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Charlie Catholique, Chair
Environmental Monitoring Advisory Board
PO Box 2577
Yellowknife, NT X1A 2P9
Canada

25 July 2020

Dear Mr. Catholique:

Subject: DDMI Response to EMAB Recommendations re: 2020 WMMP

Please find enclosed Diavik Diamond Mines (2012) Inc.'s (DDMI) response to EMAB's June 17, 2020 recommendations for the 2020 Wildlife Management and Monitoring Plan (WMMP). DDMI notes that the WMMP is consistent with the Government of Northwest Territories' *Wildlife Management and Monitoring Plan (WMMP) Process and Content Guidelines, June 2019*.

Please do not hesitate to contact the undersigned or Kofi Boa-Antwi (867 447 3001 or kofi.boa-antwi@riotinto.com) if you have any questions related to this submission.

Yours sincerely,

Sean Sinclair
Principal Advisor, Environment and Closure Readiness

cc: John McCullum, EMAB
James Hodson, GNWT

Attachments:
- DDMI 2020 Wildlife Management and Monitoring Plan
- DDMI Response to EMAB Recommendations on the 2020 WMMP

WILDLIFE MANAGEMENT AND MONITORING PLAN FOR THE DIAVIK DIAMOND MINE

Prepared for: Diavik Diamond Mines (2012) Inc.
Prepared by: Golder Associates Ltd.
July 16, 2020

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Tables

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Abbreviations

Abbreviation	Definition
AEMP	Aquatic Effects Monitoring Program
CRP	Closure and Reclamation Plan
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DDMI	Diavik Diamond Mines (2012) Inc.
Diavik mine	Diavik Diamond Mine
DNA	deoxyribonucleic acid
Dominion Diamond	Dominion Diamond Ekati Corporation
Ekati mine	Ekati Diamond Mine
ELC	Ecological Land Classification
EER	Environmental Effects Report
ENR	Environment and Natural Resources, Government of the Northwest Territories
EAQMP	Environmental Air Quality Monitoring Plan
GIS	Geographical Information System
GNWT	Government of the Northwest Territories
IQ	Inuit Qaujimajatuqangit
EMAB	Environmental Monitoring Advisory Board
KIA	Kitikmeot Inuit Association
LKDFN	Łutselk'e Dene First Nation
Mine	Diavik mine
NABBS	North American Breeding Bird Survey
NSMA	North Slave Métis Alliance
NWT	Northwest Territories
SARA	*Species at Risk Act*
spp.	multiple species
TK	Traditional Knowledge
VEC	Valued Ecosystem Component
WLWB	Wek'èezhìı Land and Water Board
WMP	Wildlife Monitoring Program
WMMP	Wildlife Management and Monitoring Plan
PKCFP	Processed Kimberlite Containment Facility Plan
WRMP	Waste Rock Management Plan
WRSA	Waste Rock Storage Area
YKDFN	Yellowknives Dene First Nation
ZOI	zone of influence

Units of Measure

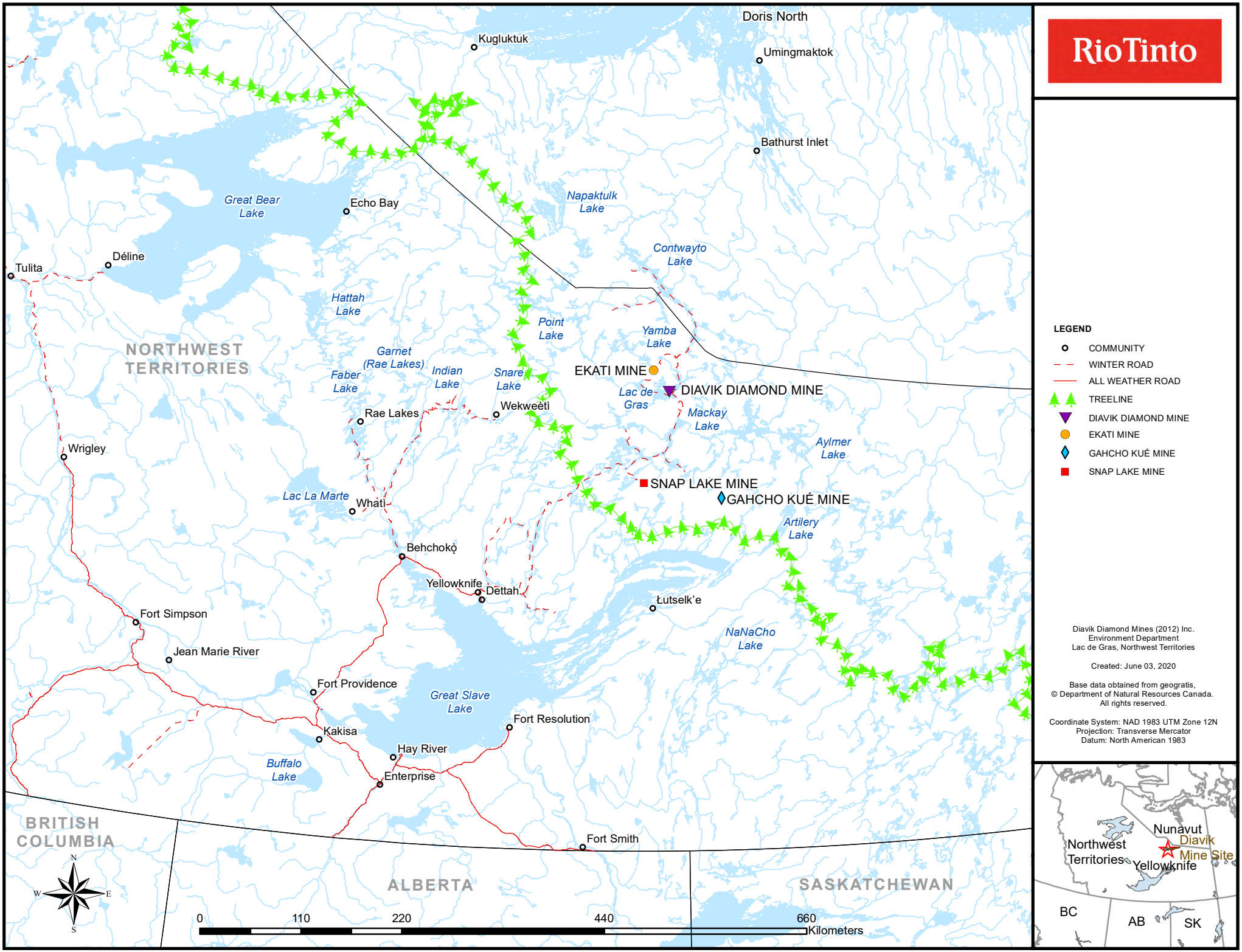
Unit	Definition
%	percent
>	greater than
<	less than
°C	degrees Celsius
cm	centimetre
km	kilometre
km/h	kilometres per hour
km^2	square kilometre
m	metre
mm	millimetre

1 INTRODUCTION

1.1 The Diavik Diamond Mine

The Diavik Diamond Mine (also referred to as the Diavik mine or Mine) is located on East Island, a 17 km^2 island in Lac de Gras, NWT, approximately 300 km northeast of Yellowknife (64°31' North, 110° 20' West) (Figure 1.1-1). The area is remote, and major freight is trucked over a seasonal winter road from Yellowknife. Worker access is by aircraft. The Diavik mine involves the mining of four diamond bearing kimberlite pipes. The pipes, designated as A154N, A154S, A418 and A21, are located directly offshore of East Island (Figure1.1-2). All mining, diamond recovery, support activities and infrastructure (roads, pipes, water and waste management facilities, accommodation complex and airstrip) are located on the East Island (Figure1.1-2). At full development, the Mine is predicted to have a physical footprint of 12.76 km^2.

The Diavik Diamonds Project Environmental Assessment documents were formally submitted to the Federal Government in September 1998, and in early November 1999 the federal Minister of the Environment approved the Diavik Diamonds Project for permitting and licensing. On March 8, 2000, the Environmental Agreement was signed and the Department of Indian Affairs and Northern Development (DIAND), now Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), issued permits to allow Diavik Diamond Mines (2012) Inc. (DDMI or Diavik) to begin construction activities. The Mine started production in January 2003, producing approximately 3.8 million carats in 2003. Full production began in 2004 with a production target of 7 to 8 million carats. It is expected that the Mine will produce approximately 107 million carats of diamonds over a 16- to 22-year mine life.


Doris North
Kugluktuk
Umingmaktok
Bathurst Inlet
Great Bear Lake
Echo Bay
Napaktulk Lake
Contwayto Lake
Tulita
Déline
Hattah Lake
Point Lake
Yamba Lake
NORTHWEST TERRITORIES
Garnet (Rae Lakes)
Faber Lake
Indian Lake
Snare Lake
EKATI MINE
DIAVIK DIAMOND MINE
Lac de Gras
Mackay Lake
Rae Lakes
Wekweètì
Wrigley
Aylmer Lake
SNAP LAKE MINE
GAHCHO KUÉ MINE
Lac La Marte
Whatì
Artilery Lake
Behchokǫ̀
Yellowknife
Dettah
Łutselk'e
Fort Simpson
NaNaCho Lake
Jean Marie River
Fort Providence
Great Slave Lake
Fort Resolution
Kakisa
Hay River
Buffalo Lake
Enterprise
Fort Smith
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
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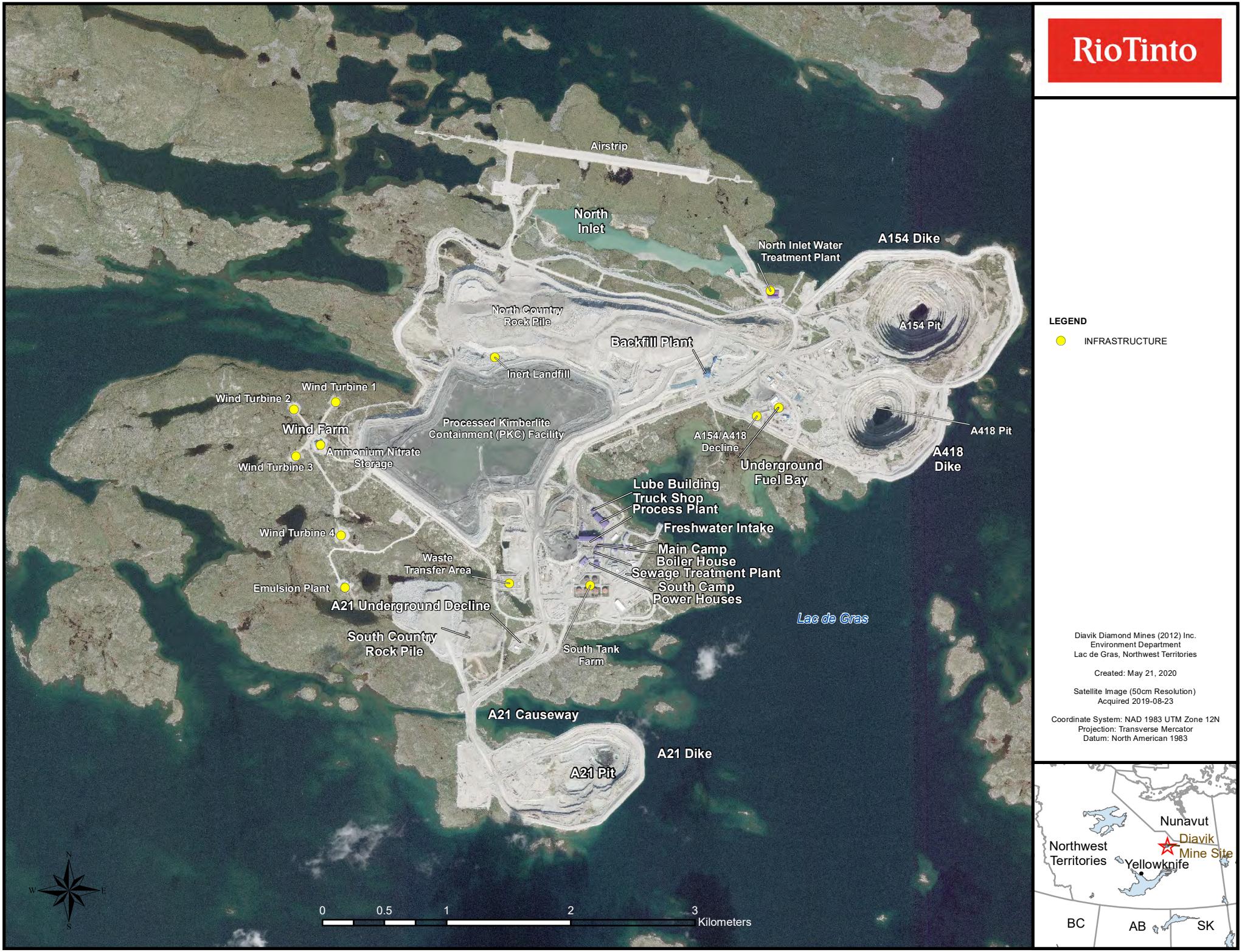
110
220
440
660
Kilometers
LEGEND
COMMUNITY
WINTER ROAD
ALL WEATHER ROAD
TREELINE
DIAVIK DIAMOND MINE
EKATI MINE
GAHCHO KUÉ MINE
SNAP LAKE MINE
Diavik Diamond Mines (2012) Inc.
Environment Department
Lac de Gras, Northwest Territories
Created: June 03, 2020
Base data obtained from geogratis,
© Department of Natural Resources Canada.
All rights reserved.
Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Nunavut
Diavik
Mine Site
Northwest Territories
Yellowknife
BC
AB
SK



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LEGEND

- INFRASTRUCTURE

Diavik Diamond Mines (2012) Inc.
Environment Department
Lac de Gras, Northwest Territories

Created: May 21, 2020

Satellite Image (50cm Resolution)
Acquired 2019-08-23

Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983

1.2 Background to Wildlife Monitoring

Diavik conducted wildlife baseline studies from 1995 to 1997. The information was used to describe ecological conditions in the Lac de Gras area in support of the Project Description and Environmental Assessment (DDMI 1998a,b). A Wildlife Monitoring Program (WMP) was developed as part of the Environmental Agreement for the Diavik Diamond Mine (DDMI 2000). Documents that were used in developing the WMP included the following:

- Comprehensive Study Report, Diavik Diamonds Project (The Canadian Environmental Assessment Act 1999);
- Environmental Assessment Overview, Diavik Diamonds Project (DDMI 1998c);
- Environmental Effects Report, Wildlife, Diavik Diamonds Project (EER; DDMI 1998b); and
- Wildlife Baseline Report, Diavik Diamonds Project (Penner 1998).

Table 1.2-1.2-1 summarizes the Environmental Agreement provisions and compliance by the WMP.

Table 1.2-1 Provisions of Environmental Monitoring Programs Under Section 7.1 of the Environmental Agreement

Section 7.1 Provision	Wildlife Monitoring Program Compliance
(a) Meet the monitoring requirements of all Regulatory Instruments.	Compliant with the NWT *Wildlife Act*, and *Species at Risk Acts* (Federal and Territorial).
(b) Verify the accuracy of the environmental assessment of the Project.	An objective of the WMP (Section 1.4).
(c) Determine the effectiveness of measures taken to mitigate any adverse environmental effects of the Project.	An objective of the WMP (Section 1.4).
(d) Consider Traditional Knowledge.	A recent example includes the grizzly bear hair snagging program and the identification of high quality habitat for hair snagging station deployment. Selection of wolverine winter track survey locations and collection of data is another example.
(e) Establish or confirm thresholds or early warning signs.	For wildlife, ecological quantitative thresholds are not available. However, the WMP provides predictions such as Mine-related mortality rates (Section 5.3).
(f) Trigger action by adaptive mitigation measures where appropriate.	Programs have been adaptively managed over time (Section 2.2), which includes changes to mitigation such as early versus more current waste management practices. Possible outcomes of adaptive management related to mitigation include more, less or unchanged mitigation depending on effectiveness. Past scope and improvements are noted in component monitoring sections.
(g) Provide opportunities for the involvement or active participation of each of the Aboriginal Peoples in the implementation of the monitoring programs.	Communities participated in caribou, wolverine, and grizzly bear studies (Section 3.2).
(h) Provide training opportunities for each of the Aboriginal Peoples.	Training is provided each time communities participate (Section 4.4).

Implementation of the WMP by DDMI from 2002 to 2019 (i.e., during construction and operation of the Mine) has been used to test effects predictions in the EER (DDMI 1998a,b), evaluate the effectiveness of mitigation, and provide feedback for adaptive management. The WMP also considers wildlife issues of concern identified by communities and regulatory agencies. The WMP is aligned with the Environmental Agreement, which states that monitoring programs contained within the management plans shall include activities designed to:

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

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

1.3 Evolution of the Wildlife Monitoring Program

The Diavik WMP is based on evaluating the assumed success of implemented mitigation and associated predicted residual effects to wildlife and wildlife habitat provided in the EER (DDMI 1998b), but has evolved through time with input from the communities, government regulators, and EMAB. Knowledge of the effects of mining on wildlife from monitoring undertaken at the Diavik mine, other diamond mines, and research in the NWT (e.g., wolverine and grizzly bear hair snagging) has also influenced the components, objectives, study designs, and sampling methods in the WMP. Over time, the content of the WMP was also modified to meet the requirements of the Draft Wildlife and Wildlife Habitat Protection Plan and Wildlife Effects Monitoring Program Guidelines provided by the Government of Northwest Territories, Department of Environment and Natural Resources (GNWT-ENR 2013a). More recently, the GNWT-ENR has provided Wildlife Management and Monitoring Plan Guidelines (GNWT-ENR 2019a) for the process and content of wildlife monitoring programs. As a result, the structure and content of the WMP has evolved into the Wildlife Management and Monitoring Plan (WMMP) presented in this document to be consistent with the GNWT-ENR (2019a) Guidelines.

Diavik Mine Environment roles and responsibilities are provided in SOP ENVI-444-0415. The Diavik mine employs Environment Supervisors to manage and guide the Environment Technicians who implement the WMP; hereafter the WMMP. The Environment Department is led by a superintendent who oversees regulatory concordance, reporting and engagement associated with the WMMP and provides the resources necessary to implement the WMMP, which is also intended to engage interested parties and solicit feedback. Consistent with the principles of adaptive management and revisions to the WMP, the WMMP is a living document that will be updated as needed.

Because the Diavik mine has been operating for 17 years, multiple environmental monitoring programs and management plans are in place, and have been effectively improved over time through adaptive management (Section 2.2). The Diavik mine environmental monitoring programs and management plans include:

- Ammonia Management Plan (DDMI 2020a)
- Aquatic Effects Monitoring Program (Golder 2020a)
- Closure and Reclamation Plan (DDMI 2019a)
- Contingency Plan (DDMI 2017a)
- Engagement Plan (DDMI 2020b)
- Environmental Air Quality Monitoring Plan (DDMI 2019b)
- North Inlet Water Treatment Operations Plan (DDMI 2020c)
- Processed Kimberlite Containment Facility Plan (DDMI 2018)
- Waste Rock Management Plan (DDMI 2020d)
- Waste Management Plan (DDMI 2017b)
- Water Management Plan (DDMI 2020e)

1.4 Objectives of the Wildlife Management and Monitoring Plan

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

The global objectives of the WMMP were developed considering the requirements of the Environmental Agreement, and the remaining key residual environmental risks to wildlife identified in the EER (DDMI 1998b). The global objectives include the following:

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

The specific objectives associated with each component of the WMMP are summarized below in Table 1.4-1.

Table 1.4-1 Specific Wildlife Management and Monitoring Program Components and Objectives

Management and Monitoring Program Components		Objectives
Direct Wildlife Habitat Loss		• Determine the amount of direct habitat loss due to development of the Diavik mine.
Waste Management	Landfill and Waste Transfer Area Inspections	• Determine the effectiveness of waste management policies and procedures, and provide feedback for improvement to reducing attraction and access by wildlife to food and other wastes.
	Waste Bin Inspections	
All Wildlife	Wildlife Incidents and Mortalities	• Document and mitigate wildlife incidents and mortalities. • Reduce risks to both wildlife and people. • Determine the effectiveness of mitigation and test EER predictions about direct Mine-related mortalities.
Caribou	Incidental Observations	• Identify the composition of caribou groups moving through the study area. • Document the seasonal timing of caribou movement through the study area to determine possible annual trends. • Document possible annual trends in the number of caribou moving through the study area.
	Zone of Influence Monitoring	• Determine whether the zone of influence changes in relation to mine activity.
	Behaviour	• Determine if caribou behaviour changes with distance from the mines.
Grizzly Bear	Incidental Observations	• Avoid and minimize bear-human interactions. • Determine the level of grizzly bear activity within the study area.
	Hair Snagging Study	• Provide estimates of grizzly bear abundance and distribution in the study area over time.
Wolverine	Incidental Observations	• Avoid and minimize wolverine-human interactions. • Determine the level of wolverine activity within the study area.
	Snow Track Monitoring	• Provide estimates of relative wolverine activity and distribution in the study area.
	Hair Snagging Study	• Provide estimates of wolverine abundance and distribution in the study area over time.
Raptors	Pit Wall Nest Monitoring and Incidental Observations	• Determine if pit walls or other infrastructure are utilized as nesting sites for raptors. • Determine nest success in areas of development and document effectiveness of deterrent efforts used.
	Regional Falcon Surveys	• Record site occupancy and productivity of historic peregrine falcon nest sites in the study area to contribute to regional falcon data for monitoring long-term population trends.
Waterbirds	Presence	• Determine if the Mine affects the presence of waterfowl and shorebird species in the study area.
Rare or Uncommon Species	Incidental Observations	• Document trends in the detection of rare or uncommon species in the study area.

In 2009 and 2010 workshops were organized to with the goal of improving and standardizing wildlife monitoring at all diamond mines (Diavik mine, Ekati mine, and Gahcho Kué mine). The first was in September 2009, and attended by representatives of the three operating diamond mines, governments, monitoring agencies, and communities. The workshop focused on general results from the monitoring programs (Marshall 2009). A technical workshop in 2010 resulted in specific recommendations for the mining companies to consider incorporating into the objectives, study designs, and methods of their monitoring programs, with an interest in standardizing approaches and regional monitoring objectives across all the mines (Handley 2010). The standardized regional monitoring objectives from this workshop for each VEC are provided in Section 5.

1.5 Concordance

The WMMP serves to meet DDMI's obligations to a range of authorities. This includes various Acts and regulations relevant to wildlife in the NWT (Table 1.5-1). The WMMP also meets the requirements of the GNWT Wildlife Management and Monitoring Plan Guidelines (GNWT-ENR 2019a). The sections of the WMMP that pertain to the NWT Acts and regulations, and the guidelines for wildlife and wildlife habitat protection and monitoring are also identified in Table 1.5-1.

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

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WMMP	Responsible Regulatory Agency
Environmental Agreement	• Measure compliance with regulatory requirements • Determine the environmental effects of the Mine • Test impact predictions • Measure the performance of operations and effectiveness of impact mitigation	Entire Document	Government of Canada, GNWT
Migratory Birds Convention Act, Migratory Bird Regulations	The taking of nests or eggs of migratory game or insectivorous or nongame birds shall be prohibited, except for scientific or propagating purposes under such laws or regulations as the High Contracting Powers may severally deem appropriate.	Section 4.6	CWS (ECCC)
NWT Wildlife Act	A wildlife management and monitoring plan must include: (a) a description of potential disturbance to big game and other prescribed wildlife, potential harm to wildlife and potential impacts on habitat; (b) a description of measures to be implemented for the mitigation of potential impacts; (c) the process for monitoring impacts and assessing whether mitigative measures are effective; and, (d) other prescribed requirements.	Entire Document	GNWT-ENR
Species at Risk Act and *Species at Risk (NWT) Act*	Diavik Diamond Mines (2012) Inc. will adhere to requirements of all applicable Regulations or Recovery Plans that may be developed over the duration of the Mine.	Section 2.5	CWS (ECCC) GNWT-ENR
NWT Wildlife Act	Guidelines for the preparation of a Tier 3 wildlife management and monitoring plan, dated June 2019.	Section 1.0	GNWT-ENR
	Purpose of and Objectives of the WMMP.		
	Measures, conditions and developer commitments concordance table.	Section 1.5	
	Engagement	Section 3.0	
	Mention of associated operational or management plans	Section 1.3	
	Project description	Section 1.0	
	Project map	Section 1.0	
	Affected species or habitat features	Section 2.3	
	Potential impacts to wildlife and wildlife habitat	Section 4.2	
	Employee wildlife awareness education and training	Section 4.4	

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

Legislation/ Regulation/ Agreement	Requirement	Corresponding Section in WMMP	Responsible Regulatory Agency
	Infrastructure design and camp layout for bear safety and/or to prevent denning, nesting and roosting	Section 4.3	
	Management of camp waste and other wildlife attractants	Section 5.2	
	Timing restrictions and/or set back distances to protect wildlife and wildlife habitat features	Section 4.3.1	
	Direct habitat loss – minimizing the project's physical footprint	Section 4.2.1	
	Habitat alteration – minimizing physical manipulation of habitat that would decrease its value to wildlife	Section 4.2.1	
	Indirect habitat loss – minimizing functional habitat loss due to sensory disturbance, dust, etc.	Section 4.2.2	
	Management of hazards to wildlife (e.g., open pits, tailings ponds, roads, airstrips, spills)	Section 4.3.1	
	Wildlife deterrence procedures	Section 4.3.4	
	Habitat restoration	Section 4.2.1	
	Description of the role of community wildlife monitors in implementing aspects of the plan	Section 3.0	
	Offsetting or compensatory measures	Sections 4.0, 5.4.1, 5.5.3, 5.6.3, 5.7.2	
	Mitigation monitoring	Section 5.0	
	Wildlife effects monitoring	Sections 5.4, 5.5, 5.6	
	Project footprint size reporting	Section 5.1	
	Support for cumulative effects assessment, monitoring or management	Sections 5.4, 5.5, 5.6	
	Description of approach to adaptive management	Section 2.2	
	Formal response frameworks with action levels	Section 2.2	
	Reporting protocols	Section 7.0	
	Roles and responsibilities	Section 1.3	
	Literature cited	Section 8.0	
	Glossary	Glossary	
	SOPs	Appendix A	
	Monitoring forms and data sheets	Appendix B	
	Reporting form templates	Appendix B	
	WMMP revisions tracking table	page iv	

CWS = Canadian Wildlife Service; ECCC = Environment and Climate Change Canada; GNWT=Government of Northwest Territories; GNWT-ENR = Government of Northwest Territories, Department of Environment and Natural Resources; WMMP = Wildlife Management and Monitoring Plan.

2 DEVELOPMENT OF THE WILDLIFE MANAGEMENT AND MONITORING PLAN

2.1 Wildlife Study Area and Setting

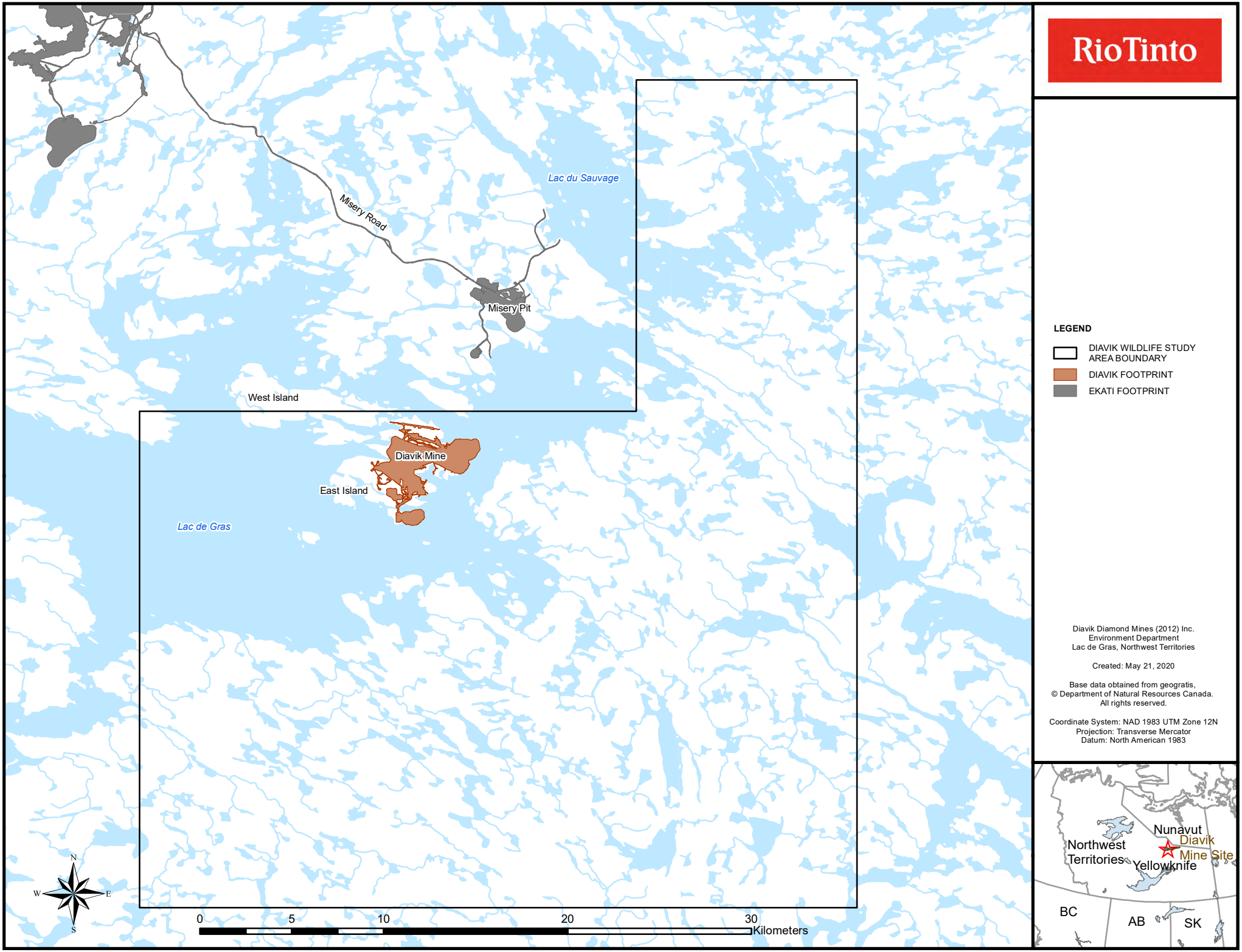
Beginning in 2002, wildlife monitoring was conducted in a study area of approximately 1,200 square kilometres (km^2) surrounding the Diavik mine (Figure 2.1-1). For caribou, a larger aerial survey study area was expanded to 1,870 km^2 in 2006, and then 2,867 km^2 during 2007 and 2008. In August 2009, the Diavik and Ekati mines collaboratively expanded the aerial survey study area to 5,930 km^2 after consultation with regulators and permission from the ENR. The study area was expanded south so that an effective buffer around the Diavik mine was surveyed to accurately assess caribou distribution relative to mine development.

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

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

Characteristic vegetation of the Tundra Shield Low Arctic (south) Ecoregion includes continuous to discontinuous low-shrub complexes and erect dwarf-shrub tundra (ECG 2012). The terrestrial vegetation community around the Diavik mine is composed mainly of heath tundra. Characteristic species are Labrador tea, bog cranberry, bearberry, black crowberry, and dwarf birch. Lichen-dominated communities are found on the crests and upper slopes of eskers where the snow does not accumulate and on bedrock or boulder complexes where exposed rock outcrops support these communities. Shrubs, such as willows and dwarf birch, are found in sheltered riparian areas along streams, seeps, and lakeshores associated with poorly drained soils. The vegetation characteristics of the sedge wetlands and tussock hummock plant communities occurring in depressions are dominantly sedges, cotton grasses, and peat mosses (DDMI 1998b).

