DOMINION DIAMOND

ANNEX VII

WILDLIFE BASELINE REPORT FOR THE JAY PROJECT

WILDLIFE BASELINE REPORT FOR THE JAY PROJECT

Prepared for: Dominion Diamond Ekati Corporation

Prepared by: Golder Associates Ltd.

September 2014

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Abbreviations

Abbreviation	Definition
BBS	breeding bird surveys
BHP	Broken Hill Proprietary Company
BHP Billiton	BHP Billiton Canada Inc. including subsidiary BHP Billiton Diamonds Inc.
BQCMB	Beverly and Qamanirjuaq Caribou Management Board
BSA	baseline study area
CI	confidence interval
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DDMI	Diavik Diamond Mines Inc.
De Beers	De Beers Canada Inc.
DNA	deoxyribonucleic acid
Diavik Mine	Diavik Diamond Mine
Dominion Diamond	Dominion Diamond Ekati Corporation
e.g.,	for example
Ekati Mine	Ekati Diamond Mine
ENR	Environment and Natural Resources (GNWT)
ERM Rescan	ERM Rescan Environmental Services Ltd.
et al.	and more than one additional author
GNWT	Government of the Northwest Territories
Golder	Golder Associates Ltd.
GPS	Global Positioning System
i.e.,	that is
LLCF	Long Lake Containment Facility
OMNR	Ontario Ministry of Natural Resources
N	number of samples
NSR	North Slave Region
NWT	Northwest Territories
P	probability
Project	Jay Project
Rescan	Rescan Environmental Services Ltd.
SARA	*Species at Risk Act*
SE	standard error
SGP	Slave Geological Province
Snap Lake Mine	Snap Lake Diamond Mine
spp.	multiple species
WMZ	Wildlife Management Zone
ZOI	zone of influence

Units of Measure

Unit	Definition
%	percent
±	plus or minus
°C	degrees Celsius
ha	hectare
km	kilometre
km^2	square kilometre
km/h	kilometres per hour
km/km^2	kilometres per square kilometre
m	metre
χ^2	chi-square

1 INTRODUCTION

1.1 Background and Scope

Dominion Diamond Ekati Corporation (Dominion Diamond) is a Canadian-owned and Northwest Territories (NWT) based mining company that mines, processes, and markets Canadian diamonds from its Ekati Diamond Mine (Ekati Mine). The existing Ekati Mine is located approximately 200 kilometres (km) south of the Arctic Circle and 300 km northeast of Yellowknife, NWT (Map 1.1-1).

Dominion Diamond is proposing to develop the Jay kimberlite pipe (Jay pipe) located beneath Lac du Sauvage. The proposed Jay Project (Project) will be an extension of the Ekati Mine, which is a large, stable, and successful mining operation that has been operating for 16 years. Most of the facilities required to support the development of the Jay pipe and to process the kimberlite currently exist at the Ekati Mine. The Project is located in the southeastern portion of the Ekati claim block approximately 25 km from the main facilities and approximately 7 km to the northeast of the Misery Pit, in the Lac de Gras watershed (Map 1.1-2).

This Wildlife Baseline Report is one component of a comprehensive environmental and socio-economic baseline program to collect information about the natural and socio-economic environment near the Project. This Wildlife Baseline Report presents results of wildlife baseline surveys completed for the Project to provide additional baseline data on wildlife and wildlife habitat at the Ekati Mine. An overview of data collected at the following projects in the North Slave Region (NSR) is also presented:

- Dominion Diamond's Ekati Mine;
- Diavik Diamond Mines Inc.'s Diavik Diamond Mine (Diavik Mine);
- De Beers Canada Inc.'s (De Beers) Gahcho Kué Project; and,
- De Beers' Snap Lake Diamond Mine (Snap Lake Mine).

Diavik Mine is located approximately 15 km south of the Project, the Gahcho Kué Project is located approximately 115 km southeast of the Project, and the Snap Lake Mine is located approximately 120 km south of the Project (Map 1.1-1).

Baseline information will be used for the assessment of Project effects on the terrestrial environment, and will help to identify mitigation and protective actions that could be implemented to avoid or reduce potential adverse effects to the existing environment.

LEGEND

- JAY PROJECT
- EXISTING MINE OR PROJECT
- TERRITORIAL CAPITAL
- POPULATED PLACE
- HIGHWAY
- ALL-SEASON ROAD
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- TERRITORIAL/PROVINCIAL BOUNDARY
- TREELINE
- WATERCOURSE
- WATERBODY

150 0 150

SCALE 1:6,000,000 KILOMETRES

REFERENCE

WATER OBTAINED FROM ATLAS OF CANADA
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
PROJECTION: CANADA LAMBERT CONFORMAL CONIC

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

LOCATION OF THE JAY PROJECT

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_002_GIS	
DESIGN	LD	15/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	10/09/14	MAP 1.1-1	
CHECK	CG	09/09/14		
REVIEW	SM	10/09/14		

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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

REFERENCE

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

DOCUMENT

WILDLIFE BASELINE REPORT

3 0 3
SCALE 1:150,000 KILOMETRES

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
EKATI PROPERTY MAP

Golder Associates

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CHECK	CG	09/09/14	
REVIEW	SM	09/09/14	

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1.2 Objectives

The objectives of this Wildlife Baseline Report were to:

- identify wildlife species for detailed description and evaluation;
- describe the population status and distribution of the wildlife species evaluated;
- describe the seasonal range, habitat use, and movement of migratory species;
- identify important habitat features and describe the use of these habitats by wildlife in relation to the Project;
- provide information on other wildlife that may be found near the Project; and,
- present information to support the assessment of Project effects on wildlife, and indirect and cumulative effects within and beyond the broader regional area.

To meet these objectives, the Wildlife Baseline Report has been organized into sections:

- **Section 1.3** provides the criteria used in the selection of species included in the wildlife baseline study.
- **Section 1.4** provides a detailed description of the study area selection.
- **Section 1.5** provides a summary of studies that have been completed for other mines in the Slave Geological Province (SGP).
- **Section 2** provides detailed descriptions of data collection methods for selected wildlife species, as well as other wildlife species potentially occurring near the Project.
- **Section 3** provides qualitative and quantitative information on the population status and distribution of selected wildlife species, local habitats, seasonal habitat use, and seasonal movement or high use areas. Information collected during the 2013 baseline surveys is further supported by a review of the currently relevant literature.
- **Section 4** provides a summary of the wildlife investigations within the baseline study area (BSA), and presents the 2013 baseline status of the wildlife species evaluated.

1.3 Selection of Baseline Species

Ten wildlife species were selected for detailed evaluation in this baseline report (Table 1.3-1). These species are either focal species for monitoring programs that occur within the BSA (e.g., grizzly bear [*Ursus arctos*] and barren-ground caribou [*Rangifer tarandus groenlandicus*]) or are species incidentally observed during these focal surveys (e.g., moose [*Alces alces*]).

Table 1.3-1 Rationale for Selection of Wildlife Species to be Evaluated

Group	Valued Component	Rationale for Selection
Ungulates	Barren-ground caribou (*Rangifer tarandus groenlandicus*)	Migratory species with extensive range requirements; sensitive to disturbance during calving and post-calving periods; may be affected by disturbance during seasonal movements; primary prey species for most carnivores in northern environments; important subsistence and cultural species.
	Moose (*Alces alces*)	Large home range size; important subsistence and cultural species; sensitive to disturbance.
	Muskoxen (*Ovibos moschatus*)	Extensive range requirements; important subsistence and cultural species; sensitive to disturbance.
Carnivores	Barren-ground grizzly bear (*Ursus arctos*)	Large home range size; sensitive to disturbance particularly when accompanied by young or during denning; long generation time means one individual may be affected by disturbance seasonally over multiple years, resulting in potential regional population effects; demonstrate prey and habitat selection behaviours (i.e., den site selection); recommended by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to be listed under *Species at Risk Act* (SARA) as a species of “special concern” (NWT SAR 2014).
	Gray wolf (*Canis lupus*)	Large home range size; demonstrates migratory behaviour and movement; sensitive to disturbance particularly during denning; long generation time means one individual may be affected by disturbance over multiple years, resulting in potential regional population effects; demonstrates specialist prey selection and den site selection behaviours.
	Arctic fox (*Alopex lagopus*) and red fox (*Vulpes vulpes*)	Small home range size and potential year-round resident within the region; tolerant of human activities, but may be affected by habitat loss; demonstrates specialist den site selection behaviours.
	Wolverine (*Gulo gulo*)	Smaller home range size relative to wolves and grizzly bears; generally not migratory, but long-distance movements are made by transient individuals; sensitive to disturbance; because wolverine are long-lived, one individual may be affected by disturbance over multiple years, resulting in potential regional population effects; recommended by COSEWIC to be listed under SARA as a species of “special concern” (NWT SAR 2014).
Migratory birds	Federally listed (SARA / COSEWIC) upland breeding birds including passerines and shorebirds	Small territory size and high bird density in tundra environments means large numbers of upland birds may be affected by habitat loss; migratory birds are susceptible to population declines as a result of changing environmental conditions to breeding and overwintering habitats; rusty blackbird (*Euphagus carolinus*) is listed as a species of “special concern” under SARA (NWT SAR 2014).
	Waterbirds: • geese; • ducks; • loons; and, • grebes.	Waterbirds may be affected by loss of shoreline habitat for breeding; important staging habitat may also be lost; sensitive to noise disturbance and human activity; some species are important for subsistence.
	Raptors: • falcons; • hawks; • eagles; and • owls.	Breeding habitat is limited in tundra environments; sensitive to noise disturbance and human activity during nesting; short-eared owl (*Asio flammeus*) and peregrine falcon (*Falco peregrinus tundrius*) are species of “special concern” under SARA (NWT SAR 2014).

NWT = Northwest Territories; COSEWIC = Committee on the Status of Endangered Wildlife in Canada; SARA = *Species at Risk Act*.

The intent of the *Species at Risk Act*, and the *Species at Risk (NWT) Act* is to protect species at risk from becoming extirpated or extinct as a result of human activity. While the former was enacted by the Government of Canada, the latter was enacted by the Government of the Northwest Territories (GNWT) and applies only to wild animals and plants managed by the GNWT (NWT SAR 2014). For the purposes of the Project, species may be considered to be of concern as a result of either their national, territorial or Committee on Status of Endangered Wildlife in Canada (COSEWIC) status (Table 1.3-2). 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 (NWT SAR 2014) and possibly leading to changes in the species at risk considered for the Project.

Table 1.3-2 Wildlife Species at Risk Observed or Expected in the Baseline Study Area

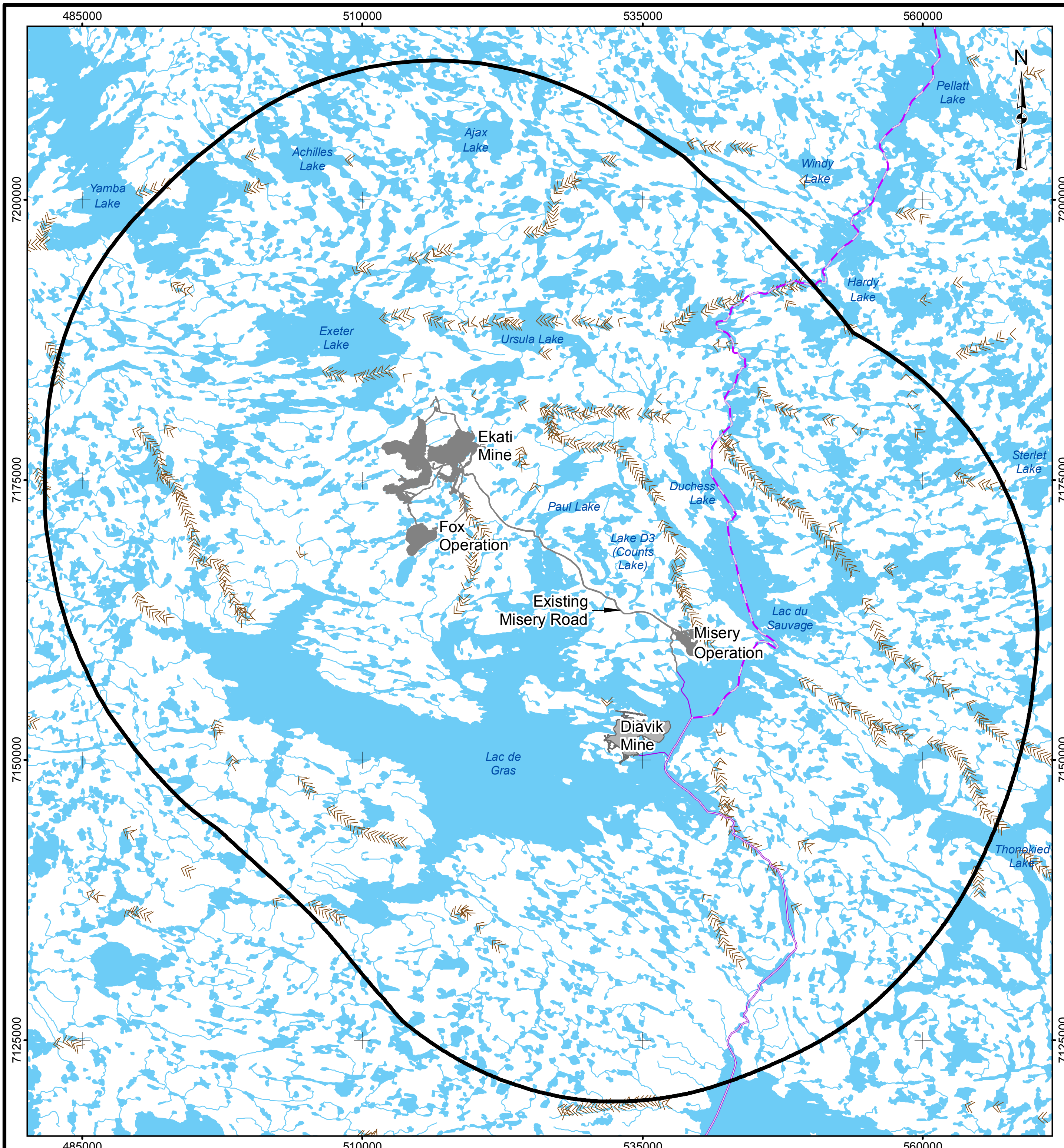
Species	Scientific Name	Species at Risk (NWT) Act	COSEWIC Status	SARA Category of Concern
Grizzly bear (northwestern population)	*Ursus arctos*	no status	special concern	under consideration
Wolverine (western population)	*Gulo gulo*	no status	special concern	no status
Peregrine falcon	*Falco peregrinus tundrius*	no status	special concern	special concern, Schedule 1
Short-eared owl	*Asio flammeus*	no status	special concern	special concern, Schedule 1
Rusty blackbird	*Euphagus carolinus*	no status	special concern	special concern, Schedule 1

Source: NWT SAR (2014).

COSEWIC = Committee on Status of Endangered Wildlife in Canada; NWT = Northest Territories; SARA = *Species at Risk Act*.

1.4 Study Area Selection

The Project is located in the barren-grounds of the SGP (Map 1.1-1, Map 1.1-2). To facilitate the assessment and interpretation of potential effects associated with the proposed Project, it is necessary to define appropriate spatial boundaries. The BSA, equivalent to the Ekati 2006 caribou aerial survey study area (Map 1.4-1), was selected to be an appropriate spatial boundary for quantifying baseline conditions on wildlife species with wide distributions. Barren-ground caribou may be present in the BSA during the northern migration (May 1 to 31), post-calving aggregation (June 16 to July 1), summer dispersal (July 2 to August 31), and fall migration (September 1 to October 31) periods (Rescan 2012a), and their range use and response to industrial activity are important factors in the BSA delineation. Current estimates for the zone of influence from major human developments on caribou, which range from 6.5 to 40 km (Boulanger et al. 2004; Golder 2005; Johnson et al. 2005; Boulanger et al. 2012), were also used to define the BSA. These studies reported that caribou were more likely to occur further from diamond mines and other developments than close to them. The BSA was selected to capture the zone of influence from the Project, the Ekati and Diavik mines, and reference areas (i.e., areas outside the zone of influence where caribou behaviour and probability of occurrence are not influenced by the Project or the Ekati and Diavik mines).



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ESKER
- WATERCOURSE
- WATERBODY
- BASELINE STUDY AREA

10 0 10

SCALE 1:500,000 KILOMETRES

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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

WILDLIFE BASELINE STUDY AREA FOR THE JAY PROJECT

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_001_GIS	
DESIGN	LD	15/01/14	SCALE AS SHOWN	REV. 0
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CHECK	CG	09/09/14	MAP 1.4-1	
REVIEW	SM	09/09/14		

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The BSA is also home to other wide-ranging species including barren-ground grizzly bear, wolverine, gray wolf, waterbirds, and raptors. As such, the boundaries of the BSA were selected to capture the diversity of habitats that support the seasonal requirements for these species. Many species that may be present in the BSA are migratory and as such, not all habitat needs for these species are likely to be met by habitat types in the BSA.

The BSA occurs within the Tundra Shield Low Arctic (south) Level III Ecoregion and is bisected by two Level IV Ecoregions, the Point Upland Ecoregion to the west of Lac du Savage and the Contwoyto Upland Ecoregion to the east (Ecosystem Classification Working Group 2012). The BSA is within the headwaters of the Coppermine River drainage basin, which flows north to the Arctic Ocean and is characterized by undulating to rolling terrain with northwest to southeast trending eskers, and exposed bedrock outcrops. Erect dwarf-shrub and low-shrub tundra dominate uplands, while sedge, moss, and low and dwarf shrub wetlands occur in low-lying areas (Ecosystem Classification Working Group 2012). For species with small home ranges, such as upland breeding birds, the BSA could contain habitat that is capable of supporting all requirements necessary for life, including forage, cover, and breeding habitat.

1.5 Summary of Previous Monitoring, Surveys, and Studies

Many wildlife investigations have been completed in the SGP northeast of Yellowknife where mineral and diamond exploration and mining are being completed. A summary of wildlife monitoring, surveys, and studies completed from 1995 to 2013 in the SGP is provided in Table 1.5-1.

Table 1.5-1 Summary of Wildlife Monitoring, Surveys, and Studies Completed in the North Slave Region, 1995 to 2013

Originator	Description	Years
Ekati Mine	aerial surveys to determine the abundance and distribution of caribou	1998 to 2009
	caribou remote camera monitoring program	2011 to 2013
	monitoring of caribou behaviour near the mine	1998 to 2013
	monitoring of road permeability to caribou during the northern migration (snow track surveys)	2002 to 2010
	monitoring to: determine whether any caribou are injured by the presence and operation of the Long Lake Containment Facility (LLCF); determine the frequency with which caribou use the LLCF; and, determine group size, group composition, and dominant group behaviours of caribou observed within the LLCF	1999 to 2013
	DNA hair snagging surveys to estimate the abundance, density, and movement of wolverine	2005, 2006, 2010, and 2011
	ground-based surveys to determine the presence of grizzly bear sign within and adjacent to high-quality habitat	2000 to 2008
	DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2010 and 2011
	regional DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2012 and 2013
	pit wall nest monitoring	2004 to 2013
	North America Breeding Bird Survey	2003 to 2013
	incidental observations of wildlife	2001 to 2013

Table 1.5-1 Summary of Wildlife Monitoring, Surveys, and Studies Completed in the North Slave Region, 1995 to 2013

Originator	Description	Years
Diavik Mine	aerial surveys to determine the abundance and distribution of caribou	1995 to 2009
	monitoring of caribou behaviour near the mine	1998 to 2013
	pellet-group count surveys to document the relative use of common vegetation/land cover types by wildlife	1995 and 1996
	ground-based surveys to determine the presence of grizzly bear sign within and adjacent to high-quality habitat	2002 to 2008
	DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2010 and 2011
	regional DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2012 and 2013
	regional DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of wolverine	2005, 2006, 2010, and 2011
	winter track count surveys to determine the relative use and distribution of wolverine	2003 to 2013
	pit wall/mine infrastructure inspections to determine whether bird nests are present in pit wall or mine infrastructure, identify bird species in these locations, determine location of nesting activity, identify egg- and chick-bearing nests, and determine whether deterrent actions are necessary	2004 to 2013
	ground-based surveys to document the presence of waterbird species	1996 to 2013
	monitoring of caribou behaviour near the mine	2002 to 2013
	ground-based surveys to document use of mine-altered waterbodies by waterfowl	2001 to 2013
Gahcho Kué Project	aerial surveys to determine the abundance, distribution, and habitat use of caribou	1999 to 2005
	habitat surveys to determine relative use of preferred habitat by grizzly bear	2005 and 2007
	winter track count surveys to determine the relative use and distribution of carnivores, ungulates, and furbearers that are active during the winter in the wildlife study area	2004 and 2005
	winter track count surveys to measure wolverine activity and distribution in the wildlife study area	2010 to 2012
	DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of wolverine	2005, 2006, 2013
	hair snagging surveys to estimate the abundance of barren-ground grizzly bear	2010 and 2011
	regional DNA hair snagging surveys to estimate the abundance of barren-ground grizzly bear	2013
	breeding bird linear transect surveys to determine the relative abundance, distribution, and habitat use of upland breeding birds	2004 and 2005
	waterbird surveys to document species occurrence, relative abundance, and habitat use during the spring migration, breeding season, and fall migration	2004
	waterbird surveys to determine species occurrence and composition at Kennady Lake and a reference waterbody	2010 to 2013
	raptor nest surveys to document nest sites and breeding success	2004 and 2010

Table 1.5-1 Summary of Wildlife Monitoring, Surveys, and Studies Completed in the North Slave Region, 1995 to 2013

Originator	Description	Years
Snap Lake Mine	incidental observations of wildlife	1999 to 2013
	aerial surveys to determine the abundance and distribution of caribou	1999 to 2011
	ground-based surveys to detect changes in bear activity and distribution	2001 to 2009
	hair snagging surveys to estimate the abundance of barren-ground grizzly bear	2010 and 2011
	regional DNA hair snagging surveys to estimate the abundance of wolverine	2013
	winter track count surveys to measure wolverine activity and distribution	2003 to 2009, 2011, and 2012
	regional DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of grizzly bear	2012 and 2013
	DNA hair snagging survey trials to estimate the abundance, density, and demographic parameters of wolverine	2013
	surveys to determine presence and distribution of wolf dens in the study area and determine whether active dens were productive	1995 to 2013
	aerial raptor nest surveys	1999 to 2010
Government of the Northwest Territories	surveys for muskoxen populations	1991, and 1998
	satellite-collar studies to document the seasonal movements of caribou herds	1996 to 2013
	DNA hair snagging surveys to estimate the abundance, density, and demographic parameters of wolverine	2005, 2006, 2010, 2011, and 2013
	Bathurst caribou population monitoring, including cow:calf ratios, composition counts, and calving ground census	Ongoing
	Surveys of known wolf den sites to estimate production	2000 to 2013

Note: This is not a comprehensive list of all monitoring studies.

DNA = Deoxyribonucleic acid.

2 METHODS

2.1 Review of Regional Monitoring and Research Programs

2.1.1 Barren-Ground Caribou

2.1.1.1 Ekati and Diavik Mines

2.1.1.1.1 Caribou Aerial Surveys

Caribou aerial surveys were completed at the Ekati Mine from 1998 to 2009 and 2012, and at the Diavik Mine from 1995 to 2009 and 2012. In 2009 and 2012, aerial surveys were jointly completed for the Ekati and Diavik mines within the BSA (5,933 square kilometres [km^2]; Map 2.1-1).

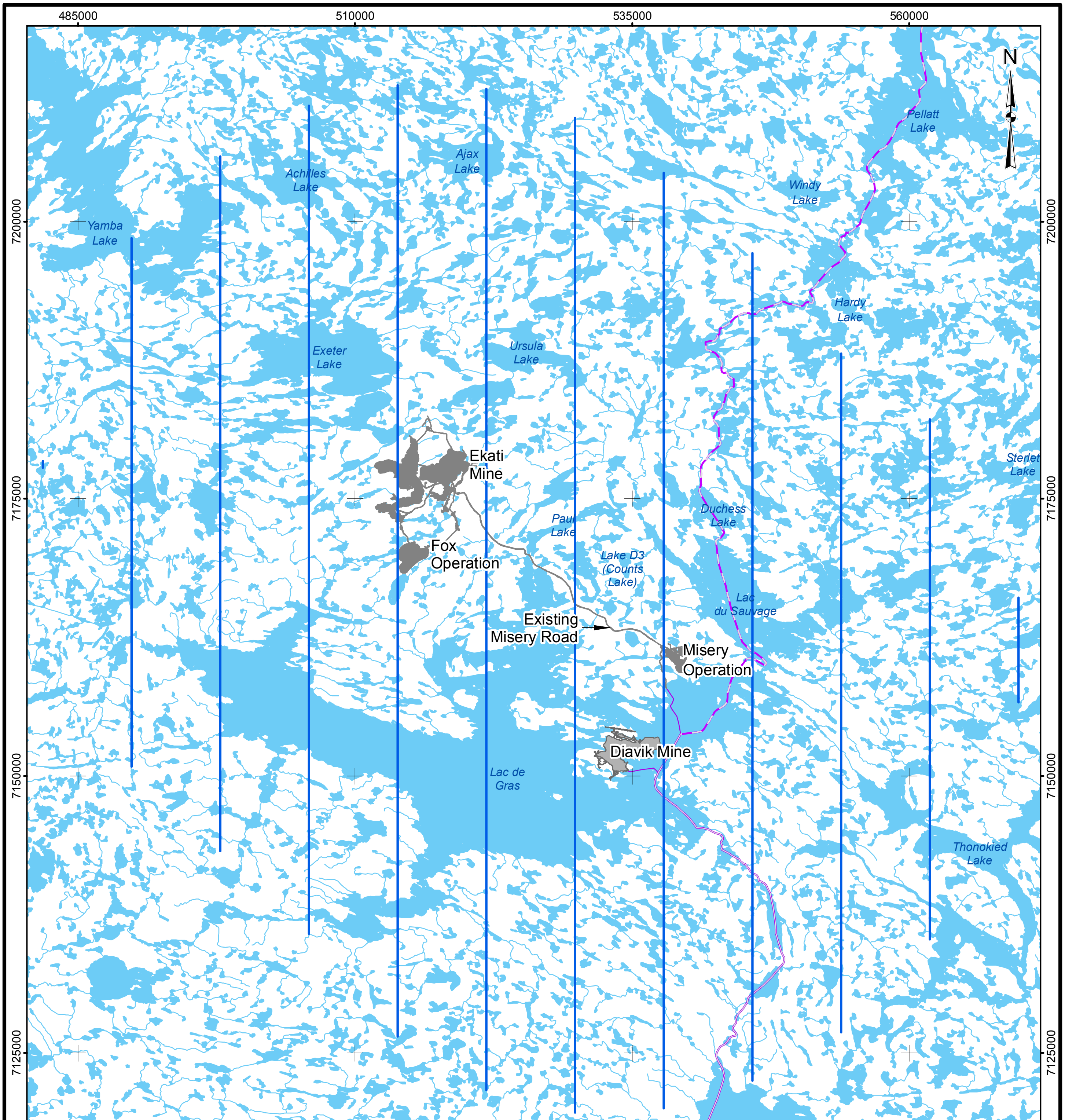
2.1.1.1.2 Caribou Behavioural Response Studies

Information to determine whether the dominant behaviour of caribou groups (with and without calves) varies with distance to the mine (i.e., activity budgets) has been collected at the Ekati Mine since 1998 using an established monitoring program (Rescan1999). Observations of caribou groups at various distances from the mine and group behaviours at specified time intervals were recorded (scan surveys). Data in 1998 were not geo-referenced and so could not be used in the analysis. From 2001 to 2009, the activity budget study was expanded to include recording of caribou groups responses to stressors (Rescan 2012a). From 2004 to 2008, increased effort was made to collect scan survey samples at greater than 7 km from the Ekati Mine (Rescan 2010a).

