 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 C-1 Changes to Wildlife Monitoring at Ekati, 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 Mine site on relative abundance and seasonal movements of caribou |

**Table C-1 Changes to Wildlife Monitoring at Ekati, 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 C-1 Changes to Wildlife Monitoring at Ekati, 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 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 Mine infrastructure |

**Table C-1 Changes to Wildlife Monitoring at Ekati, 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 Mine site, including roads and other infrastructure |
| | 2013 | Remote cameras | 90 motion sensor cameras deployed | Monitor interaction of wildlife with 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 C-1 Changes to Wildlife Monitoring at Ekati, 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 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 C-1 Changes to Wildlife Monitoring at Ekati, 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 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 Mine infrastructure | Formal monitoring and reporting program | Provide information for adaptive management and to improve early nest attempt deterrence |
| | 2006 | Nesting on 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 C-1 Changes to Wildlife Monitoring at Ekati, 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; $km^2$ = square kilometre; km/h = kilometres per hour;% = percent; NA = not available; WEMP = Wildlife Effects Monitoring Plan.

# APPENDIX D

# HIERARCHICAL MITIGATION APPLIED TO THE JAY PROJECT FOR CARIBOU AND WILDLIFE

## DRAFT

**Table D-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<br>• access roads<br>• power lines<br>• surface infrastructure and support facilities<br>• open pit<br>• waste rock storage areas<br>• accommodations<br>• 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<br>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<br>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<br>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<br>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<br>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<br>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<br>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<br>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<br>• access roads<br>• power lines<br>• surface infrastructure and support facilities<br>• open pit<br>• waste rock storage areas<br>• accommodations<br>• dikes<br>• 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 D-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 |
|---|---|---|---|---|---|
| | Site preparation and construction may result in the destruction of nests, eggs, and individuals of migratory birds (incidental take) | • If vegetation clearing is required, activities will be managed to avoid mortalities and comply with the Species at Risk Act and the Migratory Birds Convention Act. | Avoid | Used as required | Secondary |
| | Changes in surface flows (e.g., isolation and diversion, altered drainage patterns) and water levels from the construction of diked area of Lac du Sauvage alters riparian habitat and caribou distribution | • During construction of dike, silt curtains, and other sediment and turbidity mitigation will be used as appropriate. | Minimize | Applied at maximum level | |
| General Construction and Operation Activities<br>• mining of the kimberlite pipes<br>• operation of surface infrastructure and support facilities<br>• vehicle traffic along the access road | Air and dust emissions and subsequent deposition can change the quantity or quality of plant forage and alter caribou and wildlife distribution and behaviour | • Regular maintenance of equipment will continue at the Ekati Mine. | Minimize | Managed in accordance with manufacturer guidelines | Secondary |
| | | • Dust suppression will be applied, consistent with current practices, to haul roads, the airstrip, and other high traffic areas. | Minimize | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • Speed limits will continue to be applied to limit fugitive dust. | Minimize | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • Salvaged soil material stockpiles or exposed soils will be seeded or protected by berms, to reduce wind erosion. | Minimize | Used as required | |
| | Ingestion of water, soil, and vegetation, or inhalation of air that has been chemically altered by air emissions or dust deposition may affect caribou and wildlife health | • Wildlife are deterred (e.g., skirting, fencing) or removed (e.g., herding, noise making devices) from areas of risk. | Avoid/Minimize | | No Linkage |
| | | • The small, intermittent water ponds at the contaminated snow containment facility and landfarm are covered with flagging to prevent bird landings. | Minimize | Used as required | |
| | Sensory disturbance (lights, smells, noise, dust, viewscape) and barriers to movement causes changes to caribou movement and behaviour, and changes to energetics and reproduction. Will also cause changes in wildlife habitat quality, movement and behaviour | • Use of existing surface facilities will avoid disturbing some areas and limit the quantity of new sensory disturbances. | Avoid/Minimize | Applied at maximum level | Primary |
| | | • Only one access road crosses the Lac du Sauvage esker. | Minimize | Applied at maximum level | |
| | | • The Jay WRSA is set back 200 m from the Lac du Sauvage esker. | Minimize | 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 | |
| | | • 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 | Applied at maximum level | Primary for caribou<br>Secondary for wildlife |
| | | • A minimum flying altitude of 600 m above ground level (except during takeoff and landing, and during field work) will be maintained for cargo, passenger aircraft, and helicopters outside of the Project site. | Minimize | Applied at maximum level | Primary for caribou<br>Secondary for wildlife |
| | | • Environmental training will be provided for personnel. | Minimize | Applied at maximum level | Primary for caribou<br>Secondary for wildlife |
| | | • The WEMP implemented at the Ekati Mine will include the Jay Project. | Minimize | Applied at maximum level | Primary for caribou<br>Secondary for wildlife |
| | | • Wildlife always have the right-of-way. | Minimize | Applied at maximum level | Primary for caribou<br>Secondary for wildlife |
| | | • Vehicles encountering wildlife on roads will communicate the presence of wildlife on the roads to the Environment Department and others in the area. | Minimize | Applied at maximum level | Primary for caribou<br>Secondary for wildlife |
| | | • 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 | Primary for caribou<br>Secondary for wildlife |
| General Construction and Operation Activities<br>• mining of the kimberlite pipe<br>• operation of surface infrastructure and support facilities<br>• 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 caribou movement, change migration routes, and reduce population connectivity | • Only one access road crosses the Lac du Sauvage esker. | Minimize | Applied at maximum level | Primary |
| | | • Animal 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. | Minimizes | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • Spatially and temporally staged monitoring of the Bathurst caribou herd will be used to track migratory movements via (i) satellite radio collars and (ii) road surveys (i.e., advanced information on approaching caribou).Results will be used to manage traffic patterns when caribou are in close proximity of roads including closure. | Avoid/Minimize | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • Kimberlite stockpile areas have been designed in strategic locations that facilitate continued mine operations through various types of road closures. | Avoid/Minimize | Applied at maximum level | |