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



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LEGEND

- DIAVIK WILDLIFE STUDY AREA BOUNDARY
- DIAVIK FOOTPRINT
- EKATI FOOTPRINT

Diavik Diamond Mines (2012) Inc.
Environment Department
Lac de Gras, Northwest Territories

Created: May 21, 2020

Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983

2.2 Monitoring Framework and Adaptive Management

Adaptive management is a structured process of decision making to deal with uncertainty. The objective of adaptive management is to reduce uncertainty through monitoring, or "learning by doing" (WLWB 2010). In the case of wildlife monitoring, the "doing" is the environmental monitoring, and the "learning" is continual improvements to environmental management and the monitoring programs. This requires the monitoring program to be adaptive and flexible. The monitoring program must be flexible enough to incorporate comments, suggestions, and information based both on science and local and TK. The Diavik mine WMMP has and will continue to incorporate adaptive management.

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

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

Results from local (i.e., Mine-specific) and regional collaborative monitoring programs are used to provide feedback to Diavik mine operations to determine if the objectives are being met (Figure 2.2-1). Modification and/or implementation of additional mitigation may be required as determined through monitoring results and the adaptive management process. Similarly, changes to the objectives and/or study methods for local and regional monitoring programs may be required if it is determined that the measurement indictor for the associated effects pathway has a low sensitivity to detect Mine-related changes or that the scale of the response does not match the objective. For example, long-term monitoring of caribou distribution by aerial survey methods recently demonstrated that caribou distribution is explained more by habitat availability than mine-related effects (Golder 2020b) so zone of influence (ZOI) monitoring using aerial surveys will discontinue and an accepted alternate method will be applied (GNWT-ZOITTG 2015).

Alternately, the data and results may be sufficient to demonstrate that Mine-related effects on the VEC are negligible, confirming the objective and supporting the decision to stop monitoring that component of the program (Figure 2.2-1). For example, a decade of monitoring showed little effects from the Diavik and Ekati mines on falcons relative to natural factors occurring at larger regional scales (Coulton et al. 2013). Through discussions and engagement with communities, monitoring agencies, and government, the decision was made to remove annual monitoring of raptor nests from mine-specific objectives of the monitoring programs. Instead, mine sites were to contribute to regional data through the North American Breeding Bird Surveys and the Canadian Peregrine Falcon Survey (Marshall 2009; Handley 2010).

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

Diavik has and will continue to actively seek input from regulatory authorities and communities through engagement activities and other regional programs led by the GNWT. Annual reports and meetings are ways that DDMI will present the results of the monitoring program, and the basis for communities and regulatory agencies to provide feedback and direction. In accordance with the concept of adaptive management, monitoring programs and mitigation policies, practices, and actions in the WMMP have and will continue to be adaptively managed over the life of the Mine.

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

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

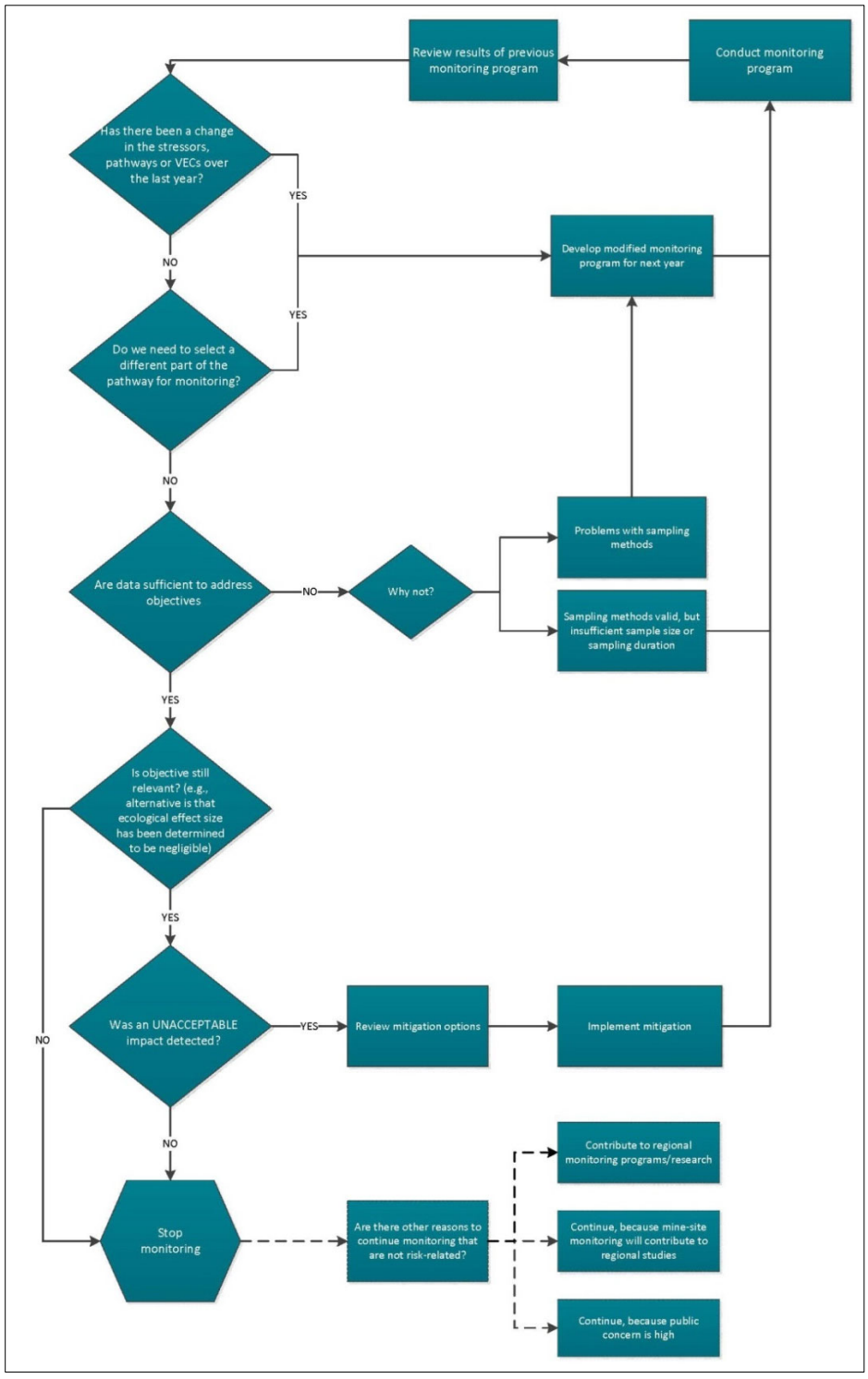
Monitoring programs must be flexible enough to incorporate comments, suggestions, and information based both on science and local and TK. There are no regulator established guidelines for wildlife critical values, threshold conditions, or action levels. If changes to the receiving environment are determined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

Following the principles of adaptive management, wildlife monitoring has undergone changes since the initial development of the WMP in 2002 (DDMI 200). These changes have been implemented following the results of monitoring and effectiveness of mitigation, recommendations and suggestions from communities, EMAB, and government agencies.

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

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

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



2.3 Valued Ecosystem Components

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

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

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

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

Valued Ecosystem Component	Rationale
Barren-ground caribou	Barren-ground caribou are a species of concern, seasonal migrants to the area, are an important component of the culture and economy of the NWT.
Grizzly bear	Grizzly bears are a species of concern, and regional monitoring is being undertaken.
Wolverine	Wolverine are a species of concern, and regional monitoring is being undertaken.
Raptors	Peregrine falcon and short-eared owl are species of concern. Peregrine falcons are known to nest on cliffs in the Mine regional study area. However, based on technical workshops with government, monitoring agencies and Aboriginal communities, falcons have been removed as a VEC from Mine-specific monitoring, and DDMI contributes to regional monitoring.
Waterbirds	Waterfowl and shorebird species are seasonal migrants to the area. Presence monitoring during operations was removed in consultation with ECCC and will resume during the closure period of the Diavik mine.

NWT = Northwest Territories.

Incidental observations of other wildlife species during monitoring, such as rare or uncommon species will also be recorded (Section 5.9). Following the principles of adaptive management, the VECs and monitoring objectives may be periodically reviewed and changed as necessary.

2.4 Species of Concern

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

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

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

Table 2.5-1 Species of Concern at the Diavik Mine

Species	*Species at Risk (NWT) Act*	COSEWIC Assessment	Federal *Species at Risk Act*	Potential Mine Impacts	WMMP
Barren-ground caribou	Threatened	Threatened	Under consideration	• may be affected by habitat loss • may be sensitive to disturbance and human activity • risk of harm or mortality	Habitat loss Site monitoring Zone of influence monitoring Behaviour monitoring
Grizzly bear (western population)	No status	Special Concern	Special Concern	• may be attracted to developments if food is available • sensitive to disturbance particularly when accompanied by young or during denning • long generation time means one individual may be affected by disturbance seasonally over multiple years, resulting in potential regional population effects	Habitat loss Site monitoring Regional hair-snagging program
Wolverine (western population)	Not at risk	Special Concern	Special Concern	• may be attracted to developments if food or shelter are available	Habitat loss Site monitoring Snow track surveys Regional hair-snagging program
Peregrine falcon (anatum-tundrius complex)	No status	Not at risk	Special Concern	• peregrines have been known to nest on Mine infrastructure and in open pits, where they may be at risk of harm or may cause delays to operations	Habitat loss Site/pit monitoring (particularly for nesting activity) Regional nest occupancy and productivity monitoring
Red-necked phalarope	Not applicable	Special Concern	Special Concern	• loss of shoreline habitat for breeding • water birds that use Mine-altered waters may be harmed	Habitat loss Site monitoring (particularly for nesting activity)
Rusty blackbird	No status	Special Concern	Special Concern	• may nest on Mine infrastructure (risk of mortality) • experiencing population declines as a result of changing environmental conditions on breeding and overwintering habitats	Habitat loss Site monitoring (particularly for nesting activity)
Short-eared owl	No status	Special Concern	Special Concern	• may be affected by habitat loss • sensitive to noise and disturbance and human activity during nesting	Habitat loss Site monitoring (particularly for nesting activity)

Source: NWT SAR (2020).

COSEWIC = Committee on the Status of Endangered Wildlife in Canada; NWT = Northwest Territories; WMMP = Wildlife Management and Monitoring Plan.

3 ENGAGEMENT AND INCORPORATION OF TRADITIONAL KNOWLEDGE

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

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

Part of the intent of DDMI's Engagement Plan is to demonstrate and provide hands-on experience for community members (Elders, adults, and youth) so that they may gain a general awareness on how the Diavik mine Environment Department conducts its day-to-day, site-based, environmental monitoring programs. To accomplish this, DDMI utilizes several different methods, including:

- A TK Panel (community Elders and youth representatives);
- TK monitoring programs; and,
- Community assistance with environmental monitoring programs.

The methods follow guiding principles for integrating TK at the Mine, which are provided in Table 3.0-1. The guiding principles were developed on the basis of respect, integrity and to demonstrate a willingness to learn from experience.

Table 3.0-1 Diavik Mine Guiding Principles of Traditional Knowledge Integration

Principle	Integration at Diavik Mine
Wildlife programs benefit most when TK is applied at the development stage. Scientific methods are then used to collect data.	Grizzly bear hair snagging program, wolverine snow track program, and vegetation and lichen sampling (caribou habitat)
TK is used throughout operations to check in and update programs.	Recommended new caribou behaviour monitoring categories
TK monitoring programs will be considered that have a clear objective directly linked to testing EER predictions or mitigation effectiveness, and are reproducible.	Vegetation and lichen monitoring program (Tłı̨chǫ Government 2013).
Communities including Elders should participate in monitoring.	Caribou monitoring up to 2013 when caribou were abundant in the study area Wolverine snow track monitoring
TK Panel Sessions will be the primary source of TK.	Recommended new caribou behaviour monitoring categories Numerous recommendations have been made for Mine closure

The TK Panel is the primary way that DDMI gathers TK for the Mine and the TK Panel meets at least once per year. The TK Panel is comprised of DDMI and TK holders from the five different communities involved in the Environmental Agreement. While Diavik may recommend discussion topics, the TK Panel has the freedom to develop its own agenda. To date the TK Panel has primarily focussed their wildlife recommendations on closure aspects of the Mine. Recommendations associated with the Mine closure phase are outside of the scope of the WMMP but will be considered by DDMI for the Closure and Reclamation Plan.

Diavik is committed to engaging with communities to explain proposed changes to the WMMP, to listen to comments, respond to questions and consider suggestions to improve components of the WMMP. Diavik will consider proposed TK monitoring programs that have a clear objective and will lead to measurable and reproducible results that relate to EER predictions or inform on mitigation effectiveness.

3.1 Support of Community-Based Traditional Knowledge Studies

The Diavik mine has a strong history of supporting community-based TK projects that extends back to the mid-1990s which is described below.

Diavik became a funding partner to the On the Land Collaborative in 2016. Through the On the Land Collaborative, Diavik is able to ensure communities across the north are supported for land-based activities. The NWT On the Land Collaborative brings together government, charitable, corporate, and other partners to combine efforts and make it easier for communities in the Northwest Territories to access money and resources for land-based projects. The Collaborative supports projects that:

- get people out on the land;
- connect community members to their land, culture, and traditions;
- build or strengthen partnerships;
- enhance community capacity; and,
- are sustainable.

For more information, visit www.nwtontheland.ca.

In addition to support for land-based projects, the Diavik mine hosted numerous site visits and community meetings to discuss archaeology, wildlife, habitat, water and waste management at the Mine site. Representatives from the communities have also helped design project activities and components in an effort to minimize potential impacts. Other site-based TK and community engagement programs related to the wildlife monitoring programs have included:

- TK Camp for Elders and youth;
- survey transect design used for wolverine snow track monitoring 2003 through 2006;
- community participation in caribou behaviour, grizzly bear hair snagging and wolverine snow track monitoring;

- annual TK Panel sessions;
- annual visits from community leadership and representatives;
- annual community participation in group workshops and site visits to demonstrate and discuss air quality, dust, and vegetation monitoring, and other specific topics of interest; and,
- periodic Winter Road tours.

Diavik mine staff also regularly participates in community-based meetings and workshops to discuss questions and concerns about ongoing mining activities and monitoring programs in conjunction with the Engagement Plan.

3.2 Incorporation of Traditional Knowledge in Monitoring

With the assistance of community experts, land users and/or TK holders during wildlife and wildlife habitat surveys, TK has been applied to help with monitoring study design, understand the results, or provide ways of preventing or reducing impacts to wildlife. In particular, TK has been an important part of wildlife monitoring program development. In general, TK is not applied as a separate line of evidence; scientific methods have been the source of data collection to provide repeatable results and comparison with the EER predictions. Diavik is committed to providing communities with the opportunity to participate in mitigation and monitoring study designs and programs. Up to 2013, communities, including Elders, were regular participants in caribou monitoring. Participation has decreased since then because of the Bathurst caribou herd decline and subsequent low numbers of caribou in the study area. Inclusion of local and TK in the monitoring of caribou, wolverine, and grizzly bear is listed in Table 3.2-1 with further description in the subsequent sections.

Table 3.2-1 Traditional Knowledge and Wildlife Monitoring at Diavik Mine

VEC	Traditional Knowledge Contributed	Monitoring Program	Program Application	WMMP Section
Barren-ground caribou	• preferred habitat • migration • traditional land use • caribou behaviour categories	Vegetation and Lichen (habitat) Caribou Behaviour	• selection of sampling locations (study design) • variables measured • interpretation of results	3.2.1
Wolverine	• preferred habitat	Snow tracking	• selection of sampling locations (study design) • monitoring participation	3.2.2
Grizzly bear	• preferred habitat	Grizzly bear hair snagging	• scale of monitoring (study design) • selection of sampling locations (study design) • monitoring participation • species samples	3.2.3

3.2.1 Caribou

Elders and holders of TK are regularly invited to site to participate in monitoring programs and to share their knowledge about caribou behaviour, diet, health and body condition, and migration movements. For example, Diavik and the Tłı̨chǫ Government carried out a TK study in the summer of 2013 through a series of workshops and site visits where four participating Elders from Tłı̨chǫ and Lutsel K'e shared stories and knowledge about caribou migration, preferred habitats (vegetation communities and landscape features) and traditional land use (Tłı̨chǫ Government 2013). The guidance provided by the Elders resulted in selection of specific sampling sites for the vegetation and lichen monitoring program that were appropriate for caribou use. In addition to influencing the study design, TK shared in this study has also been considered in the interpretation of monitoring results (see Appendix I of Golder 2017a). Elders in the 2013 TK study noted that caribou will avoid using the areas close to the Mine during migration because dust on forage will alter its taste or smell.

Traditional Knowledge was incorporated into caribou behaviour surveys in the fall of 2012 and 2013. Participating Elders added an additional behaviour "curious" for caribou that approached. Traditional Knowledge has also been incorporated into the caribou scan surveys through means of a questionnaire. Observed caribou are commented on from an animal health and traditional use perspective. For example, during 2019 caribou behaviour scans, Earnest (Patty) Lockhart from Lutseł K'e Dene First Nation and Lisa Marie Zoe from Whatí participated and commented that the caribou being observed appeared healthy.

3.2.2 Wolverine

Diavik has completed long-term monitoring of wolverine using snow track methods. From 2003 to 2006, the study design and data collection for wolverine snow track monitoring was based on the experience of Inuit Qaujimajatuqangit (IQ) to locate transects and record wolverine snow tracks in the study area. In 2008 the study design was revised and the final locations of snow track survey transects were the result of a stratified random sampling process of potential locations in the study area, but some transects were relocated from Lac de Gras to areas of preferred wolverine habitat (based on IQ). Snow track surveys are often completed with support from community members.

3.2.3 Grizzly Bear

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

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

3.2.4 Traditional Knowledge Inclusion in Effects Mitigation and Deterrents

Since 2011, the TK Panel has guided DDMI to appropriately and meaningfully consider TK in operations and closure planning and management of the Mine. The TK Panel is made up of Elders and youth from Diavik's Participation Agreement communities selected by their respective communities (Kitikmeot Inuit Association, Łutselk'e Dene First Nation, North Slave Métis Alliance, Tłı̨chǫ Government and Yellowknives Dene First Nation). Panel members have been meeting since 2012 and continue to gather at least once a year to review closure plans for various areas of the Mine, share their knowledge in relation to each topic, and present recommendations to Diavik. In this way, they are continually building their understanding of the Mine site and the closure challenges, while also directly influencing closure plans. To date, the TK Panel has provided a total of 206 detailed recommendations for consideration by DDMI and other parties. For example, the TK Panel sessions made the following resloping recommendations to encourage safe passage of wildlife through and around the Mine site and which have been incorporated into operational and closure mitigation:

- TK Panel #10 (Watching/Monitoring and the WRSA-SCRP, 14-18 September 2017): incorporate a re-sloped (3:1) pathway on the South Country Rock Pile to facilitate safe movement of wildlife across the pile
- TK Panel #9 (Focus on Caribou, 13-16 May 2016): ensure that the closure design for the North Country Rock Pile would be sloped to minimize the amount of water that would pool on top of the pile minimizing wildlife attraction
- TK Panel #7 (Re-vegetation Report, 14-18 August 2014): design the North Country Rock Pile final closure slope to be neutral to wildlife and vegetation, mimicking the approach taken at the Test Piles

4 MITIGATION

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

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

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

The Diavik mine uses mitigation that avoids, minimizes, and reclaims adverse effects associated with environmental risks or effects pathways. The results of the environmental assessments for the Diavik mine (DDMI 1998b) concluded that there were no significant residual effects to wildlife and wildlife habitat so offsetting is not required. The Bathurst Caribou Range Plan (GNWT-ENR 2019b) suggests that financial and in-kind contributions to science and TK research and monitoring (guardianship programs) are a form of offsetting even though this form of compensation cannot be demonstrated to result in no net loss or a net gain. Diavik has a history of contributions that can be considered compensatory measures. Diavik has made financial contributions to the GNWT's caribou collaring program that has supported increases in the number of collars deployed and deployment of high resolution geo-fenced collars that will inform management and the ecology of caribou. Diavik has contributed to DNA hair snagging studies for grizzly bear and wolverine that provide demographic information on these species and have informed species at risk assessments by the NWT Species at Risk Committee (NWT SARC 2014, 2017) and inform cumulative effects assessments and management by the GNWT. Diavik has completed ZOI monitoring and analysis, which contributes to understanding cumulative effects to caribou (Golder 2020b). Diavik has also analyzed collar data to describe several Bathurst caribou range attributes (e.g., autumn range size and fidelity), which informs on the broad-scale ecology of the herd (Golder 2020b).

Mitigation at the Diavik mine is applied and intensified or reduced within an adaptive management framework (Section 2.2). For example, the frequency with which wildlife deterrents are applied may increase or decrease, depending on results of monitoring (Section 2.2; Figure 2.2-1). Similarly, if monitoring demonstrated that wildlife-vehicle collisions were high or increasing, then the scope or frequency of driver training, speed limits, or other mitigation can be managed adaptively in a way that is intended to reduce the effect. Adaptive management can also include increasing monitoring, applying different mitigation, or implementing a special study to better understand an effect.

4.1 Mitigation Effectiveness at the Diavik Mine

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

4.1.1 Vehicle-Wildlife Collisions

Mitigation efforts to avoid and minimize vehicle-wildlife collisions, such as speed limits, giving animals the right-of-way, radio communication of wildlife presence, and temporary road closures have been successful. No caribou, grizzly bear, or raptors have been killed at the Diavik mine from vehicle collisions. One wolverine (2007) was killed by a vehicle (DDMI 2007). Most vehicle-wildlife collisions involve fox, Arctic hare, ptarmigan, and Arctic ground squirrel.

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

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

- caribou advisory;
- wildlife always have the right-of-way;
- speed limits are posted and enforced;
- vehicles encountering wildlife on roads are required to stop and communicate the presence of wildlife on the road(s) to the Environment Department and others in the area;
- traffic patterns may be altered and are communicated site-wide when wildlife are in the vicinity of the road; and,
- visual inspections at the airstrip for wildlife are completed prior to take-off and landing of all aircraft.

4.1.2 Waste Management

Mitigating the attraction of carnivores and scavengers (e.g., gulls and ravens) to food garbage, petroleum products, and potential shelter is a concern at all operating mines. There are indications that improved and continual employee education has resulted in a decrease in the presence of scavengers and food waste items at the Waste Transfer Area (WTA) and Landfill over time at the Diavik mine (Golder 2020b). Specifically, training and education is provided for each department and new employees on the importance of following waste management policies and practices, and wildlife awareness to reduce interactions with wildlife. Changes in the operations of waste management practices, in addition to the education and awareness programs for new and current employees and contractors include:

- more frequent burning of camp waste to reduce chance of wildlife encounters;
- littering and feeding of wildlife is prohibited; and,
- signs have been added in lunchrooms and additional labels have been added to waste bins to indicate proper waste disposal.

4.1.3 Open Pits

Open pits may lead to wildlife injury or mortality through the presence of steep sides, fly rock, and traffic. No caribou or other wildlife mortalities from animals entering the open pits at the Diavik mine have been reported (Golder 2020b).

4.1.4 Dust

The Mine produces dust through various sources including blasting and crushing rock, haul truck and light vehicle traffic, and the take off and landing of aircraft. Fugitive dust emissions are mitigated through the application of water and chemical suppressants on roads and the airstrip during summer or the non-frozen period. Monitoring of dust deposition is completed through the Environmental Air Quality Monitoring Plan (EAQMP) and the Comprehensive Vegetation and Lichen Monitoring Program, which assesses the effects of dust on plant species, and changes to lichen and soil chemistry (Section 5.1). Dust has resulted in limited and small adverse effects to plant communities/wildlife habitat (Golder 2017).

4.1.5 Health Effects from Contaminants

Diavik completed a risk assessment of caribou exposure to metals in lichen from dust deposition and found that potential health effects to caribou were negligible (Golder 2011a). Caribou exposure to metals from dust deposition and associated health risks continue to be evaluated during Mine operations as part of the Comprehensive Vegetation and Lichen Monitoring Program, and indicated metal concentrations are predicted to remain within safe levels for caribou (Golder 2017).

4.2 Mitigation of Key Environmental Risks or Pathways

The WMMP provides specific mitigation for each of the following key environmental risks or pathways:

- direct habitat alteration and loss;
- indirect habitat alteration and loss; and,
- protection of caribou and other wildlife from direct Mine-related mortality.

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4.2.1 Direct Habitat Alteration and Loss

Direct habitat loss refers to the physical disturbance and immediate loss of wildlife habitat (e.g., upland and riparian vegetation, wetlands, and water) within the footprint of the Diavik mine. Direct habitat loss is monitored in the WMMP. Mitigation for direct habitat loss is implemented so that the physical footprint of the Diavik mine does not exceed that authorized in the Land Use Permits and includes the following.

- soil disturbance will be limited to only those areas required for construction and operation of the Diavik mine;
- use progressive reclamation when areas of the Mine site are no longer required; and,
- conditions will continue to be monitored over time to evaluate the success of the Closure and Reclamation Plan (CRP) and, using industry best practice, adaptive management, and newer proven methods as available, to adjust the CRP as necessary and appropriate.

4.2.2 Indirect Habitat Alteration and Loss

Indirect habitat loss is a result of a decrease in the perceived quality of habitat by wildlife and subsequent changes in movement and behaviour of individuals that occurs outside of the Mine physical footprint. The decrease in habitat quality can be a function of sensory disturbance from Mine-related dust, noise, lights, human presence, and animal memory of previous encounters with development. Changes in movement and behaviour from sensory disturbance can affect the local abundance and distribution of animals within an area or ZOI of mining activity. Thus, sensory disturbance can reduce habitat quality for wildlife even where vegetation remains intact.

Currently, it is expected that indirect habitat alteration and loss for caribou (i.e., the ZOI) will be monitored through regional programs in collaboration with ENR, potentially through the Barren-ground Caribou Management Strategy (Section 5.8.1). Potential mechanisms for the ZOI will be monitored through the WMMP and other programs such as the EAQMP and Comprehensive Vegetation and Lichen Monitoring Program.

Mitigation policies and actions to minimize indirect habitat loss includes the following:

- regular maintenance of equipment to limit noise and particulate matter emissions;
- dust suppression is applied as appropriate to roads, airstrip, and laydown areas;
- speed limits are posted and limit fugitive dust emissions;
- wildlife always have the right-of-way; and,
- education and environmental sensitivity training will be provided to employees and contractors.

4.3 Protection of Caribou and Other Wildlife

Occasionally, mining operations have contributed to the mortality or injury of wildlife. This may be either accidental (such as vehicle collisions with wildlife), or the deliberate removal (re-location or intentional destruction) of problem wildlife to protect worker safety. Deterrent actions always start with the least intrusive method and then increase with intensity as needed. An effective way to reduce wildlife mortality has been to establish and enforce low speed limits on Mine roads. Reducing the availability of food and shelter for wildlife, thus limiting the attraction and presence of animals within the Diavik mine, is also highly effective at preventing mortality or harm to wildlife. Incidents and mortalities, and effectiveness of mitigation for the protection of caribou and other wildlife are monitored in the WMMP.

4.3.1 Direct Mine-Related Mortality and Injury

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

- The current mitigation policies and practices for safety of wildlife on roads, airstrip and other areas of the Diavik mine will be continued (Section 4.1). These practices include reporting of wildlife sightings by all employees, and control of encounters by Environment staff;
- Site environmental technicians will investigate all caribou and other wildlife incidents and mortalities, report to government, and recommend follow-up;
- Routine, systematic monitoring of different areas of the Diavik mine will be conducted, including the waste management and transfer areas and Landfill. Information collected will be used for adaptive management;
- Caribou and other wildlife will be deterred from areas of risk;
- Wildlife always have the right-of-way;
- Speed limits are posted and enforced;
- Mitigation is currently in place to minimize human-wildlife interactions, including awareness training;
- Pit wall monitoring procedures for raptor nests;
- Birds showing nesting activity in areas of critical risk will be actively deterred. Diavik will not deter birds from nesting in inactive pits;
- Although Diavik Mine is at full development, any additional land clearing will take place outside the migratory bird breeding season. If this is not possible, nest surveys will be completed and active nests avoided.
- Visual airstrip inspections for wildlife are completed prior to take-off and landing of all aircraft;
- Vehicles encountering wildlife on roads are required to stop and communicate the presence of wildlife on the road(s) to the Environment Department and others in the area.

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4.3.2 Management of Toxic Substances

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

- regular equipment maintenance (e.g., regular checks for leaks);
- drip trays are used during servicing and refuelling;
- hazardous substances are stored and handled on site in accordance with applicable regulations;
- fuel is stored at a central bulk fuel area and fuel tanks are housed within bermed areas;
- follow Diavik's Contingency Plan in the event of a spill (spill response training is provided and updated);
- soil and snow affected by hydrocarbon spills are handled in accordance with the existing Contingency Plan and soil will be remediated in the landfarm or the Type 3 zone of the North Country Rock Pile;
- dewatering and minewater management is managed by the Water Management Plan and Processed Kimberlite Containment Facility Plan;
- minewater and fine processed kimberlite slurry pipelines are monitored and inspected throughout the life of Mine. Additional mitigation is applied, if required; and,
- any leaks or spills identified along the pipelines are addressed and clean-up, following the existing Contingency Plan.

4.3.3 Management of Attractants

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

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

4.3.4 Deterring Wildlife

The goal of wildlife deterrent action is to respond to situations using humane methods that keep both humans and wildlife safe. Wildlife will only be deterred when there is a risk to either humans or wildlife, as judged by the environment staff. All deterrent actions start with the least intrusive method, and then increase in intensity as needed (ENVI-914-0119). Each deterrent action will stop as soon as the animal moves away from the potentially hazardous site and no longer poses a threat to humans. Deterrents may be used to remove wildlife from the airstrip and potentially hazardous sites and activities. All deterrent actions will be documented and reported to ENR. Specific deterrent actions for caribou consider the following:

- all incidents involving interactions, use of deterrents or potential injury of caribou will be documented and evaluated; and,
- caribou will only be moved away from roads or the airstrip under specific circumstances, such as when there are incoming flights or if there is an emergency (ENVI-911-0119).

4.4 Education

Environmental education is part of every employee's and visitors mandatory training upon starting at the Diavik mine. The Diavik Safety Training System for environmental education training includes:

- review of Environmental Management System;
- wildlife awareness (Incidental Reporting Requirements);
- wildlife right-of-way policy (Diavik Wildlife Management Policy);
- no feeding wildlife policy (DDMI Policy: No Feeding of Wildlife);
- no hunting or sport fishing policy (Diavik Wildlife Management Policy);
- spill reporting (EMS OCP Spill Management);
- wildlife reporting policy;
- Workplace Hazardous Materials Information System (WHMIS); and,
- waste management.

The Environment department also provides role and department-specific training and presentations based on seasonal environmental issues. For instance, departmental staff will be given presentations on waste management practices and if a trend is identified from monitoring.