Caribou behavioural responses to natural and human-caused stimuli at the Diavik Mine were documented from opportunistic observations from 1995 to 1997 (DDMI 1998). Additional observations of caribou response to human-caused stimuli were obtained during deflection trials completed in 1996 and 1997 (DDMI 1998). From 2003 to 2005, Diavik Mine implemented opportunistic ground-based behaviour scanning surveys (DDMI 2006). During these surveys, behavioural observations were recorded every eight minutes, and a minimum of four behavioural observations (32 minutes) were required for the scan to be considered valid. Because the number of caribou successfully surveyed in this manner was small, Diavik Mine implemented a more structured program for caribou scanning observations in 2006, which noted behavioural observations during aerial surveys (DDMI 2007).

In 2009, the Ekati and Diavik mines worked collaboratively to increase effort at sites farther from the two mines. Diavik Mine focused efforts in areas greater than 14 km from either mine (i.e., outside of the suggested zone of influence) (DDMI 2010) and Ekati Mine focussed efforts in areas close to the mine (Rescan 2010a). Data collected in 2009 were shared between the two mines.

In 2010, Ekati Mine began recording caribou behaviours using focal sampling on a single animal. Focal sampling involves observing a single animal for a minimum period of time, and time stamping changes in behaviour over the sampling period (ERM Rescan 2014a). Focal observations are more useful for obtaining information on activity budgets than scan sampling. Caribou groups were scanned every eight minutes for a minimum of four observations and a maximum of eight observations. Observers recorded caribou group composition, number of animals in each group, number of animals exhibiting each behaviour, and level of insect harassment.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- WATERCOURSE
- WATERBODY
- AERIAL SURVEY TRANSECT

10 0 10

SCALE 1:500,000 KILOMETRES

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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

CARIBOU AERIAL SURVEY TRANSECTS, EKATI AND DIAVIK MINES, 2009 AND 2012

Golder Associates

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REVIEW	SM	09/09/14		

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2.1.1.1.3 Caribou Distribution Relative to Roads

Opportunistic surveys were completed at the Ekati Mine from 2001 to 2010 (Rescan 2011) to determine whether caribou groups with calves were distributed similarly to non-nursery groups relative to roads and whether caribou group behaviours varied with distance from the road (the monitoring was later replaced by the Caribou Camera Monitoring Program). From 2001 to 2003, records of survey distances were kept so that the number of caribou observed per distance surveyed (encounter rates) could be calculated. From 2004 to 2010 records of survey distances were not kept. Instead, when caribou were recorded within the 200-metre (m) scan area, they were recorded in one of three distance categories: on the road; within 50 m of the edge of the road; or within 50 to 200 m from the edge of the road. Only caribou within 200 m of the road were recorded.

2.1.1.1.4 Permeability of Roads to Caribou

The permeability of roads to caribou was monitored by recording snow track patterns along the side of the Misery Haul Road at the Ekati Mine during the northern migration. The objective of the study was to determine whether the Misery Haul Road was a barrier to caribou movement and whether the frequency of caribou crossing varied with factors such as traffic volume and snow bank height. Surveys were completed in late April and May between 2002 and 2010 (Rescan 2011). The survey has since been replaced by the Caribou Camera Monitoring Program (ERM Rescan 2014b).

2.1.1.1.5 Caribou Long Lake Containment Facility Monitoring

From 1999 to 2013, opportunistic monitoring for caribou in the Ekati Mine's Long Lake Containment Facility (a facility to receive and store fine processed kimberlite and waste water) was completed to determine the frequency of use, group size, group composition, and dominant group behaviours of caribou observed in the Long Lake Containment Facility (ERM Rescan 2013). Monitoring in 2011 to 2013 was completed using camera-based monitoring (see below).

2.1.1.1.6 Caribou Camera Monitoring Program

Camera-based monitoring of caribou at the Ekati Mine was implemented in 2011 and continued into 2013 (ERM Rescan 2014b). A total of 229 infrared motion-triggered cameras were deployed around the mine site between 2011 and 2013. Cameras were placed around project infrastructure, such as road and fences, to collect data on caribou numbers, movements, and behaviours around these mine structures. Cameras placed along the Misery Haul Road, Pigeon Road, Sable Road, Pigeon Stream Diversion Access Road, Pigeon Fence, Waste Rock Storage Facility, Fox Pit and Beartooth Fence were used in statistical analyses. The primary objectives of the caribou camera monitoring program were to:

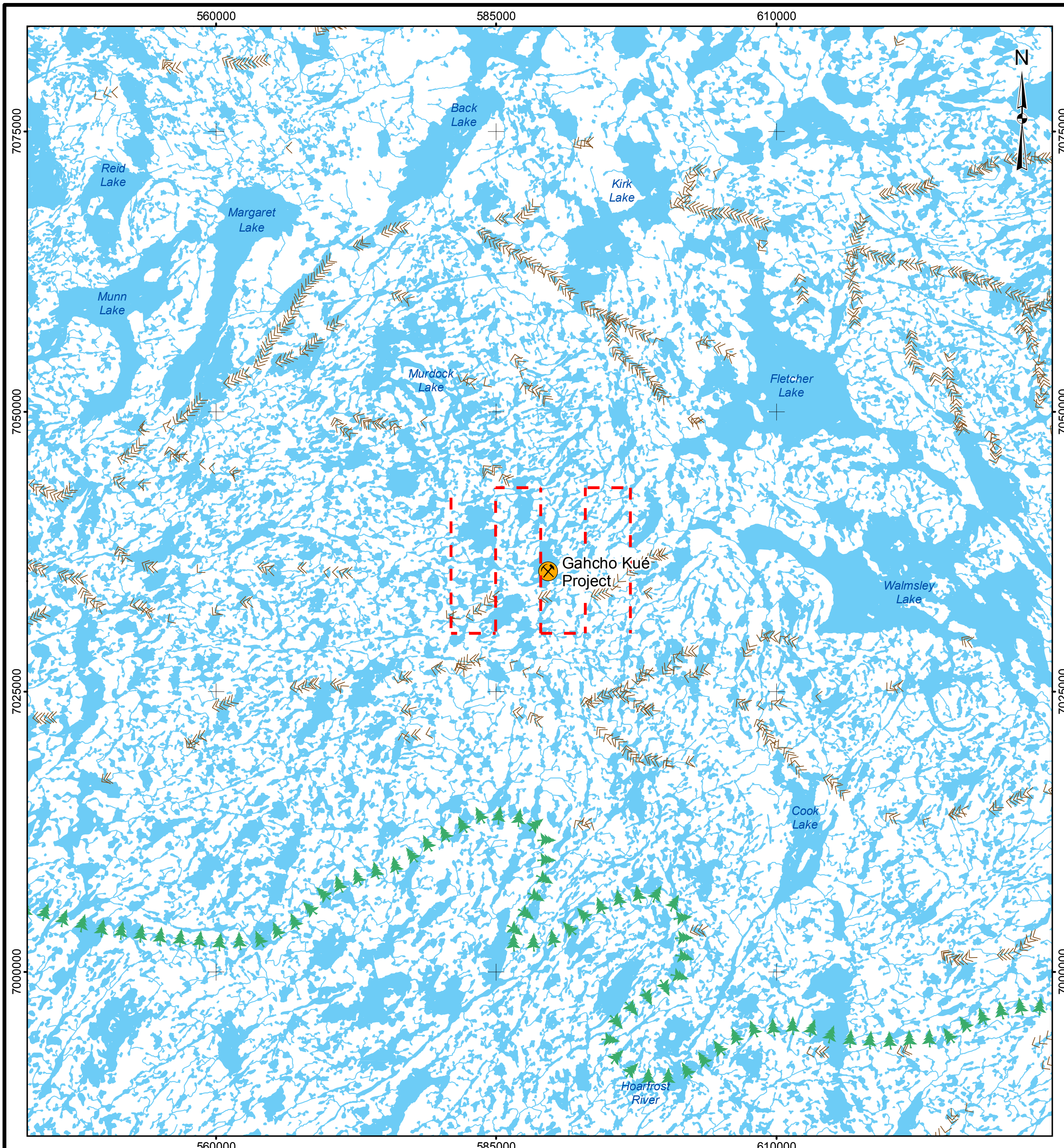
- determine and compare temporal trends in caribou abundance around the Ekati Mine;
- determine and compare which locations have the highest numbers of caribou and which may be avoided;
- determine and compare relative frequencies of behaviours in caribou among locations;
- determine whether the structure of tundra roads deters caribou from crossing;
- determine whether alert behaviours near the road are associated with traffic; and,
- determine whether plastic fencing causes adverse behavioural reactions.

2.1.1.2 Gahcho Kué Project

Initial aerial reconnaissance surveys to document barren-ground caribou and caribou sign in the Gahcho Kué Project study area and along the Gahcho Kué winter access road route were completed in 1996 and 1998 (De Beers 2008). Additional aerial reconnaissance surveys were completed in the Gahcho Kué Project study area and along the winter access road route from 1999 to 2003 (Table 2.1-1; Map 2.1-2). In 2004 and 2005, systematic aerial surveys were completed. Aerial surveys in 2004 did not have a fixed transect survey area (i.e., all animals that were seen were recorded). In 2005, the aerial surveys had a fixed width of 600 m on either side of the helicopter.

Table 2.1-1 Barren-Ground Caribou Aerial Survey Dates in the Gahcho Kué Project Study Area, 1999 to 2005

Year	Date
1999	May 6 to 9; July 17 to 22; October 3 and 4
2000	September 10; October 13
2001	May 10; October 25
2002	May 8; July 2 to August 31; September 25
2003	May 13; August 4; October 4
2004	May 4 to 7; May 26 to 28; October 8 and 9
2005	March 28 to 31; April 30 to May 2; May 18 to 20; July 28 to 31; September 22 to 25



LEGEND

- ESKER
- TREELINE
- WATERCOURSE
- WATERBODY
- GAHCHO KUÉ PROJECT
- SURVEY TRANSECT

10 0 10

SCALE 1:500,000 KILOMETRES

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

CARIBOU AERIAL SURVEY TRANSECTS, GAHCHO KUÉ PROJECT, 1999 TO 2005

REFERENCE

DE BEERS 2008
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

DOCUMENT

WILDLIFE BASELINE REPORT

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_015_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14	MAP 2.1-2	
CHECK	CG	09/09/14		
REVIEW	SM	09/09/14		

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2.1.1.3 Snap Lake Mine

Systematic aerial surveys were completed in the Snap Lake Mine study area from 1999 to 2011 during the caribou post-calving period (Table 2.1-2; De Beers 2013a). Seven transect lines, spaced 8 km apart, were flown in a north-south direction following a predetermined flight path using Global Positioning System (GPS) coordinates. In 1999 and 2000, aerial transect surveys were unbounded (i.e., all animals observed were recorded), within an estimated 1 km on either side of the helicopter. Beginning in 2001, only caribou within 600 m of either side of the helicopter along a transect line were counted. Caribou observations off-transect were not recorded, unless the group size was large (e.g., 1,000 animals). Off-transect observations were not included in the analyses.

Table 2.1-2 Aerial Survey Dates During the Caribou Post-Calving Migrations in the Snap Lake Mine Study Area, 1999 to 2011

Year	Date
1999	July 21, 22, 23
2000	July 21; August 17
2001	August 8, 11, 16; October 24
2002	July 23; August 2, 10; September 30
2003	July 25, 29; September 27; October 17
2004	July 28; September 17, 23
2005	July 28; September 14; October 13, 21
2006	September 19; November 10
2007	September 18, 28; October 23
2008	September 16
2009	October 1
2010	November 15
2011	November 2

2.1.2 Muskoxen

2.1.2.1 Ekati and Diavik Mines

Specific surveys for muskoxen have not been completed at the Ekati and Diavik mines but incidental observations of muskoxen have been recorded during caribou aerial surveys and other caribou surveys (Section 2.1.1.1) (DDMI 2013; ERM Rescan 2013).

2.1.2.2 Gahcho Kué Project

Between 1995 and 2005, incidental observations of muskoxen were recorded during caribou aerial surveys in the Gahcho Kué Project study area (Section 2.1.1.2) (De Beers 2008). Aerial and ground surveys of eskers were completed in 2007 to document the presence of muskoxen sign on all eskers within 35 km of the Gahcho Kué Project. The eskers were initially surveyed using a helicopter; follow-up surveys were completed on the ground in the locations where wildlife sign was observed during the aerial survey.

2.1.2.3 Snap Lake Mine

Specific surveys for muskoxen have not been completed at the Snap Lake Mine but incidental observations of muskoxen have been recorded during caribou aerial surveys (Section 2.1.1.3) (De Beers 2013a). Mine personnel have also maintained a wildlife log for incidental observations of wildlife, including muskoxen.

2.1.2.4 Government of the Northwest Territories

In 1989, surveys for muskoxen were completed near Artillery Lake in Wildlife Management Zone (WMZ) U/MX/02 (Bradley et al. 2001). In 1991, additional surveys were completed, centered on Aylmer Lake in WMZ U/MX/01 (Fournier and Gunn 1998). Population surveys in U/MX/02 were repeated in July 1998 (Bradley et al. 2001).

2.1.3 Moose

2.1.3.1 Ekati and Diavik Mines

Specific surveys for moose have not been completed at the Ekati and Diavik mines but incidental observations of moose have been recorded during caribou aerial surveys (Section 2.1.1.1) (DDMI 2013; ERM Rescan 2013).

2.1.3.2 Gahcho Kué Project

Between 1995 and 2012, incidental observations of moose were recorded during caribou aerial surveys in the Gahcho Kué Project study area (Section 2.1.1.2) (De Beers 2010a; 2013b).

2.1.3.3 Snap Lake Mine

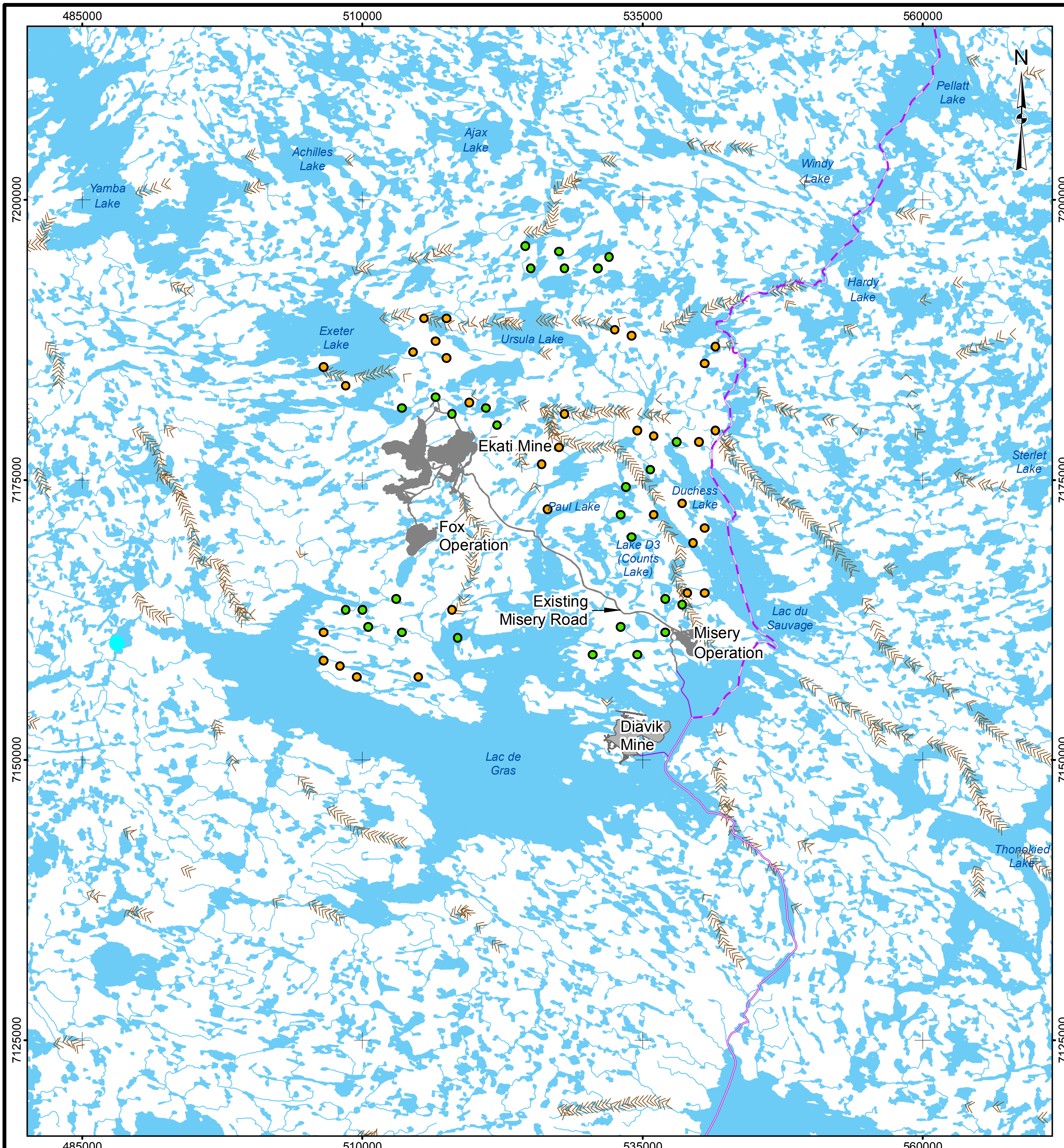
Specific surveys for moose have not been completed at the Snap Lake Mine but incidental observations of moose have been recorded during caribou aerial surveys (Section 2.1.1.3) (De Beers 2013a).

2.1.4 Barren-Ground Grizzly Bear

2.1.4.1 Ekati and Diavik Mines

2.1.4.1.1 Habitat Surveys

Habitat surveys to determine the presence of grizzly bear sign in various habitat types in the BSA were completed between 1999 and 2008 (BHP Billiton 2009). In 1999, surveys were completed within different habitat types. From 2000 to 2008, surveys focused on habitats with high potential for finding grizzly bear sign. A total of 60 permanent survey plots were established in sedge wetland (30 plots) and riparian (30 plots) habitats (Map 2.1-3). Surveys in sedge wetland habitats were completed in June and July, while surveys in riparian habitats were completed in late July and early August. Survey plots were 500 by 500 m, and surveys were standardized to one hour and completed by two observers. All recent bear sign (dens, diggings, tracks, scat, hair, and kill sites) was recorded. Habitat plot surveys were suspended in 2009 due to safety concerns associated with this program; improved study designs (e.g., DNA studies) were considered.



LEGEND

EKATI MINE FOOTPRINT
DIAVIK MINE FOOTPRINT
WINTER ROAD
TIBBITT TO CONTWOYTO WINTER ROAD
NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
ESKER
WATERCOURSE
WATERBODY

GRIZZLY BEAR PLOT
RIPARIAN PLOT
WETLAND PLOT

10 0 10
SCALE 1:500,000 KILOMETRES

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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
GRIZZLY BEAR HABITAT STUDY AREA, EKATI MINE, 2000 TO 2008

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_006_GIS	
DESIGN	LD	15/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14		
CHECK	CG	09/09/14	MAP 2.1-3	
REVIEW	SM	09/09/14		

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Grizzly bear habitat surveys were completed in the Diavik Mine study area from 2002 to 2008 (DDMI 2009). A total of 36 randomly selected 500 by 500 m plots were set up within the Diavik Mine study area (Map 2.1-4). Each plot contained at least 25 percent (%) sedge wetland or riparian shrub habitats. Each plot was searched for bear sign for approximately one hour by two observers and all bear sign (dens, diggings, tracks, scat, hair, and kill sites) was documented. Surveys in sedge wetland plots were completed in early July, and plots in riparian shrub habitat were surveyed in early August. Habitat plot surveys were suspended in 2009 due to safety concerns associated with this program; improved study designs (e.g., DNA studies) were considered.

2.1.4.1.2 Hair Snagging Surveys

A hair snagging pilot study was completed jointly by Diavik Diamond Mines Inc. (DDMI) and BHP Billiton Canada Inc. (BHP Billiton) in 2010 and 2011 (DDMI 2012; Rescan 2012a). Eight hair snagging stations were located in 10 x 10 km cells surrounding Ekati Mine. Stations were re-surveyed three times.

A regional grizzly bear hair snagging study was jointly implemented by the Ekati and Diavik mines in 2012 (DDMI 2013; ERM Rescan 2013). A total of 113 stations were surveyed and arranged in a grid pattern spaced approximately 12 x 12 km (Map 2.1-5). Stations consisted of a wooden tripod with barbed wire wrapped around the legs and were located in high-quality grizzly bear habitat (i.e., esker, riparian, upland meadow, wetland meadow). Non-reward lures were used to attract bears to the tripods. There were six sampling sessions between June 23 and September 4, 2012. Each session lasted between 9 and 13 days. At the end of each session, the snagged hair was removed and placed in a paper envelope. Each grouping of hair was stored separately and was sent to Wildlife Genetics International in Nelson, British Columbia for DNA fingerprinting.

In 2013, a regional grizzly bear monitoring program was implemented to support the GNWT Environment and Natural Resources (ENR) with cumulative effects monitoring (Rescan 2012b). This program includes the use of hair snagging stations in a 30,000 km^2 area in the North Slave Region located around the Project, the Ekati, Diavik, and Snap Lake mines, and the Gahcho Kué Project (Map 2.1-6).
The abundance and distribution of grizzly bears will be determined using DNA markers to track individuals through time.

LEGEND

EKATI MINE FOOTPRINT
DIAVIK MINE FOOTPRINT
WINTER ROAD
TIBBITT TO CONTWOYTO WINTER ROAD
NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
ESKER
WATERCOURSE
WATERBODY

GRIZZLY BEAR PLOT

RIPARIAN PLOT
WETLAND PLOT

10 0 10
SCALE 1:500,000 KILOMETRES

REFERENCE

DDMI 2009
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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
GRIZZLY BEAR HABITAT STUDY AREA, DIAVIK MINE, 2002 TO 2008

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_007_GIS
DESIGN	LD	15/01/14	SCALE AS SHOWN REV. 0
GIS	DW	09/09/14	
CHECK	CG	09/09/14	MAP 2.1-4
REVIEW	SM	09/09/14	

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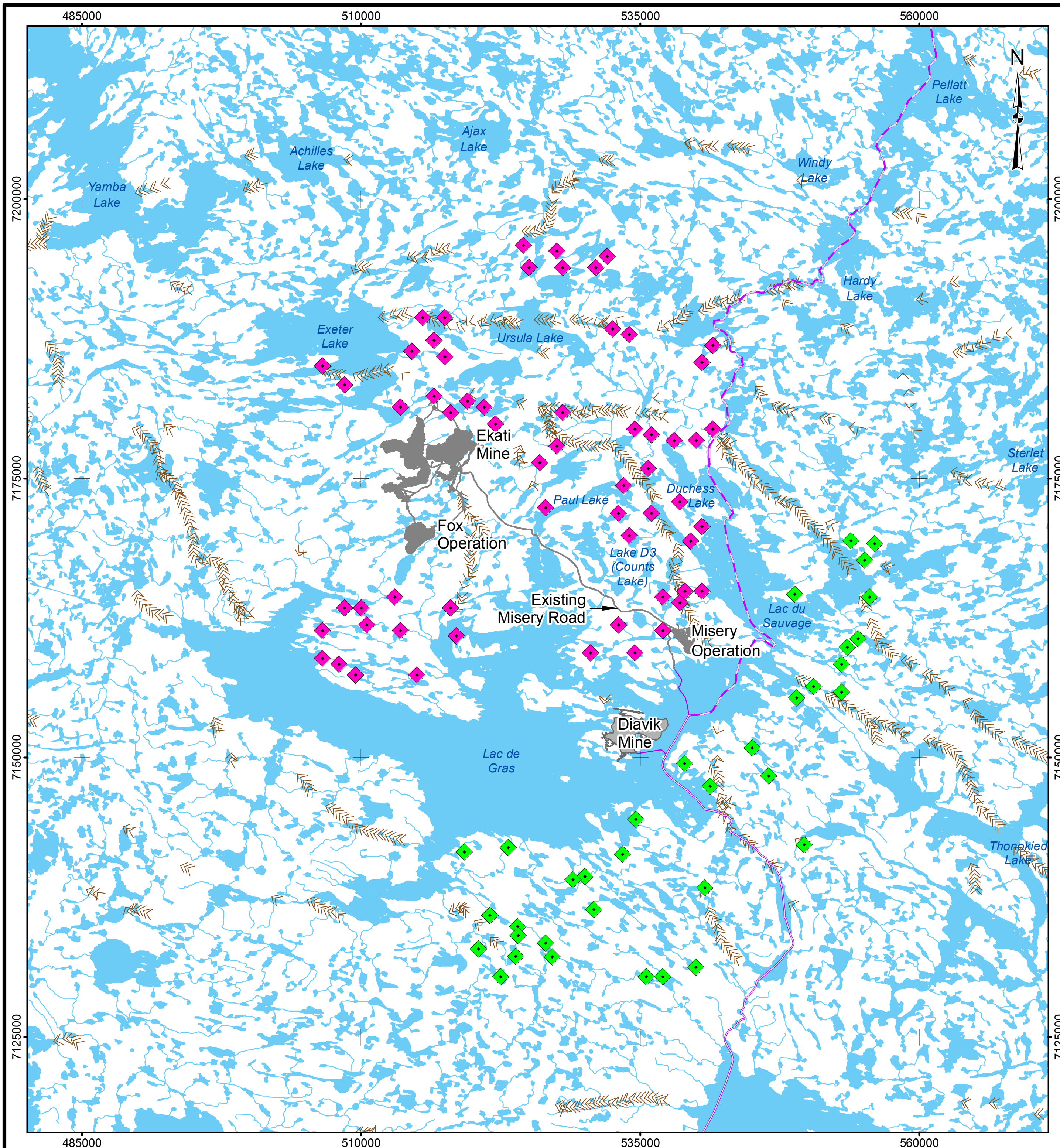

LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ESKER
- WATERCOURSE
- WATERBODY
- DIAVIK HAIR SNAGGING STATION
- EKATI HAIR SNAGGING STATION

10 0 10

SCALE 1:500,000 KILOMETRES

REFERENCE

DDMI 2013, ERM RESCAN 2013
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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

BARREN-GROUND GRIZZLY BEAR HAIR SNAGGING STATIONS, EKATI AND DIAVIK MINES, 2012

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_017_GIS	
DESIGN	LD	15/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	11/09/14	**MAP 2.1-5**	
CHECK	CG	11/09/14		
REVIEW	SM	11/09/14		

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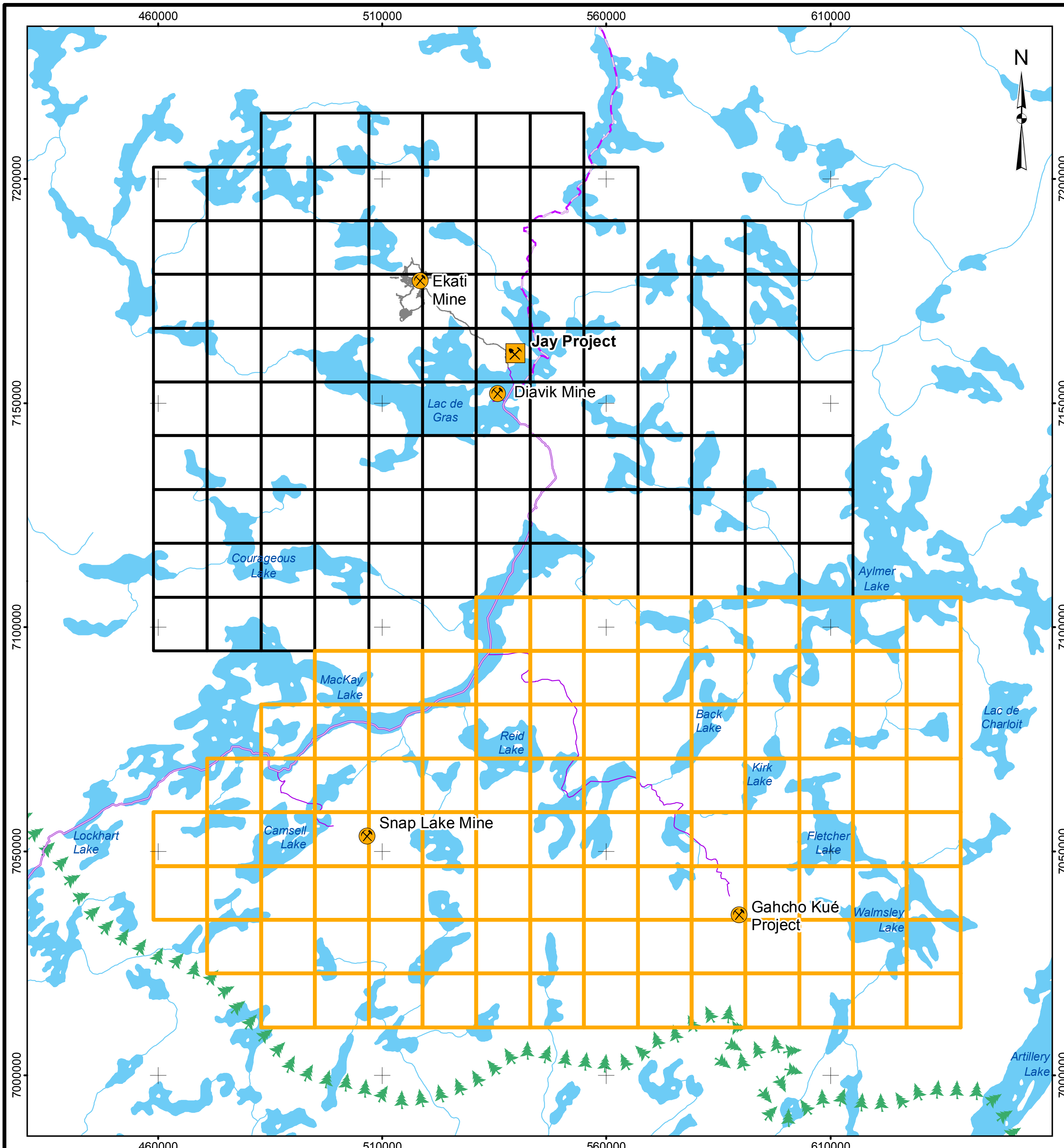

LEGEND

- JAY PROJECT
- EXISTING MINE OR PROJECT
- EKATI MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- TREELINE
- WATERCOURSE
- WATERBODY
- BHP BILLITON/RIO TINTO STUDY AREA
- DE BEERS CANADA INC. STUDY AREA

25 0 25

SCALE 1:1,250,000 KILOMETRES

REFERENCE

RESCAN 2012b
WATER OBTAINED FROM ATLAS OF CANADA
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

BARREN-GROUND GRIZZLY BEAR HAIR SNAGGING GRID, NORTH SLAVE REGION, 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_008_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	10/09/14	MAP 2.1-6	
CHECK	CG	10/09/14		
REVIEW	SM	10/09/14		

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2.1.4.2 Gahcho Kué Project

2.1.4.2.1 Esker Surveys

Esker aerial surveys were completed for the Gahcho Kué Project in 1998, 1999, 2001, and 2004 to identify historic and active grizzly bear and carnivore dens in the Gahcho Kué Project study area (De Beers 2008). Bear dens were also recorded during aerial surveys for caribou, and during non-systematic aerial searches of select areas deemed to have high potential for bear den habitat (1998 to 2005). Surveys for grizzly bear sign along eskers and esker complexes that were identified as possible sources of gravel material within 35 km of the Gahcho Kué Project were completed in 2007.

Ground reconnaissance surveys for the Gahcho Kué Project that were completed on June 23, 29, and 30, 1998, investigated the main esker along the southern portion of the project study area, as well as another prominent esker located approximately 12 km southeast of Kennady Lake (Jacques Whitford 1998). On August 15, 25, and 26, 1998, the main esker in the study area was surveyed again: the survey focused on the portion of the esker proposed for excavation of borrow materials.

The total number of each sign type (i.e., dens, digs, rubs, hair, scat, or tracks), as well as any bears present were summarized by habitat type. The probability of grizzly bear sign occurrence by habitat with confidence intervals (based on a binomial distribution) was also calculated. Data collected from baseline studies within the Gahcho Kué Project study area were also compared to regional data collected at the Snap Lake Mine and the Ekati and Diavik mines. The estimate of collared-bear distribution was based on studies completed from 1995 to 1999 (McLoughlin et al. 1999) because current collar data for grizzly bears located within or adjacent to the Gahcho Kué Project study area were not available.

Esker surveys completed from May 28 to June 1, 2004, were timed to occur after the emergence of grizzly bears from den sites, which occurs from about mid-April through mid-May (McLoughlin 2000). Using a helicopter, each side of every esker was surveyed at a flight speed of approximately 80 kilometres per hour (km/h) and an altitude of 30 m above ground level. The crew consisted of the pilot and three trained observers. Snow cover during the 2004 survey was between 70% and 80%, and the base of most eskers remained covered. Although the snow cover prevented finding older grizzly bear den sites, active den sites were relatively easy to detect. Potentially active bear dens were checked on the ground during the snow-free season in late July for verification of overwinter occupancy (i.e., fresh dirt and bedding material). During the survey, den site locations were recorded with a GPS, as were incidental observations of grizzly bears and grizzly bear sign.

On July 25 and 26, 2004, 17.5 km of the main esker within the Gahcho Kué Project study area was surveyed on foot (De Beers 2008). One person walked the top portion of the esker, while two others walked each side of the esker. The ground survey identified any den sites that were missed during the aerial survey.

2.1.4.2.2 Hair Snagging Surveys

Limited success of previous surveys to detect changes in grizzly bear activity and distribution from searches for bear sign (e.g., tracks, digs, and scat) at the Gahcho Kué Project (completed in 2005 and 2007; Section 2.1.4.2.2) and other mine developments in the NWT (Marshall 2009; Handley 2010) has resulted in testing of alternative study designs that will address problems with detection of species presence. In 2010 and 2011, a grizzly bear hair snagging pilot study was implemented at the Gahcho Kué Project as part of baseline monitoring as an alternative to earlier monitoring designs (De Beers 2010a; Golder 2012). Forty hair snagging stations were distributed throughout the survey's study area in sedge wetlands habitat locations surveyed for fresh sign of bear activity during previous years. Hair snagging stations were placed in sedge wetland habitats to increase the likelihood of bears encountering the hair snagging stations, based on patterns of seasonal diet and habitat preferences of barren-ground grizzly bears (Gau et al. 2002; McLoughlin, Case et al. 2002). Each station was surveyed every 10 to 14 days (three times in 2010 and four times in 2011) for the presence of hair. The pilot study produced limited and variable results for measuring mine-related effects on bears (De Beers 2010a; Golder 2012).

In 2013, a regional grizzly bear monitoring program was implemented to support ENR with cumulative effects monitoring (Rescan 2012b). This program included the use of hair snagging stations in a 30,000 km^2 area in the North Slave Region located around the Project, the Ekati, Diavik, and Snap Lake mines, and the Gahcho Kué Project (Map 2.1-6). The abundance and distribution of grizzly bears was determined using DNA markers to track individuals through time. This program was completed by De Beers in collaboration with the University of Calgary.

2.1.4.3 Snap Lake Mine

2.1.4.3.1 Habitat Surveys

From 2001 to 2009, bear surveys in Snap Lake Mine study area have focused on searches for bear sign in randomly selected sedge wetland and riparian habitat plots (De Beers 2010b). Plot selection criteria required at least 30% sedge wetland or 10% riparian shrub habitat/birch seep vegetation classes within a 250 x 250 m area. Sedge wetland plots were surveyed late June to early July, and riparian shrub/birch seep plots were surveyed in mid-August. The search occurred within a 1-km radius from the centre of the plot and was searched by two observers for one hour. Observers recorded all bear sign, including beds, digs, tracks, scat, hair, and prey remains. All bear sign found was recorded, but only fresh sign from bear activity that had occurred in the year of the survey (i.e., since den emergence) was included in the analysis.

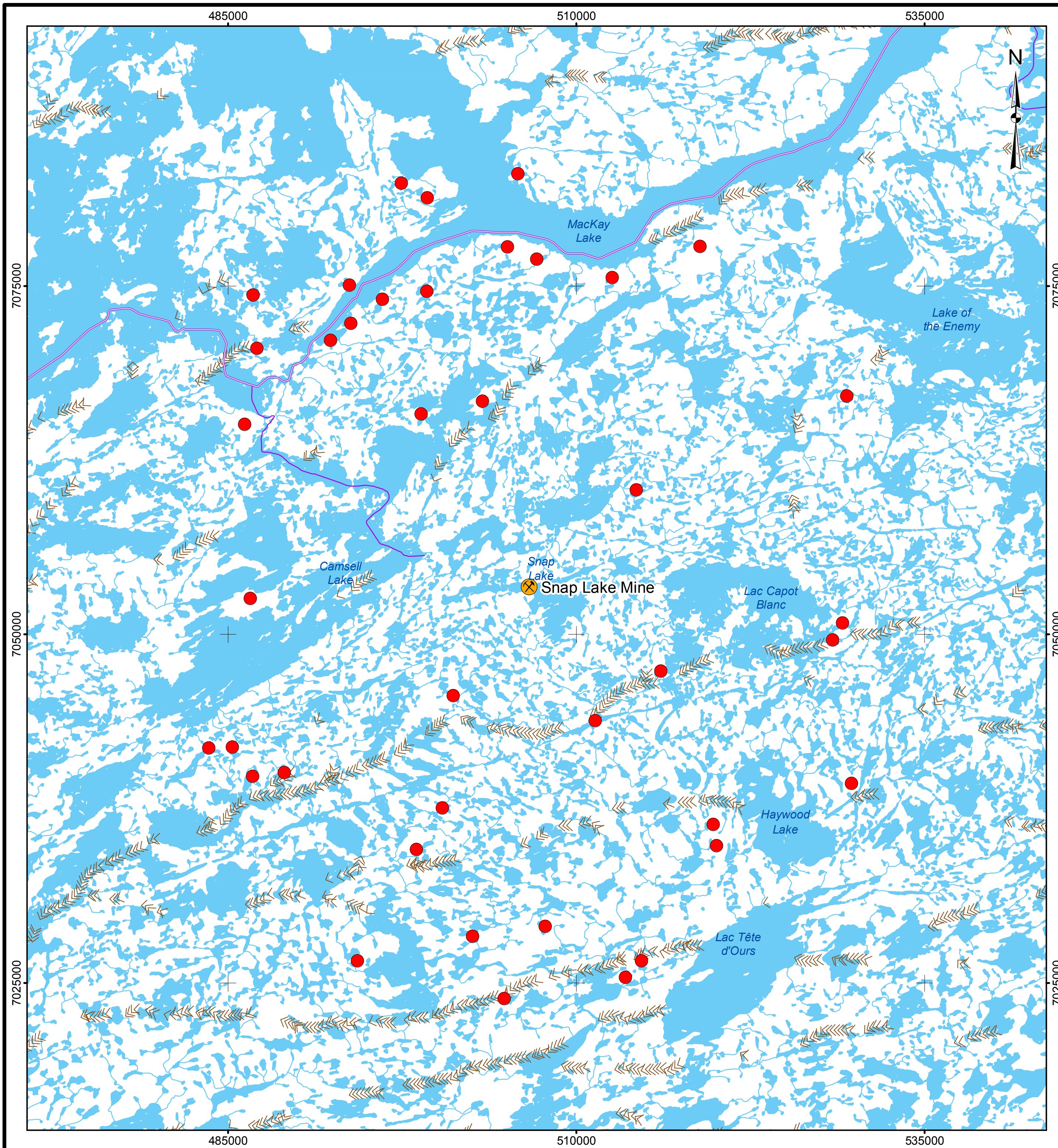
Although the method for plot searches has not changed since the inception of the habitat-based technique in 2001, the plot selection criteria were augmented for the riparian shrub/birch seep and sedge wetland habitats in 2004 and 2006 to expand the number and geographic distribution of these plots. Up to 40 sedge wetland and 40 riparian shrub/birch seep plots have been surveyed annually.

2.1.4.3.2 Hair Snagging Surveys

Due to the limited success of habitat surveys to determine bear activity and distribution, a hair snagging program was piloted in 2010 and 2011 (De Beers 2013a). Forty hair snagging stations were distributed throughout the study area in sedge wetlands habitat locations surveyed for fresh sign of bear activity during previous years (Map 2.1-7). Minor changes to the survey occurred in 2011, specifically the survey of stations during autumn and the use of alternate non-reward lures. These changes were implemented in an effort to increase the number of stations that collect grizzly bear hair. Four surveys documenting the presence of bear hair occurred from August 3 to 4, August 17 to 18, August 31 to September 1, and September 11 to 12, 2011.

Following the initial set-up period, each station was visited four times, at 10-day intervals. Hair samples collected from the barbed wire were identified to species by a community assistant or expert, and archived for possible DNA fingerprinting to validate species identification. Residual hair that could not be removed from the barbed wire was burned with a torch to avoid confusion about the presence of new hair during subsequent visits. Fresh lure was applied to each station after each visit to attract bears. No lure was applied at the last visit.

In 2013, a regional grizzly bear monitoring program was implemented to support ENR with cumulative effects monitoring (Rescan 2012b). This program includes the use of hair snagging stations in a 30,000 km^2 area in the North Slave Region located around the Project, the Ekati, Diavik, and Snap Lake mines, and the Gahcho Kué Project (Map 2.1-6). The abundance and distribution of grizzly bears will be determined using DNA markers to track individuals through time.



LEGEND

- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- ESKER
- WATERCOURSE
- WATERBODY
- BEAR HAIR SNAGGING STATION
- EXISTING MINE

8 0 8

SCALE 1:400,000 KILOMETRES

REFERENCE

DE BEERS 2013A
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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

BARREN-GROUND GRIZZLY BEAR HAIR SNAGGING STATIONS, SNAP LAKE MINE, 2010 AND 2011

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_009_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14		
CHECK	CG	09/09/14	**MAP 2.1-7**	
REVIEW	SM	09/09/14		

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2.1.5 Wolverine

2.1.5.1 Ekati and Diavik Mines

2.1.5.1.1 Snow Track Surveys

From 2003 to 2006, 23 transects of variable length within a 1,270 km^2 study area surrounding the Diavik Mine were surveyed for wolverine tracks (Map 2.1-8; DDMI 2011). Transects were established within habitats that contained boulders and valleys, and intersected lakes and drainages (Golder 2005). The length of individual transects ranged from 1.5 to 13 km (mean of 6.4 km). A change in survey design was implemented in 2008 and 2009 to increase statistical power to detect changes in wolverine occurrence in the study area (DDMI 2011). Design changes include the placement of 40 transects of equal length (4 km long) located in areas of preferred wolverine habitat, including heath tundra or heath boulder habitat (Map 2.1-8).

2.1.5.1.2 Hair Snagging Surveys

In 2005, 2006, 2010, and 2011, a regional wolverine DNA study was completed in four sampling grids in the SGP (Daring Lake, Ekati Mine, Diavik Mine, and Kennady Lake) (Map 2.1-9; Rescan 2012a). Two crews with two crew members each installed 184 baited posts within the sampling grid that covered part of each project's study area. Scent posts were wrapped in barbed wire and positioned within a 3 x 3 km grid cell. Following the initial set-up period, each post was sampled twice during two 10-day sessions. Hair samples collected from the barbed wire were submitted for DNA analysis.

Surveys were completed by snowmobile during eight periods over six years (Table 2.1-3). Two observers drove parallel to each other, separated by approximately 25 m, to reduce the chance of missing tracks. Surveys were completed in late March and April (late winter) of each year but additional surveys were completed in December 2004 and 2005 (mid-winter).

Table 2.1-3 Survey Periods for Wolverine Snow Track Surveys in the Diavik Mine Study Area, 2003 to 2009

Year	Survey Period
2003	April 10 to April 12
2004	April 16 to April 24
2004	December 2 to December 8
2005	March 30 to March 31
2005	December 7 to December 12
2006	March 30 to April 1
2008	April 30 to May 2
2009	April 2 to April 6

LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- SNOW TRACK TRANSECT, 2003 TO 2006
- SNOW TRACK TRANSECT, 2008 TO 2009

5 0 5

SCALE 1:250,000 KILOMETRES

REFERENCE

DDMI 2011
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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

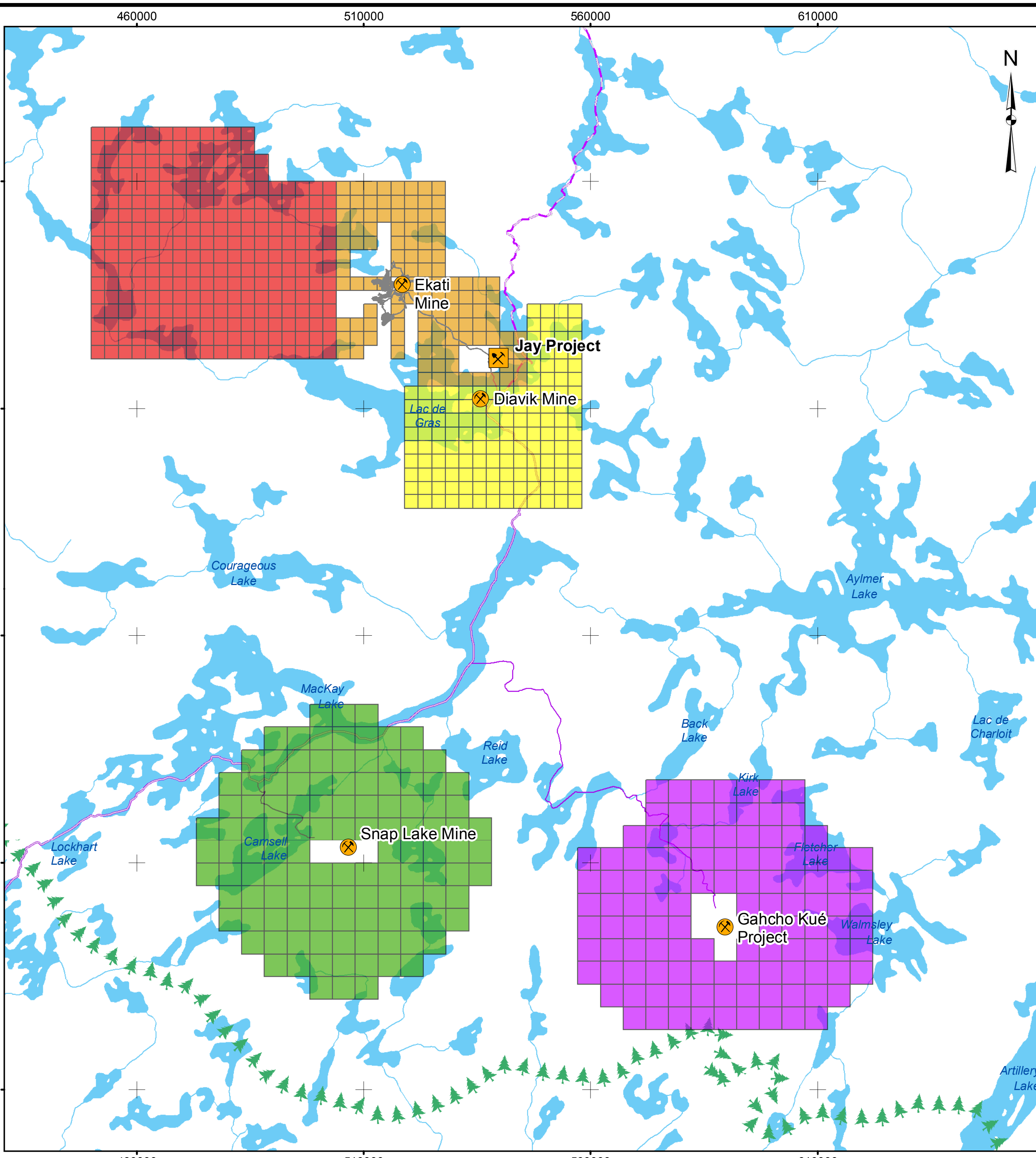
TITLE

WOLVERINE SNOW TRACK SURVEYS, DIAVIK MINE, 2003 TO 2006 AND 2008 TO 2009

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_010_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14		
CHECK	CG	09/09/14	MAP 2.1-8	
REVIEW	SM	09/09/14		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\Baseline\B_JC_Wild_010_GIS.mxd



LEGEND

JAY PROJECT	WATERCOURSE
EXISTING MINE OR PROJECT	WATERBODY
EKATI MINE FOOTPRINT	DARING LAKE GRID, 2005 TO 2006, AND 2010 TO 2011
WINTER ROAD	DIAVIK GRID, 2005 TO 2006, AND 2010 TO 2011
TIBBITT TO CONTWOYTO WINTER ROAD	EKATI GRID, 2005 TO 2006, AND 2010 TO 2011
NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD	GAHCHO KUÉ GRID, 2013
TREELINE	SNAP LAKE GRID, 2013

25 0 25

SCALE 1:1,250,000 KILOMETRES

REFERENCE

RESCAN 2012A
WATER OBTAINED FROM ATLAS OF CANADA
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

WOLVERINE SAMPLING GRIDS, NORTH SLAVE REGION, 2005, 2006, 2010, 2011 AND 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_026_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	10/09/14		
CHECK	CG	10/09/14	**MAP 2.1-9**	
REVIEW	SM	10/09/14		

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2.1.5.2 Gahcho Kué Project

2.1.5.2.1 Hair Snagging Surveys

A wolverine DNA hair snagging program was completed within a circular 1,600 km^2 study area centred on the Gahcho Kué Project camp between April 16 and May 8, 2005 (De Beers 2008). Two crews with two crew members each installed 175 baited posts within the sampling grid that covered part of the project's study area. Scent posts were wrapped in barbed wire and positioned within a 3 x 3 km grid cell. Following the initial set-up period, each post was sampled twice during two 10-day sessions. Hair samples collected from the barbed wire were submitted for DNA analysis. The survey was repeated in 2006, in conjunction with programs completed at Daring Lake, the Ekati Mine, and the Diavik Mine (reported in Boulanger and Mulders [2007]; Section 2.1.5.1).

In 2013, a regional hair snagging study was completed in conjunction with the Snap Lake Mine (Map 2.1-9). A total of 232 hair snagging posts were set up in a 5 km x 5 km grid, within 30 km of both the Snap Lake Mine and the Gahcho Kué Project; 118 posts were set up near the Snap Lake Mine and 114 posts were set up near the Gahcho Kué Project. Hair snagging posts consisted of a 4 x 4 post wrapped in barbed wire and secured upright in snow. The lure and bait were attached to the top of the post by rebar wire connected to fencing staples hammered into the top of the post.