**Table D-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 |
|---|---|---|---|---|---|
| | | • 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 | |
| | | • 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 | • Current mitigation includes deterring and removing wildlife from the airstrip. | Minimize | Used as required | Secondary |
| | | • Speed limits are in place. | Minimize | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • Wildlife always have the right-of-way. | Minimize | Applied at maximum level | |
| | | • Drivers have standard safety training and are provided with awareness training. | Minimize | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • Appropriate signage is in place to identify areas of high wildlife use. | Minimize | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • 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 | |
| | | • Vehicles are restricted to designated roads and prepared work areas (recreational use of off-road vehicles is prohibited). | Minimize | Applied at maximum level | |
| | | • 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 | |
| | | • Modified traffic patterns and road closures will be used as necessary to protect caribou and people. | Minimize | Can be intensified or reduced through monitoring and Adaptive Management | |
| General Construction and Operation Activities<br>• mining of the kimberlite pipes<br>• operation of surface infrastructure and support facilities<br>• storage of industrial, domestic, hazardous, and contaminated waste<br>• 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 | • 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 | Secondary |
| | | • 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 | |
| | | • 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 | |
| | | • 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 | |
| | | • 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 | |
| | | • Littering and the feeding of wildlife is prohibited. | Avoid | Applied at maximum level | |
| | | • Raised, heated buildings will be skirted to prevent wildlife access to shelter. | Avoid | Applied at maximum level | |
| | | • 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 | |
| | | • Incinerator is enclosed and camp waste will be burned regularly. | Minimize | Applied at maximum level | |
| | | • Landfill sites and waste storage areas will be inspected. | Minimize | Monitoring can be intensified or reduced through Adaptive Management | |
| | | • 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 | |
| | | • 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<br>• operation of surface infrastructure and support facilities<br>• 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 | • Only one access road crosses the Lac du Sauvage esker. | Minimize | Applied at maximum level | Primary |
| | | • 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. | Minimizes | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • 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 | |
| | | • 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 D-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 |
|---|---|---|---|---|---|
| | | • 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. | Minimize | Applied at maximum level | |
| | | • 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 | |
| Site Water Management<br>• dewatering of diked area of Lac du Sauvage<br>• 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 | • 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 | • 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 | • 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<br>• back-flooding of Jay Pit<br>• 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 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 D-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 | • 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 | • 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 |
| | | • Regular equipment maintenance (e.g., regular checks for leaks) will continue. | Minimize | Can be intensified or reduced through monitoring and Adaptive Management | |
| | | • Drip trays and/or absorbent pads are used during servicing and refuelling. | Avoid | Applied at maximum level | |
| | | • All hazardous substances are stored and handled on site in accordance with applicable regulations. | Minimize | Applied at maximum level | |
| | | • Fuel is stored at a central bulk fuel farm at the Ekati Mine 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 | |
| | | • 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 | |
| | | • 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 | |
| | | • Mine water management in the WPKMP will include the pipelines used for ongoing water management of the Jay Pit. | Minimize | Applied at maximum level | |
| | | • 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 | |
| | | • 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; WPKMP = Wastewater and Processed Kimberlite Management Plan; PAG = potentially acid generating; non-PAG = non-potentially acid generating; km/h = kilometres per hour; m = metre; WEMP = Wildlife Effects Monitoring Plan.

# Appendix E
# Standard Operating Procedures and Datasheets

*Placeholder – The standard operating procedure will be included in future revisions of the Wildlife Effects Monitoring Plan