4.5 Mitigation Review

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

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

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

5 MONITORING

5.1 Direct Wildlife Habitat Loss

Diavik has monitored the cumulative amount of direct habitat loss from construction through current operation of the Mine since 2000. The quantity of loss (total of 12.67 km^2) was predicted in the EER (DDMI 1998b) and approved through the Environmental Assessment process. In addition, Diavik conducts ongoing monitoring to determine if dust from the Mine is affecting vegetation communities, and lichen and soil chemistry (i.e., Comprehensive Vegetation and Lichen Monitoring Program). Permanent vegetation plots are assessed for plant species cover (relative abundance) and richness at Mine and reference sites. Metals concentrations are analyzed in lichen and soil samples near and far from the Mine. A Comprehensive Vegetation and Lichen Analysis Report is generated every three years, which was last completed in January 2017 (Golder 2017). The frequency of vegetation monitoring was recommended to increase from three to five years (i.e., next cycle in 2021) because dustfall since 2016 has not exceeded a trigger determined from the reference site.

Past Scope and Improvements

Studies conducted by Epp and Matthews (1998) and Matthews et al. (2001) classified the entire Slave Geological Province into 15 units or habitat associations. Since 2000, this 15 unit Ecological Land Classification (ELC) system has been used to assess the amount of loss per habitat association at the Diavik mine.

Objectives

The objective for this component of the WMMP is to:

- determine the amount of direct habitat loss due to development of Diavik mine.

Methods

A satellite image is used to update the area of the current Mine footprint. The image is laid over the ELC (Matthews et al. 2001) (Table 5.1-1). Each ELC type disturbed by the Mine is selected and calculations are made to determine the area (km2) of each habitat type replaced by the Mine footprint. Values provided for ELC unit loss are estimates based on the predicted Mine extent (DDMI 1998b), the actual Mine footprint, and the ELC.

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

Habitat Type	Description
Bedrock complex (>80% rock)	Exposed bedrock with very little vegetative cover.
Birch seep/riparian shrub	Vegetation in areas of active water seepage through boulder fields and boulder streams. Moist and well drained areas of low shrub with continuous vegetation cover. Birch and willow species dominate these areas.
Boulder complex (>80% rock)	Large areas of boulder fields including boulder outcrops, boulder streams, and drainages. This land cover type supports very little plant growth.
Deep water (>2 m)	Deep, clear lakes and major river systems with water depths greater than 2 m.

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

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

Data from Matthews et al. (2001).

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

Frequency

Mine footprint updates and associated habitat (ELC) loss will be provided annually.

Data Analyses

Analyses will be completed in a Geographical Information System (GIS) platform to compare predicted and observed cumulative area of ELC units altered due to Mine activities, including revegetated areas. The area of each habitat type directly disturbed by the Diavik mine will be included in the annual WMMP report.

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5.2 Waste Management

The Waste Management Plan outlines requirements so that the collection, storage, transportation and disposal of all wastes generated by mining and support activities at the Diavik mine are conducted in a safe, efficient and environmentally compliant manner. The plan also incorporates waste minimization. The main objectives of the Waste Management Plan are to:

- create a system for proper disposal of waste;
- minimize potentially adverse impacts on the physical and biological environment; and,
- comply with Federal and Northwest Territories (NWT) legislation.

5.2.1 Waste Inspections

Past Scope and Improvements

The Diavik mine site has two key areas of concern relating to waste storage, handling, and disposal. The WTA is a disposal and staging area for wastes generated on site, both hazardous and non-hazardous. The approved inert Landfill is for disposal of materials such as glass, plastic, steel and styrofoam, and is located in the Waste Rock Storage Area – North Country Rock Pile.

Objectives

The objective of this component of the WMMP is to:

- determine the effectiveness of waste management policies and procedures, and provide feedback for improvement to reducing the attraction and access by wildlife to food and other wastes.

Methods

The survey involves visual investigations of the WTA and Landfill on foot (SOP-ENVI-913-0119). The amounts and types of animal attractants (e.g., food, food packaging, oil products, and oil-contaminated wastes) and other misdirected wastes (e.g., batteries and aerosol cans) will be recorded. All attractants and other mis-directed wastes will be safely removed and properly discarded. Diavik also monitors waste segregation (ENVI-913-0119).

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

Frequency

Waste inspections at the WTA and Landfill were conducted twice per week during the winter and once per week in the summer. A site-wide compliance inspection is completed on a weekly basis.

Data Analyses

Data analyses will be completed to identify trends over time in the number of wildlife attractants and wildlife sign observed at the WTA and Landfill. Results will be used to identify any further mitigation that would improve the effectiveness of the Waste Management Plan with respect to wildlife, if necessary.

5.2.2 Recycling Initiatives

Past Scope and Improvements

During 2008, DDMI implemented an employee-driven recycling program for plastic bottles and aluminium cans generated on site. Cash from refundable recycling is donated to charity. In addition, a number of other recyclable waste materials generated on-site are shipped off-site using winter road backhauls. Items shipped off-site include:

- used oil, oil filters and grease;
- used glycol;
- aerosol cans;
- batteries (lead-acid and dry cell);
- expired/waste fuel (e.g., Jet B);
- oil-based paint; and,
- absorbents.

Objectives

The objective of this component of the WMMP is to:

- Reduce the number of waste items generated on site by recycling.

Methods

Diavik collects and stores recyclable materials for shipment off-site during winter road back hauls. The materials are delivered to recycling facilities for further processing.

Frequency

Recycling initiative occur annually.

Data Analyses

Data analysis of recycling initiatives are not completed but annual amounts recycled will provided in the annual WMMP report.

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5.3 Wildlife Incidents and Mortalities

Past Scope and Improvements

Direct Mine-related impacts to wildlife survival and reproduction are monitored through incident (e.g., deterrent action, injuries and relocations) and mortality reporting and investigations. Environment staff report wildlife concerns or issues to the GNWT. Except in the event of an emergency, the GNWT is consulted on decisions to relocate or destroy wildlife or wildlife dwellings. For migratory birds, Environment and Climate Change Canada (ECCC) is consulted. Mine-related mortality predictions in the EER (DDMI 1998b) included:

- Mine-related caribou mortality is expected to be low;
- Mortalities associated with mining activities are predicted to be 0.12 to 0.24 grizzly bears per year; and,
- Mine-related mortalities, if they occur, are not expected to alter wolverine population parameters in the Lac de Gras area.

Objectives

The objectives for this component of the WMMP are to:

- document and mitigate wildlife incidents and mortalities;
- reduce risks to both wildlife and people; and,
- determine the effectiveness of mitigation and test EER predictions about direct Mine-related mortalities.

Methods

Wildlife incidents and mortalities observed by Diavik mine staff will be reported immediately to the Environment Department (Diavik Wildlife Management Policy). Incidents include observations of wildlife-Mine and wildlife-human interactions where there is a potential risk of harm to people, wildlife, and/or Mine infrastructure. A description of management responses will be recorded for all incidents and entered into a database. Inspection by Environment staff will be made to determine the probable cause of the incident or mortality. Obvious injuries, the position of the animal, and anything considered unusual will be photographed and recorded. Further information such as time, date, location, estimated time of death, and any sightings of other wildlife in the area will also be recorded.

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

Frequency

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

Data Analyses

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

5.4 Caribou

Bathurst caribou movements through the area surrounding the Diavik mine have historically occurred from July through October annually, but the timing has varied by year. Results from aerial surveys indicate that Bathurst caribou tend to move through the Diavik mine area in pulses where large numbers of caribou are present for approximately two weeks. From 1998 to 2005, when herd size was likely greater than 100,000 individuals (Adamczewski et al. 2009), peak numbers of caribou were typically observed during July. Since then, peak caribou movements have occurred later from September to mid-October. Currently caribou are observed near the Mine during winter months (Golder 2020b).

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

Nursery groups (cows with calves) begin to arrive in the study area during summer to autumn. They usually travel in groups and frequently stop for feeding, but development, large lakes, insect abundance, and other environmental factors influence their movement and behaviour. As the rut begins in late September, and as the caribou begin to leave the barren lands for the forest for winter, groups become mixed with cows and bulls.

The Bathurst caribou herd is one of six barren-ground caribou herds in the NWT, previously considered the only herd with a range that included the Diavik study area. Information from satellite collared cows collected by ENR indicates that both the Bathurst herd, and to a lesser extent the Beverley and Ahiak herds, have seasonal ranges that overlap with the Diavik study area. The most recent population estimate determined by ENR in June 2018 was 8,200 animals (GWNT-ENR 2020a). The last census for the Ahiak herd was in June 2011 and estimated 71,000 individuals (GNWT-ENR 2020b). Similar to the Bathurst caribou herd these herds are believed to also be in decline as are a number of other circum-Arctic herds (Festa-Bianchet et al. 2011; Gunn et al. 2011). Both traditional and scientific knowledge indicate that caribou herd size cycles relatively regularly with climate patterns (GNWT-ENR 2005, 2006). Caribou herds also exhibit periodic changes in seasonal migration routes and in calving and winter ranges (Gunn et al. 1997; Gunn and D'Hont 2002; Boulanger et al. 2004; Bathurst Caribou Management Planning Committee 2004).

In 2019, ENR developed a Bathurst Caribou Range Plan (GNWT-ENR 2019b), which proposes development limitations and hierarchical management actions for different areas in the Bathurst annual range. The Mine is located in Area 2 of the draft Bathurst Caribou Range Plan, which has a proposed moderate development level and status of cautionary. The Diavik mine is in compliance with recommended mitigation described in the Bathurst Caribou Range Plan.

Barren-ground caribou (*Rangifer tarandus groenlandicus*) were listed as threatened by the NWT Species at Risk (SAR) Committee on 11 July 2018 (NWT SAR 2018). The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed barren-ground caribou in November 2016 as threatened (COSEWIC 2018).

5.4.1 Barren-ground Caribou Management Strategy

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

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

Each of the components had two or three associated strategies.

Engaging all Partners

- Strategy #1: Complete and implement management plans and agreements to promote recovery of herds and conserve habitat.
- Strategy #2: Complete inter-jurisdictional agreements, where needed, to ensure a coordinated and cooperative approach to the management monitoring of shared herds.
- Strategy #3: Enhance and promote the exchange of TK and scientific information on the status and use of caribou across the circumpolar north.

Information for Herd Management

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

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Managing Impacts of Key Factors

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

Public Education and Compliance

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

Maximizing Benefits

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

Strategy 5 is supported by DDMI's monitoring of incidental observations (Section 5.6.2) and monitoring of caribou behaviour and distribution (Sections 5.6.3 to 5.6.6). The monitoring framework (Section 2.2) incorporates results from monitoring to develop best management practices (Strategy 7) through adaptive mitigation (Section 4.5).

Recent work by Diavik in support of Strategies 3 and 4 includes work on detecting zones of influence (Golder 2020b). Collaborative work on the ZOI is related to one of the standardized caribou monitoring objectives for the diamond mines, which is determining whether the ZOI changes in relation to mine activity (Handley 2010). A new Barren-ground Caribou Management Strategy for 2018 to 2022 is under development (GNWT-ENR 2020c).

In addition, DDMI will maintain its commitment throughout the life of Diavik mine to doing what is reasonable to contribute to and support GNWT-led regional programs to improve the state of the Bathurst caribou herd. This will include working with the GNWT towards identifying and undertaking mutually acceptable actions that will support regional processes and programs such as those outlined in the Cumulative Effects Assessment Mitigation and Management Framework (GNWT 2015), and revising its WMMP to include this commitment and resulting activities. By definition, the WMMP is focused on Diavik mine-specific mitigation and monitoring, and any collaboration with the GNWT (and other agencies, communities, and mines) on regional programs for the assessment and management of cumulative effects is outside the scope of analysis and reporting in the WMMP.

5.4.2 Incidental Observations

Incidental caribou observations in the study area are monitored and recorded to minimize potential risks associated with human-caribou interactions, caribou injury/mortality due to encountering Mine site hazards (Section 5.3), and to identify Mine structures that are acting as potential barriers to caribou movement. Furthermore, recording incidental caribou observations provides anecdotal information on the composition (e.g., age and sex), timing, and number of caribou moving through the study area.

Past Scope and Improvements

Since 2002, incidental caribou sightings of individuals and groups have been recorded by Diavik mine staff. Caribou presence and group size has been recorded on an ongoing basis at the Diavik mine to better assess caribou habitat use in and around the Mine site and has not changed.

Objectives

The objectives of this component of the WMMP are to:

- identify the composition of caribou groups moving through the study area;
- document the seasonal timing of caribou movement through the study area to determine possible annual trends; and,
- document possible annual trends in the number of caribou moving through the study area.

Methods

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

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

Frequency

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

Data Analyses

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

5.4.3 Habitat Loss

Anticipated changes in caribou summer habitat quality and quantity included direct physical alteration of habitat from the Mine footprint. The EER (DDMI 1998b) predicted that at full development, direct summer habitat loss from the Mine would be 2.965 habitat units (HUs).

Past Scope and Improvements

Caribou habitat loss on East Island is expressed in habitat units (HUs) for caribou summer habitat. A habitat unit is the product of surface area and suitability of the habitat in that area to supply food for caribou and cover from predators (DDMI 1998b). To address how the change of habitat may affect caribou on East Island, a habitat suitability index (HSI) model was developed for DDMI for the EER (DDMI 1998b). The scope of monitoring caribou habitat loss has not changed since 2000.

Objective

The objective of this component of the WMMP is to:

- determine if direct summer habitat loss (in habitat units [HUs]) is greater than predicted.

Methods

Using the HSI model, habitats were rated on a scale of 0 to 1 for their capability to support use for caribou, with values >0.30 regarded as highly suitable habitat and values <0.25 rated as low suitability for caribou (Table 5.4-1). Using the ELC unit loss (Section 5.1), the area (km^2) of ELC lost is multiplied by its habitat suitability value (DDMI 1998b) to determine habitat units lost.

Table 5.4-1 Caribou Summer Habitat Suitability Values

ELC Type	Habitat Suitability Value
Heath Tundra	0.37
Heath Boulder	0.40
Riparian Shrub	0.46
Bedrock Complex	0.27
Tussock/Hummock	0.30
Sedge Wetland	0.28
Esker Complex	0.30
Birch Seep and Shrub	0.11
Boulder Complex	0.21
Heath Bedrock	0.23

Frequency

Caribou habitat loss will be monitored annually.

Data Analyses

The total amount of caribou habitat loss will be compared to the EER prediction. Cumulative caribou habitat loss will be included in the annual WMMP report.

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5.4.4 Zone of Influence Monitoring

The Diavik mine has participated and contributed to regional wildlife monitoring initiatives intended for conservation and management including the GNWT's Barren-ground Caribou Management Strategy (GNWT-ENR 2011) and the Bathurst Range Plan Working Group. One initiative that is supported in part by DDMI is the purchase of high frequency geo-fenced satellite collars that have been deployed on Bathurst caribou since 2015. Geo-fenced collars are designed to increase location frequency once a geo-referenced and imaginary "fence" has been crossed to provide finer scale information about caribou distribution and movements around developments.

Past Scope and Improvements

Information on the distribution of caribou around both the Diavik and Ekati mines has been collected since 1998. A number of alterations in the design of aerial surveys for monitoring changes in the distribution of caribou have occurred (Golder 2011a, 2020b). Changes include increasing the aerial survey transect spacing from 4 km to 8 km and expanding the size of the study area. In addition, continued monitoring of the northern migration was no longer required as agreed at the 2010 Wildlife Monitoring Workshop (Handley 2010).

The most recent analysis of the Diavik-Ekati caribou aerial survey data (1998 to 2009, and 2012) indicates that caribou exhibit a spatial distribution that corresponds with habitat quality (Golder 2020b). The analysis did not support the presence of a ZOI around the combined Diavik-Ekati mine footprint. As the results of long-term monitoring did not detect a ZOI using aerial survey data, Diavik will continue ZOI monitoring using alternative methods and data presented by the ZOI Technical Task Group (GNWT-ZOITTG 2015).

Objectives

The objective of this component of the WMMP is to:

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

Methods

Satellite and GPS collared caribou location data provided by the GNWT will be used for ZOI monitoring.

Frequency

The GNWT monitors caribou locations by satellite and GPS collars annually.

Data Analyses

Diavik will carry-out regression or other statistical models to evaluate the presence of a ZOI in relation to mining activity and natural factors. Mechanism(s) causing a ZOI are uncertain and likely related to sources of sensory disturbance operating simultaneously. Therefore, ZOI monitoring does not directly inform on mitigation or operations. Diavik will complete analysis of collar data in 2022, at the end of the closure, and once during post-closure.

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5.4.5 Behaviour: Activity Budgets

Caribou behaviour can be influenced by industrial development (Bradshaw et al. 1997). Adult female caribou with calves are more sensitive to disturbances than other caribou groups (Spence and Gratton 2005). Roads and traffic may affect caribou behaviour, as roads can act as perceived barriers to movement. In response to traffic, caribou may run, move away, and/or increase vigilance behaviour (Wolfe et al. 2000). In some situations, the Mine and associated activities can inhibit normal caribou behaviours such as feeding and resting (Nellemann and Cameron 1996).

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

Past Scope and Improvements

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

In 2004 and 2005, increased effort was made to collect samples greater than 7 km from the Mine. This effort was maintained through 2008. In 2009, Environment Department staff at Diavik and Ekati mines worked collaboratively to increase the effort at sites farther away from the two mines. Diavik focused their effort in areas greater than 14 km from either mine (outside of the estimated ZOI for caribou distribution), and Ekati focused effort at distances close to the Mine. The data were shared between DDMI and Dominion Diamond. These analyses are provided in the 2010 comprehensive analysis report. While historically, caribou were present in the study area during summer-fall period, more recently caribou are present during winter months. Extreme cold temperatures during winter have limited far-field monitoring effort. Cold temperatures would either require a helicopter to run more frequently and cause greater disturbance to caribou and/or result in an increased risk to human safety.

Objectives

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

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

Methods

Scan sampling (Altmann 1974) will be used to record the behaviour of groups of caribou (ENVI-911-0119). When first arriving at the sampling location, the observers will wait five minutes before commencing the surveys. During that time, information on group location and insect harassment will be recorded, and a composition count conducted. This component of the WMMP is completed in collaboration with Ekati mine.

Scan samples will distinguish between nursery and non-nursery groups. Observations will be conducted during the northward migration/calving (May/June), post-calving (July/August), and autumn/rut (September/October) periods. For groups of up to 30 animals, all individuals will be included in the scan. For larger groups, a sub-sample of 20 to 30 animals will be observed. There may be multiple observations from a single large group, consisting of several consecutive scans on different sub-groups. Data may be supplemented with the use of video recordings. Caribou groups are scanned every eight minutes for a minimum of four observations and a maximum of eight observations. In the event that a stressor occurs during a scan observation, the observers will record the immediate response of caribou to stressors as either exhibiting no reaction, or a reaction (caribou look towards disturbance; caribou walk away; caribou trot or run away). Estimated distance from the stressor will also be recorded. Stressors include aircraft (helicopter and airplane), three categories of vehicles (light [e.g., pick-up truck], medium [e.g., water truck], and heavy truck [e.g., haul truck]), blasts from pits, human presence and predators (wolf or grizzly bear). The methods for this monitoring are described by ENVI-911-0119.

Frequency

Monitoring will be completed every year and depends on the presence of caribou in the study area. Large numbers of observations are required to detect differences in caribou behaviour, which is strongly affected by environmental conditions such as wind, temperature, and insect abundance (Weladji et al. 2003). Diavik will implement this component of the WMMP when caribou are detected in the study area. The goal will be to obtain as many observations annually as possible to statistically analyze the data at various distances from the Mine footprint.

Data Analyses

Depending on the amount of data available, analyses will be performed to test for the effects of year (Mine activity), habitat, group composition, and distance from the Mine on the proportion of time caribou spend feeding, resting, and moving. Environmental variables such as wind speed, rainfall, and level of insect activity may be included as factors in the statistical models. Monitoring results of a given year are reported annually. More formal statistical analysis is completed every three years, sufficient data permitting.

5.5 Grizzly Bear

All populations of grizzly bears in Canada are classified as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2015) and have no status in the NWT (NWT SAR 2020).

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

5.5.1 Incidental Observations

The recording of incidental grizzly bear observations in the study area allows bear activity to be identified and monitored, which can help locate and eliminate bear attractants, minimize human-bear interactions, and risks to grizzly bear mortality (Section 5.3). Incidental observations can also be used to monitor changes in bear activity near the Mine over time and to assess potential attraction or avoidance of the Mine area by different demographic (e.g., age, sex) groups.

Past Scope and Improvements

The presence of grizzly bears, incidents and mortalities at the Mine site has been monitored since 2002. Mine-related incidents and mortalities are reported to the Environment Department for documentation in a detailed incident investigation for immediate follow-up. All grizzly bear mortalities are reported immediately to ENR, and ENR is consulted for follow-up mitigation and disposal procedures. If wildlife had to be deterred to reduce the risk of a wildlife-human incident, then all effort is made by the Environment staff to start with the least intrusive method available, and all deterrent actions are recorded.

Objectives

The objectives of this component of the WMMP are to:

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

Methods

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

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

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

Frequency

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

Data Analyses

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

5.5.2 Habitat Loss

Grizzly bears use a wide variety of vegetation and habitats types. Studies of grizzly bears in the NWT have led to understanding their seasonal habitat preferences (McLoughlin et al. 2002; Johnson et al. 2005). Loss of habitat may result in negative effects on grizzly bears. The EER (DDMI 1998b) predicted that at full development, direct terrestrial habitat loss for grizzly bear from the Mine would be 8.67 km^2.

Past Scope and Improvements

Anticipated changes in grizzly bear habitat quality and quantity included direct physical alteration of habitat by the Mine footprint. The scope of monitoring grizzly bear habitat loss has not changed since 2000.

Objective

The objective of this component of the WMMP is to

- determine if direct habitat loss is greater than predicted.

Methods

Methods used to determine grizzly bear habitat loss are similar to that described in Section 5.1; grizzly bear habitat is assumed to include all terrestrial habitats (i.e., all ELC landscape types in Table 5.1-1 except for deep water, shallow water and disturbed area).

Frequency

Grizzly bear habitat loss will be monitored annually.

Data Analyses

The total amount of grizzly bear habitat loss will be compared to the EER prediction. Cumulative grizzly bear habitat loss will be included in the annual WMMP report.

5.5.3 Hair Snagging Study

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

Past Scope and Improvements

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

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

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

Objectives

The standardized objective of grizzly bear hair snagging studies (Handley 2010) is:

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

Methods

Diavik will implement monitoring that supports cumulative effects assessment and management by the GNWT. Grizzly bear monitoring will follow the standardized methods described in Rescan (2013) (ENVI-771-1021).

Frequency

The initial 2-year program was completed in 2012, 2013, and then repeated again in 2017. After three rounds of sample collection the data have shown stable to increasing population with no Mine influence. The study is not anticipated to continue every four years frequency and the long-term duration of this program is subject to discussion with regulators, monitoring agencies, and communities.

Data Analyses

Hair samples collected during the program will undergo DNA analyses to identify individual grizzly bears for use in mark-recapture modelling. Analyses will identify any trends over time in the abundance and distribution of grizzly bears in the study area, and the effects of year and distance from the Mine, which may provide an estimate of the ZOI from the Mine. Year effects comprise both potential Mine-related influences and the temporal changes in the local abundance of grizzly bears from natural factors. No analysis of these data are anticipated to be completed by DDMI. Results will be summarized in the WMMP report, when available.

5.6 Wolverine

The western population of wolverine, including those in the NWT, are listed as a species of Special Concern by COSEWIC (2015). The status of wolverine in the NWT is not at risk (NWT SAR 2020). Wolverine are curious animals and will investigate human-made structures and food caches when humans are not present (COSEWIC 2015). Wolverine prefer undisturbed areas, but home ranges may overlap with human-caused disturbances (COSEWIC 2015). However, human activity, including mining, hunting, trapping, and major transportation routes, may displace or alter wolverine travel routes and lead to increased human-caused mortalities (Weir 2004).

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

5.6.1 Incidental Observations

Monitoring and recording incidental wolverine observations in the Diavik study area minimizes the potential risks associated with human-wolverine interactions, and risks to wolverine removal and mortality (Section 5.3). Once a wolverine is sighted within the Mine site area, DDMI staff that are potentially at risk of encountering the wolverine will be notified, and work activities will be adjusted accordingly.

Past Scope and Improvements

Incidental wolverine observations, incidents and mortalities have been formally recorded by DDMI staff since 2002.

Objectives

The objectives of this component of the WMMP are to:

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

Methods

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

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

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

Frequency

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

Data Analyses

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

5.6.2 Snow Tracking

Snow-track surveys are a common non-invasive method for surveying mammalian communities with better detectability than alternative methods (Bayne et al. 2005). Snow tracking has been successful for monitoring wolverine over large spatial scales (Magoun et al. 2007). Wolverine are more frequently observed at Diavik mine during winter months, presumably because winter is a time of nutritional stress.

Past Scope and Improvements

Snow track surveys began in 2003 and have been conducted with the assistance of a community member, when available. From 2003 to 2006, the study design and data collection used the experience of Inuit Qaujimajatuqangit (IQ) to locate transects and record wolverine snow tracks. This included surveys of 23 transects of variable length and distance from the Mine within a 1,270 km^2 area for wolverine tracks. In 2008, DDMI revised the wolverine track survey to increase statistical power to detect changes in wolverine occurrence in the study area. Design changes included the placement of 40 survey transects of equal length (4 km long, total length = 160 km) located in areas of preferred wolverine habitat including heath tundra and heath boulder habitat. The final locations of snow track survey transects were the result of a stratified random sampling process of potential locations in the study area, but some transects were relocated from Lac de Gras to areas of preferred wolverine habitat (based on IQ), including heath tundra and heath tundra boulder habitats.

Historically, each transect was driven once by a snowmobile in March or April and all wolverine tracks and other sign (e.g., digs and dens) are recorded. Since 2015, each transect was surveyed twice so that detection probability could be estimated and incorporated into analyses of relative activity and distribution.

Objectives

The objective of wolverine snow track monitoring is to:

- provide estimates of relative wolverine activity and distribution in the study area.

Methods

Two observers on two snowmobiles spaced approximately 25 m apart drive each survey transect twice in late March to April and all wolverine tracks and other sign (e.g., digs and dens) are recorded. Detection of snow tracks can be obscured by wind and/or recent snowfall events. A wind speed of 7.7 m/s is sufficient to move dry snow along the ground (Li and Pomeroy 1997). The number of days to the survey since wind or snowfall events is recorded. The methods for wolverine snow track monitoring are described in ENVI-912-0119.

Frequency

Snow track monitoring occurs annually during late spring (late March to April).

Data Analyses

For each transect, a track density index (TDI) is calculated as the number of wolverine tracks per transect length per number of days since recent snowfall or threshold wind speed. Additional analyses completed include estimates of occupancy and detection (Mackenzie et al. 2002). Depending on the amount of data available, occupancy analyses will be performed to test for the effects of year (Mine activity), habitat and distance from the Mine. Environmental variables such as wind speed and snowfall may be included as factors in the statistical models. Monitoring results of a given year are reported annually. More formal statistical analysis is completed every three years, sufficient data permitting.

5.6.3 Hair Snagging Study

The use of genetic markers (maternal DNA and allozymes) to study wolverine populations in the NWT has provided insight into the distribution, demography, and connectivity of these populations (Wilson et al. 2000; Kyle and Strobeck 2002; Efford and Boulanger 2018).

Past Scope and Improvements

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

The wolverine DNA-based study within the Diavik mine study area was carried out to obtain reliable population and range estimates, so that wolverine density and activity relative to mines could be tracked. The regional wolverine DNA study covers four sampling grids, including Daring Lake, Ekati, Diavik, and Gahcho Kué mines. The Diavik mine sampling grid encompasses an area of approximately 1,200 km^2, and includes the Mine site.

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

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

Methods

Diavik will implement monitoring that supports cumulative effects assessment and management by the GNWT. The hair snagging methods follow those outlined in the document Draft Monitoring Protocol for Wolverine DNA Hair Snagging (GNWT-ENR 2013b) (ENVR-534-0112).

Frequency

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

Data Analyses

Hair samples collected during the program will undergo DNA analyses to identify individual wolverine for use in mark-recapture modelling. Data from the Diavik mine will be provided to ENR for analysis and reporting. It is assumed the analyses will identify any trends over time in the abundance and distribution of wolverine in the study area, and support similar information for the North Slave Geological Province (e.g., Efford and Boulanger 2018). No analyses of these data are anticipated to be completed by DDMI. Results will be summarized in the WMMP report, when available.

5.7 Raptors

Raptors are birds of prey, such as, falcons, eagles, hawks, and owls. Raptor species observed frequently nesting with the Mine study area include peregrine falcon, gyrfalcon, and rough-legged hawk. Short-eared owls, snowy owls, and northern harriers have been observed in the Lac de Gras area (Dominion Diamond 2014). The peregrine falcon and the short-eared owl are classified as species of Special Concern by COSEWIC (2015) and the federal *Species at Risk Act*. Both species have no status in the NWT (NWT SAR 2020). Two subspecies of peregrine falcon, *anatum* (boreal) and *tundrius* (tundra) occur in the NWT. The *tundrius* subspecies breeds mainly on the tundra and is likely the subspecies that is observed nesting near the Diavik mine.

5.7.1 Pit Wall Nest Monitoring

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

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

Past Scope and Improvements

Detection and monitoring of raptor nesting activity on pit walls began in 2004 (DDMI 2005) and has continued. Deterrent actions have been used to reduce the suitability of pit walls in active pits as nesting habitat (DDMI 2005).

Objectives

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

- determine if pit walls or other infrastructure are utilized as nesting sites for raptors; and,
- determine nest success in areas of development and document effectiveness of deterrent efforts used.

Methods

Pit walls will continue to be monitored at the Diavik mine. Visual surveys for nesting activity will occur at all open pits between April and August, and at other infrastructure areas (ENVI-897-0119). Observations of birds, nests, and nesting activity (i.e., nest construction, perching, and incubation) will be recorded by Environment staff. If nests are observed in an active pit, ENR will be contacted immediately for advice on mitigation.

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

Frequency

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

Data Analyses

Data analyses will be completed to identify the success of pit nests. Nests detected on infrastructure will be analysed for trends in use and productivity. Nesting activity is reported annually.

5.7.2 Regional Falcon Surveys

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

Past Scope and Improvements

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

Over a decade of sampling showed little effects from the Diavik and Ekati mines on nesting raptors relative to natural factors operating on a regional scale (Coulton et al. 2013). Through discussions and engagement with communities, monitoring agencies, and government, the decision was made to remove this VEC from Mine-specific objectives of the monitoring program and contribute to regional data through the Canadian Peregrine Falcon Survey (Marshall 2009; Handley 2010). Currently, the Canadian Peregrine Falcon Survey is not being conducted from Yellowknife. Instead, regional falcon (and other raptors) data are collected and stored by ENR for distribution.

Objectives

The standardized monitoring objective for raptors include is to:

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

Methods

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

Frequency

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

Data Analyses

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

5.8 Waterbirds

Presence

The Lac de Gras area is located within the central flyway migration route for migratory waterbirds, which include waterfowl and shorebirds travelling to their nesting grounds in the high Arctic. Many waterfowl (ducks, geese, swans and loons) and shorebird (sandpipers and plovers) species use the Lac de Gras area for feeding, reproduction, and/or staging during migrations. A number of habitats surrounding East Island were identified as important for waterfowl and shorebirds, including shallow bays, melt water ponds, mudflats, and shorelines (DDMI 1998c). Two species that occur in the Lac de Gras area are currently listed in the NWT or federal status reports: red necked phalarope (*Phalaropus lobatus*) and horned grebe (*Podiceps auritus*) are both listed as species of “Special Concern” under COSEWIC (2009, 2014). Both species have a general status rank in the NWT of “Sensitive” (NWT-SAR 2020).