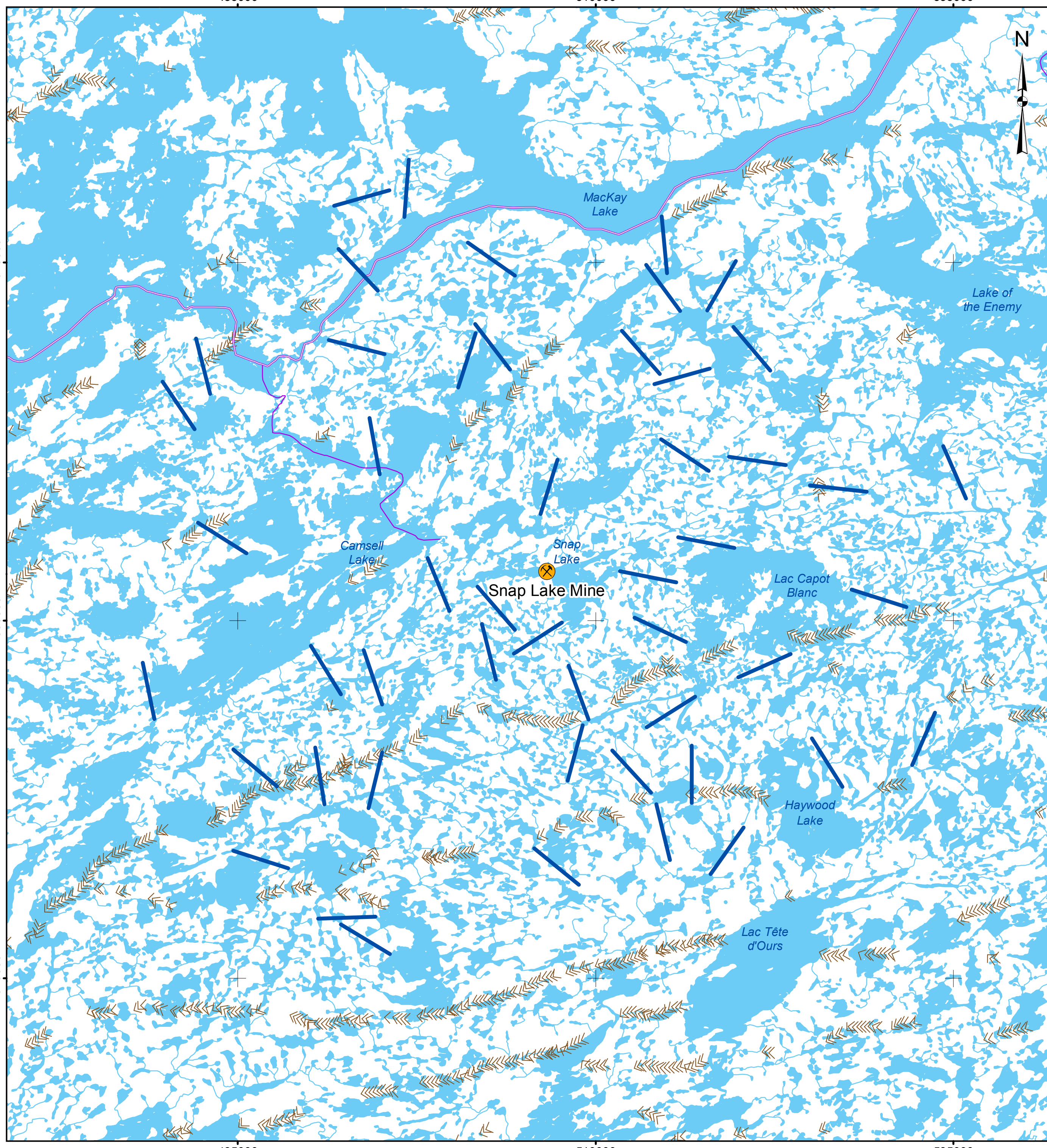
Hair snagging posts around the Gahcho Kué Project were deployed between April 2 and 12, 2013, and were surveyed twice: once between April 13 and 21, 2013, and again between April 28 and May 1, 2013. Posts were surveyed in the order they were deployed and were removed after the second visit by observers.

2.1.5.3 Snap Lake Mine

2.1.5.3.1 Snow Track Surveys

Surveys for wolverine have been completed using fifty 4-km-long transects that passed through boulder, heath tundra/boulder, and shoreline areas in the Snap Lake Mine study area from 2003 through 2012 (Map 2.1-10; De Beers 2013a). Transects were established by stratified random selection of 4 km^2 plots within the study area that contained at least 15% boulder and heath tundra/boulder habitat. Transects intersected the centre of these plots and were oriented to cross the nearest shoreline of the largest body of water within a 3-km radius of the centre of the plot. The study design from 1999 through 2002 included a single 100-km survey route around the proposed Mine (De Beers 2002; Golder 2005).

The survey was completed by snowmobile. Two observers drove parallel to each other, separated by a distance of approximately 25 m to reduce the chance of missing tracks. During the survey, observations were made of the number of wolverine tracks encountered, estimated age of the track, and the GPS location of each track.



LEGEND

- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- ESKER
- WATERCOURSE
- WATERBODY
- EXISTING MINE
- WOLVERINE SNOW TRACK TRANSECT

8 0 8

SCALE 1:400,000 KILOMETRES

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

WOLVERINE SNOW TRACK SURVEYS, SNAP LAKE MINE, 2003 TO 2013

REFERENCE

DE BEERS 2013A
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

DOCUMENT

WILDLIFE BASELINE REPORT

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_013_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14	MAP 2.1-10	
CHECK	CG	09/09/14		
REVIEW	SM	09/09/14		

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2.1.5.3.2 Hair Snagging Surveys

In 2013, a regional hair snagging survey was completed in conjunction with the Gahcho Kué Project. A total of 232 hair snagging posts were set up in a 5 km x 5 km grid within 30 km of both the Snap Lake Mine and the Gahcho Kué Project; 118 posts were set up near the Snap Lake Mine, and 114 posts were set up near the Gahcho Kué Project (Map 2.1-9). Posts were spaced approximately 5 km from each other. Hair snagging posts around the Snap Lake Mine were deployed between April 3 and 16, 2013, and were surveyed twice: once between April 17 and 26, 2013, and again between April 27 and May 7, 2013. Posts were surveyed in the order they were deployed and were removed after the second visit by observers.

2.1.5.4 Government of the Northwest Territories

Wolverine DNA sampling around the Daring Lake, the Diavik and Ekati mines, and the Gahcho Kué Project was completed collaboratively by the GNWT, BHP Billiton, DDMI, and De Beers (Boulanger and Mulders 2013). In 2005, a grid of 284, 141, 118, and 175 3 x 3 km cells was delineated around Daring Lake, the Diavik Mine, the Ekati Mine, and the Gahcho Kué Project (Kennady Lake), respectively, and a bait post was located in the centre of each cell (Boulanger and Mulders 2007) (Map 2.1-9). The number of posts was increased to 133 and the configuration of sampling was changed for the Ekati Mine grid in 2006. Sampling at Daring Lake was completed in 2005, 2006, 2007, 2009, and 2011 (Boulanger and Mulders 2013). Sampling at Diavik and Ekati mines was completed in 2005, 2006, 2010, and 2011. Sampling at the Gahcho Kué Project was completed in 2005 and 2006 (Boulanger and Mulders 2007).

The study was implemented to estimate the population size and density of wolverines, and to complete a demographic analysis to estimate trends in wolverine abundance and examine potential factors related to change in wolverine abundance.

2.1.6 Gray Wolf

2.1.6.1 Ekati and Diavik Mines

Wolf breeding in the Ekati Mine study area was monitored in conjunction with the ENR between 1995 and 2013 to evaluate the potential for mine development to affect wolf den site distribution and breeding success (ERM Rescan 2013). Surveys were completed by ENR during late May to early June to determine den occupancy. Active dens were then re-surveyed by ENR in August to determine the presence of pups.

Incidental observations of wolves in the Ekati Mine and Diavik Mine study areas have been recorded to help determine the presence, timing, and family composition of wolf packs moving through the study areas (DDMI 2013; ERM Rescan 2013).

2.1.6.2 Gahcho Kué Project

Esker surveys were completed in 1998, 1999, 2001, and 2004, to identify historic and active wolf dens in the Gahcho Kué Project study area (De Beers 2008). Wolf dens were also recorded during aerial surveys for caribou, and during non-systematic aerial searches of select areas deemed to have high potential for wolf den habitat (1998 to 2005). Incidental observations of wolves in the study area were also recorded.

When active wolf dens were identified during the aerial and ground surveys, an attempt was made to revisit each site between late July and August 2004, to record pup production. Ground surveys of 17.5 km along the main esker in the Gahcho Kué Project study area were completed on July 25 and 26, 2005. The purpose of the ground survey was to identify any den sites that were missed during the aerial survey.

Wolf sign surveys were completed on July 21 and 23, 2007, along eskers identified as possible sources for gravel material that were within 35 km of the Gahcho Kué Project (De Beers 2008). Wolf use on these eskers was estimated by calculating the sign per kilometre surveyed.

2.1.6.3 Snap Lake Mine

Specific surveys for wolves have not been completed at the Snap Lake Mine; however, incidental observations of wolves have been recorded during surveys for other wildlife species (De Beers 2013a).

2.1.7 Fox

2.1.7.1 Ekati and Diavik Mines

Specific surveys for foxes have not been completed at the Ekati and Diavik mines but incidental observations of foxes have been recorded during surveys for other wildlife species (DDMI 2013; ERM Rescan 2013).

2.1.7.2 Gahcho Kué Project

Esker surveys were completed in 1998, 1999, 2001, and 2004 to identify historic and active fox dens in the Gahcho Kué Project study area (De Beers 2008). Incidental observations of foxes in the Gahcho Kué Project study area were also recorded. Surveys from 1998 to 2005 involved both aerial and ground search methods.

2.1.7.3 Snap Lake Mine

Specific surveys for foxes have not been completed at the Snap Lake Mine; however, incidental observations of foxes have been recorded during surveys for other wildlife species (De Beers 2013a).

2.1.8 Breeding Bird Surveys

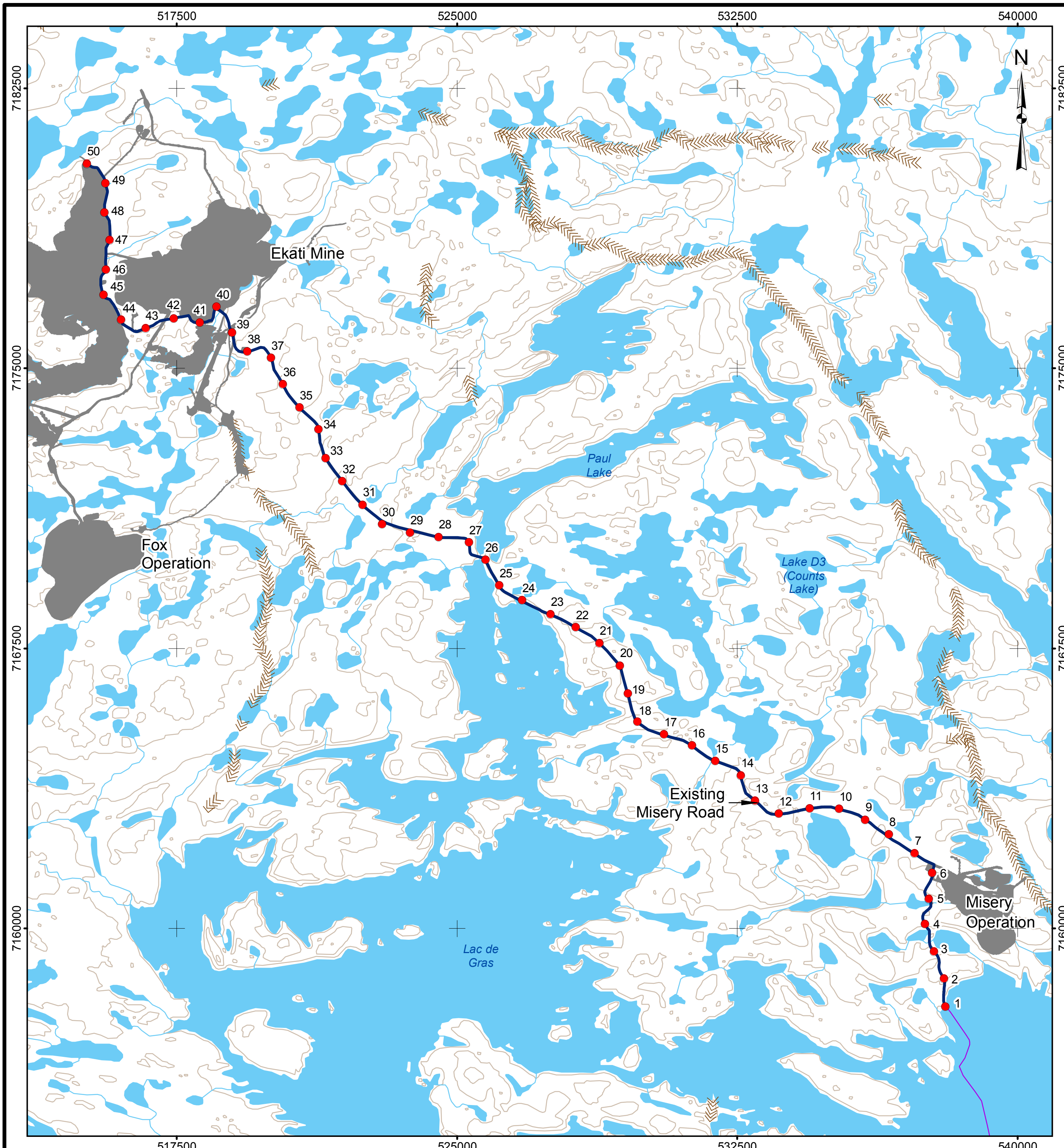
2.1.8.1 Ekati Mine

North American Breeding Bird Surveys were completed at the Ekati Mine from 2003 to 2013 (Rescan 2010b; ERM Rescan 2013). The surveys were completed along the Misery Haul Road and Long Lake Containment Facility Road, and included 50 point counts spaced approximately 0.8 km apart (Map 2.1-11). Surveys were conducted annually in June; they started a half hour before sunrise and concluded before 10:00 am. Each point count was three minutes in length and all bird species seen and heard within 400 m were recorded.

Tundra breeding bird surveys were completed for the Ekati Mine in 1996 and from 1998 to 2008 (surveys were completed in 1997 but were excluded due to limited data) (Rescan 2010a). The surveys were completed by foot on 100-m-wide strip-transects within 500 x 500 m plots classified as either mine or control plots, and were surveyed each year in June during peak breeding season (Map 2.1-12).
Mine plots were located within 1 km of the mine footprint, and controlled plots were located between 5 and 13 km from the mine footprint. To limit habitat variation, plots were located in areas dominated by heath tundra and sedge wetland. Surveys were completed between 5:00 A.M. and 12:00 A.M. by observers walking parallel to each other along the transects. All birds seen and heard within the plot were recorded and included in the analysis. Birds seen flying over the plot and those seen and heard outside the plot were not recorded or included in the analysis. Birds recorded in the survey were shorebirds, waterfowl, passerines, ptarmigan (*Lagopus* spp.), and short-eared owl.

2.1.8.2 Gahcho Kué Project

Rapid assessment breeding bird surveys (BBS) were conducted within the Gahcho Kué Project study area from 1998 to 2001 to complete a comprehensive species list (De Beers 2010a). Linear transect BBS were completed in 2004 and 2005 to determine the relative abundance, distribution, and habitat use (De Beers 2010a).



LEGEND

- EKATI MINE FOOTPRINT
- WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- 3 MINUTE POINT COUNT LOCATION
- BREEDING BIRD SURVEY ROUTE

3 0 3

SCALE 1:150,000 KILOMETRES

REFERENCE

BREEDING BIRD DATA PROVIDED BY RESCAN 2010b
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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

NORTH AMERICAN BREEDING BIRD SURVEY ROUTE, EKATI MINE, 2003 TO 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_032_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	11/09/14	MAP 2.1-11	
CHECK	CG	11/09/14		
REVIEW	SM	11/09/14		

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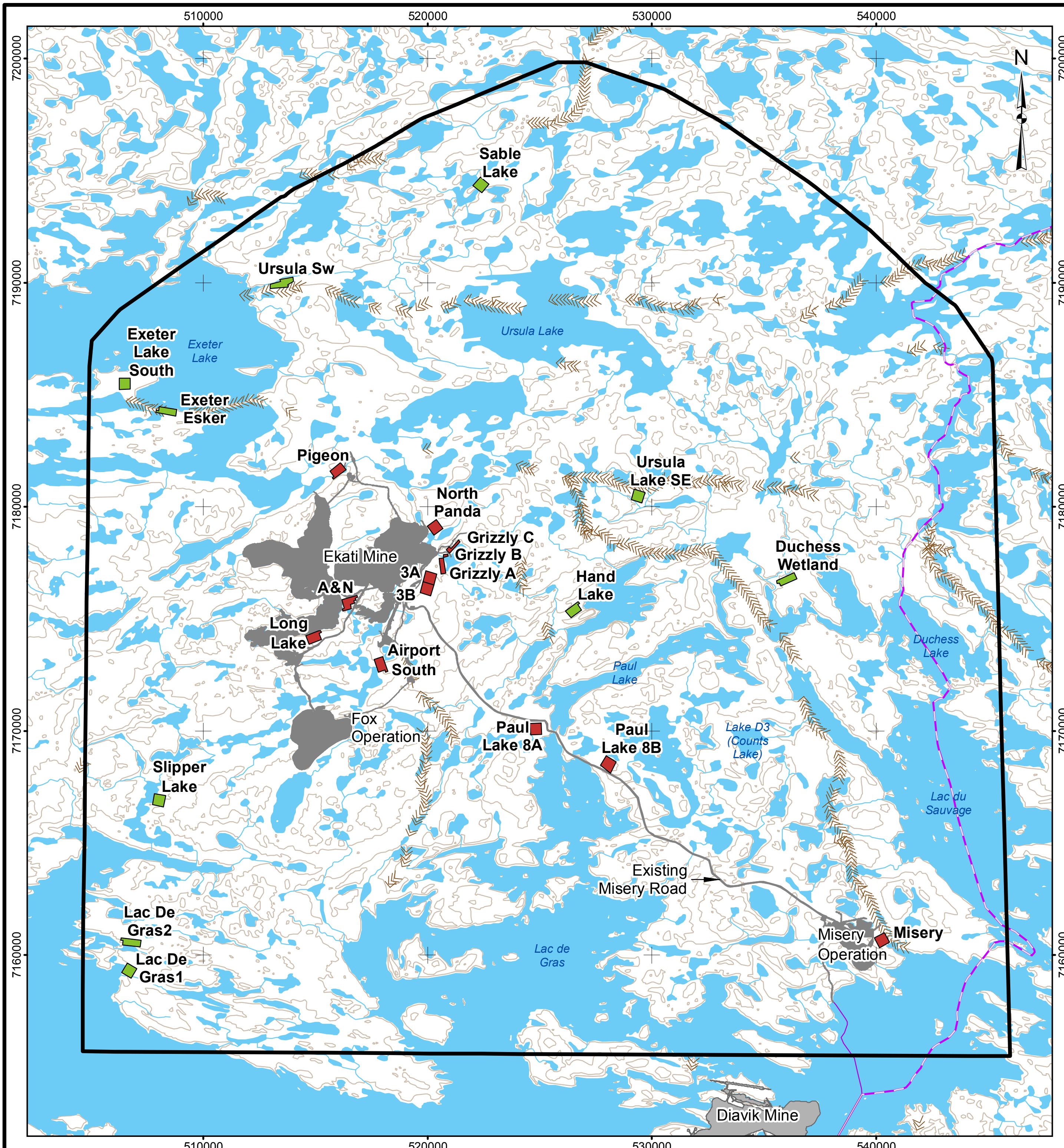

LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- CONTROL PLOT
- MINE PLOT
- EKATI WILDLIFE STUDY AREA, 1998 TO 2005

5 0 5

SCALE 1:250,000 KILOMETRES

REFERENCE

BREEDING BIRD PLOTS PROVIDED BY RESCAN 2010b
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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

TUNDRA BREEDING PLOTS, EKATI MINE 1996, AND 1998 TO 2008

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_033_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	11/09/14	MAP 2.1-12	
CHECK	CG	11/09/14		
REVIEW	SM	11/09/14		

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2.1.9 Waterbirds

2.1.9.1 Diavik Mine

2.1.9.1.1 Presence Surveys

Ground-based presence surveys have been conducted at Diavik Mine since 1996 (DDMI 2013). Waterfowl presence at the East Island shallow bays and mine-altered waterbodies (Map 2.1-13) was surveyed daily for five weeks during peak migration (May and June). The surveys were conducted by surveyors walking the perimeter of the bays and waterbodies. The identity and number of all birds observed was recorded from both the shallow bays and mine-altered waterbodies.

2.1.9.1.2 Habitat Selection

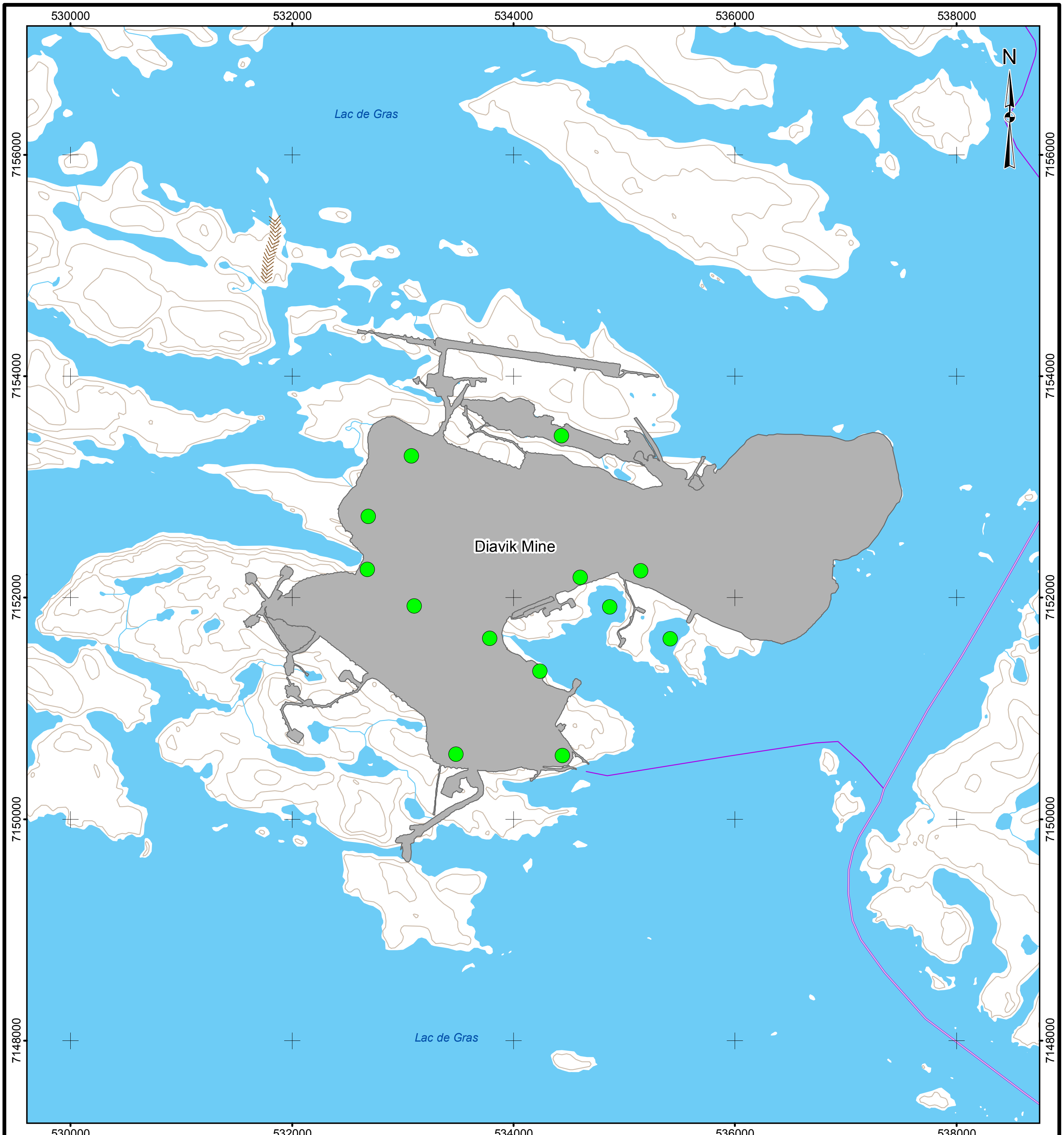
Ground-based habitat selection surveys of mine-altered waterbodies and East Island shallow bays (Map 2.1-13) have been conducted during peak spring migration (May and June) since 2001 (DDMI 2013). Surveyors identified and recorded all birds observed from the perimeter of the shallow bays and mine-altered waterbodies.

2.1.9.2 Gahcho Kué Project

Waterbird aerial surveys have been completed annually since 2010 at Kennady Lake and Lake X6 (as well as D2, D3, and E1 lakes in 2012) (Map 2.1-14) to determine species occurrence and composition (De Beers 2013a). Aerial surveys were completed by one observer using a helicopter flying 45 to 50 m above ground level at a speed of 80 km/h. The survey route followed the shoreline of each lake and its islands and the observer sat on the shoreline side of the helicopter. Smaller waterbodies occurring within 200 m of Kennady Lake and Lake X6 shoreline were also included in the survey. Aerial waterbird surveys were also completed in the Gaucho Kué study area in 2004 to document species occurrence, relative abundance, and habitat use during the spring migration, breeding season, and fall migration (De Beers 2010a).

2.1.9.3 Snap Lake Mine

Waterbird aerial surveys were completed in June of 1999 and 2000 on 18 lakes (including the water management pond area) (De Beers 2002). Ten lakes were within 10 km of the Snap Lake Mine site, and eight lakes were more than 11 km from the site (Map 2.1-15). Surveys of the 10 lakes closest to the site were repeated on July 22 and 24, 1999. Lakes were large enough to support loons (*Gavia* spp.), but not so large that identification of individuals was compromised. Maximum diameter for any lake was 500 m, and perimeters ranged from 761 m to 2,391 m. Shoreline characteristics were similar among lakes, and typically consisted of 40% to 95% sedge (median of 75%) and 5% to 60% rock. The lakes were noted on a 1:50,000-scale map and GPS coordinates were recorded.



LEGEND

- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- WATERBIRD SURVEY LOCATION

1 0 1

SCALE 1:50,000 KILOMETRES

REFERENCE

DDMI 2013
CANVEC © NATURAL RESOURCES CANADA, 2012
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
DATUM: NAD83 PROJECTION: UTM ZONE 12N

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND™

JAY-CARDINAL PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

WATERBIRD SURVEY LOCATIONS, DIAVIK MINE, 1996 TO 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_031_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14	MAP 2.1-13	
CHECK	CG	09/09/14		
REVIEW	SM	09/09/14		

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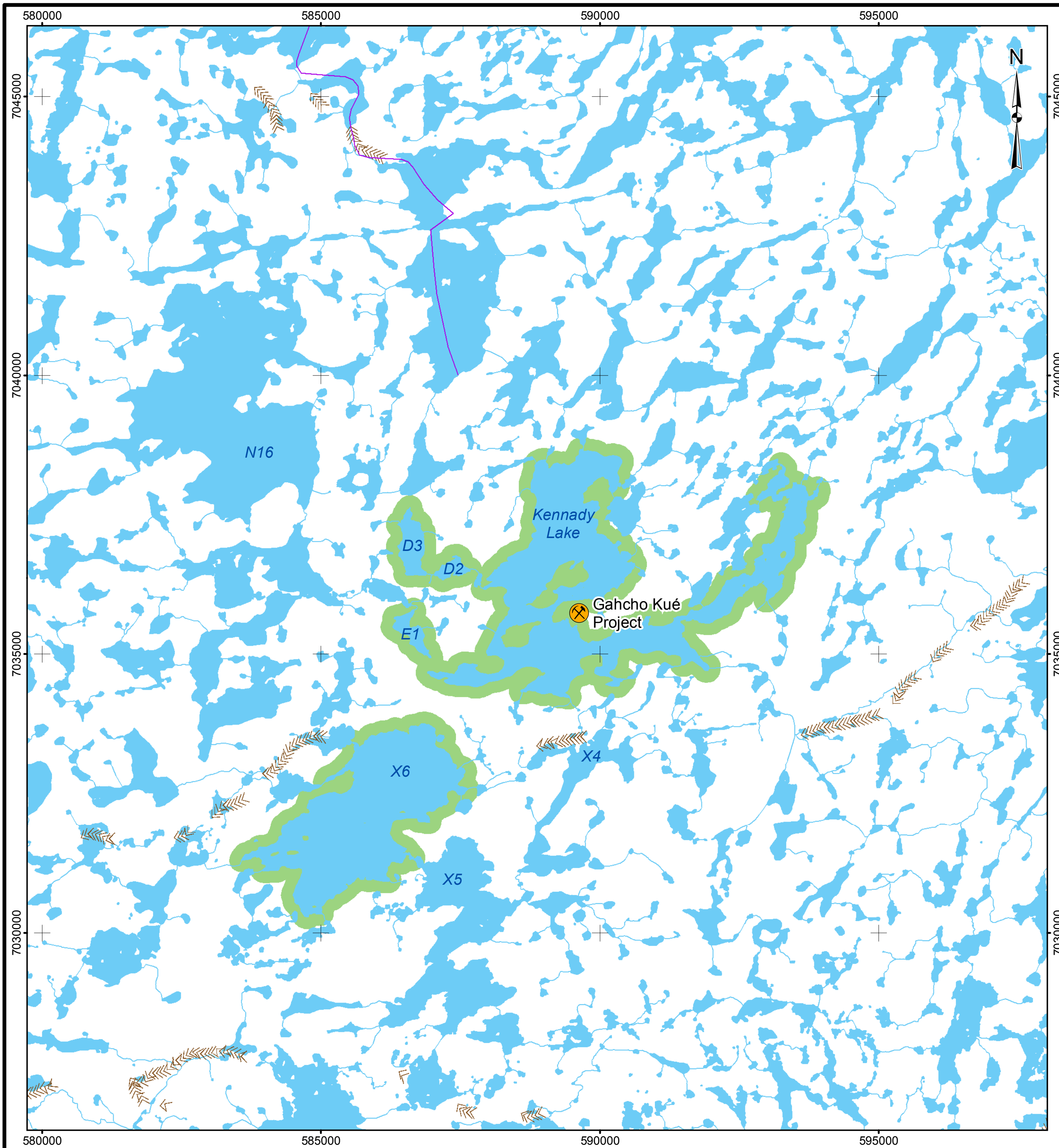

LEGEND

WINTER ROAD
ESKER
WATERCOURSE
WATERBODY
GAHCHO KUÉ PROJECT
LAKES SURVEYED

2 0 2
SCALE 1:100,000 KILOMETRES

REFERENCE

DE BEERS 2013A
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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT
DOMINION DIAMOND™
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE
WATERBIRD SURVEY AREAS,
GAHCHO KUÉ PROJECT, 2010 TO 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_020_GIS	
DESIGN	TD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14	**MAP 2.1-14**	
CHECK	CG	09/09/14		
REVIEW	SM	09/09/14		

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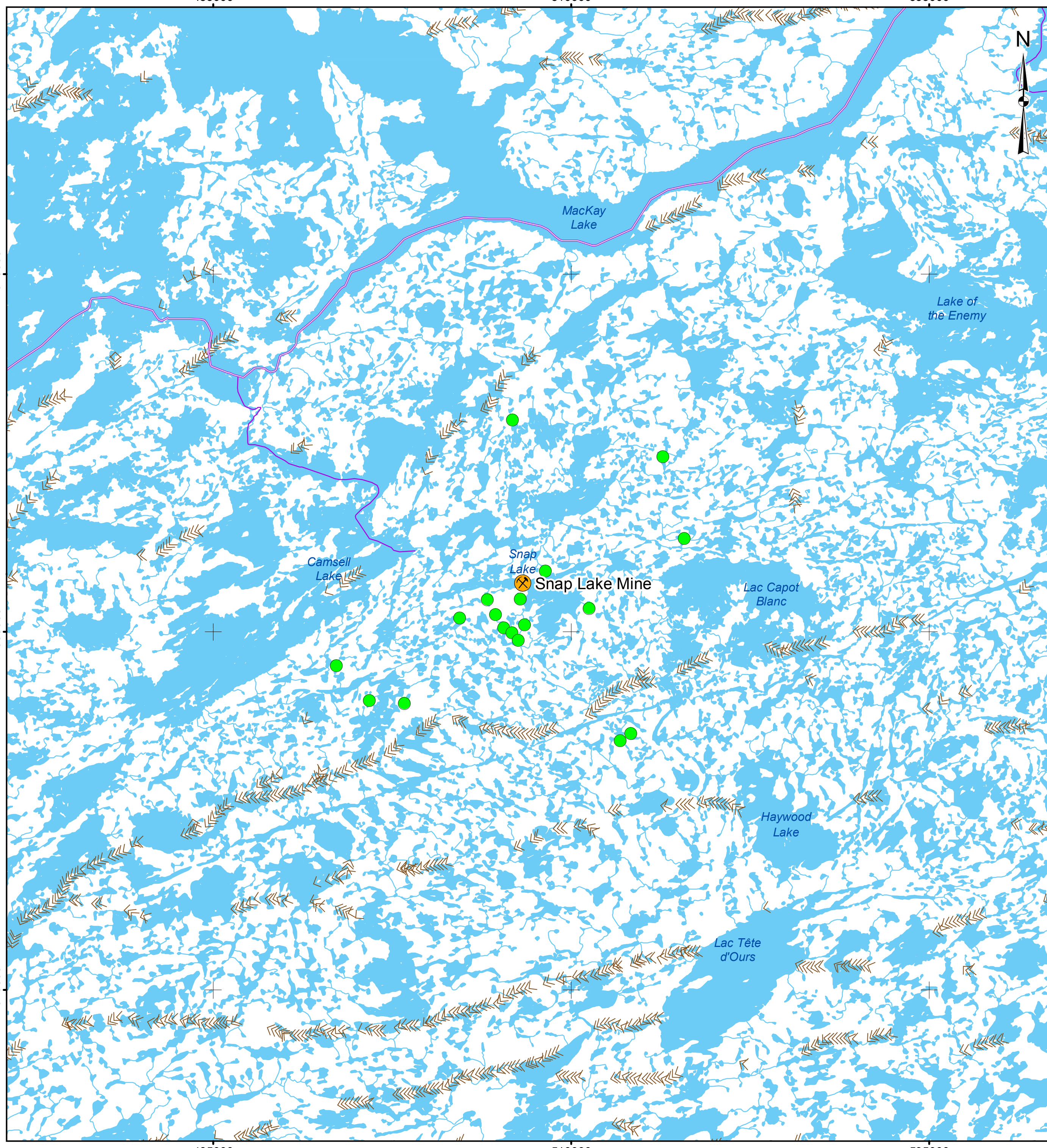

LEGEND

- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- ESKER
- WATERCOURSE
- WATERBODY
- EXISTING MINE
- WATERBIRD SURVEY LOCATION

8 0 8

SCALE 1:400,000 KILOMETRES

REFERENCE

DE BEERS 2002
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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

WATERBIRD SURVEY LOCATIONS, SNAP LAKE MINE, 1999 AND 2000

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_023_GIS
DESIGN	LD	17/01/14	SCALE AS SHOWN REV. 0
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CHECK	CG	09/09/14	
REVIEW	SM	09/09/14	

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2.1.10 Raptors

Although raptors are monitored for direct mine-related mortality, only the gyrfalcon (*Falco rusticolus*) and peregrine falcon were selected for monitoring indirect effects because they are known to nest regularly in the Lac de Gras area and are considered as indicators of environmental change (DDMI 1998). For example, studies of falcons in some areas have documented declines in populations that have been attributed to human activities (White and Thurow 1985; Kaisanlahti-Jokimäki et al. 2008) and developments (Bednarz 1984; Holthuijzen et al. 1990).

The peregrine falcon is listed as “special concern” under COSEWIC and Schedule 1 of SARA (Table 1.3-2). It is also listed in NWT as “sensitive.” In addition to the peregrine falcon, the gyrfalcon is also a high-profile species in the north and the official bird of the NWT.

2.1.10.1 Ekati and Diavik Mines

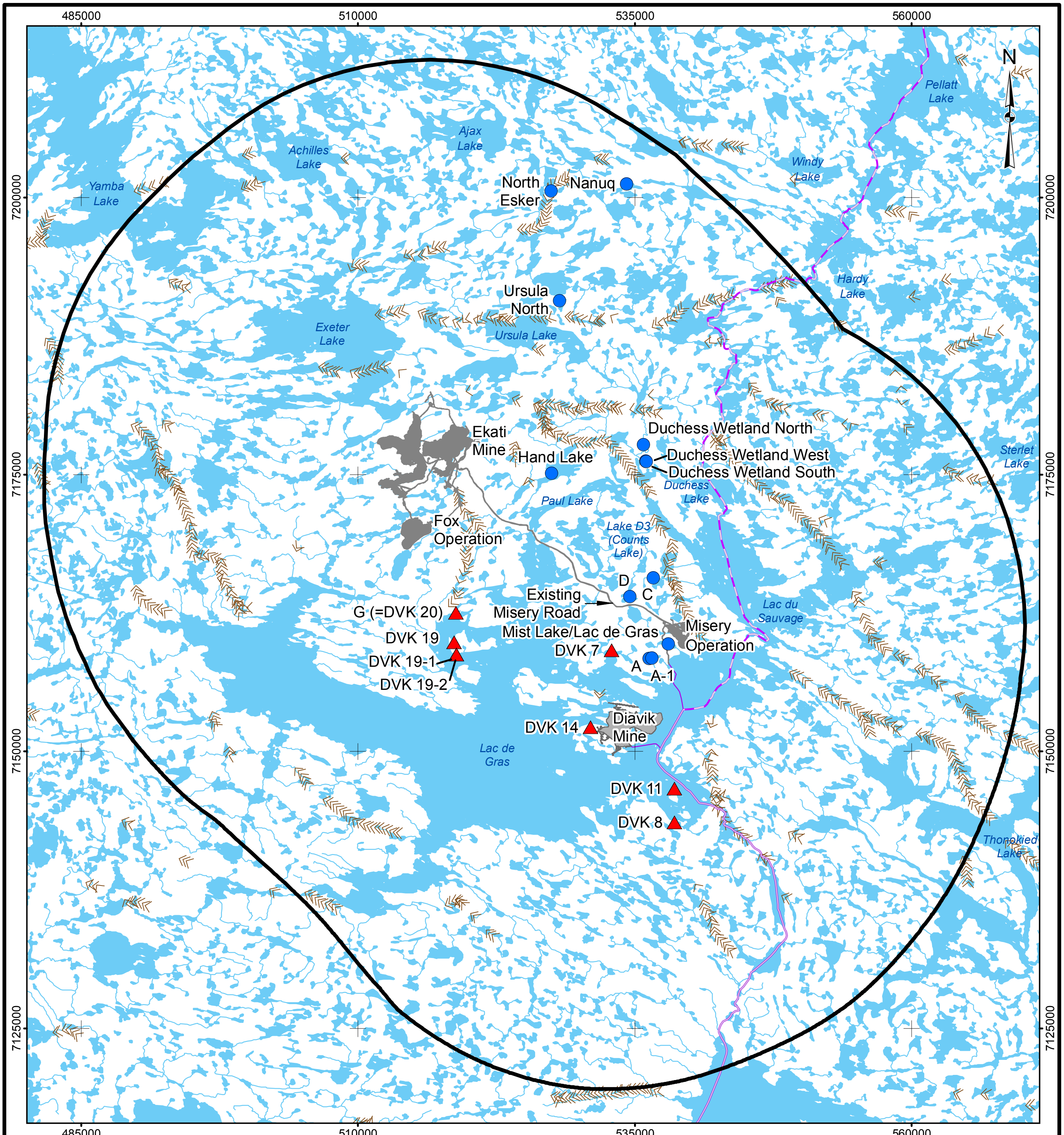
In the Ekati and Diavik mine study areas, surveys for occupied nest sites were initiated in 1995, and occupancy was determined through visual observation of two adults exhibiting territorial behaviour, the presence of eggs, or a single adult sitting on the nest (Golder 2011; Coulton et al. 2013). Nest sites identified during monitoring studies of falcons have been added to the database since 1995. Currently there are 20 known nest sites that range from 1 to 47 km from the Ekati Mine (Map 2.1-16).

2.1.10.2 Ekati Mine

Visual nest surveys have been completed since 2004 on the pit walls within the Ekati property (before 2004, surveys were completed informally and were based on an incident-based approach) (ERM Rescan 2014a). The surveys involved Beartooth, Misery, Fox, Koala North, Panda and Koala pits. In 2006, power poles along the Fox Haul Road and the Long Lake Road were added to the survey. From mid-April to early September, visual surveys of birds, nests, and nesting activity (including nest construction, perching, and incubation) were observed and recorded by BHP Billiton environmental staff. Nests observed below the top third of any pit were immediately reported to ENR for advice on mitigation measures.

2.1.10.3 Diavik Mine

The pit walls and mine infrastructure have undergone visual inspections during nesting season (May through September) at the Diavik Mine since 2004 (DDMI 2013). The surveys recorded bird nest presence in the pit wall/mine infrastructure at A154 Pit area, A418 Pit area, south tank farm, process plant, powerhouse, site services building, and backfill plant; if identified, species and presence of eggs or chicks were recorded.



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LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ESKER
- WATERCOURSE
- WATERBODY
- RAPTOR NESTS MONITORED BY DIAVIK
- RAPTOR NESTS MONITORED BY EKATI
- JAY PROJECT BASELINE STUDY AREA

10 0 10

SCALE 1:500,000 KILOMETRES

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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

RAPTOR NEST SITES, JAY PROJECT, 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_025_GIS	
DESIGN	LD	15/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14	MAP 2.1-16	
CHECK	CG	09/09/14		
REVIEW	SM	09/09/14		

2.1.10.4 Gahcho Kué Project

Aerial surveys were performed in the Gahcho Kué Project study area to identify raptor nesting habitat in June 2004 (De Beers 2010a). The survey focused on areas containing the most suitable nesting habitat, including prominent rock outcrops, cliff faces, and ledges. The presence of raptor pairs, a single adult exhibiting territorial behaviour, old nest sites, and evidence of use (i.e., scrapes and perches) were recorded. In 1996 and from 1998 to 2005 (excluding 2004), raptor species were recorded on an incidental observation basis (De Beers 2010a).

In July 2004, 2010, and 2011, previously identified nest sites in the study area were investigated through aerial surveys to determine species and nesting status (Golder 2012). Nests were considered occupied if at least one adult was observed. Eggs were counted if visible. Nests were recorded as successful if at least one chick was observed in the nest. The number of chicks was also recorded.

2.1.10.5 Snap Lake Mine

Aerial surveys were completed within the Snap Lake Mine study area from 1999 to 2010. Monitoring was discontinued in 2010 based on a recommendation from workshops held in 2009 and 2010 (De Beers 2013a). The surveys were conducted on known nest locations with a helicopter and identified species, egg, and chick numbers. The surveys were done in May and early June for nest occupancy, and mid- to late July for nest success and productivity. Nests were considered occupied if at least one adult was observed. Eggs were counted if visible. Nests were recorded as successful if at least one chick was observed in the nest. The number of chicks was also recorded.

2.1.10.6 Government of the Northwest Territories

The Tundra Ecosystem Research Station at Daring Lake is a government-run research station that is approximately 50 km from the Ekati Mine and 75 km northwest of the Diavik Mine (Golder 2011). Among the environmental monitoring programs completed at the research station is raptor monitoring. Environment and Natural Resources has collected information on falcon nest occupancy, success, and production in the Daring Lake area from 1999 through 2010. This area currently has no industrial development and can be considered a reference area for monitoring falcons near Lac de Gras. Falcon nest site demographics were typically collected during the third week of July; no nest site occupancy data were collected in the spring (Golder 2011).

The nest occupancy, success, and productivity values from Daring Lake were presented for comparison, but were not included in the statistical models presented for Diavik and Ekati mines (Golder 2011).

2.2 Specific Mine-Related Incidents and Mortalities

Project-related wildlife mortalities on mine sites in the NWT are monitored in several ways. Personnel undergo environmental orientation, whereby they are requested to report all wildlife incidents they observe. Environmental data collection programs also occur at the mine sites, such as water quality sampling and dust and vegetation monitoring programs, and any wildlife mortalities located during these sampling events are investigated by environmental personnel. Mortalities observed during wildlife surveys, such as caribou aerial surveys, are also reported and investigated. Project-related wildlife mortality and injury is determined from incident reporting.

2.3 2013 Ekati Field Program for Jay Project Baseline

In addition to the annual Wildlife Effects Monitoring Program in the Ekati wildlife study area (reported in ERM Rescan 2014a), baseline surveys for the Project began in 2013. Reconnaissance-level surveys were conducted for barren-ground caribou, carnivore dens, waterbirds, and raptors.

2.3.1 Barren-Ground Caribou

An aerial survey was completed on August 12, 2013 to provide a high-level overview of caribou travel pathways and obstacles (e.g., large lakes, rugged habitat, and development infrastructure) that may influence caribou migration routes in the Lac de Gras region. The survey was completed around Lac du Sauvage with approximate boundaries at Lake Thonokied, Sterlet Lake, and Hardy Lake (to the south, east, and north, respectively) (Map 2.3-1). The survey was completed using a helicopter that flew approximately 80 km/h at 400 m above ground level.

2.3.2 Carnivores

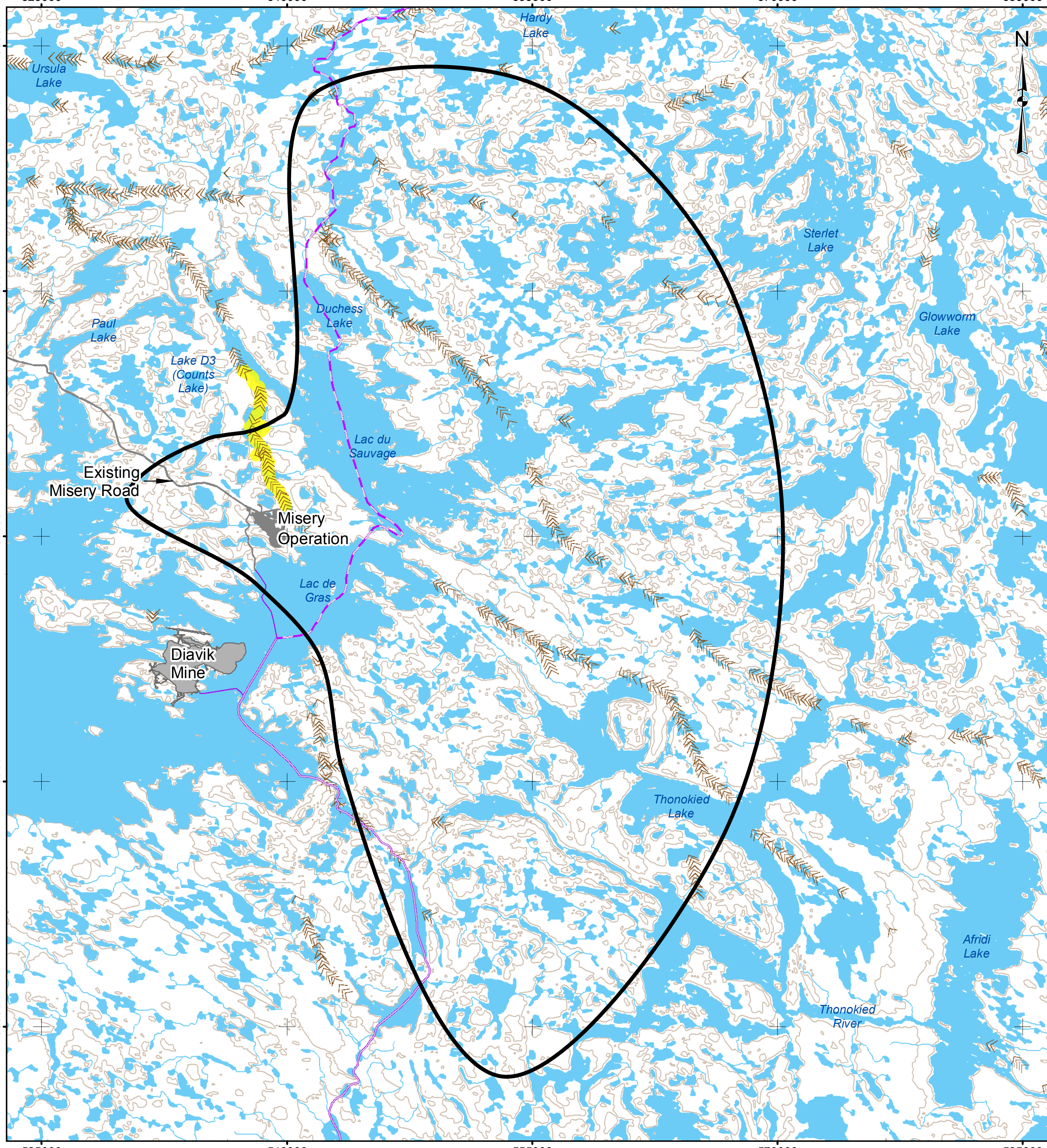
Select eskers near the Project were surveyed on foot between August 9 and 11, 2013 to determine the presence of carnivore dens (Map 2.3-1). One observer walked along the top of the esker while two other observers walked on either side of the esker to search for areas excavated by wolf, grizzly bear, or fox. The survey included the entire length of the Misery esker and associated branches, south of Lac du Sauvage.

2.3.3 Waterbirds

An aerial survey of waterbirds present at Lac du Sauvage was completed on August 8, 2013 and involved nine transects spaced 2 km apart plus the shoreline contour (Map 2.3-2). The surveys were completed by helicopter 80 m above ground level at a speed of 80 to 100 km/h. Observers recorded water birds seen within 200 m on either side of the helicopter. The survey also assessed the presence of nesting colonies on near-shore islands. Due to rough water conditions on Lac du Sauvage on August 8, the shoreline survey was completed a second time on August 12, 2013.

2.3.4 Raptors

An aerial survey was completed on July 24 and 25, 2013, of 36 potential nest sites located in highly suitable habitat (high elevation and steep terrain) to determine the presence of raptors. The survey covered an area up to 30 km from the Project site. Nest locations were visually observed and the presence and absence of adult raptors, white wash, stick nests, fledglings in stick nests, or fledglings on scrapes were noted.



LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 M INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- SURVEYED ESKER
- RECONNAISSANCE SURVEY AREA

6 0 6

SCALE 1:350,000 KM

NOTE

LOCATION OF PATHWAYS, OBSTACLES AND ESKERS SURVEYED DURING THE CARNIVORE DEN SURVEYS

REFERENCE

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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

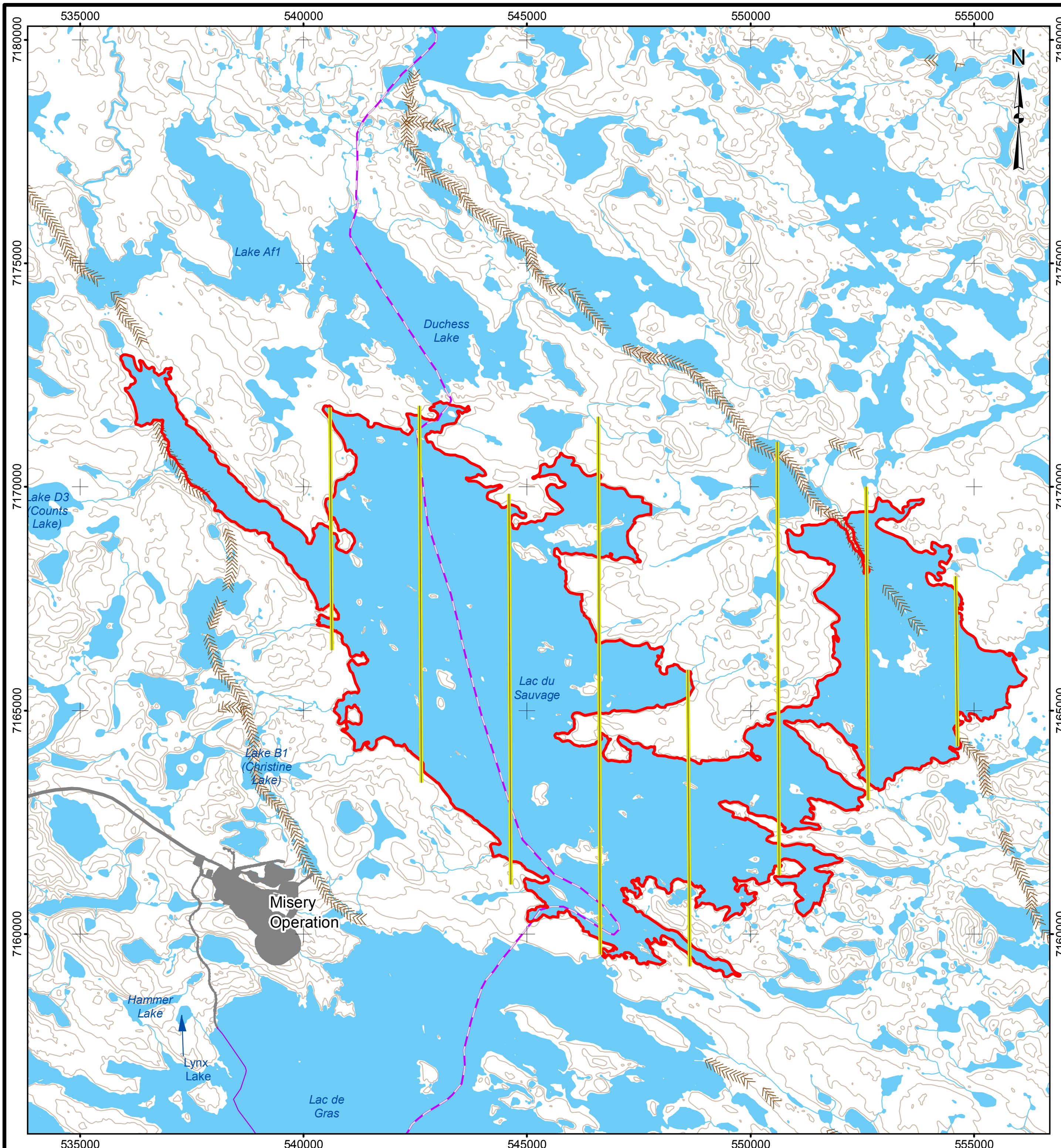
TITLE

RECONNAISSANCE SURVEY AREA FOR CARIBOU TRAVEL PATHWAYS AND LOCATION OF ESKERS SURVEYED DURING THE CARNIVORE DEN SURVEYS, 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_030_GIS	
DESIGN	TD	20/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14		
CHECK	CG	09/09/14	**MAP 2.3-1**	
REVIEW	SM	09/09/14		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\Baseline\B_JC_Wild_030_GIS.mxd



G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\Baseline\B_JC_Wild_022_GIS.mxd

LEGEND

- EKATI MINE FOOTPRINT
- WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- WATERBIRD SURVEY TRANSECT
- SHORELINE SURVEY

2.5 0 2.5

SCALE 1:125,000 KILOMETRES

REFERENCE

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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

WATERBIRD SURVEY AREA, LAC DU SAUVAGE, 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_022_GIS	
DESIGN	TD	20/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	10/09/14	MAP 2.3-2	
CHECK	CG	10/09/14		
REVIEW	SM	10/09/14		

3 RESULTS

3.1 Barren-Ground Caribou

3.1.1 Caribou Distribution and Abundance

The Bathurst, Ahiak, and Beverly barren-ground caribou herds have ranges that potentially overlap with the BSA. Their estimated annual home ranges are 309,000 km^2 for the Bathurst herd (1996 to 2007, based on 95% kernel density [i.e., probability density] from satellite collar data); 345,000 km^2 for the Ahiak herd (data from 2001 to 2007); and, 282,000 km^2 for the Beverly herd (1995 to 2007) (GNWT 2013a). The estimate from the 2012 survey of the Bathurst herd is approximately 35,000 animals, with slightly fewer than 16,000 breeding females (Adamczewski 2014).