Mine activities had a negligible influence on waterfowl and shorebird communities on East Island based on monitoring annual changes in species richness and diversity indices (DDMI 2009; Handley 2009; Golder 2014). There was little variation in species richness of waterbirds from 1996 to 2013 at the East and West bays. Sixteen species of shorebirds and 24 species of waterfowl were detected.

Past Scope and Improvements

Monitoring of waterbirds on and around East Island occurred in 1996, 1997, and 2000 to 2013. The prediction in the EER (DDMI 1998b) was that the Diavik mine is not predicted to cause a measurable change in waterfowl presence in the study area. After demonstrating negligible changes to waterfowl and shorebird richness and diversity indices, the value of continued monitoring was discussed by Diavik and consultants to EMAB (MSES 2010). Further, during a workshop to discuss wildlife monitoring at all Northwest Territories diamond mines, it was the consensus that development and activities of the mines have not had any significant impacts on the habitat or abundance and distribution of waterfowl or shorebirds in the areas around the Diavik and Ekati mines (Marshall 2009). In 2013, DDMI consulted with ECCC about whether monitoring of waterbird species abundance and diversity at the East and West bays should be continued given the negligible effects detected (Golder 2014). Following their review of the results, ECCC agreed that monitoring of waterbirds during operation should be discontinued and recommended this monitoring be implemented again at closure when there would be a change in surface activity (Environment Canada 2014).

Objectives

This objective of this monitoring program is to:

- determine if the Mine affects the presence of waterfowl and shorebird species in the study area.

Methods

During closure, East Island shallow bays and Mine-altered water bodies will be surveyed for waterbird presence daily for 5 weeks during peak migration, late May to late June (ENVR-502-0512). Shallow Bays surveys will be completed by Environment personnel walking the perimeter of the bays. Given the unique nature of the Shallow Bays in the region around the Mine, no control site was identified or monitored during baseline, construction, and operation of the Mine.

All birds observed will be identified to species, weather conditions permitting, counted and recorded. Species observations, from both the Shallow Bays and Mine-altered water bodies, will be categorized into guilds based upon easily identifiable characteristics and similarities (i.e., shorebird, geese, dabbling duck and diving duck). Birds that are unidentifiable to species during surveys are recorded as unidentified within each group. The methods used for waterbird monitoring are described in ENVR-502-0512.

Frequency

Following recommendations from ECCC, the waterbird surveys will resume during Mine closure for the first three years.

Data Analyses

Specific details on the statistical methods or techniques used to analyze waterbird data collected during closure have not been determined, but will likely include evaluating patterns of species presence, richness, and evenness. Similar measures were calculated during previous analyses (Golder 2014).

5.9 Rare or Uncommon Species

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

6 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality assurance (QA) refers to plans or programs encompassing internal and external management and technical practices designed so that data of known quality are collected, and that such collections match the intended use of those data (Environment Canada 2012). Quality control (QC) is an internal aspect of quality assurance. It includes the techniques used to measure and assess data quality and the remedial actions to be taken when QC assessment criteria are not met. The QA/QC procedures are implemented so that field sampling, laboratory analyses, data entry, data analysis, and report preparation produce technically sound and scientifically defensible results. Diavik's SOP ENVI-902-0119 outlines QA/QC implemented by Diavik mine.

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

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7 REPORTING

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

At the conclusion of the monitoring season, all data will be analyzed in preparation of reporting. The annual monitoring report will be produced and distributed to communities, EMAB, and government to provide feedback. The annual report will summarize monitoring results for the previous season and make comparisons to previous years. It will briefly describe methods and related objectives. A discussion and interpretation of results will be presented. The report will use plain English as much as possible and make effective use of graphics and photographs.

The annual monitoring report will include the following information:

- any updates or recommended changes to mitigation, environmental design features, and component-specific objectives, study designs and sampling methods required to meet the global objectives of the WMMP;
- occurrences of human-wildlife interactions, incidents, accidents, injuries or mortalities involving wildlife;
- records of disturbances to wildlife habitat that were not predicted;
- documentation of all monitoring activities that occurred during the previous calendar year; and,
- reference to communities participating in monitoring programs, and contributing Traditional or Local Knowledge.

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Appendix A
Standard Operating Procedures and Datasheets

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Description of Employee Responsibilities

1. Environment Superintendent:

It is the responsibility of the Superintendent to ensure that:

- All legal requirements are in place and met for the required task(s),
- Environment Supervisors have the necessary resources and support to meet lab quality objectives,
- Instituting, maintaining and communicating all SOP's for the applicable task(s),
- Technical best practice requirements are properly incorporated into all SOP's,
- The responsibilities for health, safety environment and quality are communicated to all Personnel,
- The risks associated with remote field activities are managed effectively,
- Appropriate information, instruction, resources and training are provided to all Personnel, and
- Corrective action is administered for failure to adhere to Company and/or Legal Standards/Requirements.

2. Environment Supervisor:

It is the responsibility of the Supervisor to ensure that:

- All legal requirements are in place and met for the required task(s) and all lab quality objectives are met,
- All new Personnel receive an orientation of the applicable work area (office, laboratory, field lab, hanging tree) and understand the hazard of each applicable area,
- All Personnel have read and understand the appropriate SOP's,
- Contractors understand and adhere to the Companies Standards/Regulations when on site,
- Proper tools are used for risk management (CCCs, JHAs, Take 5's, Team Based Risk Assessments),
- All equipment and PPE required for the task(s) are available, appropriate and have had the scheduled maintenance and repairs completed,
- The appropriate quality control/quality assurance practices are followed,
- All Personnel have completed the required training before completing the task(s) assigned,
- All required permits are reviewed and signed off prior to commencement of the task(s),
- Data / laboratory sheets / MP5 imports are reviewed for accuracy and completion, and

- The Company Non-Conformance, Incident and Action Management Policy is followed, as required.

3. Environment Technicians and All Other Personnel:

It is the responsibility of all other Personnel working within the Environment Department to ensure that:

- They comply with all standard operating procedures and lab quality systems,
- They complete all required permits and receive appropriate signoff from the Environment Supervisor, or their delegate, prior to commencing the task(s),
- Proper controls are in place before commencing the task(s),
- Concerns are raised with the Environment Supervisor, or their delegate,
- They are engaged and attentive during required training,
- They reviewing and become familiar with all task related documents and reference material,
- They take action to eliminate, minimize, avoid, and report hazards,
- All safety devices and PPE are used properly,
- They do not place themselves, or others, at risk,
- All equipment is maintained and inspected prior to use and if required unsafe/damaged equipment is removed from service,
- All samples are collected, handled and stored following the SOP,
- Proper, legible documents are completed and saved, and
- Reporting all incidents to Environment Supervisor, or their delegate, as soon as possible.

RioTinto

Environment STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVI-897-0119**
		Revision:	**5**
Task Title:	**Raptor Pit Inspection**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 **Bird Species of Lac de Gras** – Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Archive Forms\2013 - FORMS

1.2 **Peterson Field Guide Western Birds Reference book -** Environment Office Library

1.3 **Smithsonian Handbooks Birds of North America Western Region -** Environment Office Library

1.4 **The Sibley Field Guide to Birds -** Environment Office Library

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	17-May-2012	D. Bourassa
1	New Format	10-Dec-2014	K. Gray
2	New Format	05-Nov-2016	S. Martin-Elson
3	Template, location map and area manager updated	20-Oct-2017	S. Skinner
4	Superintendent update	10-Mar-18	S. Skinner
5	Annual update	30 Mar-19	M. Nelson L. Case
6	Update A21 Procedures	20-Oct-19	L. Case

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	D. Patterson

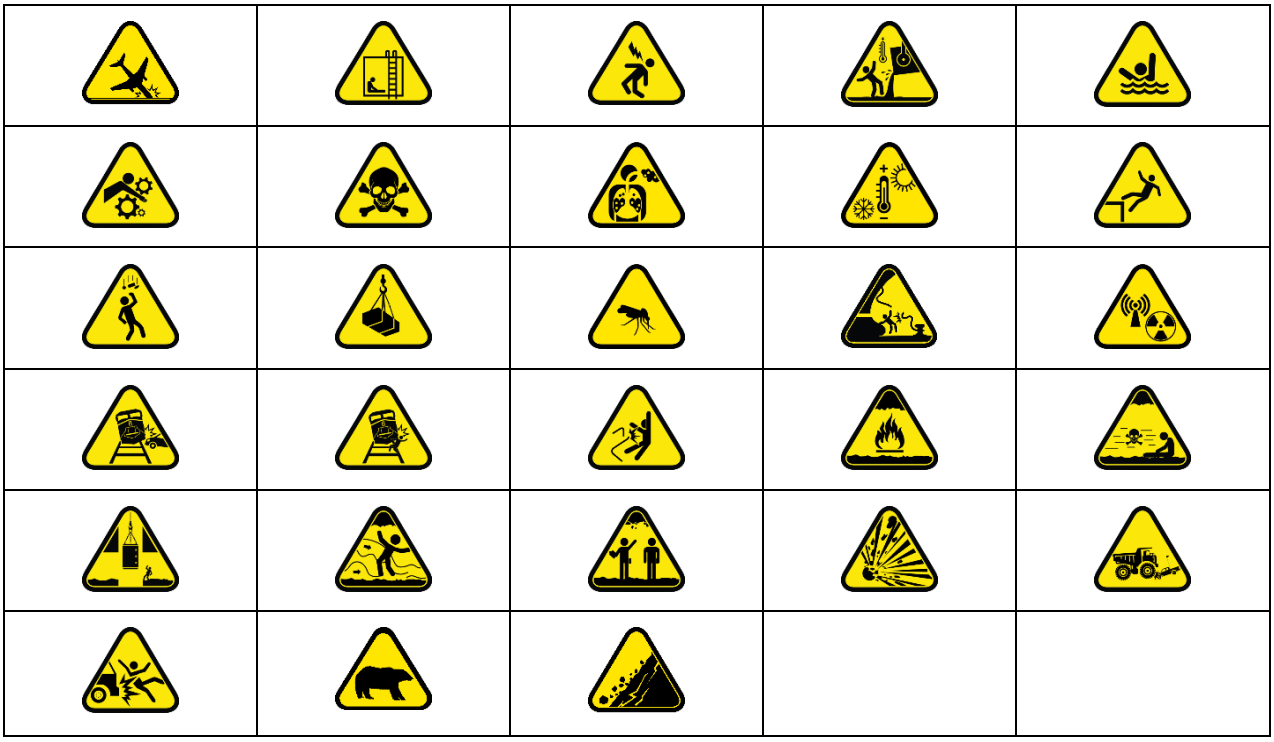
Environment

STANDARD OPERATING PROCEDURE

Raptor Pit Inspection

CRITICAL RISKS

Other potential critical risks not currently assessed as part of this SOP



Peregrine Falcon

Rough Legged Hawk

Gyrfalcon

Figure 1. Common raptors

Description

This SOP outlines the procedure for conducting Pit Wall and Infrastructure inspections at the Mine Site.

2 PURPOSE

The main objective of these surveys is to monitor the Mine Site for any active raptor nesting sites, and to ensure proper mitigation actions, such as deterrence, are implemented to ensure nest developments are not located in sensitive areas with high activity.

3 SCOPE

3.1 Scope of Procedure

This SOP describes the responsibilities and processes for undergoing Pit Wall and Mine Infrastructure Inspections; and monitoring of bird nesting locations. All findings during these inspections will be recorded onto the electronic field sheet in iAuditor and will be transferred onto an electronic excel sheet.

3.2 Scope of Activities

All findings during these inspections will be recorded onto the electronic field sheet in iAuditor and will be transferred onto an electronic excel sheet.

4 DEFINITIONS

Definitions							
ACTS		Groundwater		PROVE		SOP	✓
AEMP		JHA		QA		TSS	
COC		NTU		QC		TSP	
DI water		PAL		Remote work		WHMIS	
DO		PFD		SDS		WLWB	
ELT		PPE	✓	Seepage			
GPS	✓	Problem bear		SNP			

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Aircraft		**Extreme Weather**		**Line of Fire**		**Snowmobile Operation**	
Burns		**Fall into Water**		**Manual Labour**		**Spills**	
Chemical Contact		**Falling**	✓	**Noise**		**Sprain / Strain**	
Confined Space		**Fire**		**Overhead Objects**		**Stored Energy**	
Cuts Scrapes		**Firearms / Deterrents**		**Perception**	✓	**Uneven Terrain / Ground**	✓
Dehydration		**Fumes / Gases**		**Pinch Points**		**Unfamiliar Area**	✓
Electrical		**Glass**		**Risk to Wildlife**		**Visibility**	
Entanglement		**Heavy Equipment**	✓	**Rotating Parts**		**Watercraft Operation**	
Equipment Loss or Damage		**Lifting**		**Sample Loss or Damage**		**Wildlife**	✓
Ergonomics		**Light Vehicle**	✓	**Slip, Trip, Fall**	✓	**Working Remotely**	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Wildlife	Scans, Means of egress
Vehicle collision or rollover	Seatbelt, Segregation, Defensive driving
Vehicle impact on person	Seatbelt, Segregation, Defensive driving/walking
Fall from heights	Stay away from edge

6.3 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Supplies**	**Quantity**
GPS	**1**	**iPad**	**1**
Binoculars	**1**	**PPE (required for travel around site)**	**1 per person**
Field Identification Bird Guides	**1**	**Radio**	**1**
Digital Camera	**1**	**A21 Field Sheet**	**1**

6.4 Procedural Steps

Open iAuditor on a field iPad and start a Raptor Survey audit.

6.4.1 A418 and A154 Pit Walls Inspection Procedure

Gather all equipment necessary to complete inspection and drive to the pit and dike areas.

Drive to the lookout locations being mindful of any raptor activity on the dikes. See Figure 2 below. Proceed to lookout and scan pit walls and skies above pit for a minimum of 15 minutes

Record any findings in iAuditor; take photos and obtain GPS coordinates of nesting location (if possible).

Repeat procedure at all four lookouts around the A418 and A154 pits.

Figure 2. A154 and A418 Lookout Locations

6.4.2 Infrastructure Inspection Procedure

Gather all equipment necessary to complete inspection. Drive to and stop at areas where infrastructure can be easily and completely scanned. Ensure all areas listed on the field sheet are visited. Radio communication is required when entering into restricted areas (e.g., Process Plant, Backfill Plant).

Scan area infrastructure completely looking for raptors or signs of nesting.

Record any findings in iAuditor, take photos, and obtain GPS coordinates of nesting location (if possible).

6.4.3 A21 Inspection Procedure

Print A21 Pit Wall Monitoring Field Sheet (ENVI-951-0319) (Located in 13.4 Wildlife>2019 Wildlife>A21 Pit Wall)

Gather all equipment necessary to complete inspection and drive to the A21 Dike areas. Contact Pit Supervisor on Channel 7 for access and notify that you are going to be around the dike area conducting a Raptor Survey. Drive to the first lookout location being mindful of any raptor activity on the dikes (Figure 3). Proceed to lookout and scan pit walls and skies above pit for a minimum of 15 minutes. Record any findings on field data sheet; take photos and obtain GPS coordinates of nesting location (if possible). Repeat at second lookout.

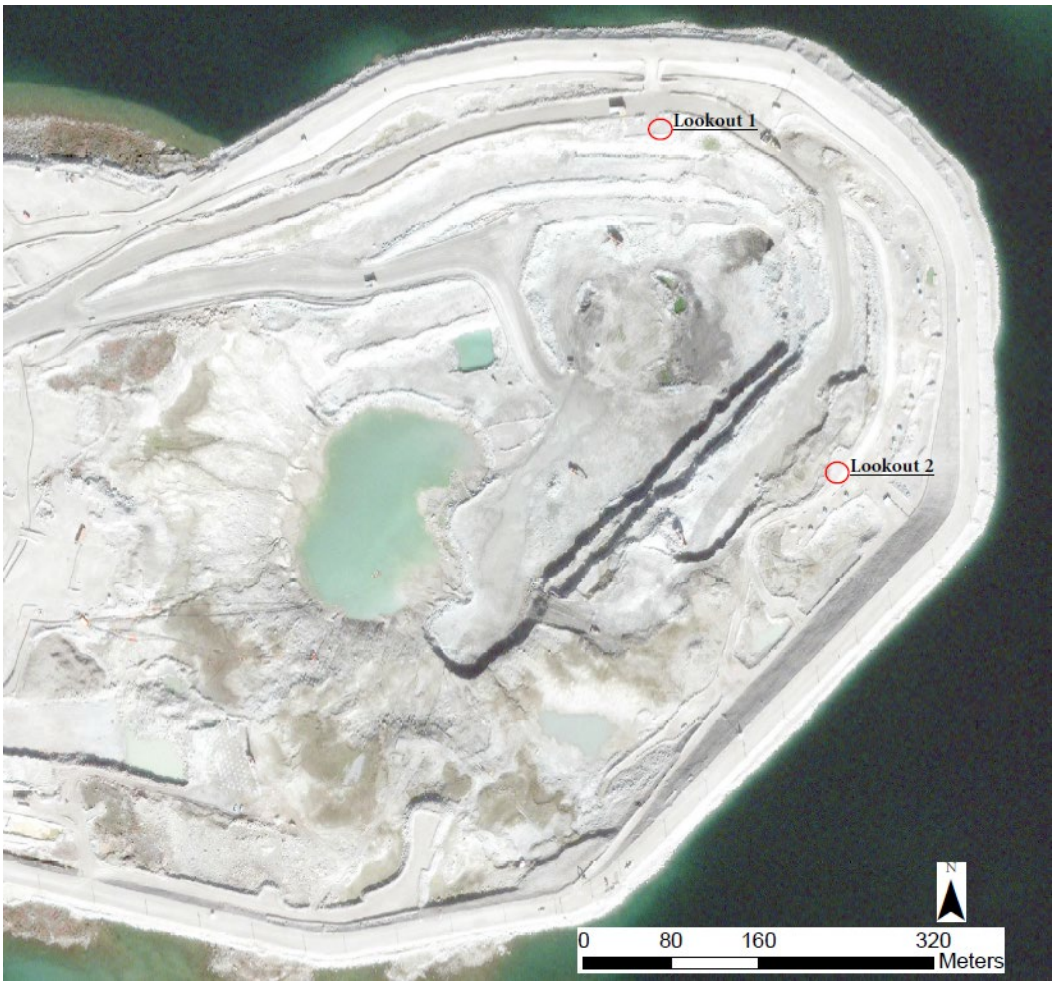


Figure 3. A21 Lookout Locations

6.4.4 A21 Deterrence

Technicians will not bring bear bangers with them for A21 pit inspections. If a raptor or raven appears to be nesting the Environment Supervisor and Pit Supervisor will need to approve the use of bear bangers in the pit.

If bear bangers are approved by both the Environment Supervisor and Pit Supervisor Print A21 Pit Wall Deterrence Field Sheet (ENVI-950-0319) (Located in 13.4 Wildlife>2019 Wildlife>A21 Pit Wall). The details of deterrent use will be recorded on the field sheet along with the Response Index of the Raptors. Request Pit Supervisor arrange an escort for you into the pit to fire bear bangers up towards the bird(s). If possible record video of birds reaction of banger. Do not fire banger directly at bird to avoid injuring it.

A combination of passive visual and auditory deterrence will be deployed in the active A21 open pit. Deterrents include:

- Scarecrows
- Wetland Wailer (aka Screaming Bird Machine)
- Decoy ground and air predators

6.5 Follow-up

If any potential raptor nesting activity is noted on the pit walls or on any infrastructure, the Environment Supervisor should be notified who in turn will contact ENR. If the nest is still being constructed every effort will be taken to deter continued construction of the nest and actions to destroy the nest and incinerate the nest material will be implemented. Dependent on location and stage of nest production, ENR may request DDMI to attempt to relocate the nest. If relocation is not an option; continued monitoring will be conducted by DDMI Environment Staff.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

RioTinto

ENVIRONMENT STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVR-303-0112**
		Revision:	**5**
Task Title:	**Quality Assurance/Quality Control**		
	Supersedes: ENV SOP 303		
FOR DOCUMENT CONTROL USE ONLY: **Next Review:** **1 year from Area Manager Authorized Signature Date below** **Effective Date:** **See Area Manager Authorized Signature Date below**			

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVI-656-0117 DDMI Environment Lab – Training – Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.2 Training

1.2 ENVI-901-0119 – SOP- General Laboratory Safety - Located in: Diavik Intranet – SOPs – Environment Folder

1.3 ENVI-900-0119 - SOP- Chain of Custody & Sample Shipping - Located in: Diavik Intranet – SOPs – Environment Folder

1.4 ENVI-133-0112 - Aquatic Effects Field Sheet - Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Water Quality Forms

1.5 ENVI-134-0112 – 1645-19 SNP Monitoring Field Sheet – Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Water Quality Forms

1.6 ENVI-668-0117 DDMI Environment Lab – Equipment Management - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.5 Equipment

1.7 ENVI-669-0117 DDMI Environment Lab – Measurement Traceability - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.6 Measurement Traceability

1.8 ENVI-653-0117 DDMI Environment Lab – Record Control - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\4.13 Record Control

1.9 ENVI-650-0117 DDMI Environment Lab – Document Control - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\4.3 Document Control

1.10 ENVI-904-0119 – SOP Total Suspended Solids Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.11 ENVI-905-0119 – SOP pH Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.12 ENVI-906-0119 – SOP Turbidity Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.13 ENVI-918-0119 – SOP Field Meter - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Initial Release	01-Jan-12	D. Grabke
1	Formatting	08-Dec-15	D. Birch
2	Revision of QC schedule and measures	29-May-16	N. Goodman
3	CALA Updates	15-Dec-16	N. Goodman
4	Update to template, area manager and CRM	21-Oct-17	A. Hehn
5	Superintendent update	10-Mar-18	S. Skinner
6	Annual review	27-Feb-19	M. Nelson N. Goodman

			L. Case
7	Clarification on TSS LBW frequency	22-Nov-2019	N. Goodman

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	S. Sinclair, A/ BP HSE

(Document owners will be prompted annually to update content; however, changes may or may not result.)

CRITICAL RISKS

There are no critical risks associated with this SOP

Other potential critical risks not currently assessed as part of this SOP

Internal QA/QC
LABBW
LDUPW1/ LDUPW2
DUPRDGS
EBINT

External QA/QC KEY		
-1	=	EBW
-2	=	FBW
-3	=	TBW
-4	=	DUPW1
-5	=	DUPW2
-6	=	DLS

Description

This SOP reviews the quality assurance and quality control measures used to ensure best practices are being utilized while collecting and analysing samples.

2 PURPOSE

The objective of this Standard Operating Procedure is to establish consistent and uniform criteria and procedures to be implemented for laboratory activities undertaken during water quality analysis to ensure environmental data generated and processed is scientifically valid.

This SOP is intended to define Environmental Quality Assurance (QA) and Quality Control (QC) measures in place to ensure all data generated in the DDMI Environment Laboratory shall be of known precision and accuracy, be complete, representative, and comparable.

3 SCOPE

3.1 Scope of Procedure

This procedure applies to all Diavik Diamond Mines personnel and contract personnel authorized by the Environment Superintendent to collect, analyse and ship samples. All persons conducting analyses in the DDMI laboratory are required to read, understand, and fully comply with the methods outlined in the SOP for each analytical test conducted, respectively.

This procedure has been developed to be consistent with the requirements of the Rio Tinto HS & E standards.

4 DEFINITIONS

Definitions							
ACTS		**Groundwater**		**PROVE**		**SOP**	✓
AEMP		**JHA**		**QA**		**TSS**	
COC		**NTU**		**QC**		**TSP**	
DI water		**PAL**		**Remote work**		**WHMIS**	

DO		**PFD**		**SDS**		**WLWB**	
ELT		**PPE**		**Seepage**			
GPS		**Problem bear**		**SNP**			

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key Safety Aspects

Task Hazards							
Aircraft		**Extreme Weather**		**Line of Fire**		**Snowmobile Operation**	
Burns		**Fall into Water**		**Manual Labour**		**Spills**	
Chemical Contact		**Falling**		**Noise**		**Sprain / Strain**	
Confined Space		**Fire**		**Overhead Objects**		**Stored Energy**	

Cuts Scrapes		**Firearms / Deterrents**		**Perception**		**Uneven Terrain / Ground**	
Dehydration		**Fumes / Gases**		**Pinch Points**		**Unfamiliar Area**	
Electrical		**Glass**		**Risk to Wildlife**		**Visibility**	
Entanglement		**Heavy Equipment**		**Rotating Parts**		**Watercraft Operation**	
Equipment Loss or Damage		**Lifting**		**Sample Loss or Damage**		**Wildlife**	
Ergonomics		**Light Vehicle**		**Slip, Trip, Fall**		**Working Remotely**	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
N/A	N/A

6.3 Procedural Steps

6.3.1 Quality Assurance (QA)

Quality assurance for the environmental laboratory encompasses all quality-related activities that ensure the validity of aquatics testing and analysis and all relevant technical support. All DDMI environment personnel, from management to field laboratory technicians, are required to conscientiously follow applicable quality control measures and standard operating procedures (SOPs). Adherence to these documents, combined with staff vigilance, can help ensure that the analytical data and other test results collected will be acceptable as the bases for making significant decisions.

The DDMI laboratory ("the lab") encompasses a broad range of activities including preparation of samples for internal analytical processing, calibration and maintenance of equipment, data management, and sample handling for external analysis.

Our approach to quality assurance places an emphasis on four aspects:

- Infrastructure (instruments, testing capabilities, calibrations, SOP's)
- Control Measures (internal/external)
- Personnel (competence, ethics, and integrity)
- Data Management/Control of Non-Conforming Work

The quality of the outputs is at risk if any of these four aspects are deficient in any way.

6.3.2 Infrastructure

6.3.2.1 Equipment

All equipment is to be maintained and operated in accordance with manufacturer instructions and SOPs. Modifications to equipment/equipment settings/any issues are to be recorded in the spreadsheet in the relevant Equipment folder, which is accessible to all staff and should be regularly consulted during troubleshooting, as per ENVI DDMI Environment Lab – Equipment Management (ENVI-668-0117).

6.3.2.2 Testing Capabilities

Continued testing capability is verified through an annual program of Proficiency Testing (PT). During PT testing, an analyst will analyze multiple samples of varying and unknown (to them) concentrations, either prepared by another analyst in the lab or externally sourced as appropriate.

Environmental conditions within the lab (such as sample storage areas, as well as within test-specific equipment such as ovens and desiccators) shall be maintained such that the exact requirements of specific methods are met and testing capability is not impaired. Furthermore, lab management has a responsibility to review new editions of external method reference documents (such as the Standard Methods) whenever a new edition is released to ensure continued consistency with internationally approved best practice.

6.3.2.3 Calibrations

Lab equipment with the potential to impact test results are calibrated regularly. Calibrations follow a predefined schedule and SI units are used wherever possible. When performed internally, calibrations are always done in accordance with method SOPs. Reference checks are preformed after calibration with secondary standards that have a different lot number than the calibration standards. All observations and maintenance actions must be reported in the QA/QC Lab Performance logbook.

The logbook must also keep record of the instrument calibration history. Calibration records for fixed and portable laboratory measuring equipment, and individual monitoring devices, shall be maintained and include dates, personnel, and specifics of calibration standards and reference solutions, such as the lot numbers for the standards used. Instrument calibration procedures and schedules are clearly outlined in individual SOP's.

More details on calibrations and calibration records are available in DDMI Environment Lab – Measurement Traceability (ENVI-669-0117), DDMI Environment Lab – Record Control (ENVI-670-0117), and DDMI Environment Lab – Document Control (ENVI-650-0117)

6.3.2.4 Purchasing and Verifying Supplies and Services

Services and supplies that affect the quality of tests and/or calibrations shall be purchased only from suppliers that have been investigated and approved. Suppliers shall only be approved when they have been verified as complying with standard specifications or requirements defined in the methods for the tests and/or calibrations concerned. All received supplies will be compared against their accompanying purchase documents, and their reception and specifications must be recorded. Supplies must be verified prior to use according to DDMI Environment Lab – Purchasing Supplies and Services (ENVI-651-0117).

6.3.3 Internal Quality Control (QC) Measures

Laboratory quality control consists of both internal and external checks on precision and accuracy of analytical results. Employees are trained in quality control and good lab practices through the lab analyst certification process (ENVI-560-0616, ENVI-561-0616, ENVI-562-0616). An annual performance evaluation ensures that the integrity of analytical procedures remains intact.

Best practices in water quality monitoring dictate that QC samples will comprise at least 10% of all samples analyzed, and more as required to maintain assurance of quality across homogenous sampling matrices and conditions. Due to fluctuating sample volumes the DDMI Environment department often performs more than 10% internal QC in order to ensure that any errors or sources of contamination in procedures or equipment are caught immediately. No batch of samples is ever analyzed without some form of internal QC (at least a Lab Blank, below).

Internal Quality Control sample types (descriptions below) consist of: Lab Blanks (LBW), Lab Duplicates (LDUPW1/LDUPW2), Duplicate Readings (DUPRDGS), Laboratory Splits (DLS), and Internal Equipment Blanks (EBINT). Results of Internal Quality Control samples are recorded as per DDMI Environment Lab - Record Control Procedure (ENVI-653-0117), and reviewed by Environment Supervisors to detect trends.

6.3.3.1 Lab Blanks (LABBW)

A laboratory blank is a sample comprised of deionised (DI) water, prepared in the lab, which remains in the lab for analysis. This blank is exposed to any and all reagents that are used in the analytical process and is carried through the entire analytical processes including any filtration required. Lab blanks may identify unsuspected contaminates associated with DI water purity, improper cleaning procedures, filters or air contaminants in the lab. LABBWs are the most frequent form of QC at DDMI and occur every day that samples are analyzed for turbidity and conductivity. Lab blanks for Total Suspended Solids are performed biweekly (along with the Total Suspended Solids standard check), but can be required more frequently as supervisor discretion.

6.3.3.2 Lab Duplicates (LDUPW1/LDUPW2)

A laboratory duplicate consists of a single sample to be analyzed twice internally (using the same techniques) as though it is two separate samples. The entire lab procedure is repeated twice, using two separate aliquots of water poured from the same sample bottle. Lab duplicates evaluate analytical precision and sample homogeneity, as well as consistency of lab and operator procedures. LDUPW1/LDUPW2 are the most frequent form of QC at DDMI and occur every day that samples are analyzed.

*in Monitor Pro 5 (MP5), under regular sample data entry, the sample that is to be the LDUP is assigned a sample type of “LDUPW1”. Then, in the data entry section for that day’s LDUPW1/LDUPW2, the corresponding sample site is to be assigned a sample type of “LDUPW2”.

6.3.3.3 Duplicate Readings (DUPRDG)

Duplicate readings are intentionally obtained during the analysis of samples, with a single sample being read twice. The only aspect of the lab procedure to be repeated is the actual measurement, with sample preparation occurring only once on a single sample. Variability between duplicate readings can be attributed to instrumentation or operator error, rather than variation in the sample. Note that field meters are included in DUPRDGS.