Caribou travel routes observed during the Project aerial reconnaissance survey are presented on Map 3.1-1. Overall, there is a high level of spatial and temporal variability in the distribution and abundance of caribou because barren-ground herds typically winter south of the treeline and calve in the barren-ground tundra. For example, between 1995 and 1997, caribou numbers in the Diavik Mine study area ranged from an estimated 0 to 100,000 individuals among seasons (DDMI 1998). From 2002 to 2009, the number of caribou observed in the Diavik Mine study area was lower than recorded in 1996 and 1997 (DDMI 2010). Since 1999, the number of caribou observed per area surveyed (mean density) in the Snap Lake Mine study area ranged from 0.00 to 3.62 caribou per km^2 during the post-calving migration (De Beers 2013a). At the Ekati mine, encounter rates of caribou with motion-triggered remote cameras were highest in August and October, and the encounter rate with the cameras was highest at the Sable/Pigeon Road (ERM Rescan 2014b).

In addition to natural variability, evidence suggests that caribou herds change their distribution around diamond mine developments (Boulanger et al. 2004; Johnson et al. 2005; Golder 2005, 2008a,b; Rescan 2007; Boulanger et al. 2009, 2012). Caribou are more likely to occur further from the mine than closer to the mine. This reduction in caribou occurrence is called the zone of influence.

Analysis of satellite collar data suggests that mines and other major developments may have a zone of influence of up to 33 km (Johnson et al. 2005). A study using aerial survey and satellite-collar data collected around the Diavik, Ekati, and Snap Lake mines suggests a zone of influence that may be 16 to 50 km (Boulanger et al. 2004). More recent analyses using satellite-collar data suggest that the zone of influence around the Ekati-Diavik mine complex is between 12 and 40 km (Golder 2011; Boulanger et al. 2012). The zone of influence around the Diavik Mine site may be confounded by the presence of open water around East Island, because caribou avoid this area during the open-water season. There is no relationship between the extent of the zone of influence and level of activity at the Diavik Mine (Golder 2011). At the smaller Snap Lake Mine, a zone of influence of 6.5 to 28 km was detected (Golder 2008a; Boulanger et al. 2009). There is an indication that the zone of influence around the Snap Lake Mine has been increasing linearly with time from baseline through construction (Golder 2008a).

LEGEND

- EKATI MINE FOOTPRINT
- DIAVIK MINE FOOTPRINT
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- ELEVATION CONTOUR (20 M INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- CARIBOU TRAIL

5 0 5

SCALE 1:300,000 KM

REFERENCE

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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

CARIBOU TRAVEL PATHWAYS OBSERVED DURING AERIAL RECONNAISSANCE SURVEY, 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_029_GIS	
DESIGN	TD	20/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	10/09/14	MAP 3.1-1	
CHECK	CG	10/09/14		
REVIEW	SM	10/09/14		

G:\CLIENTS\DOMINION\DDEC Jay and Lynx Projects\Figures\13-1328-0041 Jay & Lynx EA\Wildlife\Baseline\B_JC_Wild_029_GIS.mxd

Data collected between 1995 and 2009 at the Ekati Mine suggest that the probability of observing a caribou in a transect cell during the post-calving migration increases as distance from the mine increases (Rescan 2010a). Generally, the Ekati Mine seems to have a larger influence on the distribution of nursery groups than non-nursery groups. The total counts of caribou were also found to have a statistically significant relationship with year (except 2004, 2005, and 2006).

3.1.2 Caribou Behaviour and Habitat Use

Data from satellite-collared caribou revealed that caribou regularly travel through the BSA. Habitat selection and behaviour of barren-ground caribou are frequently the result of their response to environmental conditions; therefore, caribou can be found in a variety of habitat types at any one time (Case et al. 1996). The selection of habitat appears to be related to food availability, ease of travel, relief from insects, and predation (Curatolo 1975). Caribou likely select habitats at several spatial scales. At the scale of the seasonal range, caribou select habitats dominated by lichen, heath tundra, and rock vegetation types (Johnson et al. 2005). The Bathurst caribou herd has been found to prefer lichen heath habitat (Griffith et al. 2002). Cows select calving grounds based on the potential for high levels of green plant biomass (Griffith et al. 2002).

At the regional scale, heath tundra, heath tundra/boulder-bedrock, and riparian shrub appear to be the most preferred habitat types during the northern and post-calving migration periods (BHP Billiton 2004; Golder 2008a,b). Feeding and resting behaviours (from aerial survey observations at the Gahcho Kué Project) were more common in riparian shrub and sedge wetland habitats (Golder 2008a,b). Frozen lakes and eskers may be important as movement corridors during the northern migration (Golder 2005, 2008a). Large lakes also appear to influence caribou distribution during the summer period because animals tend to move around large open bodies of water (Golder 2008a,b).

Analysis of data collected at the Gahcho Kué Project indicated that caribou were found more frequently than expected on frozen lakes during the northern migration, which were used for travel through the Gahcho Kué Project study area (Chi-square [χ^2] = 22.84, P = 0.04) (De Beers 2008). During summer, caribou used bog, heath tundra, and tussock-hummock habitats in higher proportion than their availability (χ^2 =62.58, P less than 0.01). In the fall, caribou selected heath tundra, sedge wetlands, and tussock-hummock habitats relative to their availability (χ^2 =86.95, P less than 0.01). Pellet-group densities in the Diavik Mine study area were greatest in heath tundra, esker sides, sedge associations, tall shrub, and esker tops (DDMI 1998).

Caribou are also known to use artificial habitats created by mine structures, such as roads and mine rock piles. These structures may provide a means of avoiding insect harassment, as caribou have been observed bedding or resting on these structures (Gunn et al. 1998; BHP Billiton 2004, 2007). Since 1999, there have been 622 caribou observed during 19.0% of the 487 surveys within the LLCF at the Ekati Mine (Rescan 2012a). Most observations (89.0%) were of small groups (less than or equal to five individuals) travelling through the area (52.3% of groups). Caribou observations at the Ekati Mine (2001 to 2010) show that single caribou are more likely to occur within 50 m of road berms, while nursery and non-nursery groups are more likely to be observed within 50 to 200 m of road berms (Rescan 2012a). Single animals have been observed on roads at the Ekati Mine 20.7% of the time, while nursery and non-nursery groups have been observed on roads 14.0% and 10.5% of the time, respectively.

Monitoring of caribou behaviour has indicated that feeding, bedded and standing are the most commonly observed behaviours (approximately 80% of the observations), but cows spent more time bedded than bulls, while bulls spent more time standing. Running, an energy expending behaviour, occurred rarely, and was in approximately 15% of cases related to natural disturbances (insects or predators). Approximately 20% of the observed running events coincided with mine-related noise and vehicles. For caribou within 200 m of the mine footprint, there were on average 45 stressors per day involving light vehicles, and 21 per day involving people. These rates dropped with distance from the mine, with very few recorded at greater than 2 km from the mine. Analysis of the data indicated that male and female caribou responded on average for 35 seconds and 16 seconds to stressors before returning to a stress-free behaviour. No difference was found in the proportion of time spent feeding before and after any specific stressor type, but less time was spent bedded or standing following stressors. Distance from mine infrastructure exhibited no significance influence on caribou group activity around the two-mine complex.

Remote cameras placed around the Ekati mine, with particular emphasis on the Misery Haul Road, have indicated that caribou behaviours near the roads were typically foraging, and will cross roads. Road deflections were more common in the Sable and Pigeon roads than the Misery Haul Road. However, observations of deterred road crossings were limited to 2% of the observations. In most cases, this deterrence could not be linked to a specific trigger such as a vehicle (ERM Rescan 2014b). Caribou crossings and deterrences did not change with traffic volumes.

Studies at the Diavik Mine showed that the majority of caribou observed moved away from the stimuli when they were approached by humans on foot (within 100 to 200 m) or were exposed to noise from aircraft takeoffs at the camp (DDMI 1998). Alarm responses (moving away from the stimuli) were documented when noise stimuli were within 75 m of caribou groups (DDMI 1998). Caribou expressed lower behaviour response intensity to visual stimuli (i.e., white cloth flutters and a flashing construction light); most responses were animals becoming more alert but not moving away from the stimuli. Caribou generally become more alert but do not move away from stimuli associated with humans at camps, exploration camp infrastructure, and vehicles operating on roads (Rescan 2012a). Nursery groups are more likely to respond to anthropogenic (man-made) stressors than non-nursery groups (Rescan 2007; 2012a).

Activity budgets of caribou are influenced by both environmental and anthropogenic variables. Insect harassment is known to reduce foraging and influence body condition for caribou (Gunn et al. 2001; Weladji and Holland 2003). Recent analyses of point observations of behaviour confirmed that the likelihood of feeding or resting declined as insect abundance increased (Golder 2008a,b).

3.1.3 Caribou Population Characteristics

Herds of barren-ground caribou in the NWT appeared to decline from the 1990s to about 2010, with some herds experiencing declines since the 1970s (BQCMB 2008, 2009; Fisher et al. 2009; Vors and Boyce 2009). As a result, herds of barren-ground caribou in the NWT (except Peary and Dolphin-Union caribou) are ranked as "sensitive" in the NWT (NWT Infobase 2012). Barren-ground caribou are not listed under COSEWIC or SARA (NWT SAR 2014). The number of animals in barren-ground caribou herds increase and decrease at relatively regular intervals, for example, every 30 to 60 years (Zalatan et al. 2006; GNWT-ENR 2013). Although these natural fluctuations in herd size appear to be linked to changes in climatic patterns and winter range quality (Ferguson and Messier 2000; Weladji and Holland 2003; Gunn 2009; Vors and Boyce 2009), the exact mechanisms responsible for generating these population cycles are unknown.

The Bathurst, Ahiak, and Beverly barren-ground caribou herds have ranges that potentially overlap with the BSA. The Bathurst caribou herd has declined from 472,000 individuals in 1986 to 31,900 individuals in 2010 (decline of 93.2% over 26 years) (GNWT-ENR 2013). Surveys completed in 2012 suggest that the Bathurst caribou herd has increased to 35,000 individuals (increase of 9.7% since 2010).
The Qamanirjuaq herd's population estimate was 345,000 individuals in 2008, which is down from the estimate of 496,000 individuals in 1994 (a 30% decrease) (BQCMB 2009). Although the Porcupine herd experienced a 23% decrease between 1992 and 2001 (from 160,000 individuals to 123,000 individuals), surveys completed in 2010 suggest that this population is increasing (GNWT-ENR 2013). The Cape Bathurst, Bluenose East, and Bluenose West herds also seem to be stable or increasing in recent years (based on surveys completed in 2010 and 2012). Although a population survey has not been successfully carried out on the Beverly herd since 1994, reconnaissance surveys in 2008 recorded 93 females on the calving grounds; this is down 98% from the 1994 population census of 5,737 females (BQCMB 2008). The status of the Ahiak herd since the mid-1990s is unknown, but given the synchronicity in population cycles of barren-ground caribou, population decreases in this herd are suspected. Reduced fecundity and adult survival have been cited as contributing factors to these declines in herd size (Boulanger and Gunn 2007; Nishi et al. 2007).

Using modelling techniques and data collected from 1996 to 2003, Boulanger and Gunn (2007) estimated annual survival rates of caribou as follows: 0.842 for female adults; 0.842 for female yearlings (age 1); and, 0.259 for female calves (i.e., young-of-the-year). Male adult survival was estimated to be 0.730. Estimates of survival rates for male yearlings and calves were not presented in Boulanger and Gunn (2007). Fecundity, defined as the average number of calves produced for each sex and a function of adult survival, was 0.45. Further modelling of herd demographics by Boulanger et al. (2011) indicated that the Bathurst herd decline from 2006 to 2009 was driven by decreasing adult female and calf survival rates and possibly reduced fecundity. The effect of a constant hunter harvest (estimated at an average of 7,484 bulls and 8,380 cows per year from 1988 to 1993) during the decline was identified as a potential cause for the accelerated decline (Boulanger et at. 2011). The modelling indicated that a large increase in adult survival and productivity is required to for the herd to recover.

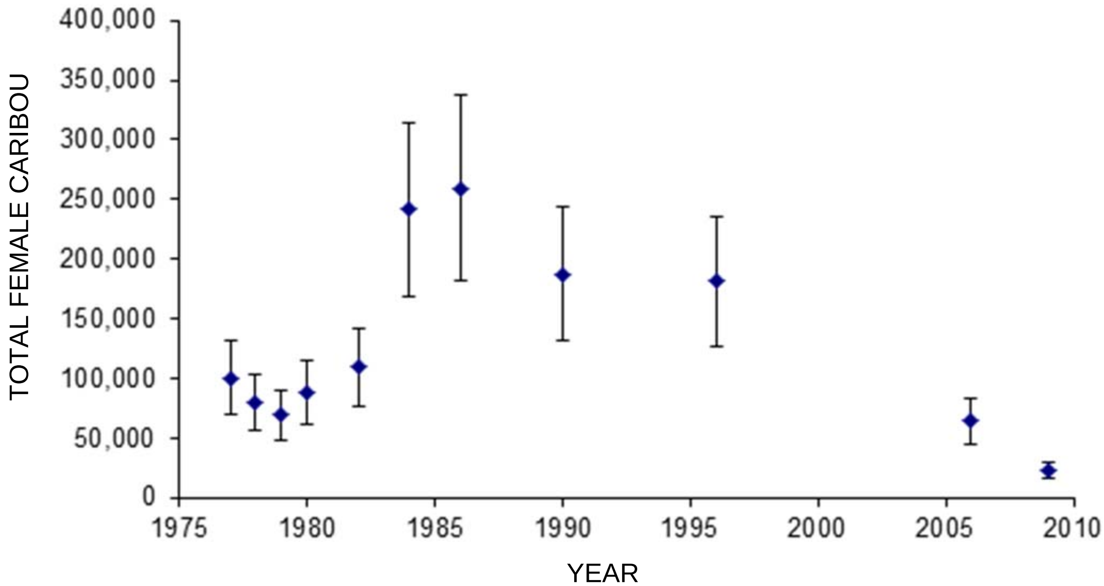
Factors that may influence adult and calf survival include insects, climate change, hunting, food quantity and quality, and industrial development. Direct and indirect loss of habitat from human development footprints and their associated zones of influence have likely resulted in changes to the carrying capacity of the landscape (Johnson et al. 2005). There could also be energy costs associated with sensory disturbance events (e.g., noise, presence of humans, smells) (Tyler 1991). Although a single encounter with disturbance (i.e., loud noise) is unlikely to cause adverse energy consumption by an animal, the effect of exposure to disturbance could be proportional to the number of times an individual encounters disturbance events (Bradshaw et al. 1998).

Effects from human developments may be confounded by effects with natural factors such as insect pest outbreaks and climate change. Caribou that experience high levels of insect harassment generally have poor body condition (Weladji and Holland 2003) because they spend less time foraging and more time being active (Toupin et al. 1996; Łutsel K'e Dené Elders and Land-Users et al. 2003). Climate warming is expected to increase the duration and intensity of insect harassment on caribou because of earlier insect emergence, greater insect abundance, and increased insect distribution (Weladji and Holland 2003; Vors and Boyce 2009). Climate change is also expected to increase the frequency and intensity of wildfires and enable plants to expand their ranges northward. As fires increase and plants move north, moose and wolves may also increase their northern distribution, which may negatively affect caribou populations and distributions (Sharma et al. 2009).

Climate change is also likely to lead to earlier plant emergence. Because plants are most nutritious soon after emergence, it is important for caribou to access these resources as close to plant emergence as possible; however, caribou migrations are mainly cued by day length. Therefore, as the climate becomes warmer, caribou migrations may become asynchronous with plant emergence, which may lead to a decline in reproductive success, as observed in Greenland (Post and Forchhammer 2008).

Density-dependence may be an important factor in caribou population dynamics (Tews et al. 2007). Density-dependence occurs when the growth rate of a population decreases as its density increases. In some cases, growth rates decrease because of declining forage resources that cause decreases in survival and/or reproduction. This mechanism can lead to cyclical trends in abundance starting when foraging levels surpass a critical level for maintenance of population size, resulting in either gradual reductions in population growth or abrupt population declines. Temporal data on population size in Case et al. (1996), combined with more recent information from Boulanger and Gunn (2007) and GNWT surveys in 2010 and 2012 (GNWT-ENR 2013), clearly show cyclical trends in abundance of Bathurst caribou from 1976 to 2009 (Figure 3.1-1). Thus, density-dependence is one possible mechanism that may underlie recent (beginning in the 1990s) declines in population size.

Figure 3.1-1 Temporal Trend in Number of Female Caribou From the Bathurst Herd, 1976 to 2009



Note: Values from 1977 to 1984 are from Case et al. (1996), values from 1986 to 2006 are from Boulanger and Gunn (2007), and the value from 2009 is from Adamczewski et al. (2009); values from 1997 to 1980 are based on a visual census, whereas values after 1980 are based on a photograph method.

3.2 Muskoxen

3.2.1 Muskoxen Distribution and Abundance

Muskoxen in the NWT are currently found on Banks, Eglinton, Melville, and Victoria islands, and on the mainland NWT from the Arctic coast southwest to Artillery Lake (GNWT-ENR 2012a). Muskoxen in the BSA are considered nomadic.

Approximately 50,000 muskoxen are in the Kitikmeot region of Nunavut, and approximately 25,000 muskoxen are on the mainland (Dumond 2006). In 1998, there were estimated to be 1,162 muskoxen, with a density estimate of 3.5 muskoxen per 100 km^2, in WMZ U/MX/02, which is east of the BSA in the NWT (Bradley et al. 2001).

Specific surveys for muskoxen are not completed at mines in the SGP, but incidental observations of muskoxen are recorded during wildlife surveys and monitoring programs. Incidental observations of muskoxen observed on or near the Ekati Mine between 1994 and 2012 are detailed in Table 3.2-1.

Table 3.2-1 Number of Muskoxen Incidentally Observed on or Near the Ekati Mine, 1994 to 2012

Year	Number of Muskoxen	Comments
1994[(a)]	6	near Lac de Gras
1995[(a)]	4	same herd observed near mine site between June 5 and June 28
	4	same herd seen near T-Lake on July 14 and 15
	9	same herd observed near mine between July 29 and August 1
	28	24 adults and four calves
	1	—
1996[(a)]	13	nine adults and four calves observed multiple times
1997[(a)]	15	—
1998[(a)]	25	all 25 individuals observed on May 28; 19 of these individuals observed again on June 2
1999[(a)]	2	an unknown number of individuals observed outside of the study area on July 25
2000[(b)]	0	—
2001[(b)]	20 to 30	observed on numerous occasions between May 21 and 26; group included calves
	1	—
	2	—
2002	N/A	—
2003[(c)]	1	—
2004[(d)]	0	—
2005[(e)]	0	—
2006[(f)]	0	—
2007[(g)]	0	—
2008[(h)]	0	—
2009[(i)]	0	—
2010[(j)]	6	—
2011[(k)]	0	—
2012[(l)]	0	—

Sources: a) Rescan (1999); b) BHP Billiton (2002); c) BHP Billiton (2004); d) BHP Billiton (2005); e) BHP Billiton (2006); f) BHP Billiton (2007); g) BHP Billiton (2008); h) BHP Billiton (2009); i) Rescan (2010b); j) Rescan (2011); k) Rescan (2012a); l) ERM Rescan (2013).

N/A = information not available. — = no comments.

3.2.2 Muskoxen Behaviour and Habitat Use

Habitat studies in Greenland and Alaska show that muskoxen prefer low-lying, but not saturated, tussock tundra, and riparian areas during the summer (Klein et al. 1993; Danks and Klein 2002). Muskoxen are not well adapted to digging through heavy snow for food (Smith et al. 2008). Therefore, areas with low snow accumulation or areas blown free of snow, such as ridge tops and coastal bluffs, are preferred during the winter (Klein et al. 1993; Schaefer and Messier 1995; Danks and Klein 2002). Muskoxen diet in the winter typically consists of water sedge (*Carex aquatilis*) and narrow-leaved cotton-grass (*Eriophorum angustifolium*) (Schaefer and Messier 1995).

3.2.3 Muskoxen Population Characteristics

Muskoxen are not a listed species in Canada (SARA) or in the NWT (NWT Infobase 2012). Limited information is available for mainland muskoxen populations in the NWT. A survey of the muskoxen population in 1998 determined that the population in WMZ U/MX/02, which is east of the BSA, had doubled since 1989 (from 563 to 1,162 individuals) (Bradley et al. 2001). In the Kitikmeot region of Nunavut, the muskoxen population appears to be in decline, after having increased for many years (Dumond 2006). Muskoxen population surveys completed in 1986, 1991, 1999, and 2010 in the Kivalliq and northeast Kitikmeot region of Nunavut, which is east of the BSA, indicate that the muskoxen population in this region has been steadily increasing since 1986 (Rankin Inlet Hunter's and Trapper's Organization et al. 2012).

The muskoxen population of the Rae-Richardson River valley, near Kugluktuk, was surveyed in 1989, 1990, and 1991 (Gunn and Fournier 2000). The proportion of calves in the surveyed herds was similar among years and month, except for 1989. There was a decrease in the proportion of calves in herds between July and November 1989 (from 20.8% to 8.9%). Excluding November and July 1989, estimates of the proportion of herds that consisted of calves ranged between 11.2% and 17.7%.

3.3 Moose

3.3.1 Moose Distribution and Abundance

Moose populations in the NWT are listed as "secure" (NWT Infobase 2012), and are not listed federally (NWT SAR 2014). Traditional moose range encompasses suitable habitat south of the treeline throughout the NWT. However, since the early 1900s, moose have been seen at numerous locations on the tundra where adequate forage is available (GNWT-ENR 2012b). In the BSA, moose are considered occasional visitors (GNWT-ENR 2012b). Specific surveys for moose are not completed at mines in the SGP, but incidental observations of moose are recorded during wildlife surveys and monitoring programs. Five moose have been incidentally observed at the Ekati Mine during the 16 years of wildlife monitoring at the mine (Rescan 2011, 2012a; ERM Rescan 2013).

Moose densities in northern environments are low (140 to 160 moose per 1,000 km^2 [Stenhouse et al. 1994]) compared to southern boreal forest regions (Sly et al. 2001). Moose in the NWT have large home ranges when compared to southern areas. The mean home range size for moose in the Mackenzie Valley in the NWT was 174 km^2 (range 40 to 942 km^2; N=29) (Stenhouse et al. 1994). The mean home range size for moose in Ontario, Alberta, Minnesota, and Sweden was between 13 and 97 km^2 (Stenhouse et al. 1994).

3.3.2 Moose Behaviour and Habitat Use

Moose select different habitat types during different seasons. Dense coniferous forest is preferred during the winter (GNWT-ENR 2012b) because it provides easier movement and protection from inclement weather and predators (OMNR 2000). In the summer, moose select habitats that have an abundance of deciduous browse, such as riparian areas (GNWT-ENR 2012b; Bohm et al. 2013). Moose are adapted to withstand cold temperatures but are intolerant of high temperatures; upper critical temperatures are thought to be between 14 degrees Celcius (°C) and 20°C during the summer (Renecker and Hudson 1986). As such, treed lowland areas (e.g., treed bog and treed fen) are important for moose during the summer because of their cooler microclimates (Allen et al. 1987).

In the boreal forest of northern Alberta, moose appeared to avoid mining activity and linear features (Bohm et al. 2013). Humans elicit flight responses in moose at greater distances than disturbances that were recognized as mechanical (Andersen et al. 1996). For example, the noise of a jet flying at an altitude of 150 m did not trigger any flight response in moose, while people approaching moose on foot or skis from a distance of 200 to 400 m caused the animals to run. Andersen et al. (1996) found that the home range size for moose increased during active military manoeuvres (e.g., using helicopters and jet fighters), but no collared individuals abandoned the area. Moose have been found to avoid roads, although they may venture nearer to roads to access scarce resources (e.g., salt) (Leblond et al. 2007; Laurian et al. 2008a,b; Grosman et al. 2011).

3.3.3 Moose Population Characteristics

Moose are not a territorial (NWT Infobase 2012) or federally (NWT SAR 2014) listed species. The mean survival rate for female moose in the Mackenzie Valley, NWT was 85% when hunting was included and 88% without hunting (Stenhouse et al. 1994). This estimate is lower than reported for other areas in Alaska and the Yukon. The mean calf survival rate in the Mackenzie Valley was 44% (Stenhouse et al. 1994).

Moose populations in areas with low primary productivity and low predation (e.g., the BSA) are thought to have high year-to-year variation in population size because food abundance is likely the most limiting factor (Ferguson et al. 2000). However, weather and predation may also influence moose population dynamics (Bergerud et al. 1983; Post and Stenseth 1998).