6.3.3.4 Allowable Discrepancy Limits between LDUPWs and DUPRDGs

If the relative percent difference (RPD) exceeds 20% when analyte concentrations are ≥ 5 times the detection limit (DL), the environment supervisor must be informed so that the data can be flagged and sampling/analytical methods and instrumentation performance can be reviewed. Relevant DLs for DDMI laboratory analysis are:

- TSS – 1.2mg/L
- Turbidity – 0.15 NTU
- Conductivity – 0.9uS/cm

- pH has no applicable detection limit.

6.3.3.5 Laboratory Splits (DLS)

A laboratory split consists of a single sample divided into two aliquots, one to be analyzed internally, and the other to be sent to an external lab using the same techniques to analyze their aliquot so that the two results would be compared. Variability of results must be considered carefully in light of analyte hold times. RPD between duplicate samples will be assessed by environment supervisor.

6.3.3.6 Equipment Blanks, Internal (EBINT)

An aliquot of DI water is subjugated, in the DDMI Environmental Laboratory, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned before they are utilized at the field sampling location

6.3.4 Internal QC Scheduling

DDMI Environment internal QC falls under two schedules: Station-Dependent Internal QC and Station-Independent Internal QC. Station-Dependent Internal QC is tied to different sample matrices and is included in regular sampling schedules in MP5 (ex. samplers will be required to complete one DLS every four PKC sampling events, i.e., quarterly).

Station-Dependent Internal QC		**QC Frequency per sampling event**		
Sample Matrix	**Sampling Event Frequency***	**EBINT**	**DLS**	**DUPRDGS**
Ponds	Monthly	Every event	none	none
Diffuser	Monthly	Every event	none	none
PKC	Monthly	n/a	1 in 4	1 in 4
UG /clarifiers	Biweekly	n/a	none	none

NIWTP Influent/Effluent	6 days	n/a	none	none

*Note that sampling frequency refers to the frequency with which the entire set of samples is taken, and not the number of sites sampled (ex. the monthly pond sampling includes **10** sample sites but compromises **1** sampling event).

Station-Independent Internal QC is not tied to any particular sample matrix and QC sample types are scheduled as stand-alone events in MP5.

Station-Independent Internal QC	Frequency
LABBW	Daily when samples collected
LDUPW	Daily when samples collected

6.3.5 External Quality Control (QC) Measures

External QC samples comprise ~ 10% of all samples analyzed and are spaced across sampling matrices and sample events to capture as much process homogeneity as possible. With the exception of Trip Blanks (TBW, below), external quality control samples are prepared by DDMI Environment staff, who subject them to the relevant procedures. All external QC samples are then shipped off-site to a qualified external laboratory, where all analysis is conducted.

External QC sample types consist of Trip Blanks (TBW), Equipment Blanks (EBW), Field Blanks (FBW), and Duplicates (DUPW1/DUPW2). Results of External Quality Control samples are recorded as per DDMI Environment Lab – Record Control (ENVI-670-0117), and reviewed by Environment Supervisors to detect trends.

6.3.5.1 Trip Blanks (TBW)

A Trip Blank is an aliquot of laboratory grade distilled water, which is received from an external lab, in the same type of container that is required for the analytical test. The trip blank is sealed and labelled in the external lab from which it originates. Upon our receipt of the trip blanks they are to be stored, sealed, at ~ 4°C until such a time as they are to be utilized (no longer than 1

month). When utilized, trip blanks travel with the sampling cooler from the laboratory to the sampling site and back to the laboratory without being opened. The trip blank is then packaged and shipped to the originating laboratory to be analyzed. The purpose of the trip blank is to verify that no sample contamination occurred during transportation or sampling operations.

6.3.5.2 Equipment Blanks (EBW)

An aliquot of DI water is subjugated, in the Environment laboratory, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned before they are utilized at the field sampling location.

6.3.5.3 Field Blanks (FBW)

An aliquot of DI water is subjugated, in the field, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the field blank is to demonstrate that sample contamination has not occurred during field sample collection and processing.

6.3.5.4 Duplicates (DUPW1/DUPW2)

Co-located samples are independent samples collected as close as possible to the same point in space and time and are intended to assess precision of the entire program (field and laboratory components). The use of replicates for this purpose assumes that the variability between DUPW1 and DUPW2 is affected by the sampling method or technician. In most cases natural variability between samples collected in close succession will be low. When performing duplicate samples, the second sample will consist of each bottle that is regularly collected for that station, including the DDMI internal routine bottle.

*in MP5, under regular sample data entry, the sample that is to be the DUPW is assigned a sample type of “DUPW1.” Then, in the data entry section for that day’s DUPW1/DUPW2, the corresponding sample site is to be assigned a sample type of “DUPW2.”

6.3.6 External QC Scheduling

DDMI Environment external QC is entirely station-dependent, and QC types have different frequencies for each sample matrix that are programmed into MP5.

External QC	QC Frequency per sampling event	

Sample Matrix	Sampling Frequency	DUPW	FB	TB	EB	Total % External QC (all types)
Ponds	Monthly	1 in 2	1 in 6	1 in 6	1 in 3	**11.7**
Diffuser	Monthly	1 in 1	1 in 6	1 in 6	1 in 3	**11.1**
PKC	Monthly	1 in 3	1 in 12	None	n/a	**10.4**
UG /clarifiers	Biweekly	1 in 6	1 in 6	1 in 12	n/a	**10.4**
NIWTP Influent/Effluent	6 days	1 in 6	1 in 12	1 in 12	n/a	**11.1**

Again, note that sampling frequency refers to the frequency with which the entire set of samples is taken, and not the number of sites sampled (e.g., the monthly pond sampling includes **10 sample sites but compromises **1** sampling event.)

6.4 Data Management

6.4.1 External Sample Tracking – Chain of Custody

All samples collected, packaged and shipped to external laboratories are tracked via Chain of Custody (CoC) documentation. The CoC record is used to document change in possession from sampling to delivery to receipt by the external analytical laboratory. CoC procedures are clearly outlined in ENVI-900-0119 – SOP - Chain of Custody.

6.4.2 Internal Sample Tracking

All samples collected are documented in Monitor Pro 5 on the Environment iPads as per the regular sampling schedule.

6.4.3 Data Recording/Record Keeping

The lab has a procedure in place (DDMI Environment Lab – Record Control, ENVI-670-0117), to ensure accurate and appropriate record keeping and review of records.

6.4.4 Data Reporting

Immediately following laboratory analyses, all records are transferred from the applicable field sheets, to their respective electronic databases.

Laboratory supervisors will regularly review the electronic databases to ensure that laboratory recordkeeping meets the aforementioned elements. Results can then be queried and exported as required from MP5 for reporting purposes.

Reporting considerations for individual methods can be found both in individual Method Validations and summarized in method SOPs.

6.5 Control of Nonconforming Testing and/or Calibration Work

The lab has procedures in place to define responses to nonconforming test or calibration work or results (DDMI Environment Lab – Control of Nonconformances, ENVI-652-0117) Testing and/or Calibration Work). This procedure covers responsibility and authority pertaining to management of nonconforming work, evaluation of non-conformance significance, and guidelines for corrective action. Environment Supervisors are to ensure that all employees are trained in this procedure.

6.5.1 Corrective and Preventive Action

The laboratory has procedures (DDMI Environment Lab - Control of Non-Conformance, ENVI-652-0117) in place to provide guidelines for both corrective and preventive action (as per 6.4, above, and also pertaining to departures from policies and procedures in the management system or technical operations). Procedures also provide guidance on identifying and incorporating preventive action (addressing needed improvements and potential sources of management or technical nonconformities).

6.5.2 Continual Improvement

The laboratory shall continually improve the effectiveness of its QAQC system and produced data through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

6.6 Personnel

6.6.1 Competency – Certification of Analyst Proficiency

Certification of Analyst Proficiency is the process for assessing and recognizing the technical competence and the effective quality processes of the DDMI Environment Laboratory and staff.

Staff proficiency means that an individual is capable of performing specified test methods and procedures correctly, and familiar with all related policies and procedures pertaining to lab quality as referenced in the Quality Manual. Staff will be trained and tested so as to document their competence for the range of activities they will be expected to perform in the lab, in accordance with all method SOPs. A performance evaluation will be conducted annually at a minimum, to ensure that staff are fully trained and competent.

Details on staff training are available in DDMI Environment Lab – Training (ENVI-656-0117).

6.6.2 Ethics

Ethics is a set of moral principles, code for right and wrong, or behaviour which conforms to acceptable professional practices.

All employees at all times shall conduct themselves in an honest and ethical manner.

Examples of unethical behaviour include but are not limited to the following:

- Improper manipulation of data or software
- Improper handling of data errors, non-compliant data, or QC outliers
- Lack of reporting unethical behaviour of others
- Artificially fabricating results
- Misrepresenting data such as peak integration, calibration, tuning, or system suitability
- Improper clock setting to meet holding times
- Intentional deletion of non-compliant data

An employee must report any suspected unethical behaviour or fraudulent activities to the Environment Supervisor.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

RioTinto

ENVIRONMENT STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVR-517-0912**
		Revision:	**6**
Task Title:	**Caribou Management/ Observation On and Off East Island SOP**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVR-501-0112- SOP Remote Field Safety - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.2 ENVI-135-0112-Remote Field Safety Permit - Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Remote Field Safety Plans

1.3 ENVR-601-0112- SOP Helicopter - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.4 ENVI-243-0912- Caribou Scanning (Activity Budget): Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Wildlife Forms\Caribou

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	16-Sep-12	D. Grabke
1	Update template and combined all caribou SOP's into one	25-May-14	K. Moore
2	Format update	19-July-15	G. Reid
3	Updated Template including CRM Critical Risks	06-Nov-16	E. Neba
4	Template and area manager updated	20-Oct-17	S. Skinner

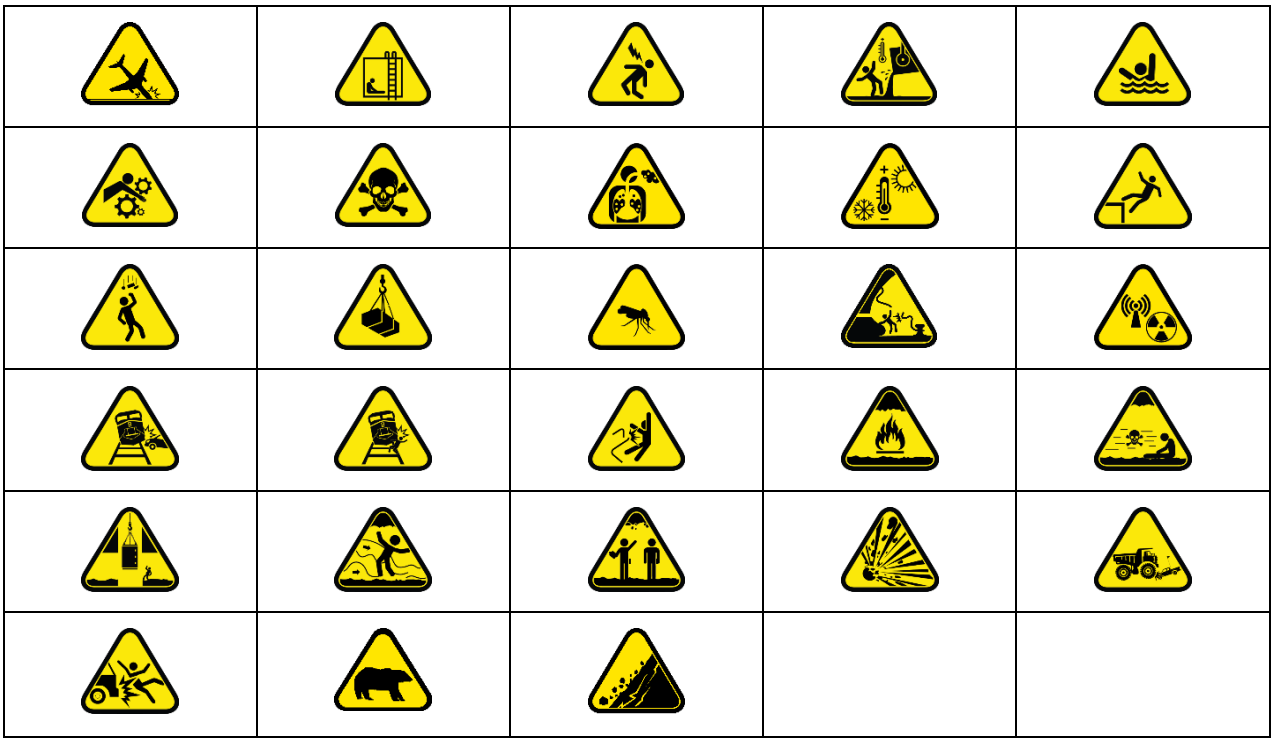
5	Superintendent update	10-Mar-18	S. Skinner
6	Annual Review Removed reference to Caribou Advisories, clarified scanning procedures	16-Jan-20	N. Goodman

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	D. Patterson

(Document owners will be prompted annually to update content; however, changes may or may not result.)

CRITICAL RISKS

Other potential critical risks not currently assessed as part of this SOP



ENVIRONMENT

STANDARD OPERATING PROCEDURE

Caribou Management/ Observation On and Off East Island SOP

Description

Collecting information on caribou presence in and around Diavik area can be conducted by completing Caribou scanning. When caribou are observed in hazardous areas around the mine site additional measures are required to safely move them away.

2 PURPOSE

The Bathurst caribou herd frequently forages in and around the East Island where Diavik is located and this species is ranked as Threatened according to the Species at Risk Committee in April 2017. Diavik has developed this SOP to ensure proper action and response occurs with the presence of caribou in and around the Diavik area. The intent of caribou management at and away from Diavik site is to collect information on caribou activity in order to determine whether a change in behavior occurs in relation to distance from mining infrastructure. In addition to monitoring caribou behavior in response to mining activities, caribou movements are monitored so that mine personnel are aware of caribou presence and to ensure the animal safety near heavy work areas. The following SOP will outline the procedure on what to do when caribou are spotted on the East Island, what steps are to be followed when herding actions are required to safely move caribou, notifying site personnel on caribou presence on east island and lastly the steps to follow when conducting caribou scanning (activity budgets) either away or at Diavik site.

3 SCOPE

3.1 Scope of Procedure

This SOP outlines the step by step procedure for managing caribou observed at the mine site and away from site.

3.2 Scope of Activities

The activities involved in this SOP outline the Environment Department's role for managing caribou in and around the Diavik Area. This SOP outlines the specific response required for the caribou observation as well as the process for notifying employees of caribou presence around East Island.

4 DEFINITIONS

Definitions							
PPE	✓	GPS	✓	DO		NTU	
MSDS		SOP	✓	DI Water		ELT	
Problem Bear		JHA	✓	AEMP		WLWB	
QA		Groundwater		COC		PAL	
QC		Seepage		WHMIS		ACTS	
Remote Work	✓	SNP		TSS		PROVE	
TSP							

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415-R0- Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Slip, Trip, Fall	✓	Chemical Contact		Rotating Parts		Uneven Terrain / Ground	✓
Sprain / Strain	✓	Fall into Water		Firearms / Deterrents	✓	Perception	✓
Working Remotely	✓	Overhead Objects		Dehydration		Risk to Wildlife	✓
Aircraft	✓	Visibility		Ergonomics		Unfamiliar Area	
Watercraft Operation		Fire		Glass		Falling	
Snowmobile Operation	✓	Line of Fire	✓	Fumes / Gases		Confined Space	
Light Vehicle	✓	Cuts Scrapes		Entanglement		Heavy Equipment	
Lifting		Pinch Points		Stored Energy		Extreme Weather	✓
Manual Labour		Noise		Burns		Electrical	
Wildlife	✓	Spills		Equipment Loss or Damage		Sample Loss or Damage	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Vehicle Collision or Roll Over	Seat belts, Segregation, Positive Communication/Defensive Driving, Follow road signs/rules
Vehicle Impact on Person	Positive communication/Defensive walking
Aircraft Transport	Safety Briefing, Seat belts, Trained, Follow Pilot Instructions
Wildlife	Scan, Truck or means of Egress

6.3 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Supplies**	**Quantity**
Light Vehicle	**1**	**Field sheets**	**8-10**
Helicopter (Caribou Location)	**1**	**IPAD/camera**	**1-2**
Radio/ Sat Phone	**2**	**Field Work Permit**	**1**
Field Kits to include: GPS, Binoculars, Personal Gear, Survival Gear, Deterrents	**1**		
Stop Watch	**1**		

6.4 Procedural Steps

Caribou observations at site are called in by site employee's, pilots or observed by Environment personnel conducting inspections in various areas around the mine site. Upon receiving the report of Caribou presence, ensure all pertinent information is collected from the caller- who is calling the report in, where is the animal spotted, what direction is the animal moving, are there people working in that general area. This information should be documented in the Wildlife Incidental Sheet on the P: Drive.

Caribou monitoring is triggered when caribou are spotted on East Island or spotted during remote field work. The caribou monitoring required at the mine site will depend on the location of the caribou. If the caribou are not in a hazardous area of the mine site then caribou scanning can occur if two or more caribou are present, this will be the same action required if a herd of caribou is present away from the mine site. The caribou herding procedures are to be applied under three specific locations and circumstances, or where Environmental site personnel identify additional hazard areas or situations during ongoing monitoring and inspections.

6.5 Herding Action

6.5.1 6.5.1 Dikes

The caribou herding procedures are to be applied when caribou move onto the dikes of mine pits, either traveling over land or by swimming to the dike, and where they are vulnerable to:

A. Injury from flying rock during blasting operations;

B. Severe behavioural response to blasting or other operational sensory stimuli;

C. Entrapment on the dike, hazardous terrain and behavioural response to sensory stimuli from construction or operational activities.

Any number of caribou present on the mining dikes will trigger caribou herding action. This threshold is established to prevent injury from flying rock and disturbance from severe adverse response to blasting or equipment operation.

- Caribou herding on dikes and confined corridors will use a combination of a small truck and/or foot patrol as most appropriate to the local situation and terrain. The direction of herding will depend on their location on the dike or confined corridor relative to the escape routes to the shoreline buffer. The shortest escape route may not always be the most appropriate route.
- Maintain the necessary radio communication with Surface Operations Supervisor on Channel 7, for timing of the herding and personnel safety. Maintain the necessary radio communication with surface operations to facilitate any modification to traffic, and construction or operational activities where required to allow caribou escape to a shoreline buffer as planned in the previous step, and to announce the "All-Clear" at the completion of caribou herding procedures.
- Herding by vehicle and on foot will entail approaching caribou at a slow speed (i.e., < 5 km/hr for vehicles) and stopping when caribou show an alarmed response. When caribou stall, the patrol will slowly move forward to initiate a further alarmed response. Observation of caribou behaviour will provide cues on when to proceed. Herding should never stimulate a Very Alarmed-Panic Escape Response.

6.5.2 Constricted Corridors

The caribou herding procedures are to be applied when caribou are trapped in hazardous and constricted spaces such as corridors within the mine footprint where they are vulnerable to collisions with vehicles and severe behavioural response to sensory stimuli associated with vehicles and employee activities.

The criteria to trigger herding of caribou in confined corridor or other hazardous sites are dependent on a combination of factors. Good judgment is required to avoid disturbance and caribou injury, but the following should be considered: number of caribou present, distance of caribou from roads or other stimuli, the nature of the confining feature, the effectiveness of traffic control, duration of entrapment, and behavioral response by caribou in the confined space.

The steps for undertaking herding procedures in constricted corridors are the same as outlined in the section on Dikes, above.

6.5.3 Airstrip

The caribou herding procedures are to be applied when caribou are on or near the airstrip or at the water crossing west of the airstrip during aircraft landing or take-off where they are vulnerable to collisions with aircraft or severe behavioural response to sensory stimuli associated with aircraft during landing or take-off.

Any number of caribou present on the airstrip or are located within 100 m of the airstrip will trigger caribou herding action. This threshold is established to prevent any potential for caribou-aircraft collisions.

- A small truck will be used for patrol, and, if necessary, to move caribou off the airstrip. Vehicle patrols should proceed from east to west to encourage caribou to move to escape routes leading to the west island and to avoid herding the caribou to active construction and mining operations. Maintain communication with air traffic control. Vehicles can travel at normal site speed limits unless caribou are visible.
- When caribou are present on the airstrip, the vehicle will approach caribou at a slow speed (i.e., < 5 km/hr) and stop when caribou show an alarmed response. During airstrip patrols, the herder should wait no longer than 3 minutes for caribou to begin moving off the airstrip, before continuing the herding procedure. If the caribou stall, the patrol may slowly move forward to initiate an alarmed response. If caribou travel along the airstrip ahead of the patrol, the vehicle may proceed to move caribou from the airstrip surface.
- In the event that a herd of caribou remains within 100 m of the airstrip and exhibits behavior for returning or crossing the airstrip, the patrol may need to park at a push-out of the airstrip from where the patrol may proceed to continue the herding on foot. Environment personnel will be in contact with Diavik air traffic control if a delay in takeoff or landing must occur to ensure the animals are a safe distance from the runway.

6.5.4 Other Hazards or Entrapment Sites

The caribou herding procedures are to be applied when caribou are trapped in hazardous and constricted spaces and situations that are identified by Environmental site personnel during ongoing monitoring and inspections. These spaces and situations may include:

- Caribou trapped within the area of infrastructure and above-ground pipelines;
- Prolonged caribou entrapment in the area near the shallow bays;
- Caribou presence or entrapment on the islands adjacent to the mine pits during the brief period of thin ice hazard in October / early November.

6.6 Determining Caribou Hazards

- When caribou are present on the east island, Environment site personnel or other designated personnel (i.e. contractors or site services) are responsible for conducting the following searches and communications:
- Maintain radio contact with airport terminal operator and security personnel to receive reports of caribou on or near the runway and take management action if required. All Environment staff accessing the runway will need permission from Diavik Air traffic control in addition to completing the training to access this specific area.
- Maintain radio communication with security personnel, truck drivers, contractors, helicopter pilots and other site operators to receive reports of caribou on the dikes and confined road corridors. Verify reports of caribou to determine numbers and appropriate management action.
- Maintain communication and radio contact as necessary with area owners and/or air traffic controller as necessary to implement adjustments to vehicle traffic, construction and operations activities and/or aircraft traffic to expedite the herding of caribou from hazard sites.

6.7 Caribou Scanning

6.7.1 Scan Sampling of Caribou Groups

Scan sampling of caribou groups or individuals will be used to monitor caribou behaviour as a function of distance from the mine. Note: Include the direction and distance from Diavik on the field sheet in the space provided for location.

The method to be used is adapted from Curatolo and Murphy (1983). Individual caribou activities will be recorded as feeding, bedded, standing, alert, walking, trotting, or running. Individuals will be classified as feeding when they are actually foraging or searching for food (i.e., walking with head down).

GPS location will be recorded, and observations will be conducted when caribou are observed on-site or during remote field work, provided that scans can be completed in a safe manner. Group composition will be classified (see descriptor codes below), and the number of animals in the group will be recorded. Thus, response variable is caribou behaviour, while the potential stressors include distance from mine, season, and group composition. Habitat type and level of insect harassment will also be recorded.

The group will be scanned every 8 minutes for a minimum of 4 observations and a maximum of 8. For each scan, the number of animals exhibiting each type of behaviour will be recorded.

6.7.2 Response to Specific Stressors

For all caribou groups, instantaneous observations will be used to assess the response of caribou to different potential stressors as a function of distance. These observations will occur during scan sampling. In the event that a stressor is introduced during scan sampling, the observers will note the time (in the comments box) and record the response of caribou to stressors as "no reaction" or "exhibiting a reaction" (i.e., alert posture, walking or running away from disturbance; see data sheet). The reaction of the majority of the group will be used in selecting the category. Estimated distance (m) from the stressor will also be recorded. Stressors include type of aircraft, type of vehicle, and blasts from pits.

The observers will then wait until the animals resume previous behaviour, and begin scanning observations again.

Level of insect harassment will be recorded if possible for mosquitoes/black flies and for bot/warble flies. Bot and warble flies will be recorded simply as being present or absent during the observation period, based on observed reaction of caribou (sudden bolting, aberrant running, or rigid standing).

6.8 Analysis and Reporting

Data sheets will be transferred to the wildlife database. Data sheets and the database will also be checked for omissions and/or errors by Environment Supervisor to ensure accurate data entry. All data collected during caribou scanning will be used in the Annual Wildlife report that is released on March 31st of every year.

6.9 Description Codes

Habitat Codes	
BE	Bedrock (>80%)
BO	Boulders (>80%)
EC	Esker Complex
HT	Heath Tundra
RB	Riparian Birch
RS	Riparian Shrub
SW	Sedge Wetland
SF	Spruce Forest
SF/BE	Spruce Forest/Bed Rock
SW/HT	Wetland/Heath Tundra
HT/BE	Heath Tundra/Bedrock
HT/BO	Heath Tundra/Boulders
LA	Lake
IC	Ice

Composition Codes	
F	females
M	males
C	calf
Y	yearling
F/C	females and calves
F/M	females and males
F/M/C	females, males, calves

Activity Codes	
A	Alert
B	Bedded
F	Feeding
R	Running
S	Standing
T	Trotting
W	Walking

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

RioTinto

Environment STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVI-912-0119**
		Revision:	**9**
Task Title:	**Wolverine Snow Track Survey**		
	Supersedes ENV SOP 521		
FOR DOCUMENT CONTROL USE ONLY:			
Next Review:	**1 year from Area Manager Authorized Signature Date below**		
Effective Date:	**See Area Manager Authorized Signature Date below**		

1 REFERENCES/RELATED DOCUMENTS

1.1 **ENVI-919-0119 - SOP Snowmobiles -** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.2 **ENVI-907-0119 – SOP Remote Field Safety -** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.3 **ENVI-601-0916 – Snowmobile Pre-Op Inspection -** Located in: **-** P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Check Sheets

1.4 **ENVI-135-0112 - Remote Field Safety Permit Form -** Located in: **-** P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Remote Field Safety Plans

1.5 **WL500353 – Wildlife Monitoring Permit** Located in: **-** P:\DDMI Environment\2.0 Legal and Other Requirements\2.7 ENR (GNWT)\Wildlife Permits

1.6 **ENVI-362-0214 – Wolverine Snow Track Field Sheet –** Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Wildlife Forms\Wolverine

Environment

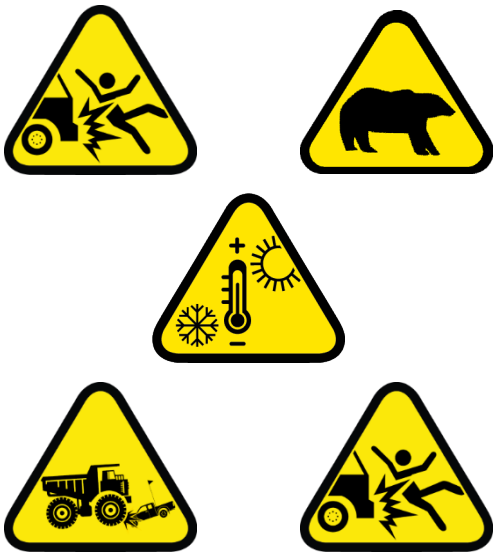
STANDARD OPERATING PROCEDURE

Wolverine Snow Track Survey

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	07-Sep-12	D. Meredith
1	Annual Update	20-Mar-13	K. Moore
2	Annual Update, Added Snowmobile check list, Wildlife Permit, Picture, Definitions, Task Hazard & Supplies, Tools and Equipment Tables	20-Feb-14	D. Dul
3	Reference Documents, 6.3 & 6.4	20-Nov-14	D. Dul
4	WL Permit Number, Reference numbers for Responsibilities and Hazards, Title	16-Jan-16	D. Dul
5	Updated Template including CRM	05-Nov-16	E. Neba
6	Annual Update	21-Mar-17	S. Skinner
7	Update to template and area manager	21-Oct-17	A. Hehn
8	Superintendent update	10-Mar-18	S. Skinner
9	Annual update	18-Jan-20	M. Nelson A. Hehn

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	D. Patterson

CRITICAL RISKS



Other potential critical risks not currently assessed as part of this SOP

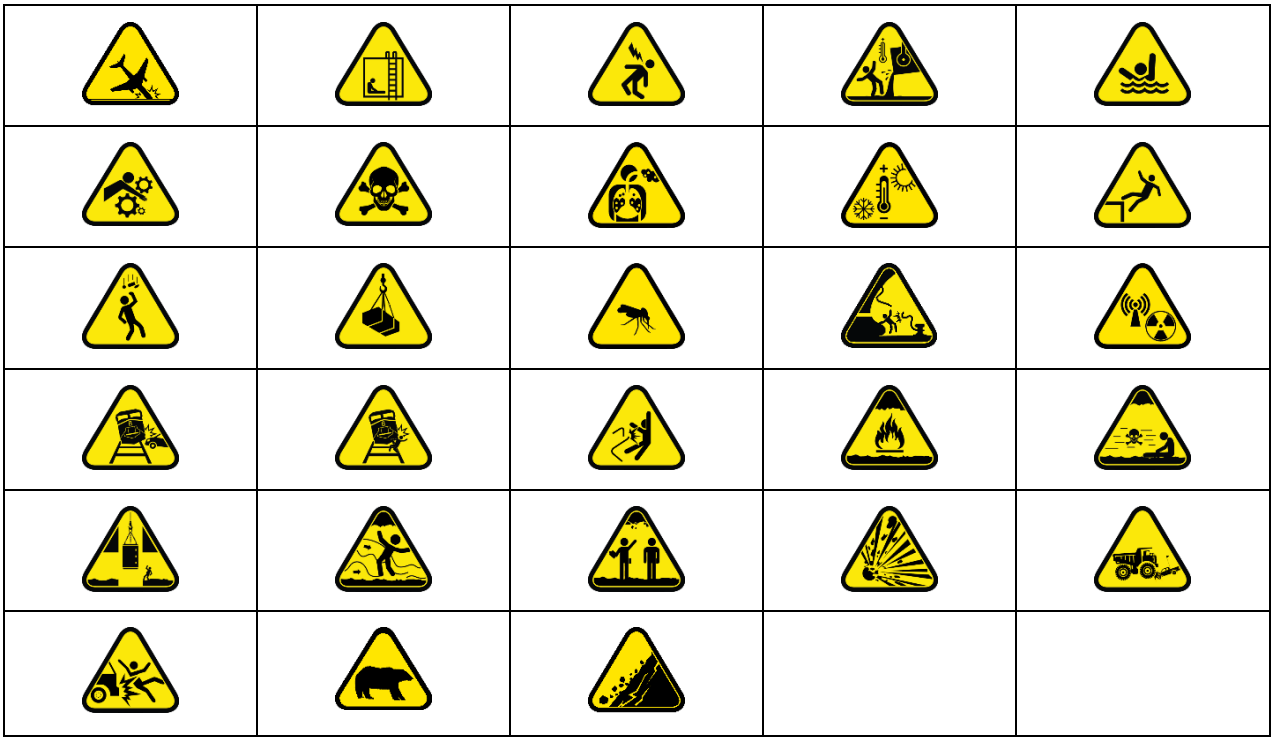


Figure 1. DDMI Wolverine Track Survey (2004-Mar-16)

Description

This Standard Operating Procedure (SOP) provides guidelines on procedures to follow when carrying out the wolverine snow track surveys.

2 PURPOSE

The main objective for this program is to determine if mining activities are influencing the presence of wolverine in the wildlife study area. The Wolverine Snow Track survey will provide insight if wolverine activity is higher closer to the mine versus further away. Monitoring for these surveys generally takes place once per year with assistance from a community member/assistant.