3.4 Barren-Ground Grizzly Bear

3.4.1 Grizzly Bear Distribution and Abundance

Approximately 4,000 to 5,000 grizzly bears are found in the NWT, with most individuals residing in the Mackenzie Mountains (GNWT 2013b). No barren-ground grizzly bear dens were found during the carnivore dens surveys in 2013.

The number of dens located during esker surveys in the Ekati Mine study area between 1994 and 1998 was low and statistical analyses could not be completed (Rescan1999). Esker surveys are deemed unsuitable for determining whether bears have denned in an area or continue to use an area that supports a mine or other development (BHP Billiton 2001)

The mean probability estimate (plus or minus [±] 1 standard error [SE]) of grizzly bear presence in the Snap Lake Mine study area using hair detection data from four surveys was 0.05 (0.04) (De Beers 2013a). Detection probability averaged 0.46 (0.20) among the four surveys. Low and imprecise estimates of presence and detection are the result of the low number of stations with grizzly bear hair both within and among surveys.

Between 20% and 44% of hair snagging posts contained grizzly bear hair during regional hair snagging surveys in 2012.

3.4.2 Grizzly Bear Behaviour and Habitat Use

Barren-ground grizzly bears in the SGP were found to prefer esker, tussock-hummock, lichen veneer, birch seep, and tall shrub riparian habitats (McLoughlin, Case et al. 2002). Esker and tall shrub riparian habitats were selected throughout the year, while lichen veneer, tussock-hummock, and birch seep were preferred during different seasons. Female grizzly bears with cubs avoided areas preferred by male grizzly bears (McLoughlin, Case et al. 2002; Suring et al. 2006). Barren-ground grizzly bears in the SGP were found to construct dens under tall shrub cover on well-drained esker slopes (McLoughlin, Cluff et al. 2002). During habitat surveys at Diavik Mine in 2008, 72% of sedge wetland plots and 61% of riparian shrub plots contained grizzly bear sign (DDMI 2009).

Barren-ground grizzly bears in the SGP primarily consume caribou in the spring, mid-summer, and autumn (Gau et al. 2002). Horsetail (*Equisetum* spp.) and sedges (*Carex* spp.) are the primary food items eaten during the early summer. Berries (e.g., black crowberry [*Empetrum nigrum*]) are an important dietary component during the late summer and contribute greatly to body fat reserves.

3.4.3 Grizzly Bear Population Characteristics

The barren-ground grizzly bear (western population) is not currently listed under SARA but has been recommended by COSEWIC to be listed as a species of special concern (NWT SAR 2014). The barren-ground grizzly bear population in the SGP of the NWT is currently considered stable or slightly increasing (McLoughlin, Mitchell et al. 2003). However, barren-ground grizzly bear is considered a sensitive species in the NWT (NWT Infobase 2012) because the population is sensitive to increased harvest rates and habitat change due to human development (McLoughlin, Taylor et al. 2003). It is estimated that the harvesting of an additional six bears per year could result in a greater than 40% chance of a decrease by one-quarter population size over the next 50 years (McLoughlin, Taylor et al. 2003). This is compared to a 10% chance of one-quarter population size decrease over the next 50 years with the current of level of harvesting (13.4 bears per year).

3.5 Wolverine

3.5.1 Wolverine Distribution and Abundance

The wolverine DNA mark-recapture study at Daring Lake, Ekati Mine, and Diavik Mine suggests that the wolverine populations around Daring Lake and the Diavik Mine are decreasing at approximately 11% per year, while the population around Ekati Mine may be stable (Boulanger and Mulders 2013). However, population trends for Ekati Mine may be positively biased because the sampling area of the Ekati Mine grid was increased each sampling year between 2005 and 2011 (1,062 km^2 in 2005; 1,197 km^2 in 2006; 1,593 km^2 in 2010; and, 1,647 km^2 in 2011). The density of wolverines in the Daring Lake sampling grid was estimated to have decreased from 8 wolverine per 1,000 km^2 in 2005 to 4 wolverine per 1,000 km^2 in 2011. Similarly, in the Diavik Mine sampling grid, the density of wolverines has decreased from 11 wolverine per 1,000 km^2 in 2005 to 4 wolverine per 1,000 km^2 in 2010 and 4 wolverine per 1,000 km^2 in 2011. The density of wolverine in the Ekati Mine sampling grid ranged between 10 wolverine per 1,000 km^2 in 2005 and 6 wolverine per 1,000 km^2 in 2011. There were estimated to be 18 wolverines near the Gahcho Kué Project in 2005 and 2006 (Boulanger and Mulders 2007).

No wolverine dens were recorded during carnivore den surveys at the Project in 2013.

Between 2003 and 2012, mean wolverine track densities at the Snap Lake Mine ranged from 0.01 (2008) to 0.21 (2003 and 2004) (De Beers 2013a). Generally, the mean track density index has decreased over time, although the associated variances indicate that the track densities may not statistically differ among most years. However, the mean track density index during 2008 to 2011 was lower than during 2003 to 2006. The proportion of transects in the Snap Lake Mine study area with wolverine tracks ranged from 22% in 2009 to 67% in 2003. Since 2005, point estimates of the proportion of transects with wolverine tracks has been lower than in 2003 and 2004. Since 2005, the proportion of transects with tracks has been consistent based on overlap of confidence intervals.

In 2011, the mean probability estimate (±1 SE) of wolverine presence in the Gahcho Kué Project study area after accounting for detection of snow tracks was 0.96 (0.27) (Golder 2012). Detection probability of snow tracks was 0.37 (0.12), after controlling for effect of weather. This detection rate suggests that failure to observe tracks in previous years, where a single survey was completed, likely underestimated wolverine activity and distribution.

The wolverine track index recorded in the Diavik Mine study area ranged between 0.03 and 0.17 tracks/km between 2003 and 2012 (DDMI 2013).

3.5.2 Wolverine Behaviour and Habitat Use

There is little evidence that the operation of the Diavik Mine has caused a measurable shift in the presence of wolverine in the study area across years (Golder 2011). These findings are different from those observed at Snap Lake Mine where trends related to distance, zone of influence, and survey weather were important indicators of wolverine snow track occurrence (Golder 2013).

3.5.3 Wolverine Population Characteristics

The western population of wolverine in Canada is not listed under SARA but has been recommended by COSEWIC to be listed as a species of special concern (NWT SAR 2014).

The DNA mark-recapture study completed by Boulanger and Mulders (2013) suggests that the wolverine population around Daring Lake may be declining at approximately 11% per year.

3.6 Gray Wolf

3.6.1 Gray Wolf Distribution and Abundance

The abundance of gray wolves within the BSA is expected to vary annually and seasonally in response to prey availability. The mean annual territory sizes of female and male wolves in the central Canadian Arctic (minimum convex polygon) were 44,936 and 63,058 km^2, respectively (Walton et al. 2001). Winter territories are generally larger than summer territories, which may be due to low prey densities during the winter. Wolves can disperse from their natal territories during all months of the year, but dispersal is generally highest in April through September.

Three wolf dens were located during carnivore den surveys for the Project in 2013 (Map 3.6-1). One den was active and two dens were inactive. The three dens were located approximately 4 km west of the Project.

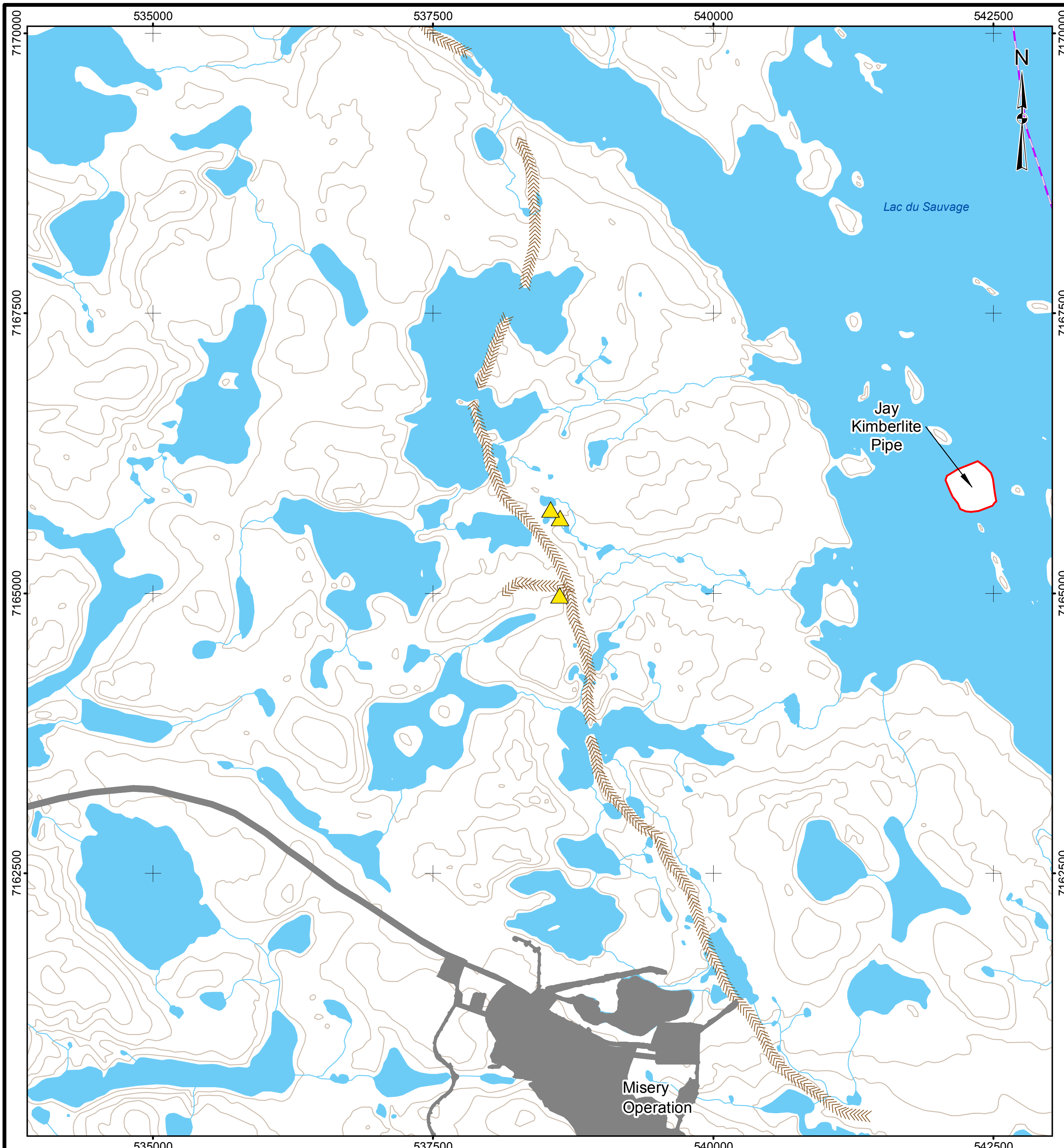
Twenty-two wolf den sites were identified near the Ekati Mine between 1995 and 2012 (ERM Rescan 2013). Overall, active wolf den sites have continued to be present in the Ekati Mine study area over the last 15 years. Although some sites appear to have been abandoned, additional den sites have been established in the Ekati Mine study area. The number of pups per occupied den has varied from a high of eight in 1996 to none in 2007 and 2009. Overall, the average pup production for the Ekati Mine study area since 1995 is 6 pups per year, 2.3 pups per active den, and 3.2 pups per productive den. Since 2003 (excluding 2006), wolf productivity has been lower (from 0 to 1.7 pups per year) than the average of 2.3 pups per occupied den pooled across years. However, these results may be skewed because some den sites were not surveyed in 2006 and 2007, potentially missing active wolf dens in the area. Alternatively, the wolves may have moved their pups away from the area before the August survey (Frame et al. 2007).

3.6.2 Gray Wolf Behaviour and Habitat Use

Suitable habitat for gray wolf includes habitats that have high densities of prey species (Theuerkauf et al. 2003; Theberge and Theberge 2004; OMNR 2005), although wolves are considered habitat generalists (Mladenoff et al. 1995; Kuzyk et al. 2004; McLoughlin et al. 2004; Houle et al. 2010; Gurarie et al. 2011; Milakovic et al. 2011). Esker habitat is preferred at the home range scale for wolves in the SGP, possibly because it provides suitable denning habitat (McLoughlin et al. 2004).

Wolves have a positive correlation with road density in areas with low road density and use by humans (Thurber et al. 1994; Houle et al. 2010; Bowman et al. 2010). Roads with high traffic volumes may be a partial barrier to wolf movement, but other linear developments such as roads with low traffic volumes or power line corridors may be preferred travel corridors for wolves, especially when snow is deep (Paquet and Callaghan 1996; Gurarie et al. 2011). However, road densities greater than 0.6 kilometres per square kilometre (km/km^2) have been found to negatively affect wolf populations (Thiel 1985; Jensen et al. 1986; Mech et al. 1988; Mladenoff et al. 1995; Potvin et al. 2005). Research shows that gray wolves can adapt to the presence of humans and may select areas closer to human activity (Mech 1995; Thiel et al. 1998; Boitani 2000; Hebblewhite and Merrill 2008).

Wolves in northwest Alaska were found to primarily consume caribou and moose (51% and 42% of kills, respectively) (Ballard et al. 1997). Caribou were preferred but wolves switched to preying on moose when caribou densities were less than 200 individuals per 1,000 km^2. Caribou was also the most important dietary item for wolves in Nunavut, but seasonally abundant foods (e.g., migratory birds) were also important during certain times of the year (e.g., during the late summer during the molt season for ducks and geese) (Wiebe et al. 2009).



LEGEND

- EKATI MINE FOOTPRINT
- KIMBERLITE PIPE
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- CONTOUR (10 m INTERVAL)
- ESKER
- WATERCOURSE
- WATERBODY
- GREY WOLF DEN LOCATION

1 0 1
SCALE 1:50,000 KILOMETRES

REFERENCE

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

DOCUMENT

WILDLIFE BASELINE REPORT

PROJECT
DOMINION DIAMOND
JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

GRAY WOLF DENS OBSERVED, JAY PROJECT, 2013

Golder Associates

PROJECT		13-1328-0041	FILE No. B_JC_Wild_014_GIS	
DESIGN	LD	17/01/14	SCALE AS SHOWN	REV. 0
GIS	DW	09/09/14	MAP 3.6-1	
CHECK	CG	09/09/14		
REVIEW	SM	09/09/14		

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3.6.3 Gray Wolf Population Characteristics

The abundance of wolves within the BSA is expected to vary annually and seasonally in response to factors such as prey availability and suitability of den habitat. At the regional scale, home ranges are established based on food availability (McLoughlin et al. 2004). As predators of migratory caribou, wolves in the Arctic have larger home ranges and less territorial behaviour than other wolves of North America (Walton et al. 2001). At the local scale, wolves select areas with suitable den habitat, such as eskers, kames, and other glaciofluvial deposits (McLoughlin et al. 2004). The wolf population in the NWT is considered secure, and is considered not at risk by COSEWIC (NWT SAR 2014).

The mean annual survival rate for wolves in northwest Alaska, when rabies was not a significant source of mortality, was estimated to be between 58.5% and 65.4% (Ballard et al. 1997). Survival rates for wolves in the Kenai Peninsula, Alaska are reported to be 64%. Survival rates for heavily harvested wolf populations in south-central Alaska and the Yukon are reported to be 48% and 40%, respectively. Wolf populations are most vulnerable to changes in hunter-related mortality (OMNR 2005; Sidorovich et al. 2007; Creel and Rotella 2010).

3.7 Fox

3.7.1 Fox Distribution and Abundance

Arctic fox are primarily distributed above the tree line in the NWT, while red foxes are distributed below the high Arctic (GNWT-ENR 2012c,d). Arctic and red foxes in Sweden were found to occupy similar areas during the winter but occupied areas were dramatically different in the summer; Arctic foxes migrated to higher altitudes further from the tree line, while red foxes stayed near the tree line in the summer (Dalén et al. 2004).

Fox distribution and abundance in the SGP is not well-documented. Red foxes are thought to be common in the BSA (GNWT-ENR 2012d). Adults typically have home ranges between 15 and 25 km^2 (Banfield 1974; Lariviere and Pasitschniak-Arts 1996). No fox dens were recorded near the Project during carnivore den surveys in 2013.

3.7.2 Fox Behaviour and Habitat Use

Although information regarding general habitat requirements is limited, the physical characteristics of den sites and their surrounding areas have been used to identify critical fox habitat requirements in the Arctic tundra (Prestrud 1992; Smits and Slough 1993; Anthony 1997. Dens are most often associated with well-drained upland terrain, which is typically associated with eskers, hummocks, or moraines (Jones and Theberge 1982; Garrott et al. 1983; Smits et al. 1988; Smits and Slough 1993; Anthony 1997). Both fox species often select historically favoured den locations and den site fidelity is high (Garrott et al. 1983; Smits and Slough 1993; Anthony 1997; Landa et al. 1998). Between 1999 and 2009, 24 active fox dens were identified in the Gahcho Kué Project study area (De Beers 2010a). Dens were established on eskers or other glaciofluvial deposits such as kames, and ranged from 2 to 38 km from the Gahcho Kué Project footprint. Eight den sites were recorded within the Snap Lake Mine study area in 1999 and 2000, and ranged from 8 to 30 km from the Snap Lake Mine footprint (De Beers 2002).

Arctic foxes in Alaska did not have a habitat preference, likely because prey abundance and distribution were similar among habitat types (Anthony 1997). Arctic fox primarily consume lemmings, but also eat birds (primarily Passeriformes), caribou (carrion), voles and shrews, and hares (Elmhagen et al. 2000). Red foxes in Sweden were found to consume more field voles and birds than Arctic foxes, but lemmings were still an important part of their diet (Elmhagen et al. 2002).

3.7.3 Fox Population Characteristics

Arctic and red fox are the most abundant carnivores in the Arctic tundra and are listed as secure in the NWT (NWT Infobase 2012). Arctic and red fox are not listed federally (NWT SAR 2014). A 30-year study in Finland found that Arctic fox densities have close correlations with microtine densities (e.g., small mammals such as voles), roughly in a five-year cycle (Kaikusalo and Angerbjörn 1994).

3.8 Upland Breeding Birds

Two federally listed upland bird species have the potential to occur within the study areas reviewed for this baseline report: the short-eared owl and rusty blackbird (Table 1.3-2). In 2009, one short-eared owl was observed during the North American BBS completed within the Ekati Mine study area (ERM Rescan 2013), and two individuals were recorded within control plots during the tundra BBS completed from 1996 to 2008 (Rescan 2010b). The rusty blackbird was observed during the 1999 to 2001 and 2004 to 2005 BBS within the Gahcho Kué Project study area (De Beers 2010a), including three individuals in 1999 and one in 2005.

In general it appears that the Ekati mine has had a limited effect on upland breeding bird communities in the BSA. Analysis of data collected between 1996 and 2008 indicated that community species richness and diversity (Shannon's H diversity index) at mine and control plots were not significantly different among years (Rescan 2010a). Fisher's alpha index indicated that, between 1996 and 2003, species diversity was slightly higher on mine plots than control plots (Smith et al. 2005). Species evenness at mine plots increased significantly across years but remained similar across years at control sites (Rescan 2010). Similarly, the reproductive success of Lapland longspurs does not appear to be affected by roads associated with the Ekati mine (Male and Nol 2005). Birds were found to nest directly adjacent to roads in similar numbers to sites at least 5 km from the site (Male and Nol 2005).

3.9 Waterbirds

Waterbird observations have been recorded in the Diavik Mine study area since 1996 (DDMI 2013). During this time, 40 different species have been recorded (14 to 27 species annually). The total number of individuals of all species has ranged from 410 to 6,060 annually (Golder unpublished data). The abundance of waterbirds fluctuates annually, with no increasing or decreasing trend observed over time.

Waterbird surveys completed for the Gahcho Kué Project between 2010 and 2013 have recorded 11 different species and have ranged from 4 to 6 species annually (De Beers 2010a). The total number of individuals observed annually has ranged from 26 to 38.

Results are not yet available for the 2013 waterbird aerial surveys completed on Lac du Sauvage.

Waterfowl surveys conducted for the Snap Lake Mine in June and July of 1999 and 2000 identified 18 different species (De Beers 2002). For surveys completed in June, average densities of individuals per 1,000 m of shoreline were 2.2 in 1999 and 2.4 in 2000 (N=18 lakes). For surveys completed in July, average density of individuals per 1,000 m of shoreline was 2.2 in 1999 (N=10). It was reported that the low density of waterfowl among lakes within the study area may be due to limited high-quality nesting habitat (both upland and water nesting species) and low abundance of food resources (De Beers 2002).

3.10 Raptors

3.10.1 Raptor Distribution and Abundance

Peregrine falcon nest sites have been monitored for occupancy around the Diavik and Ekati mines since 1995 (Golder 2011; Coulton et al. 2013). Between 6 and 19 sites were checked each year and occupancy rates ranged from 44% to 100% during baseline (1995 to 1999), 64% to 79% during construction (2000 to 2002), and 63% to 94% during current operation of the Diavik Mine (2003 to 2010). Recent analysis of these data indicated that nests that were older were more likely and consistently used than nests that were established more recently (Coulton et al. 2013). A decrease in nest use associated with the mines was not detected. Nest use was apparently correlated with the distribution of suitable habitats in the study area. Hatch success of nests was unrelated to annual increases in mine footprint area. Although natural and anthropogenic effects were generally weak, the lines of evidence suggested that the observed patterns were more likely the result of natural factors operating at a regional scale than more localized effects from the activity of two diamond mines (Coulton et al. 2013).

In the Daring Lake area, annual occupancy rates for falcon nest sites from 1999 to 2010 ranged between 20% and 75% (Golder 2011). The average annual occupancy rate was 46%.

From 1996 to 2005, ten raptor species were recorded within the Gahcho Kué Project study area (De Beers 2010a). The most frequently observed species were peregrine falcons, northern harriers (*Circus cyaneus*), bald eagles (*Haliaeetus leucocephalus*), rough-legged hawks (*Buteo lagopus*), and gyrfalcons.

Fifteen raptor nest sites have been identified within the Snap Lake Mine study area since 1999, although not all of these sites have been surveyed or occupied every year (Golder 2013). The distance of nest sites to the Snap Lake Mine footprint ranges from 8 km (Reference Lake) to 30 km (Munn C and Portage Bay). From 1999 to 2010, occupancy at raptor nest sites (not including eagle and kestrel [*Falco sparvius*]) varied from 27% to 92%.

Of the six mine pits surveyed at Ekati Mine in 2012, three were found to have active nests present, all of which produced fledglings (ERM Rescan 2013). Rough-legged hawk, peregrine falcon, and gyrfalcon established nests within the Fox Pit. Each nest successfully produced three chicks. Peregrine falcons nested in the Beartooth and Koala North pits and successfully produced four chicks at each nest. In 2011, two open pits produced nests and in 2012, nesting activity was found in all Ekati open pits (ERM Rescan 2013).

In the most recent documented pit wall/mine infrastructure inspections at the Diavik Mine (2012), one peregrine falcon nest was identified near the processing plant containing two adults and three fledglings (DDMI 2013).

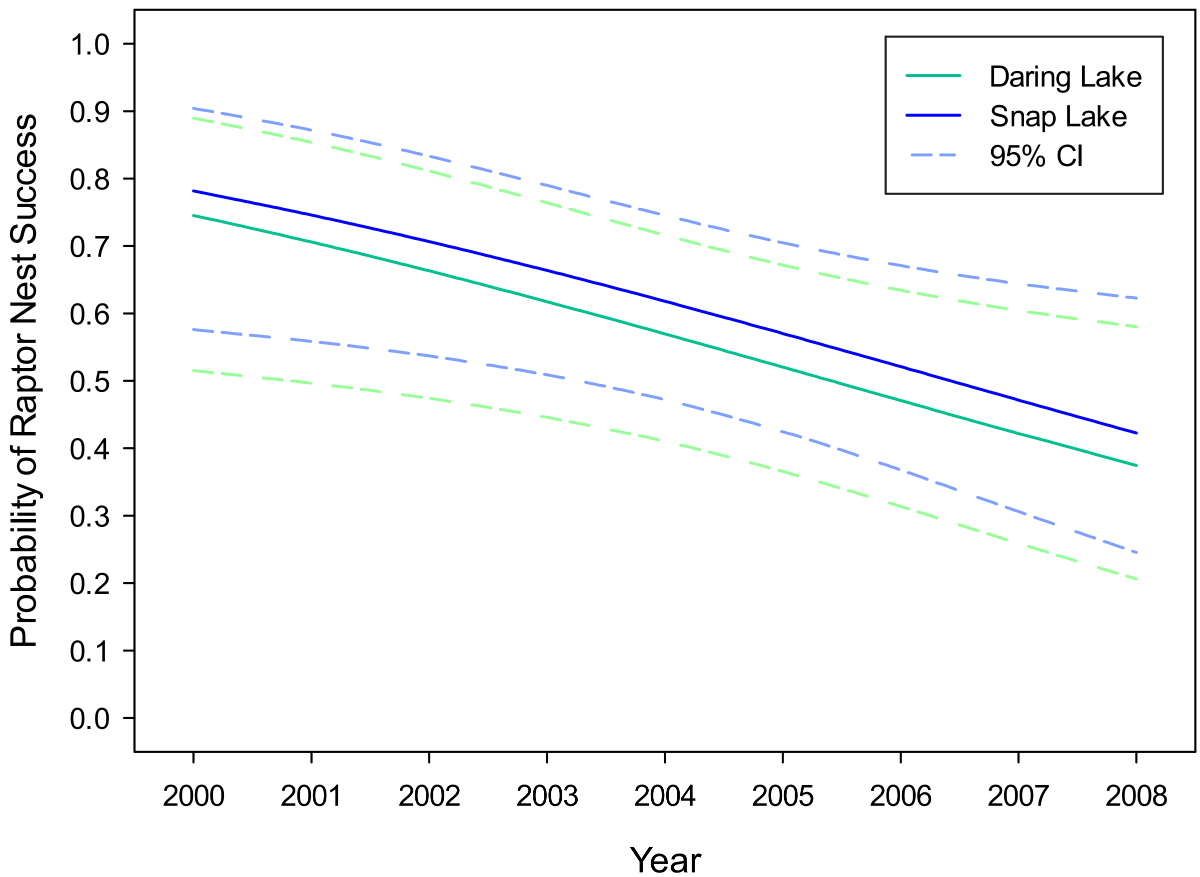
3.10.2 Raptor Nest Success

From 1998 to 2010, between 6 and 15 occupied peregrine falcon nests were detected each year in the Diavik Mine and Ekati Mine study area surveys. The nests were monitored for nest success and chick production. The mean annual nest success rate for all years of monitoring was 31.0% (range: 0% to 100%). Total mean annual productivity from all monitored nests (1998 to 2010) was 9.2 ± 1.8 SE young, a mean annual productivity of 0.9 ± 0.2 young per occupied site (Golder 2011).

Between 1999 and 2010, the number of occupied peregrine falcon nests at Daring Lake ranged between 2 and 10. Mean annual nest success was 56% (range: 17% to 100%). Total mean annual productivity in the Daring Lake area was 5.7 ± 1.2 SE young per year, while mean annual productivity was 1.2 ± 0.3 young per occupied site (Golder 2011). While average annual nest success was lower in the BSA (31%) than Daring Lake (56%), estimates for Daring Lake do not account for birds that abandoned their nests from spring to early summer. Estimated nest success may be higher because birds remaining on nests later in the season are more likely to reproduce successfully. When based on nest success relative to occupancy only during the late-season survey, the average annual success rate in the BSA was 41%, lower than 56% at Daring Lake.

Peregrine falcon nest success in the Snap Lake Mine study area ranged from 14% to 83% between 2000 and 2003. Chicks have been produced in every year and productivity has ranged from 0.25 to 2.8 chicks per occupied site. The analysis of nest success indicated that a decline in success of raptors has occurred in the Snap Lake Mine study area. However, a similar decline in raptor nest success was also observed at Daring Lake where industrial development does not occur (Figure 3.10-1; Golder 2013). Thus, the decline observed in the Snap Lake Mine study area cannot be attributed solely to the presence of the mine. The variables of site quality, prey, and rainfall were not supported in the nest success in the analysis indicating that these were not contributing factors to changes in nest success.

Figure 3.10-1 Model Predictions of Mean Probability of Raptor Nest Success at Daring Lake and Snap Lake Mine Study Areas, 2000 to 2008



Source: Golder (2013).

% = percent; CI = confidence interval.

3.11 Specific Mine-Related Incidents and Mortalities

3.11.1 Barren-Ground Caribou

Caribou incidents and mortality that have occurred at the Diavik, Ekati, and Snap Lake mines since 1996 are summarized in Table 3.11-1. Incidents include all occasions when there was an interaction between the mine and a caribou, and some action was required (e.g., deterrent). An incident does not include mortality. The cause of wildlife mortality is clear for cases where problem wildlife are deliberately destroyed, or when an accidental event was witnessed. However, in other cases, such as when an animal is found dead within the mine property with no physical injury, the cause of death (natural or mine-related) may not be known.

Table 3.11-1 Caribou Incidents and Mortality at the Ekati, Diavik, and Snap Lake Mines, 1996 to 2012

Site	Year	Phase	Species	Mortalities			Other Incidents[d]
				Intentional[a]	Non-Intentional[b]	Found Dead[c]	
Diavik Mine[e]	1996 to 1999	exploration	caribou	—	—	8	—
	2000	construction	caribou	—	—	7	—
	2001	construction	caribou	—	—	1	—
	2002	construction	caribou	—	—	1	—
	2003	production	no incidents	—	—	-	—
	2004	production	caribou	—	1	2	—
	2005	production	no incidents	—	—	—	—
	2006	production	no incidents	—	—	—	—
	2007	production	caribou	—	—	1	—
	2008	production	no incidents	—	—	—	—
	2009	production	no incidents	—	—	—	—
	2010	production	no incidents	—	—	—	—
	2011	production	caribou	—	—	3	—
	2012	production	caribou	—	—	1	—
Ekati Mine[f]	1998 to 2001	construction-production	caribou	—	3	—	—
	2000	production	no incidents	—	—	—	—
	2001	production	no incidents	—	—	—	—
	2002	production	no incidents	—	—	—	—
	2003	production	no incidents	—	—	—	—
	2004	production	caribou	—	1	—	—
	2005	production	caribou	—	—	—	1
	2006	production	no incidents	—	—	—	—
	2007	production	no incidents	—	—	—	—
	2008	production	no incidents	—	—	—	—

Table 3.11-1 Caribou Incidents and Mortality at the Ekati, Diavik, and Snap Lake Mines, 1996 to 2012

Site	Year	Phase	Species	Mortalities			Other Incidents[d]
				Intentional[a]	Non-Intentional[b]	Found Dead[c]	
Ekati Mine[f] (continued)	2009	production	caribou	—	4	4	1
	2010	production	caribou	—	1	6	—
	2011	production	caribou	1	—	4	—
	2012	production	no incidents	—	—	—	—
Snap Lake Mine[g]	1999 to 2003	exploration	no incidents	—	—	—	—
	2004	exploration	no incidents	—	—	—	—
	2005	construction	no incidents	—	—	—	—
	2006	construction	no incidents	—	—	—	—
	2007	construction	no incidents	—	—	—	—
	2008	production	no incidents	—	—	—	—
	2009	production	caribou	—	—	—	1
	2010	production	no incidents	—	—	—	—
	2011	production	caribou	—	—	—	1
	2012	production	information not available	—	—	—	—

a) Animal intentionally destroyed by mine or government personnel.

b) Accidental mine-related mortality (e.g., entanglement in fence).

c) Animal found dead, mortality cannot be linked to mine activities.

d) Each occasion where animals were deterred or relocated, or a damage report was filed. General observations and mortalities are not included. The number of different individuals involved may be unknown.

e) Sources: DDMI (1998, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013).

f) Sources: BHP Billiton (2001, 2002, 2003), Rescan (2004, 2005, 2006, 2007, 2008, 2009, 2010a, 2011, 2012a); ERM Rescan (2013).

g) Sources: De Beers (2002, 2004, 2013a); Golder (2006, 2007, 2008b, 2010).

— = no mortality or incident.

3.11.1.1 Barren-Ground Caribou Intentionally Destroyed

One female caribou was intentionally destroyed at the Ekati Mine in 2011. The individual consistently returned to forage adjacent to the airstrip, despite numerous attempts to deter it. The individual was destroyed after consultation with the ENR and the meat was distributed to nearby communities.

3.11.1.2 Barren-Ground Caribou Non-Intentionally Destroyed

Ten non-intentional project-related caribou deaths have been reported for the three mines since 1996. Three caribou died after becoming stuck in sediments during the dewatering of King Pond on the Ekati Mine site (Rescan 2012a). One caribou was found dead, entangled in the electric fence around the Ekati airstrip in 2004; the exact cause of death was unclear because there was evidence of wolf predation that could have occurred before, during, or after the caribou became entangled in the fence. In 2009, four caribou died after becoming entangled in the Ekati Mine airstrip fence. In 2010, one caribou died after becoming entangled in the Ekati airstrip fence. The fence around the airstrip was replaced in August 2010 with a construction and safety barrier fence to avoid further fence-related caribou mortalities at the airstrip. One caribou was unintentionally killed at the Diavik Mine site in 2004 after becoming entangled in an electric fence that surrounded the Traditional Knowledge camp and becoming easy prey for a grizzly bear.

3.11.1.3 Barren-Ground Caribou Found Dead

Thirteen caribou have been found dead on the Ekati, Diavik, and Snap Lake mine sites since 1996. Most of these caribou were assumed to have been killed by wolves, although the exact cause of death could not always be determined.

3.11.1.4 Other Barren-Ground Caribou Incidents

Between 1996 and 2012, there have been four incidents at the Ekati, Diavik, and Snap Lake mines where caribou have had to be deterred from using areas or have had non-fatal interactions with infrastructure. At the Ekati Mine in 2005, one caribou became entangled in the support guy wires of a tower. The caribou was successfully freed after parts of its antler were cut off. One caribou was observed inside the fence that surrounds the Ekati airstrip in 2009. This caribou successfully rejoined a group of caribou that was on the other side of the fence.

On the Snap Lake Mine site in 2009, caribou had to be herded off the airstrip; herding activities were completed by personnel on foot, in a truck, and in a helicopter. In 2011, one caribou had to be deterred from entering a high-traffic area near the process plant by herding activities.

3.11.2 Carnivores

Carnivore incidents and mortality that have occurred at the Diavik, Ekati, and Snap Lake mines since 1996 are summarized in Table 3.11-2. Incidents include all occasions when there was an interaction between the mine and the carnivore, and some action was required (e.g., deterrent, re-location, or report of damage). Incidents do not include mortality. The cause of wildlife mortality is clear for cases where problem wildlife are deliberately destroyed, or when an accidental event is witnessed (such as the wolf pup that was struck by a vehicle at Ekati Mine in 2002). However, in other cases, such as when an animal is found dead within the mine property with no physical injury, the cause of death (natural or mine-related) may not be known.

Some of the carnivore incidents and mortalities have been directly associated with waste management. One source of attraction that has been problematic is the feeding of wildlife by mine staff, which has occurred deliberately and accidentally. For example, at the Ekati Mine in 1997, lunch bags were found at a local fox den on several occasions, and staff reported seeing a fox travelling with food scraps. In 1999, a fox became habituated to staff at the Ekati Mine truck shop, presumably due to availability of food scraps. The fox was live-captured and relocated. The most effective means of managing this pathway is through continuing education of mine staff and providing garbage cans labelled for food waste in areas where people eat.

3.11.2.1 Carnivores Intentionally Destroyed

The 27 carnivores that were intentionally destroyed on the Ekati, Diavik, and Snap Lake mine sites since 1996 were 4 grizzly bears, 6 wolverines, 16 foxes, and 1 wolf. Grizzly bear kills were one cub of unknown sex in 2000, a 3-year old male and 13-year old male in 2005 at Ekati Mine, and an adult male at Diavik Mine in 2004. Ninety percent of intentionally destroyed foxes were destroyed at Ekati Mine in 2001. All of these removals occurred with the permission of ENR, usually following an extended period of habituation to the site and multiple deterrent attempts with the same individual animal. No wildlife has been intentionally destroyed at the Snap Lake Mine from 1999 through 2009.

Table 3.11-2 Carnivore Incidents and Mortality at the Ekati, Diavik, and Snap Lake Mines, 1996 to 2012

Site	Year	Phase	Species	Mortalities			Other Incidents[d]
				Intentional[a]	Non-Intentional[b]	Found Dead[c]	
Diavik Mine[e]	1996 to 1999	exploration	wolverine	1	—	—	1
	2000	construction	no incidents	—	—	—	—
	2001	construction	wolverine	—	—	1	2
	2001	construction	grizzly bear	—	—	—	3
	2002	construction	no incidents	—	—	—	—
	2003	production	grizzly bear	—	—	—	1
	2004	production	grizzly bear	1	—	—	20
	2005	production	grizzly bear	—	—	—	43
	2005	production	wolverine	—	—	—	5
	2006	production	grizzly bear	—	—	—	21
	2006	production	wolverine	—	—	—	2
	2007	production	grizzly bear	—	—	—	20
	2007	production	wolverine	—	—	—	1
	2008	production	grizzly bear	—	—	—	3
	2008	production	wolverine	—	—	1	17
	2009	production	grizzly bear	—	—	—	18
	2009	production	wolverine	—	—	—	1
	2010	production	grizzly bear	—	—	—	40
	2011	production	grizzly bear	—	—	—	31
	2012	production	grizzly bear	—	—	—	66
	2012	production	wolverine	—	—	—	1

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Table 3.11-2 Carnivore Incidents and Mortality at the Ekati, Diavik, and Snap Lake Mines, 1996 to 2012

Site	Year	Phase	Species	Mortalities			Other Incidents[d]
				Intentional[a]	Non-Intentional[b]	Found Dead[c]	
Ekati Mine[f]	1998 to 2001	construction-production	wolverine	2	—	—	3
	2000	production	grizzly bear	1	—	—	—
	2001	production	fox	9	—	—	—
	2001	production	wolverine	2	—	—	7
	2002	production	wolf	—	1	—	—
	2002	production	fox	1	1	—	—
	2003	production	grizzly bear	—	—	—	5
	2004	production	wolf	—	—	—	4
	2004	production	wolverine	—	—	—	3
	2004	production	grizzly bear	—	—	—	3
	2005	production	fox	—	1	—	6
	2005	production	grizzly bear	2	—	—	18
	2005	production	wolverine	1	—	1	23
	2005	production	wolf	—	—	—	5
	2006	production	grizzly bear	—	—	—	15
	2006	production	wolf	—	—	1	4
	2006	production	fox	—	—	—	13
	2007	production	fox	6	—	2	—
	2008	production	wolf	1	—	—	5
	2008	production	fox	—	—	4	2
	2008	production	grizzly bear	—	—	—	15
	2008	production	wolverine	—	—	—	4
	2009	production	wolf	—	—	—	1
	2009	production	fox	—	1	1	11
	2009	production	grizzly bear	—	—	—	19

Table 3.11-2 Carnivore Incidents and Mortality at the Ekati, Diavik, and Snap Lake Mines, 1996 to 2012

Site	Year	Phase	Species	Mortalities			Other Incidents[d]
				Intentional[a]	Non-Intentional[b]	Found Dead[c]	
Ekati Mine[f] (continued)	2010 to 2011	production	wolf	—	—	—	2
	2011	production	grizzly bear	—	—	—	5
	2012	production	no incidents	—	—	—	—
Snap Lake Mine[g]	1999 to 2003	exploration	no incidents	—	—	—	—
	2004	exploration	fox	—	—	—	1
	2005	construction	fox	—	—	—	1
	2005	construction	grizzly bear	—	—	—	1
	2006	construction	wolverine	—	—	—	2
	2006	construction	fox	—	—	—	41
	2007	construction	fox	—	—	—	36
	2007	construction	black bear	—	—	—	2
	2008	production	grizzly bear	—	—	—	1
	2009	production	wolverine	—	1	—	—
	2009	production	fox	—	—	1	—
	2011	production	fox	—	—	1	—
	2011	production	wolverine	—	—	1	—
	2012	production	information not available	—	—	—	—

a) Animal intentionally destroyed by mine or government personnel.
b) Accidental mine-related mortality (e.g., entanglement in fence).
c) Animal found dead, mortality cannot be linked to mine activities.
d) Each occasion where animals were deterred or relocated, or a damage report was filed. General observations and mortalities are not included. The number of different individuals involved may be unknown.
e) Sources: DDMI (1998, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013).
f) Sources: BHP (2001); BHP Billiton (2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009); Rescan (2010a, 2011, 2012a); ERM Rescan (2013).
g) Sources: De Beers (2002, 2004, 2013a); Golder (2006, 2007, 2008b, 2010).
— = no mortality or incident.

3.11.2.2 Carnivores Accidentally Destroyed

All five occasions where carnivores were accidentally destroyed, and where the cause of death was clearly attributable to the mine, were a result of vehicle collisions. Three fox and one juvenile wolf were killed by vehicles at the Ekati Mine. On October 9, 2002 a wolf pup carcass was found on the Misery Haul Road, 5 m from the shoulder. Fog and blowing snow resulted in poor visibility at the time. A necropsy revealed that cause of death was due to a blow to the back of the head, which broke the skull. A red fox mortality was reported in 2002 due to a vehicle collision on the Misery Haul Road. The fox pup and adult mortalities that occurred at Ekati Mine in 2005 and in 2009, respectively, were due to vehicle collisions. A wolverine was accidentally hit by a vehicle at Snap Lake Mine in 2009.

3.11.2.3 Carnivores Found Dead

Fourteen carnivores (four wolverine, one wolf, and nine fox) have been found dead among the three mines since monitoring began in 1996. This category includes wildlife found dead for which the cause of death could not be directly linked to mine activities. For example, a wolf apparently died from starvation at Ekati Mine in 2006. The carcass was found underneath a building at Misery Camp. A wolverine was found dead at Ekati Mine in 2005, and the cause of death was not determined. One wolverine was found dead in a shipping container on the Snap Lake Mine site in 2011; it was assumed that the wolverine gained access and became trapped when the door of the shipping container was closed. Cause of death could not be determined because the carcass was well decomposed.

3.11.2.4 Other Carnivore Incidents

Between 1996 and 2012, 554 carnivore incidents (not including mortalities) were reported at the Ekati, Diavik, and Snap Lake mines. Although the definition of a wildlife incident varies, this statistic generally includes all occasions where there was some kind of direct interaction between an animal and the mine. Examples include the use of deterrents, wildlife gaining access to areas where they present a risk to themselves or to humans and are re-located, or wildlife causing damage to property.

Most incidents recorded on the three mines involved grizzly bears (63%). Approximately 4% of recorded incidents involved wolves, 13% involved wolverines, and 20% involved foxes. Two black bear incidents have also been recorded on the three mines since 1996.

4 SUMMARY

This section of the baseline report summarizes wildlife investigations that have occurred within the BSA, and presents the 2013 baseline status of the ten wildlife species evaluated. The BSA includes the zone of influence from the Project, the Ekati-Diavik mine complex, and reference areas. The BSA boundaries contain the diversity of habitats that support the seasonal requirements for the target species. Wildlife species were selected if species or species associations were listed federally or otherwise reflect current priorities of regulatory agencies, First Nations groups, communities, and other people interested in the Project.

The Bathurst, Ahiak, and Beverly barren-ground caribou herds all have ranges that potentially overlap with the BSA. Of the three herds, the Bathurst herd, with a range of approximately 309,000 km^2 (GNWT 2013a), is of greatest concern. The number of animals in barren-ground caribou herds increase and decrease at relatively regular intervals, for example, every 30 to 60 years (Zalatan et al. 2006; GNWT-ENR 2013). Although these natural fluctuations in herd size appear to be linked to changes in climatic patterns and winter range quality (Ferguson and Messier 2000; Weladji and Holland 2003; Gunn 2009; Vors and Boyce 2009), the exact mechanisms responsible for generating these population cycles are unknown. The Bathurst herd declined from 472,000 individuals in 1986 to 31,900 individuals in 2010 (decline of 93.2% over 26 years; GNWT-ENR 2013) and is currently thought to be stable near 35,000 animals (Adamczewski 2014).

Data from satellite-collared Bathurst herd caribou revealed that they travel regularly through the BSA, although there is a high level of spatial and temporal variability in their distribution and abundance. In the 1990s estimated caribou numbers in the Diavik Mine study area ranged between 0 and 100,000 depending on the season (DDMI 1998). In addition to natural variability, evidence suggests that caribou herds change their distribution around diamond mine developments, with caribou more likely to occur further away from the mines (Boulanger et al. 2004; Golder 2005; Johnson et al. 2005; BHP Billiton 2007; Golder 2008a,b; Boulanger at al. 2009, 2012). Caribou are also known to alter their behaviour in response to roads, artificial habitats created by mine structures, and human activity. Analyses of data from satellite collared caribou near the Ekati, Diavik, and Snap Lake mines indicate that the zones of influence of the mines on caribou behaviour range 12 km to as much as 50 km (Boulanger et al. 2004; Boulanger et al. 2012; Golder 2011). Data collected between 1995 and 2009 at the Ekati Mine suggest that the probability of observing a caribou in a transect cell during the post-calving migration increases as distance from the mine increases (Rescan 2010a). Deployment of remote cameras on the Misery Haul Road have indicated that caribou frequently cross the road; observations of deterred road crossings represented only 2% of the observations (ERM Rescan 2014b), and did not vary with changes in traffic volumes.

At the regional scale, heath tundra, heath tundra/boulder-bedrock, and riparian shrub appear to be the most preferred habitat types for caribou during the northern and post-calving migration periods (BHP Billiton 2004; Golder 2008a,b). Caribou activity budgets are influenced by environmental (e.g., insect harassment) and anthropogenic (e.g., mine operation) variables, and may have energetic implications (Gunn et al. 2001; Weladji and Holland 2003).

The barren-ground grizzly bear population in the SGP of the NWT is currently considered stable or slightly increasing (McLoughlin, Mitchell et al. 2003). However, barren-ground grizzly bear is considered a sensitive species in the NWT (NWT Infobase 2012) because the population is sensitive to increased harvest rates and habitat change due to human development (McLoughlin, Taylor et al. 2003). No barren-ground grizzly bear dens were found during carnivore den surveys for the Project in 2013. In 2012, a regional grizzly bear monitoring study was implemented to determine the relative abundance and density of grizzly bears in the area surrounding the Ekati and Diavik mines. The study was also designed to be compatible with other regional studies to improve cumulative effects monitoring. This program includes the use of hair snagging stations in a 30,000 km^2 area in the North Slave Region, including an area of 16,000 km^2 around the Ekati and Diavik mines. The abundance and distribution of grizzly bears will be determined using DNA markers to track individuals through time.

The wolverine DNA mark-recapture study at Daring Lake, Ekati Mine, and Diavik Mine suggests that the wolverine populations around Daring Lake and the Diavik Mine are decreasing at approximately 11% per year, while the population around Ekati Mine may be stable (Boulanger and Mulders 2013). No wolverine dens were recorded during carnivore den surveys for the Project in 2013.

Wolf abundance and distribution is expected to vary annually and seasonally in response to prey availability. Overall, active wolf den sites have continued to be present in the Ekati Mine area since 1995 (ERM Rescan 2013). Suitable habitat is that associated with high densities of prey species. Three wolf dens were located during carnivore den surveys for the Project in 2013. One den was active and two dens were inactive. The three dens were located approximately 4 km west of the Project.

A large diversity in waterbirds is found in the BSA; 40 different species have been observed since 1996. The numbers of individuals observed during surveys fluctuates annually, with no increasing or decreasing trend observed over time. While some of the species are considered sensitive within the NWT, none is listed federally.

Monitoring within the BSA has documented known raptor nest sites that are surveyed annually. These include nest sites in active mine pits. Species observed most frequently are peregrine falcons, northern harriers, bald eagles, rough-legged hawks, and gyrfalcons. Survey data for peregrine falcons from 1998 to 2010 show a mean annual productivity of 0.89 ± 0.21 young per occupied nest in the BSA (Golder 2011).

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6 GLOSSARY

Term	Definition
Bog	A type of wetland receiving water exclusively from precipitation and not influenced by groundwater; the vegetation is dominated by peatmoss (*Sphagnum spp.)*.
Boreal forest	The northern hemisphere, circumpolar, tundra forest type consisting primarily of black spruce and white spruce with balsam fir, birch, and aspen.
Carnivore	Any of an order of mammals that feed chiefly on flesh or other animal matter rather than plants.
Coniferous	A tree that bears cones. Evergreens compose the majority of this type of tree. They are called evergreens because they do not shed their leaves all at once in the fall.
Deciduous	Deciduous means *temporary* or *tending to fall off* (deriving from the Latin word *decidere*, to fall off) and is typically used in reference to trees or shrubs that lose their leaves seasonally.
Density	The number of individuals per unit area.
Ecoregion	Subdivisions of ecozones that are relatively homogeneous with respect to soil, terrain, and dominant vegetation.
Ecosystem	Ecological system consisting of all the organisms in an area and the physical environment with which they interact.
Esker	Linear structure of loose sand and gravel, formed by glacial rivers. Eskers provide critical habitat for carnivores and ungulates in the Arctic.
Furbearer	Mammals that have traditionally been trapped or hunted for their fur.
Glaciofluvial	Sediments or landforms produced by melt waters originating from glaciers or ice sheets. Glaciofluvial deposits commonly contain rounded cobbles arranged in bedded layers.
Habitat	The physical space within which an organism lives, and the abiotic and biotic entities (e.g., resources) it uses and selects in that space.
Habitat fragmentation	A process by which habitats are increasingly subdivided into smaller units, resulting in their increased restriction as well as an overall loss of habitat area and biodiversity.
Heath	Vegetation typical of the Arctic, often characterized by lichens, mosses, sedges, and dwarf trees and shrubs.
Home range	The area traversed by an animal during its activities during a specific period of time.
Kame	A steep-sided mound of stratified material deposited against an ice-front.
Kimberlite	A rock of igneous origin that is forced to the Earth‘s surface via volcanic pipes. The name is derived from Kimberley, South Africa, where the rock was first discovered.
Kimberlite pipe	A more or less vertical, cylindrical body of kimberlite that resulted from the forcing of the kimberlite material to the Earth‘s surface.
Landscape	Mosaic of patches that differ in ecologically important properties.
Lichen veneer	A continuous mat of lichen that appears as a “veneer.” These sites are windswept and dry, allowing very little other plant growth. Lichen veneer consists mainly of Iceland moss, several other species of Cetraria, green and black hair lichens, grey mealy lichen, worm lichens and other species.
Microtine	Small mammal species (voles) with the genus name *Microtus*.
Migratory	Migration occurs when living organisms move from one biome to another. In most cases, organisms migrate to avoid local shortages of food, usually caused by winter or overpopulation. Animals may also migrate to a certain location to breed.
Outwash	Stratified sediments (chiefly sand and gravel) deposited by meltwater streams in front of the end moraine or the margin of an active glacier.
Overwintering habitat	Habitat used during the winter as a refuge and for feeding.
Passerines	Perching birds, mostly small and living near the ground, with feet having four toes arranged to allow for gripping the perch; most are songbirds.

Term	Definition
Peat polygon	A perennially frozen bog, rising approximately 1 m above the surrounding fen. The surface is relatively flat, scored by a polygonal pattern of trenches that developed over ice wedges. The permafrost and ice wedges developed in peat originally deposited in a non-permafrost environment. Polygonal peat plateaus are commonly found near the boundary between the zones of discontinuous and continuous permafrost.
Permafrost	Permanently frozen ground; that is, soil that remains frozen for at least two years.
Polygons	A map delineation that represents a tract of land with certain landform, soil, hydrologic, and vegetation features. The smallest polygon on a 1:50,000 scale map is approximately 0.5 cm^2 and represents a tract of approximately 12.5 hectares (ha).
Population	A collection of interbreeding individuals.
Range	The geographic limits within which an organism occurs.
Raptor	A carnivorous (meat-eating) bird; includes eagles, hawks, falcons, and owls.
Riparian	Refers to terrain, vegetation, or simply a position next to or associated with a stream, floodplain, or standing waterbody.
Sensory disturbance	Visual, auditory, or olfactory stimulus that creates a negative response in wildlife species.
Tundra	A type of ecosystem dominated by lichens, mosses, grasses, and woody plants; a treeless plain characteristic of the Arctic and sub-Arctic regions.
Ungulate	Belonging to the former order Ungulata, now divided into the orders Perissodactyla and Artiodactyla, and composed of the hoofed mammals such as horses, cattle, deer, swine, and elephants.
Upland	Ground elevated above the lowlands along rivers or between hills; highland or elevated land; high and hilly country.
Valued component	Represents physical, biological, cultural, and economic properties of the social-ecological system that is considered to be important by society.
Wetlands	Wetlands are land where the water table is at, near, or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation. Wetlands include organic wetlands or “peatlands,” and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat.
Yearling	An animal in its second year.
Zone of influence	The area surrounding a development site in which animal occurrence is reduced, possibly due to avoidance of sensory disturbances or low-quality habitat.