3 SCOPE

3.1 Scope of Procedure

The Standard Operating Procedure (SOP) describes the responsibilities and processes for surveying the various wolverine track locations within the DDMI study area. This procedure applies to all Diavik Diamond Mine personnel and contractors.

3.2 Scope of Activities

This procedure has been developed to conduct wolverine surveys along 40 transects distributed among key habitats and landscape features throughout the DDMI study area, and at varying distances from the mine.

4 DEFINITIONS

Definitions							
ACTS	✓	Groundwater		PROVE		SOP	✓
AEMP		JHA		QA		TSS	
COC		NTU		QC		TSP	
DI water		PAL		Remote work	✓	WHMIS	
DO		PFD		SDS		WLWB	
ELT		PPE		Seepage			
GPS		Problem bear		SNP			

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Aircraft		Extreme Weather	✓	Line of Fire		Snowmobile Operation	✓
Burns		Fall into Water		Manual Labour		Spills	
Chemical Contact		Falling		Noise		Sprain / Strain	✓
Confined Space		Fire		Overhead Objects		Stored Energy	
Cuts Scrapes	✓	Firearms / Deterrents		Perception	✓	Uneven Terrain / Ground	✓
Dehydration		Fumes / Gases		Pinch Points		Unfamiliar Area	✓
Electrical		Glass		Risk to Wildlife	✓	Visibility	✓
Entanglement		Heavy Equipment		Rotating Parts		Watercraft Operation	
Equipment Loss or Damage	✓	Lifting		Sample Loss or Damage		Wildlife	✓
Ergonomics	✓	Light Vehicle	✓	Slip, Trip, Fall	✓	Working Remotely	✓

See: ENVI-445-0415 - Environment Hazards Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Vehicle Collision or Rollover (between snow mobiles)	Positive communication, Defensive driving, Helmet
Vehicle Impact on Person	Positive communication, Defensive walking
Wildlife	Scan, Truck, Deterrents
Temperature extremes (cold)	Layers, Buddy check, Remote field safety permit

6.3 Tools Required

Supplies, Tools and Equipment

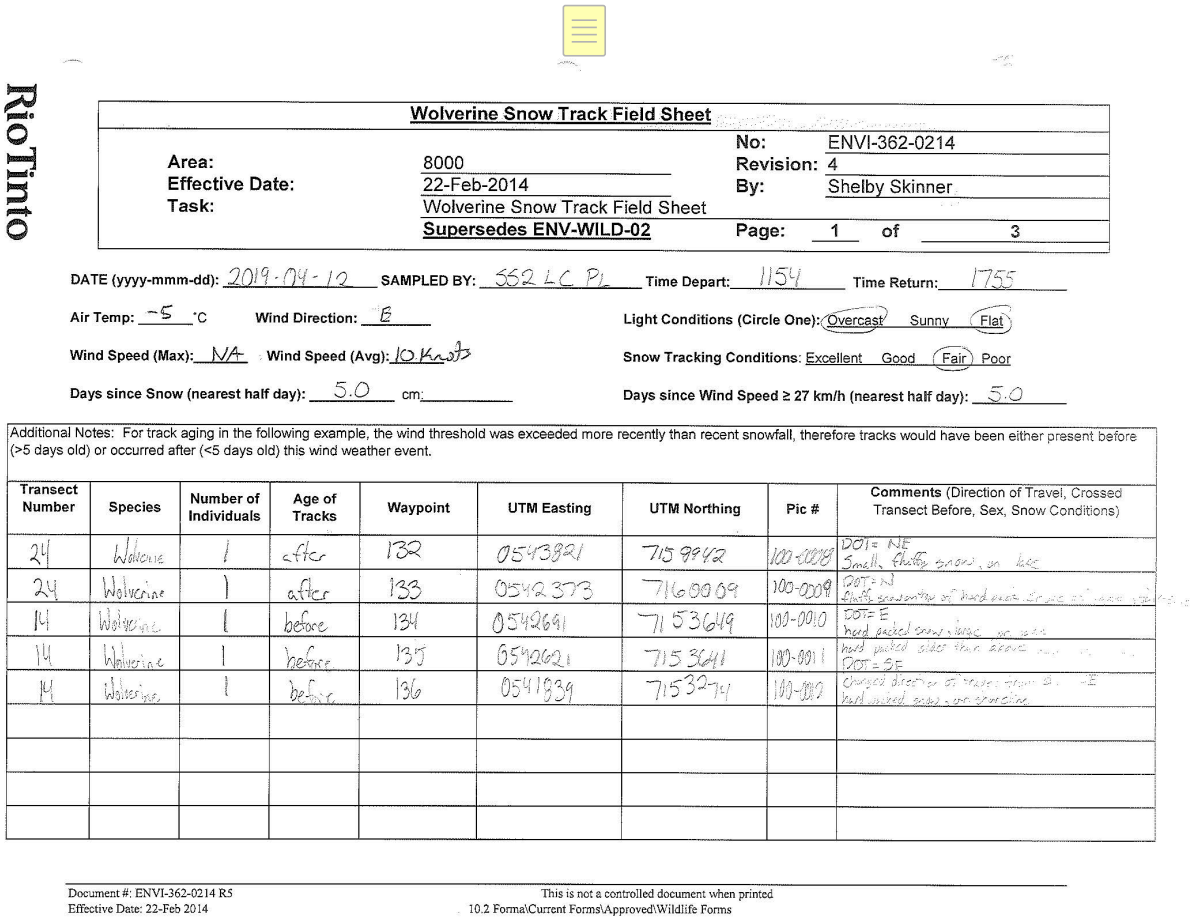
Tool / Equipment	Quantity	Supplies	Quantity
Snowmobile	per person	Winter Survival Gear (Set)	1
GPS/ Loaded Coordinates	per person	Spare Batteries	4
Satellite Phone	1	Personal Gear (per person)	1
Spot or Spot Tracker (per snowmobile)	1	Remote field safety permit	1
Camera	1	Map	2
Binoculars	1	Field Sheets	20
Radio with spare battery (per person)	1	Pencils and Pens	2

6.4 Procedural Steps

- Surveys are conducted once a year in the early spring by snowmobile. The surveys will be conducted twice per traverse - typically once in late March and once in mid April. Surveys are best conducted 2-6 days after a snowfall.
- Personnel will follow each transect from start to finish, using the GPS waypoints provided for each transect. **Drive the snowmobile slowly (between 10 km/h and 15 km/h) to ensure that all wolverine tracks are recorded.** The observer pair drives a distance of approximately 25 m apart with the transect line between them. This reduces the chance of missing any tracks.
- If weather conditions are deemed unsuitable for tracking (high winds or heavy snowfall) the survey should be postponed until conditions are favourable. The threshold for wind speeds capable of moving fallen snow is 27 km/h. If a survey needs to be postponed, personnel must wait at least 12 hours after unsuitable weather stops before resuming surveys. The effects of snow and wind will be estimated by determining the number of ½ days since the most recent snow or wind event.
- Each day of survey should include transects from a variety of distances from site. Ensure you include near and far field sites each day, if conditions allow.
- For each wolverine transect observation, record:
  - Date survey completed, who the transect was sampled by, and departure and return times for the day
  - Weather (temperature, wind direction, maximum and average wind speed, days since snow, light conditions, days since last threshold wind and snow tracking conditions)

    Excellent snow is characterized as being light/fluffy/easy to leave tracks and poor snow as being packed/hard to leave tracks
  - Transect Number
  - Number of wolverines: tracks within 200 m of each other are assumed to be a single individual unless tracks can be reliably distinguished as two separate individuals
  - Age of signs: did signs occur before or after the most recent snowfall or wind threshold event?
  - Waypoint
  - UTM coordinates
  - Photo of the sign/s with a reference object (i.e. GPS, pen, glove, etc.)

- Other important comments such as:
  - Sex (male or female)
  - Observation type (tracks, scat, hair, etc.)
  - Has individual crossed transect before?
  - Direction of travel
  - Wolverine dens on or off transect, waypoint of den, whether the den is active or inactive and photographs
  - Other wildlife sightings or signs: note in comments only, waypoint not required
- If no wolverine tracks are observed on a given transect, record this on the field sheet.
- A local community member generally comes to site for one (1) week to help out with this survey. This participation is extremely valuable and should be maintained. If tracks are seen discuss and document comments from the community member.



RioTinto

Wolverine Snow Track Field Sheet

Area:	8000	No:	ENVI-362-0214
Effective Date:	22-Feb-2014	Revision:	4
Task:	Wolverine Snow Track Field Sheet	By:	Shelby Skinner
	Supersedes ENV-WILD-02	Page:	1 of 3

DATE (yyyy-mmm-dd): 2019-MA-12 SAMPLED BY: SS2 LC PL Time Depart: 1154 Time Return: 1755

Air Temp: -5 °C Wind Direction: E Light Conditions (Circle One): Overcast Sunny Flat

Wind Speed (Max): NA Wind Speed (Avg): 10 Knots Snow Tracking Conditions: Excellent Good Fair Poor

Days since Snow (nearest half day): 5.0 cm: Days since Wind Speed ≥ 27 km/h (nearest half day): 5.0

Additional Notes: For track aging in the following example, the wind threshold was exceeded more recently than recent snowfall, therefore tracks would have been either present before (>5 days old) or occurred after (<5 days old) this wind weather event.

Transect Number	Species	Number of Individuals	Age of Tracks	Waypoint	UTM Easting	UTM Northing	Pic #	Comments (Direction of Travel, Crossed Transect Before, Sex, Snow Conditions)
24	Wolverine	1	after	132	0543821	7159942	100-0008	DOT= NE Small, fluffy snow on top
24	Wolverine	1	after	133	0542373	7160009	100-0009	DOT= N Fluffy accumulation of hard packed snow on top
14	Wolverine	1	before	134	0542691	7153649	100-0010	DOT= E hard packed snow/ice
14	Wolverine	1	before	135	0542621	7153641	100-0011	hard packed older snow above DOT= SE
14	Wolverine	1	before	136	0541939	7153274	100-0012	changed direction of travel from SE to E hard packed snow/ice

Document #: ENVI-362-0214 R5 This is not a controlled document when printed
Effective Date: 22-Feb 2014 10.2 Forms\Current Forms\Approved\Wildlife Forms

Figure 2. Example: Wolverine Snow Track Field Sheet

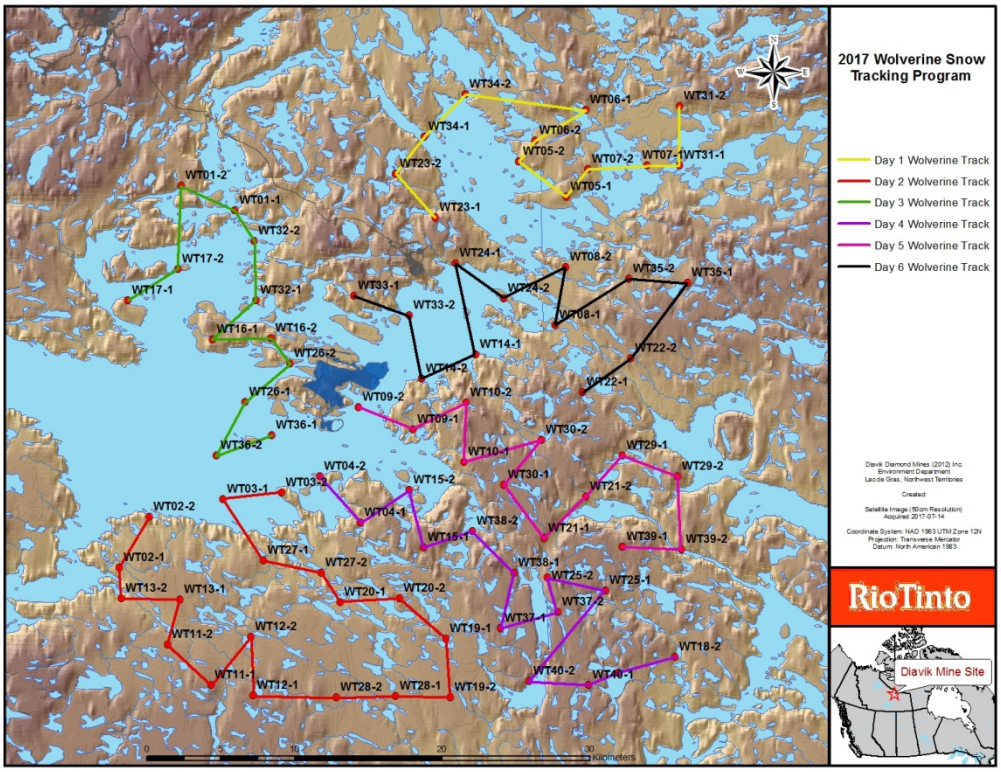


Figure 3. Wolverine Snow Track Routes

Table 1. Waypoint (UTM) for Wolverine Snow Track Survey

Snow Tracking Waypoints					
WT01-1	527154	7163751	WT21-1	548095	7141561
WT01-2	523512	7165406	WT21-2	550923	7144389
WT02-1	519342	7139565	WT22-1	550687	7151420
WT02-2	521368	7143014	WT22-2	553948	7153738
WT03-1	526328	7144222	WT23-1	540709	7163249

WT03-2	530303	7144664	WT23-2	538041	7166229
WT04-1	535664	7142603	WT24-1	542106	7160157
WT04-2	532915	7145764	WT24-2	545336	7157797
WT05-1	549587	7164671	WT25-1	552216	7138023
WT05-2	546387	7167072	WT25-2	548311	7138891
WT06-1	550907	7170519	WT26-1	527842	7150759
WT06-2	547487	7168446	WT26-2	530871	7153372
WT07-1	555053	7166771	WT27-1	529069	7140045
WT07-2	551061	7166521	WT27-2	532979	7139200
WT08-1	548820	7155990	WT28-1	538013	7130889
WT08-2	549549	7159924	WT28-2	534015	7130780
WT09-1	539233	7148932	WT29-1	553364	7147169
WT09-2	535527	7150438	WT29-2	557110	7145764
WT10-1	542646	7146716	WT30-1	545338	7145166
WT10-2	542813	7150713	WT30-2	547899	7148239
WT11-1	525536	7131632	WT31-1	557247	7166783
WT11-2	522605	7134354	WT31-2	557247	7170783
WT12-1	528374	7130906	WT32-1	528595	7157671
WT12-2	528241	7134904	WT32-2	528477	7161669
WT13-1	523442	7137411	WT33-1	535199	7157975
WT13-2	519443	7137516	WT33-2	538964	7156624
WT14-1	543434	7154009	WT34-1	539971	7168745
WT14-2	539789	7152362	WT34-2	542765	7171607

WT15-1	539934	7140921	WT35-1	557801	7158832
WT15-2	538964	7144802	WT35-2	553810	7159099
WT16-1	525618	7154997	WT36-1	529663	7148505
WT16-2	529616	7155111	WT36-2	525904	7147138
WT17-1	519913	7157646	WT37-1	545145	7135483
WT17-2	523292	7159785	WT37-2	548999	7136553
WT18-1	553120	7132451	WT38-1	546054	7139224
WT18-2	556972	7133530	WT38-2	543225	7142052
WT19-1	541434	7134770	WT39-1	553388	7140989
WT19-2	541713	7130780	WT39-2	557384	7140815
WT20-1	534286	7137244	WT40-1	551067	7131638
WT20-2	538276	7137516	WT40-2	547074	7131880

6.5 Analysis and Reporting

Upon return from the field, check the data sheets for completeness and accuracy and enter the data into the Excel workbook in P:\DDMI Environment\15.0 Data & Records Management\15. Wildlife Database\Wolverine Track Survey.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 Safely complete the tasks outlined in this SOP, without incident.

7.2 No or minimal safety or environmental incidents during program.

7.3 No or minimal error in conducting survey.

7.4 Thorough documentation of field data.

RioTinto

ENVIRONMENT STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVI-913-0119**
		Revision:	**9**
Task Title:	**Waste Inspection**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVI-444-0415 R4 – Environment Roles and Responsibilities- Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs\Current

1.2 ENVI-445-0415 R3 – Environment Hazard Definitions – Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs\Current

1.3 ENVI-443-0415 R3 – Environment Term Definitions – Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs\Current

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	03-Mar-00	
1	Updated	Mar-05	R.Eskelson/S. Oystryk
2	Updated - related documents, review date	Oct-06	C. English
3	Biennial update, frequency amended	Jan-09	C. English
4	Updated - Format, Description, Pictures, 2, 3.1, 3.2, 6.2, 6.3	16-Oct-14	K. Gray
5	Format Update	08-Dec-15	G. Reid

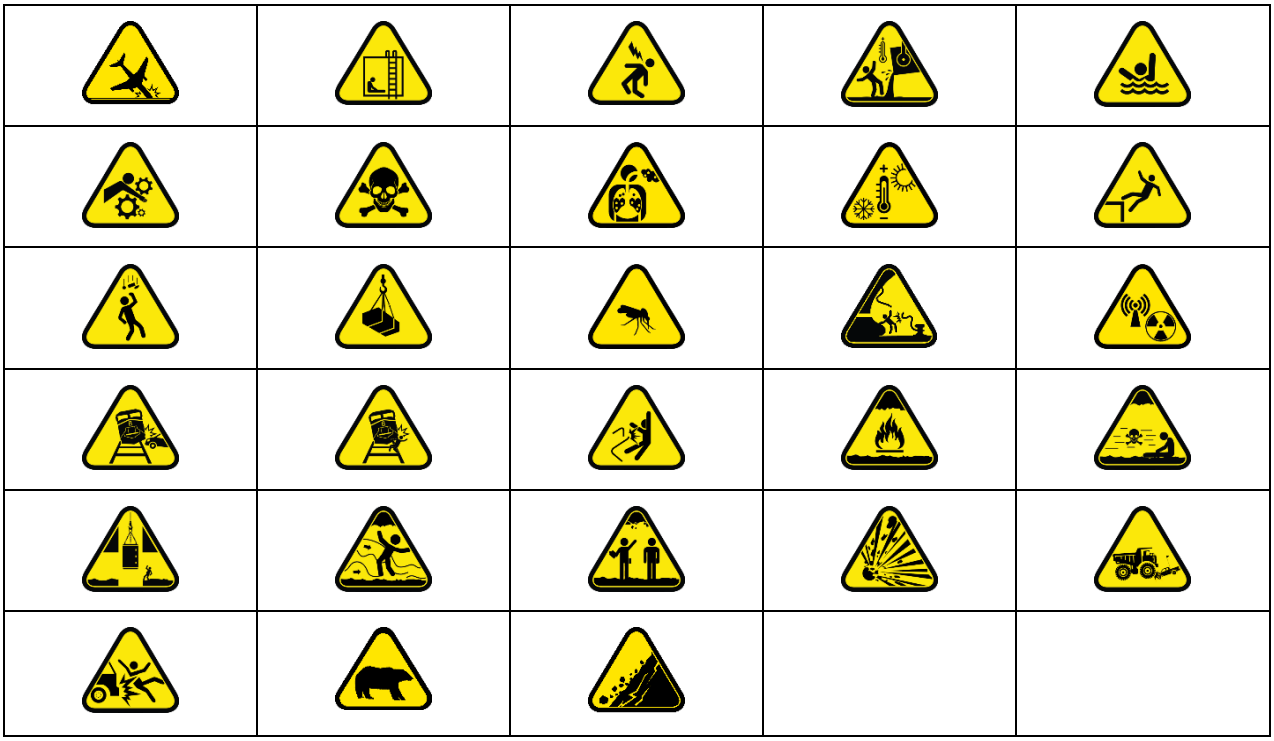
6	Updated Template including CRM Critical risk	05-Nov-16	E. Neba
7	Update to template and area manager	21-Oct-17	A. Hehn
8	Superintendent update	11-Mar-18	S. Skinner
9	Annual update	30-Mar-19	M. Nelson

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	D. Patterson

(Document owners will be prompted annually to update content; however, changes may or may not result.)

CRITICAL RISKS

Other potential critical risks not currently assessed as part of this SOP



Landfill

Waste Transfer Area burn pit

Waste Transfer Area waste storage

Figure 1. Landfill (top) and Waste Transfer Area Burn Pit/Waste Storage (bottom)

Description

This SOP covers the undertakings involved with weekly/semi-weekly monitoring visits to Diaviks Landfill and Waste Transfer Area to ensure that the collection, storage and disposal of all wastes are being done in a safe, efficient, and environmentally compliant manner. This is to avoid environmental contamination and wildlife occurrences /interactions, as some waste can be an attractant if not disposed of correctly.

2 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide direction for monitoring the Waste Transfer Area (WTA) and the Landfill to ensure proper waste disposal, as well, for both attractants to wildlife and wildlife that may visit these sites. Wildlife can potentially be very dangerous by becoming habituated to human activity. This situation can pose a threat to the safety of both the personnel on site and to the animal itself.

3 SCOPE

3.1 Scope of Procedure

This procedure applies to all Diavik Diamond Mines personnel and contractor personnel.

3.2 Scope of Activities

This procedure describes the monitoring procedure of the waste piles/burn pit and storage areas for improperly disposed/stored waste and looking for presence or signs of wildlife.

4 DEFINITIONS

Definitions							
ACTS		**Groundwater**		**PROVE**		**SOP**	✓
AEMP		**JHA**		**QA**		**TSS**	
COC		**NTU**		**QC**		**TSP**	
DI water		**PAL**		**Remote work**		**WHMIS**	
DO		**PFD**		**SDS**		**WLWB**	
ELT		**PPE**		**Seepage**			
GPS		**Problem bear**		**SNP**			

See: ENVI-443-0415- Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Aircraft		Extreme Weather		Line of Fire		Snowmobile Operation	
Burns		Fall into Water		Manual Labour		Spills	
Chemical Contact		Falling		Noise		Sprain / Strain	✓
Confined Space		Fire		Overhead Objects		Stored Energy	
Cuts Scrapes	✓	Firearms / Deterrents		Perception		Uneven Terrain / Ground	✓
Dehydration		Fumes / Gases		Pinch Points		Unfamiliar Area	✓
Electrical		Glass		Risk to Wildlife		Visibility	✓
Entanglement		Heavy Equipment	✓	Rotating Parts		Watercraft Operation	
Equipment Loss or Damage		Lifting		Sample Loss or Damage		Wildlife	✓
Ergonomics		Light Vehicle	✓	Slip, Trip, Fall	✓	Working Remotely	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Vehicle collision or Rollover	Seatbelts, segregation, Positive communication/Defensive driving, follow road signs/rules
Vehicle Impact on Person	Positive communication/defensive walking
Wildlife	Scan, Truck

6.3 Tools Required

Supplies, Tools and Equipment

Tool / Equipment	Quantity	Supplies	Quantity
iPad	**1**		

6.4 Procedural Steps

Monitoring will be happen every three days in summer and twice per week in winter.

Prior to leaving the office, download the “Waste Inspection” monitoring schedule from the MP-Field program on the iPad. Press: **Download Current Visits.**

Find and press the Waste Inspection visit for that day, the visit will automatically download onto the day’s schedule (make sure to manually change date if inspection was completed on a different day, record reasoning in comments)

6.4.1 Landfill Inspection

Upon arrival, note time visited on iPad and use drop down menu to highlight Sample Taken.

***Note: If the inspection was not completed, select Sample Not Taken and leave reasoning in the sample comments.

Scan area for wildlife.

Identify new waste piles since last visit, inspect those first.

Inspect waste piles for any attractants such as food/food product/oil contaminated items/paints/gloves, as well for things such as batteries, bulbs containing mercury, chemicals, and aerosol cans that can be hazardous to the environment (Figure 2). Everything in the landfill should be inert and pose no risk to the safety of the environment, people, or wildlife.

Figure 2. These items do not belong in the Landfill

Look for signs of wildlife i.e. scat/tracks/chewed garbage.

Record all findings on the iPad, example shown below (Figure 3).

Report any concern of improperly stored material to the Environment Supervisor. Provide pictures and coordinates if possible.

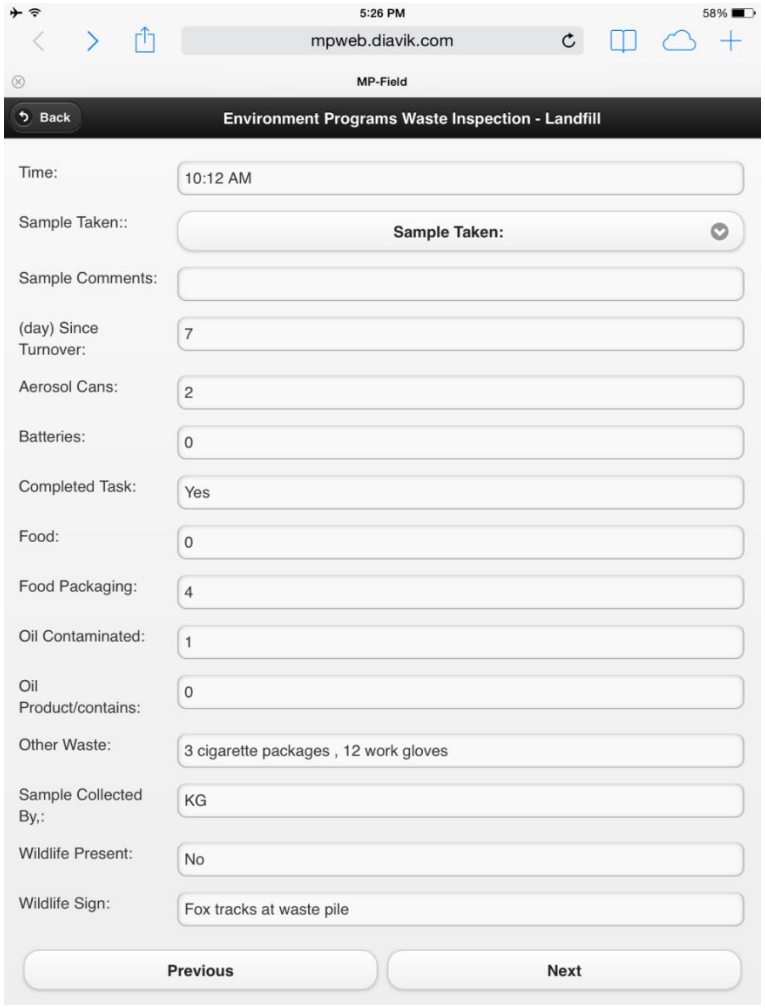


Figure 3. Screenshot of Landfill inspection in MP Field

6.4.2 Waste Transfer Area

Announce when entering/leaving Waste Transfer Area CH.5, the gate should remain closed all times to reduce the chance of wildlife entering the area. Contact the operator if gate is open.

Note time visited on iPad and use drop down menu to highlight **Sample Taken.**

***Note: If the inspection was not completed, select Sample Not Taken and leave reasoning in the sample comments.

Inspect waste storage containers and drums alongside fence for anything out of place/leaking/broken. Placards on fence clearly mark what is to be stored in each section.

Visually inspect fence for any potential entry points for wildlife.

Inspect burn pit area. If burn pit is active with a fire do not enter. The burn pit should only contain burnable waste such as wood, paper, paper products, and cardboard.

Look for signs of wildlife i.e. scat/tracks/chewed garbage.

Record all finding on iPad.

Report any concern of improperly stored material, wildlife and entry points to the environment supervisor. Provide pictures if possible.

6.4.3 A21 and Underground Waste Bins

Note time visited on iPad and use drop down menu to highlight **Sample Taken.**

***Note: If the inspection was not completed, select Sample Not Taken and leave reasoning in the sample comments.

Check burn bin and note any materials present that are not burnable

Check non-burn bin and note any materials present that should not be reporting to the Landfill such as food and drink containers, PPE, and chemicals.

6.4.4 Uploading Completed Inspections

**Remember to check that date is correct before uploading. Once inspections are complete the Waste Inspection visit will read 100% and is now ready to upload to MP5 from the iPad. Connect to ddmiipad and press upload visit. The visit will disappear when upload is complete.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

RioTinto

ENVIRONMENT STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVI-914-0119**
		Revision:	**9**
Task Title:	**Wildlife Monitoring (Carnivores)**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVI-916-0119 - SOP Helicopter - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.2 ENVI-919-0119 – SOP Snowmobiles - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.3 ENVI-907-0119 – SOP Remote Field Safety - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.4 ENVI- - SOP Firearms - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.5 Wildlife Report Template - Located in: iAuditor on iPad1 and iPad2

1.6 Wildlife Awareness Presentation - Located in: Diavik Intranet – HSEQ – Operational Control - Environment

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	01-Aug-12	D. Grabke
1	Annual Review and Update	20-Aug-13	K. Moore
2	Template Update and Annual Review	17-May-14	K. Moore

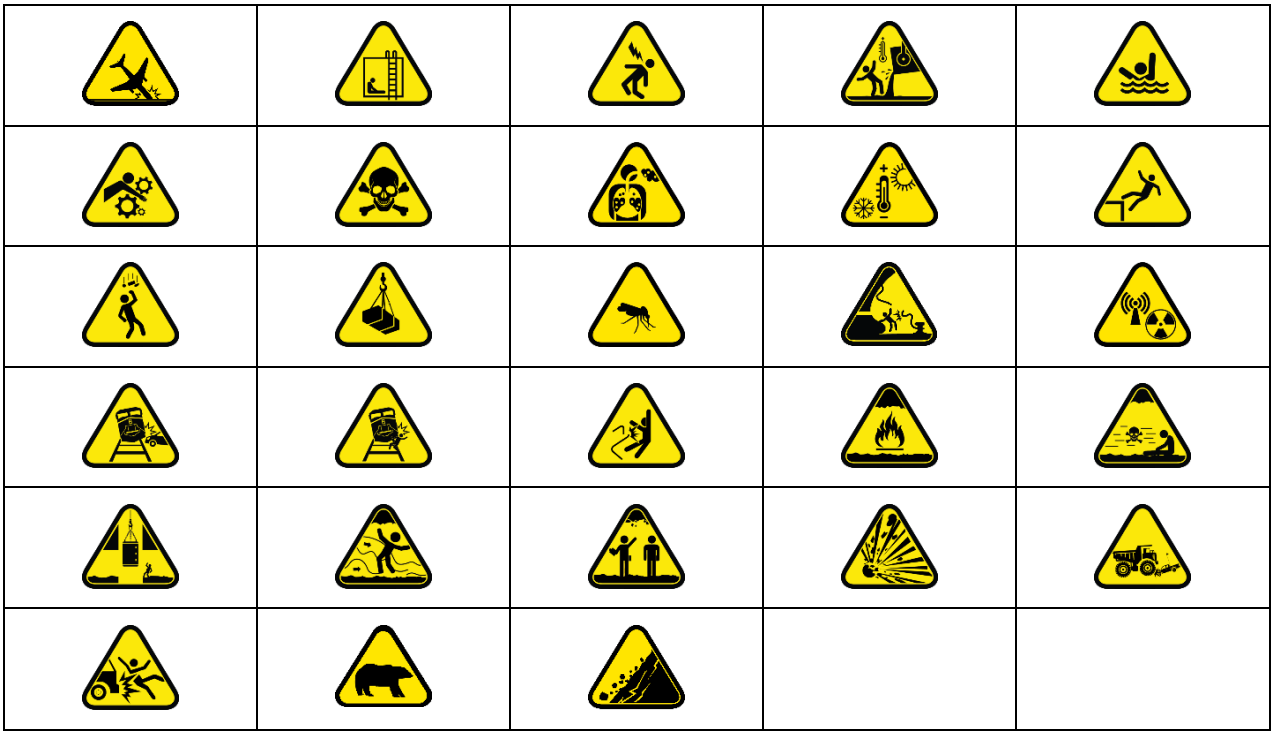
3	Format update	20-July-15	G. Reid
4	Format update	06-Dec-15	G. Reid
5	Updated template including CRM Critical risk	05-Nov-16	E. Neba
6	Security check-in at night	24-Sep-17	S. Sinclair
7	Update to template and area manager	21-Oct-17	A. Hehn
8	Superintendent update	11-Mar-18	S. Skinner
9	Annual update	2-Feb-19	M Nelson

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	J. Kozian

(Document owners will be prompted annually to update content, however, changes may or may not result.)

CRITICAL RISKS

Other potential critical risks not currently assessed as part of this SOP



ENVIRONMENT

STANDARD OPERATING PROCEDURE

Wildlife Monitoring (Carnivores)

Description

This SOP has been developed to provide guidance when responding to bear/wildlife calls at the Diavik site.

2 PURPOSE

This Standard Operating Procedure (SOP) provides a guideline to follow when responding to wildlife (bears, wolves, wolverines, and foxes) at the Diavik (DDMI) site. This procedure applies to all DDMI personnel, contractors, and visitors' at the mine site. However, wildlife control is managed by trained Environment personnel. Grizzly bears and other carnivores are frequently sighted at the mine site; therefore, worker safety is a priority. There will be situations when management actions will be required to deter problem wildlife away from the mine site.

3 SCOPE

3.1 Scope of Procedure

This SOP outlines the step-by-step procedure for managing bear and other carnivores observed at the mine site.

3.2 Scope of Activities

The activities involved in this SOP outlines the Environment Department's role for deterring bears/ wildlife away from the mine site along with initiating site wide Wildlife Alerts to notify site employees of the animal presence. This SOP also outlines the responsibilities and accountabilities of updating crews on wildlife locations. Activities covered by the SOP include monitoring, deterrence, relocation, and destruction.

4 DEFINITIONS

Definitions							
ACTS	✓	**Groundwater**		**PROVE**	✓	**SOP**	✓
AEMP		**JHA**		**QA**		**TSS**	
COC		**NTU**		**QC**		**TSP**	
DI water		**PAL**		**Remote work**		**WHMIS**	

DO		**PFD**		**SDS**		**WLWB**	
ELT		**PPE**	✓	**Seepage**			
GPS	✓	**Problem bear**	✓	**SNP**			

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415-R0- Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

This SOP references the use of helicopters and snowmobiles as potential deterrents or options for remote relocation. These critical risks and hazards are not routine for this task and the appropriate SOPs should be consulted to address hazards and risks associated with those modes of transportation.

Task Hazards							
Aircraft		**Extreme Weather**		**Line of Fire**	✓	**Snowmobile Operation**	
Burns		**Fall into Water**		**Manual Labour**		**Spills**	
Chemical Contact		**Falling**		**Noise**	✓	**Sprain / Strain**	
Confined Space		**Fire**		**Overhead Objects**		**Stored Energy**	

Cuts Scrapes		**Firearms / Deterrents**	✓	**Perception**	✓	**Uneven Terrain / Ground**	✓
Dehydration		**Fumes / Gases**		**Pinch Points**	✓	**Unfamiliar Area**	✓
Electrical		**Glass**		**Risk to Wildlife**	✓	**Visibility**	✓
Entanglement		**Heavy Equipment**	✓	**Rotating Parts**		**Watercraft Operation**	
Equipment Loss or Damage		**Lifting**		**Sample Loss or Damage**		**Wildlife**	✓
Ergonomics	✓	**Light Vehicle**	✓	**Slip, Trip, Fall**	✓	**Working Remotely**	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Uncontrolled release of energy (flares or firearms)	Scan, positive communication, training, ACTS and PROVE, lock-out mechanisms
Vehicle collision or rollover	Seat belts, segregation, positive communication, defensive driving
Vehicle impact on person	Positive communication, defensive walking
Wildlife	Scan, truck or means of egress, deterrents

6.3 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Tool / Equipment**	**Quantity**
Light Vehicle	**1**	**iPad with iAuditor**	**1**
Aircraft (pending location/ behavior of bear)	**1**	**GPS**	**1**
Field kit equipped with deterrents	**1**	**Camera**	**1**
Shot gun and ammunition kit	**1**	**Radio (Blue Stripe Antennae)**	**1**

6.4 Procedural Steps

The following flow chart (Figure 1) outlines the steps to be taken when wildlife (carnivores) have been observed on site:

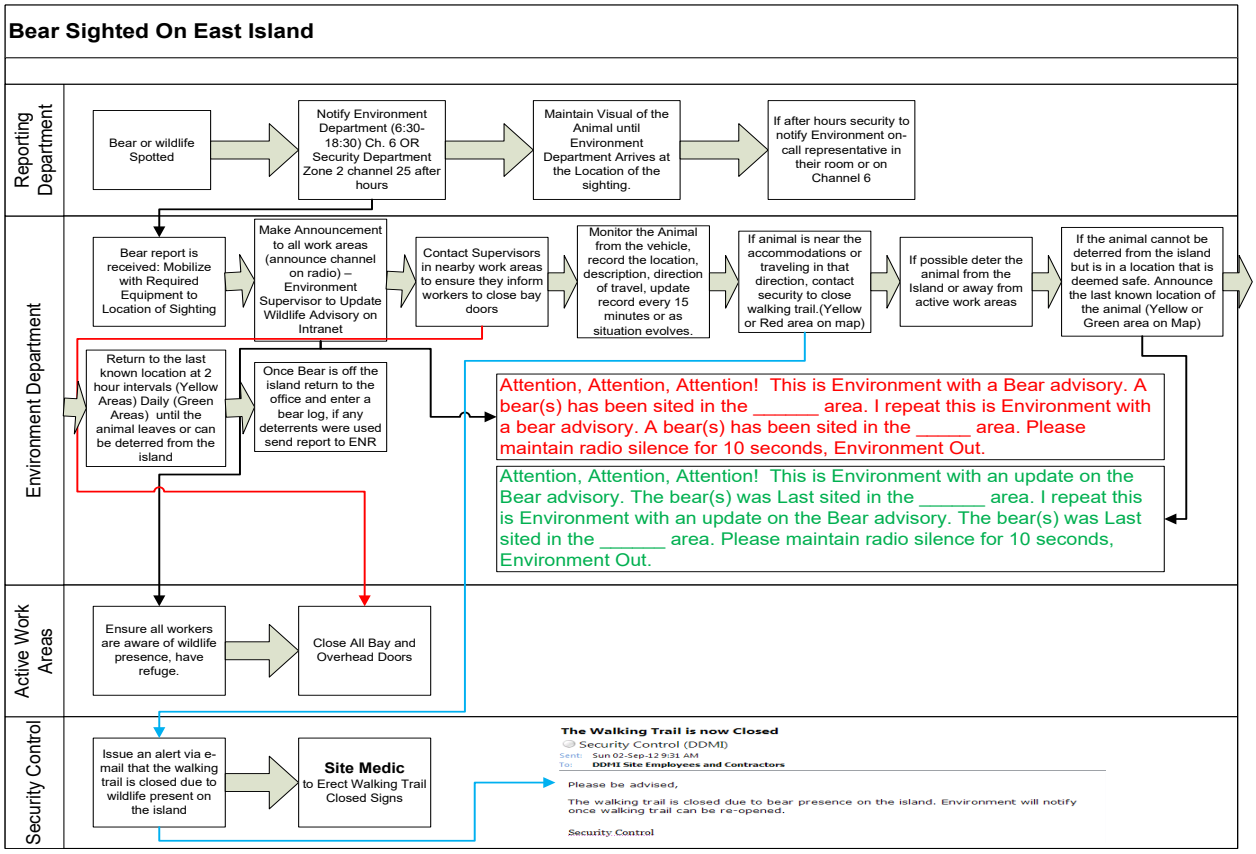


Figure 1: Procedural steps for wildlife monitoring

Figure 2: Monitoring Criteria for Problem Carnivores

6.4.1 Additional Information

Pertinent information to collect upon receipt of wildlife call

- Name and contact information of individual reporting the sighting;
- Number of animals; and
- Last known location and ask to maintain visual until Environment arrives at the scene.

Contact sequence for after hour callouts

- Environment Technician(s)
- Environment Term Technician(s)
- Environment Supervisor

NOTE: Environment staff who are on after hour callouts shall check in with security control every 2 hours and inform security control when the callout is complete.

6.4.2 Controls to protect workers

- Supervisors of work areas adjacent to the sightings need to be contacted to inform them to close any open doors to ensure the animals do not enter any mine infrastructure.
- The walkway between south camp and the main accommodations will remain open, unless Environment determines a need to close it. Environment will check with security to see if anyone is using the walkway. Environment will do a sweep of the walkway if there are people using the walkway. Environment will be responsible for arranging closure.
- If an alert occurs during shift change, Environment, with input from Site Services, will determine the need for buses to move personnel.

6.4.2.1 Wildlife Inside Buildings or Corridors

Special consideration should be taken if wildlife is reported inside buildings. Most wildlife will not remain in buildings and corridors; however, problem carnivores can become food conditioned and may seek to enter structures inhabited by workers.

When contacted by Security Control or individuals, the responding Environment personnel should ensure:

- The individual(s) reporting the animal have informed the area supervisor.
- People working in the structure have evacuated the building to the nearest vehicle.
- Where possible leave exterior structure doors open so that the wildlife can exit the structure and close and latch interior doors to prevent the animal moving into other areas of the structure, the idea is to provide the animal one or two obvious exits.
- Structure exits are monitored until Environment personnel arrive at the scene to understand when the animal has left the building.

After confirming that the reporting individual(s) are secure and structure doors are open and monitored the on-call Environment personnel should activate additional resources:

- At a minimum the Environment Supervisor or their designate should be made aware of the situation
- Emergency Response Team Advisor
- Security Control

As the problem carnivore is in a structure, deterrent options are limited to air horns and fire extinguishers. No bear spray, banger, or firearm should ever be used in a structure.

On arrival at the structure, Environment personnel will determine if there is a safe way to enter the structure and use air horns to encourage the animal to move toward an open exterior door. Personnel should never enter a building if entering the building would place the employee between the animal and the only open exit.

Problem wildlife in structures can be trapped and relocated if they are reluctant to move on. DDMI should have two traps:

- A larger drum-style trap owned by the Environment Department, and
- A smaller cage trap owned by Underground Operations.

Depending on the trap style and the animal in the trap a minimum of two people are required to pick up and move the trap, in many instances three people are required. The style of trap used is dictated by the structure, the animal involved in the disturbance, and the availability of help to move the trap. Once set and baited the trap should be checked every hour; additionally, the structure exit should be monitored continually to know when the animal has left the building.

Once trapped the animal should be moved to the Environment Field Lab for temporary storage until ENR can be contacted and a plan for relocation generated – see relocation under remedial actions.

6.4.3 Duties of supervisors

- All supervisors are responsible to monitor the radio for changes or updates on the bear's movement on site.
- Supervisors are responsible to account for and notify their staff. If necessary, supervisors are responsible to restrict work in certain areas, depending on the problem carnivore's location.

6.4.4 Criteria for Lifting Advisory (See Figure 2):

6.4.4.1 Green

Bear/ problem carnivore can be left in this area, use discretion where the animal is close to infrastructure.

6.4.4.2 Yellow

Bear/ problem carnivore can be left at the discretion of the person monitoring the animal.

Things to consider:

- Is the bear moving around?
- Is the bear bedded down, if so for how long?
- Do you have a visual on the animal and how long have you had the visual for?
- How active has the animal been?
- What time of day is it?
- Are there people in the area?
- Have you assigned alternate monitor(s) (night…who??)
- What is the distance from active work areas?
- Have you contacted area supervisors to ensure they are aware a problem carnivore is close?

- Can security monitor the animal with their cameras?

Ensure the alert has been updated.

6.4.4.3 Red

Bear/ problem carnivore needs to be monitored continuously while in the red zone.

- In the event there is an unconfirmed wildlife sighting (i.e., reported by workers but not seen by Environment), the search can be abandoned after 1 hour with no sighting.
- The alert will stay in effect until the bear or other carnivore has left the red zone.

6.4.5 Remedial Action for Problem Wildlife

Preventing the attraction for wildlife through proper food storage, garbage disposal and camp maintenance is the most effective way of avoiding problem carnivores in general. Management action will be carried out if bears or other carnivores pose a threat to people and/or property.

Occasional visitations by grizzly bears, wolverines, and wolves to the mine site are anticipated. Procedures for dealing with problem wildlife are outlined below.

The Environment Superintendent and the Environment Supervisor will work with Environment Natural Resources (ENR), GNWT to deal with problem wildlife at site. There is a hierarchy of options for control of problem wildlife that poses a nuisance or danger to human safety; the three levels of increased effort to deal with problem wildlife are:

- Level I: Deterrence
- Level II: Relocation
- Level III: Destruction

The Environment Supervisor will maintain effective communication with ENR in reporting problem carnivores and in evaluating options for wildlife control.

6.4.5.1 Level I: Deterrence

A method or device, either physical or chemical, designed to chase the animal away. This could involve one or a combination of the following approved and recommended methods by ENR:

- Use of vehicles
- Bear Bangers
- Noise crackers
- Rubber bullets
- Bean bag marking cartridge
- Aircraft
- Pepper spray

Each member in the Environment Department has been trained and are responsible to ensure they have deterrents with them while on a wildlife call-out. Firstly, the Environment representative must do an inventory of the number of bangers, screamers, they have present in their field kits. They must keep track and log the number of deterrents they use on the animal (documented on the iPad in iAuditor and Ammunition Used Log). If any discrepancies are noticed (i.e., lost live bangers or other deterrents), notify the Environment Supervisor and an incident report will be generated. Each member in the Environment Department is accountable for their field kits containing bear bangers and screamers. The Technician must ensure kits are stored adequately for the duration of their shift. All discharged deterrents must be brought back to the environment office and placed in a zip lock bag with the technician initials and date of use. These bags will be stored in the firearms cabinet for periodic reconciliation.

Individuals using methods of deterrence must properly assess the situation that they are in and the following points must be considered:

- Vehicles are an acceptable method of deterring bears, wolves, wolverines, and foxes; however, ensure that the animal is moved away from project activities and not scared towards camp infrastructure or toward unsuspecting people. This is the preferred method of deterring wildlife as they move adjacent to the mine site, and for moving problem carnivores off site.
- Increase the level of deterrent accordingly, based on the behaviour of the animal: vehicles & their horns, air horns, bear bangers, cracker shells, rubber bullets, and helicopter.
- No shooting of a bear banger towards buildings or fuel sources.
- Ensure that the bear banger is shot between you and the problem carnivore so that the animal is not scared towards you. If using an air horn, ensure that it is directed towards the animal.
- If a helicopter is available on or near the site, it may be used to deter the problem carnivore off the island **if other methods of deterrents are unsuccessful**. Ideally, an attempt should be made to move the animal onto the small islands, west of the airstrip - thereby encouraging the animal to move off East Island onto the mainland. Note: This method of deterrence can only be conducted at the discretion of pilot and all DDMI personnel will follow the procedures laid out in the helicopter usage SOP (ENVI-916-0119). A qualified DDMI Environment personnel should be onboard the aircraft or on the ground with visual (and radio) contact to provide the pilot with guidance. Ground to air radio contact with the helicopter can be maintained using Zone 7 – Great Slave Helicopters Channel.
- The pilot should:
    - Stress the animal as little as possible. A stressed bear running for a distance can overheat and die.
    - Keep the helicopter well back from the animal. The minimum distance between the helicopter and the bear is 100 m (320 ft) back and 30 m (100 ft) up from the ground.

  - Keep the animal in visual contact. This should be done by taking the helicopter to a higher altitude rather than getting closer than the minimum distance.
  - Only get close enough to the bear to make it move, not fly over it. A carnivore moving at a 'fast walk' can cover a lot of ground quickly and efficiently; there is no need to run the animal.
  - DO NOT push a bear for more than 10 minutes or 3 km (2.2 miles).
- Documentation of all deterrent actions must be completed. This includes all notes made in the iPad iAuditor and uploaded to 15.3 Wildlife Database → Wildlife Deterrence Used → Year. In this final copy, be sure to include as much detail as possible. This includes the description of the animal (colour, build, stature and approx: age), behaviour of the animal, response to stressor (deterrent), the number of each deterrents used, location (coordinates) and any movement that occurred with the animal. Any additional pictures will be helpful to identify the animal in the future.

Note: If you are required to deter problem carnivores from the site, a deterrence report must be completed. This report should be e-mailed to Adrian Lizotte Adrian_Lizotte@gov.nt.ca

6.4.5.2 Level II: Relocation

DDMI Environment will work with ENR; GNWT to determine if/when a problem carnivore should be relocated. A completed relocation permit is usually required by ENR prior to starting relocation. Relocation is completed under the authority of ENR, and would be supported by DDMI Environment. Relocation typically involves remote work (ENVI-907-0119) and helicopters (ENVI-916-0119) or snow machines (ENVI-919-0119). Prior to undertaking relocation the relevant SOPs should be reviewed and a JHA completed.

If a problem carnivore is trapped inside a structure the trap containing the animal will be stored in the Environment Field Lab until an action plan is formulated with ENR. The following are potential options:

- Smaller animals, e.g., foxes, can be relocated to Pond 3 or the Wind Farm
- If Lac de Gras is frozen or the winter ice road is open the animal can be relocated away from East Island, release of the animal should occur at least 75km from site and preferably in an environment that is attractive to the carnivore
- If it is summer the animal may have to be tranquilized and transported via helicopter as far as possible

If possible, relocation should be in an environment that is attractive to the carnivore (e.g., caribou herds for wolf and wolverine). Otherwise, it is recommended to relocate the wildlife to the north or northwest of the mine site as this region is typically upwind of the mine site.

Prior to releasing the problem carnivore an attempt should be made to mark the animal with a bright colour spray paint. This is to help identify repeat offenders.

Individuals involved in the release of animals from traps at the relocation site should be as close to a means of safe egress as possible. The most likely response of a released animal is to run away from the trap; however, it could turn and attack.

If the problem carnivore repeatedly offends after relocation, contact ENR and discuss destruction options.

6.4.5.3 Level III: Destruction

The destruction of problem carnivores will only be implemented as a last resort deterrence method if all the above methods have failed. ENR wildlife officials will make this decision upon recommendation and discussions with designated biologists and DDMI Environment personnel. However, if an emergency arises where there is direct danger to an individual then it may be necessary to destroy problem carnivores immediately. **Note: Unless the wildlife poses an immediate threat to life or safety, approval to destroy an animal must come from ENR prior to destruction.**

Only Environment personnel holding a valid Possession and Acquisition License (PAL) are to handle any firearm or to destroy problem carnivores, if the situation arises. Direct permission must be obtained from **ENR using their 24-hr emergency contact phone number: (867) 873-7181**. Prior to destroying problem carnivores the responsible person will complete a JHA and will follow the firearm SOP (ENVI-920-0119) when performing the destruction. The one exception to this policy is if an indigenous trapper has been hired to trap and destroy the animal. In this instance, the trapper will hold a valid PAL and will only shoot the animal after it has been trapped.

If destruction of an animal occurs, a detailed incident report must be prepared and submitted to ENR officials. This report would also be included as an appendix in the annual wildlife monitoring report.

If an animal is destroyed, the hide must be preserved in such a manner that it will not be allowed to spoil. ENR will require the head along with any other requested samples which will change from year to year dependent on research priorities.

7 QUALITY OUTCOMES AND EXPECTATIONS

To safely complete the tasks outlined in this SOP, without incident.

Producing quality, accurate and repeatable results.

Appendix B
Monitoring and Report Forms

RioTinto

Description of Employee Responsibilities

1. Environment Superintendent:

It is the responsibility of the Superintendent to ensure that:

- All legal requirements are in place and met for the required task(s),
- Environment Supervisors have the necessary resources and support to meet lab quality objectives,
- Instituting, maintaining and communicating all SOP's for the applicable task(s),
- Technical best practice requirements are properly incorporated into all SOP's,
- The responsibilities for health, safety environment and quality are communicated to all Personnel,
- The risks associated with remote field activities are managed effectively,
- Appropriate information, instruction, resources and training are provided to all Personnel, and
- Corrective action is administered for failure to adhere to Company and/or Legal Standards/Requirements.

2. Environment Supervisor:

It is the responsibility of the Supervisor to ensure that:

- All legal requirements are in place and met for the required task(s) and all lab quality objectives are met,
- All new Personnel receive an orientation of the applicable work area (office, laboratory, field lab, hanging tree) and understand the hazard of each applicable area,
- All Personnel have read and understand the appropriate SOP's,
- Contractors understand and adhere to the Companies Standards/Regulations when on site,
- Proper tools are used for risk management (CCCs, JHAs, Take 5's, Team Based Risk Assessments),
- All equipment and PPE required for the task(s) are available, appropriate and have had the scheduled maintenance and repairs completed,
- The appropriate quality control/quality assurance practices are followed,
- All Personnel have completed the required training before completing the task(s) assigned,
- All required permits are reviewed and signed off prior to commencement of the task(s),
- Data / laboratory sheets / MP5 imports are reviewed for accuracy and completion, and

- The Company Non-Conformance, Incident and Action Management Policy is followed, as required.

3. Environment Technicians and All Other Personnel:

It is the responsibility of all other Personnel working within the Environment Department to ensure that:

- They comply with all standard operating procedures and lab quality systems,
- They complete all required permits and receive appropriate signoff from the Environment Supervisor, or their delegate, prior to commencing the task(s),
- Proper controls are in place before commencing the task(s),
- Concerns are raised with the Environment Supervisor, or their delegate,
- They are engaged and attentive during required training,
- They reviewing and become familiar with all task related documents and reference material,
- They take action to eliminate, minimize, avoid, and report hazards,
- All safety devices and PPE are used properly,
- They do not place themselves, or others, at risk,
- All equipment is maintained and inspected prior to use and if required unsafe/damaged equipment is removed from service,
- All samples are collected, handled and stored following the SOP,
- Proper, legible documents are completed and saved, and
- Reporting all incidents to Environment Supervisor, or their delegate, as soon as possible.

RioTinto

Environment STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVI-897-0119**
		Revision:	**5**
Task Title:	**Raptor Pit Inspection**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 **Bird Species of Lac de Gras** – Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Archive Forms\2013 - FORMS

1.2 **Peterson Field Guide Western Birds Reference book -** Environment Office Library

1.3 **Smithsonian Handbooks Birds of North America Western Region -** Environment Office Library

1.4 **The Sibley Field Guide to Birds -** Environment Office Library

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	17-May-2012	D. Bourassa
1	New Format	10-Dec-2014	K. Gray
2	New Format	05-Nov-2016	S. Martin-Elson
3	Template, location map and area manager updated	20-Oct-2017	S. Skinner
4	Superintendent update	10-Mar-18	S. Skinner
5	Annual update	30 Mar-19	M. Nelson L. Case
6	Update A21 Procedures	20-Oct-19	L. Case

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	D. Patterson

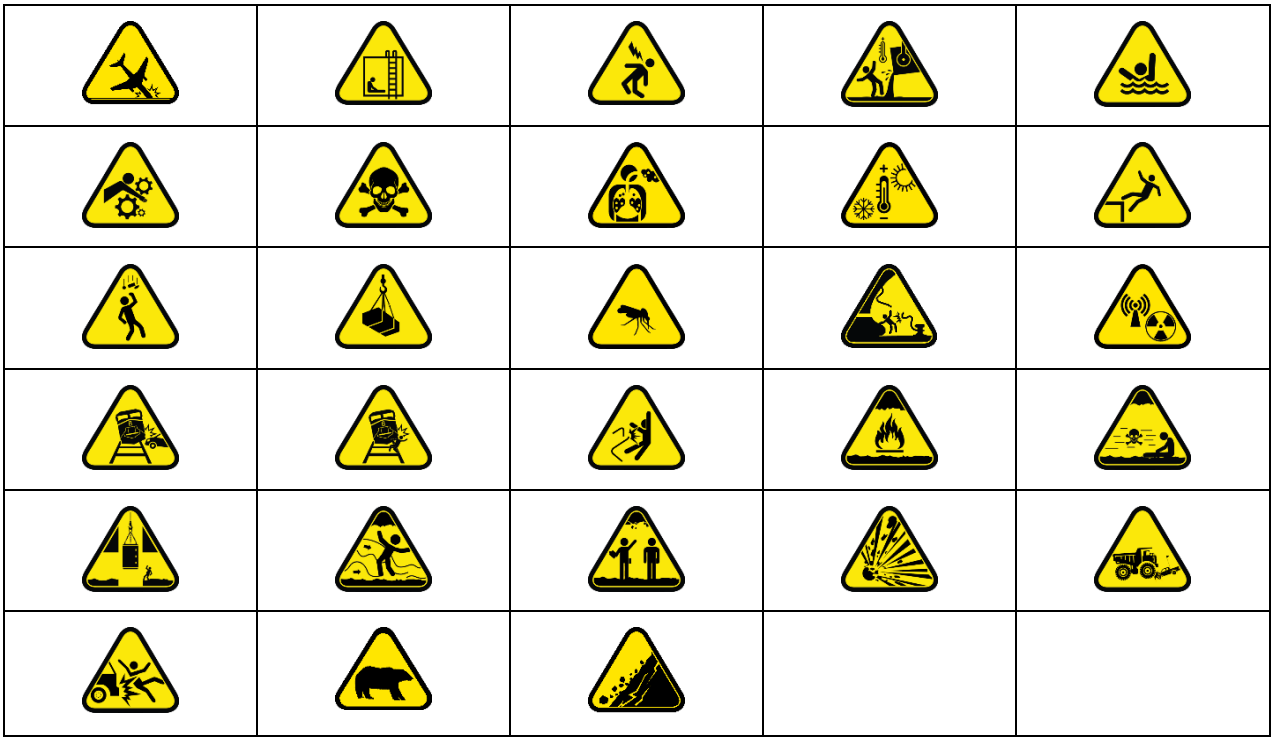
Environment

STANDARD OPERATING PROCEDURE

Raptor Pit Inspection

CRITICAL RISKS

Other potential critical risks not currently assessed as part of this SOP



Peregrine Falcon

Rough Legged Hawk

Gyrfalcon

Figure 1. Common raptors

Description

This SOP outlines the procedure for conducting Pit Wall and Infrastructure inspections at the Mine Site.

2 PURPOSE

The main objective of these surveys is to monitor the Mine Site for any active raptor nesting sites, and to ensure proper mitigation actions, such as deterrence, are implemented to ensure nest developments are not located in sensitive areas with high activity.

3 SCOPE

3.1 Scope of Procedure

This SOP describes the responsibilities and processes for undergoing Pit Wall and Mine Infrastructure Inspections; and monitoring of bird nesting locations. All findings during these inspections will be recorded onto the electronic field sheet in iAuditor and will be transferred onto an electronic excel sheet.

3.2 Scope of Activities

All findings during these inspections will be recorded onto the electronic field sheet in iAuditor and will be transferred onto an electronic excel sheet.

4 DEFINITIONS

Definitions							
ACTS		Groundwater		PROVE		SOP	✓
AEMP		JHA		QA		TSS	
COC		NTU		QC		TSP	
DI water		PAL		Remote work		WHMIS	
DO		PFD		SDS		WLWB	
ELT		PPE	✓	Seepage			
GPS	✓	Problem bear		SNP			

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Aircraft		**Extreme Weather**		**Line of Fire**		**Snowmobile Operation**	
Burns		**Fall into Water**		**Manual Labour**		**Spills**	
Chemical Contact		**Falling**	✓	**Noise**		**Sprain / Strain**	
Confined Space		**Fire**		**Overhead Objects**		**Stored Energy**	
Cuts Scrapes		**Firearms / Deterrents**		**Perception**	✓	**Uneven Terrain / Ground**	✓
Dehydration		**Fumes / Gases**		**Pinch Points**		**Unfamiliar Area**	✓
Electrical		**Glass**		**Risk to Wildlife**		**Visibility**	
Entanglement		**Heavy Equipment**	✓	**Rotating Parts**		**Watercraft Operation**	
Equipment Loss or Damage		**Lifting**		**Sample Loss or Damage**		**Wildlife**	✓
Ergonomics		**Light Vehicle**	✓	**Slip, Trip, Fall**	✓	**Working Remotely**	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Wildlife	Scans, Means of egress
Vehicle collision or rollover	Seatbelt, Segregation, Defensive driving
Vehicle impact on person	Seatbelt, Segregation, Defensive driving/walking
Fall from heights	Stay away from edge

6.3 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Supplies**	**Quantity**
GPS	**1**	**iPad**	**1**
Binoculars	**1**	**PPE (required for travel around site)**	**1 per person**
Field Identification Bird Guides	**1**	**Radio**	**1**
Digital Camera	**1**	**A21 Field Sheet**	**1**

6.4 Procedural Steps

Open iAuditor on a field iPad and start a Raptor Survey audit.

6.4.1 A418 and A154 Pit Walls Inspection Procedure

Gather all equipment necessary to complete inspection and drive to the pit and dike areas.

Drive to the lookout locations being mindful of any raptor activity on the dikes. See Figure 2 below. Proceed to lookout and scan pit walls and skies above pit for a minimum of 15 minutes

Record any findings in iAuditor; take photos and obtain GPS coordinates of nesting location (if possible).

Repeat procedure at all four lookouts around the A418 and A154 pits.

Figure 2. A154 and A418 Lookout Locations

6.4.2 Infrastructure Inspection Procedure

Gather all equipment necessary to complete inspection. Drive to and stop at areas where infrastructure can be easily and completely scanned. Ensure all areas listed on the field sheet are visited. Radio communication is required when entering into restricted areas (e.g., Process Plant, Backfill Plant).

Scan area infrastructure completely looking for raptors or signs of nesting.

Record any findings in iAuditor, take photos, and obtain GPS coordinates of nesting location (if possible).

6.4.3 A21 Inspection Procedure

Print A21 Pit Wall Monitoring Field Sheet (ENVI-951-0319) (Located in 13.4 Wildlife>2019 Wildlife>A21 Pit Wall)

Gather all equipment necessary to complete inspection and drive to the A21 Dike areas. Contact Pit Supervisor on Channel 7 for access and notify that you are going to be around the dike area conducting a Raptor Survey. Drive to the first lookout location being mindful of any raptor activity on the dikes (Figure 3). Proceed to lookout and scan pit walls and skies above pit for a minimum of 15 minutes. Record any findings on field data sheet; take photos and obtain GPS coordinates of nesting location (if possible). Repeat at second lookout.

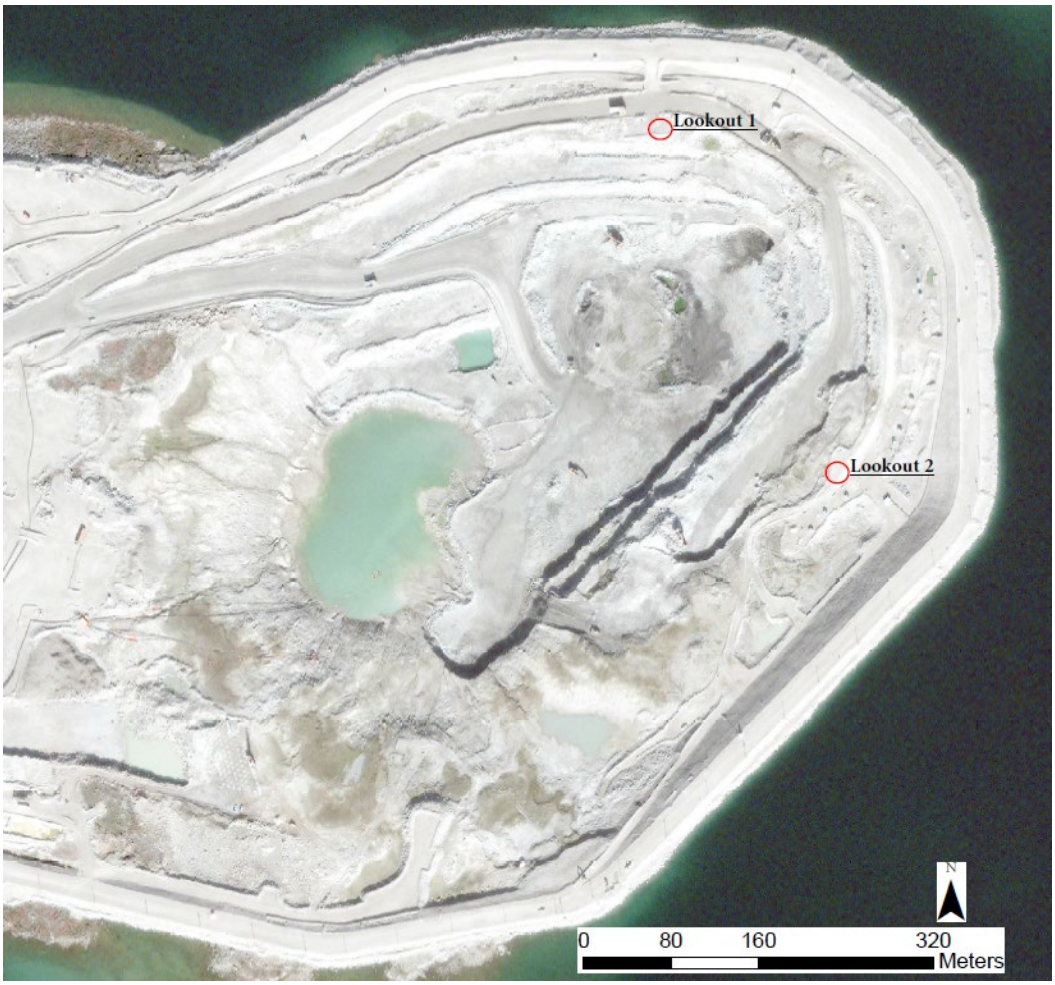


Figure 3. A21 Lookout Locations

6.4.4 A21 Deterrence

Technicians will not bring bear bangers with them for A21 pit inspections. If a raptor or raven appears to be nesting the Environment Supervisor and Pit Supervisor will need to approve the use of bear bangers in the pit.

If bear bangers are approved by both the Environment Supervisor and Pit Supervisor Print A21 Pit Wall Deterrence Field Sheet (ENVI-950-0319) (Located in 13.4 Wildlife>2019 Wildlife>A21 Pit Wall). The details of deterrent use will be recorded on the field sheet along with the Response Index of the Raptors. Request Pit Supervisor arrange an escort for you into the pit to fire bear bangers up towards the bird(s). If possible record video of birds reaction of banger. Do not fire banger directly at bird to avoid injuring it.

A combination of passive visual and auditory deterrence will be deployed in the active A21 open pit. Deterrents include:

- Scarecrows
- Wetland Wailer (aka Screaming Bird Machine)
- Decoy ground and air predators

6.5 Follow-up

If any potential raptor nesting activity is noted on the pit walls or on any infrastructure, the Environment Supervisor should be notified who in turn will contact ENR. If the nest is still being constructed every effort will be taken to deter continued construction of the nest and actions to destroy the nest and incinerate the nest material will be implemented. Dependent on location and stage of nest production, ENR may request DDMI to attempt to relocate the nest. If relocation is not an option; continued monitoring will be conducted by DDMI Environment Staff.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

RioTinto

ENVIRONMENT STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVR-303-0112**
		Revision:	**5**
Task Title:	**Quality Assurance/Quality Control**		
	Supersedes: ENV SOP 303		
FOR DOCUMENT CONTROL USE ONLY: **Next Review:** **1 year from Area Manager Authorized Signature Date below** **Effective Date:** **See Area Manager Authorized Signature Date below**			

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVI-656-0117 DDMI Environment Lab – Training – Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.2 Training

1.2 ENVI-901-0119 – SOP- General Laboratory Safety - Located in: Diavik Intranet – SOPs – Environment Folder

1.3 ENVI-900-0119 - SOP- Chain of Custody & Sample Shipping - Located in: Diavik Intranet – SOPs – Environment Folder

1.4 ENVI-133-0112 - Aquatic Effects Field Sheet - Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Water Quality Forms

1.5 ENVI-134-0112 – 1645-19 SNP Monitoring Field Sheet – Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Water Quality Forms

1.6 ENVI-668-0117 DDMI Environment Lab – Equipment Management - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.5 Equipment

1.7 ENVI-669-0117 DDMI Environment Lab – Measurement Traceability - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\5.6 Measurement Traceability

1.8 ENVI-653-0117 DDMI Environment Lab – Record Control - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\4.13 Record Control

1.9 ENVI-650-0117 DDMI Environment Lab – Document Control - Located in: P:\DDMI Environment\10.0 Operational Control\10.13 CALA Certification\Approved Quality Manual Documents\4.3 Document Control

1.10 ENVI-904-0119 – SOP Total Suspended Solids Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.11 ENVI-905-0119 – SOP pH Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.12 ENVI-906-0119 – SOP Turbidity Analysis - Located in: Diavik Intranet – SOPs – Environment Folder

1.13 ENVI-918-0119 – SOP Field Meter - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Initial Release	01-Jan-12	D. Grabke
1	Formatting	08-Dec-15	D. Birch
2	Revision of QC schedule and measures	29-May-16	N. Goodman
3	CALA Updates	15-Dec-16	N. Goodman
4	Update to template, area manager and CRM	21-Oct-17	A. Hehn
5	Superintendent update	10-Mar-18	S. Skinner
6	Annual review	27-Feb-19	M. Nelson N. Goodman

			L. Case
7	Clarification on TSS LBW frequency	22-Nov-2019	N. Goodman

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	S. Sinclair, A/ BP HSE

(Document owners will be prompted annually to update content; however, changes may or may not result.)

CRITICAL RISKS

There are no critical risks associated with this SOP

Other potential critical risks not currently assessed as part of this SOP

Internal QA/QC
LABBW
LDUPW1/ LDUPW2
DUPRDGS
EBINT

External QA/QC KEY		
-1	=	EBW
-2	=	FBW
-3	=	TBW
-4	=	DUPW1
-5	=	DUPW2
-6	=	DLS

Description

This SOP reviews the quality assurance and quality control measures used to ensure best practices are being utilized while collecting and analysing samples.

2 PURPOSE

The objective of this Standard Operating Procedure is to establish consistent and uniform criteria and procedures to be implemented for laboratory activities undertaken during water quality analysis to ensure environmental data generated and processed is scientifically valid.

This SOP is intended to define Environmental Quality Assurance (QA) and Quality Control (QC) measures in place to ensure all data generated in the DDMI Environment Laboratory shall be of known precision and accuracy, be complete, representative, and comparable.

3 SCOPE

3.1 Scope of Procedure

This procedure applies to all Diavik Diamond Mines personnel and contract personnel authorized by the Environment Superintendent to collect, analyse and ship samples. All persons conducting analyses in the DDMI laboratory are required to read, understand, and fully comply with the methods outlined in the SOP for each analytical test conducted, respectively.

This procedure has been developed to be consistent with the requirements of the Rio Tinto HS & E standards.

4 DEFINITIONS

Definitions							
ACTS		**Groundwater**		**PROVE**		**SOP**	✓
AEMP		**JHA**		**QA**		**TSS**	
COC		**NTU**		**QC**		**TSP**	
DI water		**PAL**		**Remote work**		**WHMIS**	

DO		**PFD**		**SDS**		**WLWB**	
ELT		**PPE**		**Seepage**			
GPS		**Problem bear**		**SNP**			

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key Safety Aspects

Task Hazards							
Aircraft		**Extreme Weather**		**Line of Fire**		**Snowmobile Operation**	
Burns		**Fall into Water**		**Manual Labour**		**Spills**	
Chemical Contact		**Falling**		**Noise**		**Sprain / Strain**	
Confined Space		**Fire**		**Overhead Objects**		**Stored Energy**	

Cuts Scrapes		**Firearms / Deterrents**		**Perception**		**Uneven Terrain / Ground**	
Dehydration		**Fumes / Gases**		**Pinch Points**		**Unfamiliar Area**	
Electrical		**Glass**		**Risk to Wildlife**		**Visibility**	
Entanglement		**Heavy Equipment**		**Rotating Parts**		**Watercraft Operation**	
Equipment Loss or Damage		**Lifting**		**Sample Loss or Damage**		**Wildlife**	
Ergonomics		**Light Vehicle**		**Slip, Trip, Fall**		**Working Remotely**	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
N/A	N/A

6.3 Procedural Steps

6.3.1 Quality Assurance (QA)

Quality assurance for the environmental laboratory encompasses all quality-related activities that ensure the validity of aquatics testing and analysis and all relevant technical support. All DDMI environment personnel, from management to field laboratory technicians, are required to conscientiously follow applicable quality control measures and standard operating procedures (SOPs). Adherence to these documents, combined with staff vigilance, can help ensure that the analytical data and other test results collected will be acceptable as the bases for making significant decisions.

The DDMI laboratory ("the lab") encompasses a broad range of activities including preparation of samples for internal analytical processing, calibration and maintenance of equipment, data management, and sample handling for external analysis.

Our approach to quality assurance places an emphasis on four aspects:

- Infrastructure (instruments, testing capabilities, calibrations, SOP's)
- Control Measures (internal/external)
- Personnel (competence, ethics, and integrity)
- Data Management/Control of Non-Conforming Work

The quality of the outputs is at risk if any of these four aspects are deficient in any way.

6.3.2 Infrastructure

6.3.2.1 Equipment

All equipment is to be maintained and operated in accordance with manufacturer instructions and SOPs. Modifications to equipment/equipment settings/any issues are to be recorded in the spreadsheet in the relevant Equipment folder, which is accessible to all staff and should be regularly consulted during troubleshooting, as per ENVI DDMI Environment Lab – Equipment Management (ENVI-668-0117).

6.3.2.2 Testing Capabilities

Continued testing capability is verified through an annual program of Proficiency Testing (PT). During PT testing, an analyst will analyze multiple samples of varying and unknown (to them) concentrations, either prepared by another analyst in the lab or externally sourced as appropriate.

Environmental conditions within the lab (such as sample storage areas, as well as within test-specific equipment such as ovens and desiccators) shall be maintained such that the exact requirements of specific methods are met and testing capability is not impaired. Furthermore, lab management has a responsibility to review new editions of external method reference documents (such as the Standard Methods) whenever a new edition is released to ensure continued consistency with internationally approved best practice.

6.3.2.3 Calibrations

Lab equipment with the potential to impact test results are calibrated regularly. Calibrations follow a predefined schedule and SI units are used wherever possible. When performed internally, calibrations are always done in accordance with method SOPs. Reference checks are preformed after calibration with secondary standards that have a different lot number than the calibration standards. All observations and maintenance actions must be reported in the QA/QC Lab Performance logbook.

The logbook must also keep record of the instrument calibration history. Calibration records for fixed and portable laboratory measuring equipment, and individual monitoring devices, shall be maintained and include dates, personnel, and specifics of calibration standards and reference solutions, such as the lot numbers for the standards used. Instrument calibration procedures and schedules are clearly outlined in individual SOP's.

More details on calibrations and calibration records are available in DDMI Environment Lab – Measurement Traceability (ENVI-669-0117), DDMI Environment Lab – Record Control (ENVI-670-0117), and DDMI Environment Lab – Document Control (ENVI-650-0117)

6.3.2.4 Purchasing and Verifying Supplies and Services

Services and supplies that affect the quality of tests and/or calibrations shall be purchased only from suppliers that have been investigated and approved. Suppliers shall only be approved when they have been verified as complying with standard specifications or requirements defined in the methods for the tests and/or calibrations concerned. All received supplies will be compared against their accompanying purchase documents, and their reception and specifications must be recorded. Supplies must be verified prior to use according to DDMI Environment Lab – Purchasing Supplies and Services (ENVI-651-0117).

6.3.3 Internal Quality Control (QC) Measures

Laboratory quality control consists of both internal and external checks on precision and accuracy of analytical results. Employees are trained in quality control and good lab practices through the lab analyst certification process (ENVI-560-0616, ENVI-561-0616, ENVI-562-0616). An annual performance evaluation ensures that the integrity of analytical procedures remains intact.

Best practices in water quality monitoring dictate that QC samples will comprise at least 10% of all samples analyzed, and more as required to maintain assurance of quality across homogenous sampling matrices and conditions. Due to fluctuating sample volumes the DDMI Environment department often performs more than 10% internal QC in order to ensure that any errors or sources of contamination in procedures or equipment are caught immediately. No batch of samples is ever analyzed without some form of internal QC (at least a Lab Blank, below).

Internal Quality Control sample types (descriptions below) consist of: Lab Blanks (LBW), Lab Duplicates (LDUPW1/LDUPW2), Duplicate Readings (DUPRDGS), Laboratory Splits (DLS), and Internal Equipment Blanks (EBINT). Results of Internal Quality Control samples are recorded as per DDMI Environment Lab - Record Control Procedure (ENVI-653-0117), and reviewed by Environment Supervisors to detect trends.

6.3.3.1 Lab Blanks (LABBW)

A laboratory blank is a sample comprised of deionised (DI) water, prepared in the lab, which remains in the lab for analysis. This blank is exposed to any and all reagents that are used in the analytical process and is carried through the entire analytical processes including any filtration required. Lab blanks may identify unsuspected contaminates associated with DI water purity, improper cleaning procedures, filters or air contaminants in the lab. LABBWs are the most frequent form of QC at DDMI and occur every day that samples are analyzed for turbidity and conductivity. Lab blanks for Total Suspended Solids are performed biweekly (along with the Total Suspended Solids standard check), but can be required more frequently as supervisor discretion.

6.3.3.2 Lab Duplicates (LDUPW1/LDUPW2)

A laboratory duplicate consists of a single sample to be analyzed twice internally (using the same techniques) as though it is two separate samples. The entire lab procedure is repeated twice, using two separate aliquots of water poured from the same sample bottle. Lab duplicates evaluate analytical precision and sample homogeneity, as well as consistency of lab and operator procedures. LDUPW1/LDUPW2 are the most frequent form of QC at DDMI and occur every day that samples are analyzed.

*in Monitor Pro 5 (MP5), under regular sample data entry, the sample that is to be the LDUP is assigned a sample type of “LDUPW1”. Then, in the data entry section for that day’s LDUPW1/LDUPW2, the corresponding sample site is to be assigned a sample type of “LDUPW2”.

6.3.3.3 Duplicate Readings (DUPRDG)

Duplicate readings are intentionally obtained during the analysis of samples, with a single sample being read twice. The only aspect of the lab procedure to be repeated is the actual measurement, with sample preparation occurring only once on a single sample. Variability between duplicate readings can be attributed to instrumentation or operator error, rather than variation in the sample. Note that field meters are included in DUPRDGS.

6.3.3.4 Allowable Discrepancy Limits between LDUPWs and DUPRDGs

If the relative percent difference (RPD) exceeds 20% when analyte concentrations are ≥ 5 times the detection limit (DL), the environment supervisor must be informed so that the data can be flagged and sampling/analytical methods and instrumentation performance can be reviewed. Relevant DLs for DDMI laboratory analysis are:

- TSS – 1.2mg/L
- Turbidity – 0.15 NTU
- Conductivity – 0.9uS/cm

- pH has no applicable detection limit.

6.3.3.5 Laboratory Splits (DLS)

A laboratory split consists of a single sample divided into two aliquots, one to be analyzed internally, and the other to be sent to an external lab using the same techniques to analyze their aliquot so that the two results would be compared. Variability of results must be considered carefully in light of analyte hold times. RPD between duplicate samples will be assessed by environment supervisor.

6.3.3.6 Equipment Blanks, Internal (EBINT)

An aliquot of DI water is subjugated, in the DDMI Environmental Laboratory, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned before they are utilized at the field sampling location

6.3.4 Internal QC Scheduling

DDMI Environment internal QC falls under two schedules: Station-Dependent Internal QC and Station-Independent Internal QC. Station-Dependent Internal QC is tied to different sample matrices and is included in regular sampling schedules in MP5 (ex. samplers will be required to complete one DLS every four PKC sampling events, i.e., quarterly).

Station-Dependent Internal QC		**QC Frequency per sampling event**		
Sample Matrix	**Sampling Event Frequency***	**EBINT**	**DLS**	**DUPRDGS**
Ponds	Monthly	Every event	none	none
Diffuser	Monthly	Every event	none	none
PKC	Monthly	n/a	1 in 4	1 in 4
UG /clarifiers	Biweekly	n/a	none	none

NIWTP Influent/Effluent	6 days	n/a	none	none

*Note that sampling frequency refers to the frequency with which the entire set of samples is taken, and not the number of sites sampled (ex. the monthly pond sampling includes **10** sample sites but compromises **1** sampling event).

Station-Independent Internal QC is not tied to any particular sample matrix and QC sample types are scheduled as stand-alone events in MP5.

Station-Independent Internal QC	Frequency
LABBW	Daily when samples collected
LDUPW	Daily when samples collected

6.3.5 External Quality Control (QC) Measures

External QC samples comprise ~ 10% of all samples analyzed and are spaced across sampling matrices and sample events to capture as much process homogeneity as possible. With the exception of Trip Blanks (TBW, below), external quality control samples are prepared by DDMI Environment staff, who subject them to the relevant procedures. All external QC samples are then shipped off-site to a qualified external laboratory, where all analysis is conducted.

External QC sample types consist of Trip Blanks (TBW), Equipment Blanks (EBW), Field Blanks (FBW), and Duplicates (DUPW1/DUPW2). Results of External Quality Control samples are recorded as per DDMI Environment Lab – Record Control (ENVI-670-0117), and reviewed by Environment Supervisors to detect trends.

6.3.5.1 Trip Blanks (TBW)

A Trip Blank is an aliquot of laboratory grade distilled water, which is received from an external lab, in the same type of container that is required for the analytical test. The trip blank is sealed and labelled in the external lab from which it originates. Upon our receipt of the trip blanks they are to be stored, sealed, at ~ 4°C until such a time as they are to be utilized (no longer than 1

month). When utilized, trip blanks travel with the sampling cooler from the laboratory to the sampling site and back to the laboratory without being opened. The trip blank is then packaged and shipped to the originating laboratory to be analyzed. The purpose of the trip blank is to verify that no sample contamination occurred during transportation or sampling operations.

6.3.5.2 Equipment Blanks (EBW)

An aliquot of DI water is subjugated, in the Environment laboratory, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned before they are utilized at the field sampling location.

6.3.5.3 Field Blanks (FBW)

An aliquot of DI water is subjugated, in the field, to all aspects of sample collection and analysis, using the same procedures that are utilized in the field, including contact with all sampling devices and apparatus (e.g. tubing, jars, samplers, filters). The purpose of the field blank is to demonstrate that sample contamination has not occurred during field sample collection and processing.

6.3.5.4 Duplicates (DUPW1/DUPW2)

Co-located samples are independent samples collected as close as possible to the same point in space and time and are intended to assess precision of the entire program (field and laboratory components). The use of replicates for this purpose assumes that the variability between DUPW1 and DUPW2 is affected by the sampling method or technician. In most cases natural variability between samples collected in close succession will be low. When performing duplicate samples, the second sample will consist of each bottle that is regularly collected for that station, including the DDMI internal routine bottle.

*in MP5, under regular sample data entry, the sample that is to be the DUPW is assigned a sample type of “DUPW1.” Then, in the data entry section for that day’s DUPW1/DUPW2, the corresponding sample site is to be assigned a sample type of “DUPW2.”

6.3.6 External QC Scheduling

DDMI Environment external QC is entirely station-dependent, and QC types have different frequencies for each sample matrix that are programmed into MP5.

External QC	QC Frequency per sampling event	

Sample Matrix	Sampling Frequency	DUPW	FB	TB	EB	Total % External QC (all types)
Ponds	Monthly	1 in 2	1 in 6	1 in 6	1 in 3	**11.7**
Diffuser	Monthly	1 in 1	1 in 6	1 in 6	1 in 3	**11.1**
PKC	Monthly	1 in 3	1 in 12	None	n/a	**10.4**
UG /clarifiers	Biweekly	1 in 6	1 in 6	1 in 12	n/a	**10.4**
NIWTP Influent/Effluent	6 days	1 in 6	1 in 12	1 in 12	n/a	**11.1**

Again, note that sampling frequency refers to the frequency with which the entire set of samples is taken, and not the number of sites sampled (e.g., the monthly pond sampling includes **10 sample sites but compromises **1** sampling event.)

6.4 Data Management

6.4.1 External Sample Tracking – Chain of Custody

All samples collected, packaged and shipped to external laboratories are tracked via Chain of Custody (CoC) documentation. The CoC record is used to document change in possession from sampling to delivery to receipt by the external analytical laboratory. CoC procedures are clearly outlined in ENVI-900-0119 – SOP - Chain of Custody.

6.4.2 Internal Sample Tracking

All samples collected are documented in Monitor Pro 5 on the Environment iPads as per the regular sampling schedule.

6.4.3 Data Recording/Record Keeping

The lab has a procedure in place (DDMI Environment Lab – Record Control, ENVI-670-0117), to ensure accurate and appropriate record keeping and review of records.

6.4.4 Data Reporting

Immediately following laboratory analyses, all records are transferred from the applicable field sheets, to their respective electronic databases.

Laboratory supervisors will regularly review the electronic databases to ensure that laboratory recordkeeping meets the aforementioned elements. Results can then be queried and exported as required from MP5 for reporting purposes.

Reporting considerations for individual methods can be found both in individual Method Validations and summarized in method SOPs.

6.5 Control of Nonconforming Testing and/or Calibration Work

The lab has procedures in place to define responses to nonconforming test or calibration work or results (DDMI Environment Lab – Control of Nonconformances, ENVI-652-0117) Testing and/or Calibration Work). This procedure covers responsibility and authority pertaining to management of nonconforming work, evaluation of non-conformance significance, and guidelines for corrective action. Environment Supervisors are to ensure that all employees are trained in this procedure.

6.5.1 Corrective and Preventive Action

The laboratory has procedures (DDMI Environment Lab - Control of Non-Conformance, ENVI-652-0117) in place to provide guidelines for both corrective and preventive action (as per 6.4, above, and also pertaining to departures from policies and procedures in the management system or technical operations). Procedures also provide guidance on identifying and incorporating preventive action (addressing needed improvements and potential sources of management or technical nonconformities).

6.5.2 Continual Improvement

The laboratory shall continually improve the effectiveness of its QAQC system and produced data through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

6.6 Personnel

6.6.1 Competency – Certification of Analyst Proficiency

Certification of Analyst Proficiency is the process for assessing and recognizing the technical competence and the effective quality processes of the DDMI Environment Laboratory and staff.

Staff proficiency means that an individual is capable of performing specified test methods and procedures correctly, and familiar with all related policies and procedures pertaining to lab quality as referenced in the Quality Manual. Staff will be trained and tested so as to document their competence for the range of activities they will be expected to perform in the lab, in accordance with all method SOPs. A performance evaluation will be conducted annually at a minimum, to ensure that staff are fully trained and competent.

Details on staff training are available in DDMI Environment Lab – Training (ENVI-656-0117).

6.6.2 Ethics

Ethics is a set of moral principles, code for right and wrong, or behaviour which conforms to acceptable professional practices.

All employees at all times shall conduct themselves in an honest and ethical manner.

Examples of unethical behaviour include but are not limited to the following:

- Improper manipulation of data or software
- Improper handling of data errors, non-compliant data, or QC outliers
- Lack of reporting unethical behaviour of others
- Artificially fabricating results
- Misrepresenting data such as peak integration, calibration, tuning, or system suitability
- Improper clock setting to meet holding times
- Intentional deletion of non-compliant data

An employee must report any suspected unethical behaviour or fraudulent activities to the Environment Supervisor.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

RioTinto

ENVIRONMENT STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVR-517-0912**
		Revision:	**6**
Task Title:	**Caribou Management/ Observation On and Off East Island SOP**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVR-501-0112- SOP Remote Field Safety - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.2 ENVI-135-0112-Remote Field Safety Permit - Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Remote Field Safety Plans

1.3 ENVR-601-0112- SOP Helicopter - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.4 ENVI-243-0912- Caribou Scanning (Activity Budget): Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Wildlife Forms\Caribou

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	16-Sep-12	D. Grabke
1	Update template and combined all caribou SOP's into one	25-May-14	K. Moore
2	Format update	19-July-15	G. Reid
3	Updated Template including CRM Critical Risks	06-Nov-16	E. Neba
4	Template and area manager updated	20-Oct-17	S. Skinner

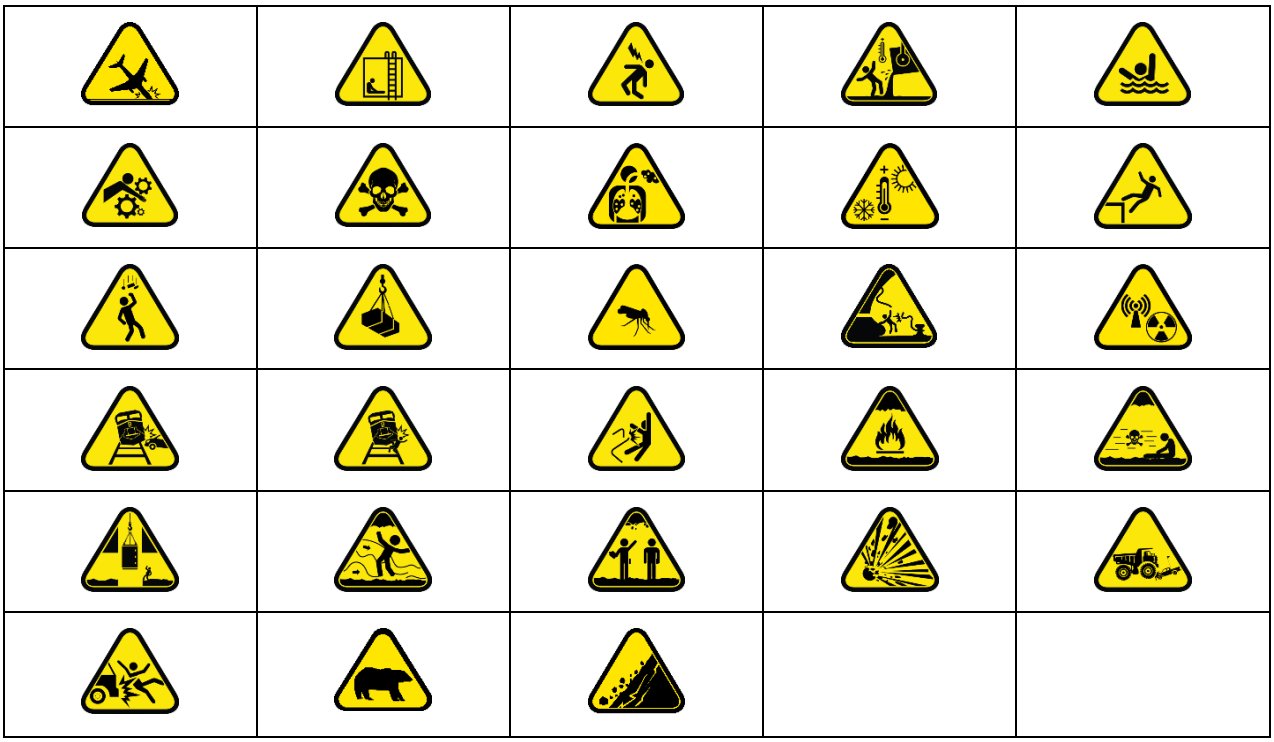
5	Superintendent update	10-Mar-18	S. Skinner
6	Annual Review Removed reference to Caribou Advisories, clarified scanning procedures	16-Jan-20	N. Goodman

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	D. Patterson

(Document owners will be prompted annually to update content; however, changes may or may not result.)

CRITICAL RISKS

Other potential critical risks not currently assessed as part of this SOP



ENVIRONMENT

STANDARD OPERATING PROCEDURE

Caribou Management/ Observation On and Off East Island SOP

Description

Collecting information on caribou presence in and around Diavik area can be conducted by completing Caribou scanning. When caribou are observed in hazardous areas around the mine site additional measures are required to safely move them away.

2 PURPOSE

The Bathurst caribou herd frequently forages in and around the East Island where Diavik is located and this species is ranked as Threatened according to the Species at Risk Committee in April 2017. Diavik has developed this SOP to ensure proper action and response occurs with the presence of caribou in and around the Diavik area. The intent of caribou management at and away from Diavik site is to collect information on caribou activity in order to determine whether a change in behavior occurs in relation to distance from mining infrastructure. In addition to monitoring caribou behavior in response to mining activities, caribou movements are monitored so that mine personnel are aware of caribou presence and to ensure the animal safety near heavy work areas. The following SOP will outline the procedure on what to do when caribou are spotted on the East Island, what steps are to be followed when herding actions are required to safely move caribou, notifying site personnel on caribou presence on east island and lastly the steps to follow when conducting caribou scanning (activity budgets) either away or at Diavik site.

3 SCOPE

3.1 Scope of Procedure

This SOP outlines the step by step procedure for managing caribou observed at the mine site and away from site.

3.2 Scope of Activities

The activities involved in this SOP outline the Environment Department's role for managing caribou in and around the Diavik Area. This SOP outlines the specific response required for the caribou observation as well as the process for notifying employees of caribou presence around East Island.

4 DEFINITIONS

Definitions							
PPE	✓	GPS	✓	DO		NTU	
MSDS		SOP	✓	DI Water		ELT	
Problem Bear		JHA	✓	AEMP		WLWB	
QA		Groundwater		COC		PAL	
QC		Seepage		WHMIS		ACTS	
Remote Work	✓	SNP		TSS		PROVE	
TSP							

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415-R0- Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Slip, Trip, Fall	✓	Chemical Contact		Rotating Parts		Uneven Terrain / Ground	✓
Sprain / Strain	✓	Fall into Water		Firearms / Deterrents	✓	Perception	✓
Working Remotely	✓	Overhead Objects		Dehydration		Risk to Wildlife	✓
Aircraft	✓	Visibility		Ergonomics		Unfamiliar Area	
Watercraft Operation		Fire		Glass		Falling	
Snowmobile Operation	✓	Line of Fire	✓	Fumes / Gases		Confined Space	
Light Vehicle	✓	Cuts Scrapes		Entanglement		Heavy Equipment	
Lifting		Pinch Points		Stored Energy		Extreme Weather	✓
Manual Labour		Noise		Burns		Electrical	
Wildlife	✓	Spills		Equipment Loss or Damage		Sample Loss or Damage	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Vehicle Collision or Roll Over	Seat belts, Segregation, Positive Communication/Defensive Driving, Follow road signs/rules
Vehicle Impact on Person	Positive communication/Defensive walking
Aircraft Transport	Safety Briefing, Seat belts, Trained, Follow Pilot Instructions
Wildlife	Scan, Truck or means of Egress

6.3 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Supplies**	**Quantity**
Light Vehicle	**1**	**Field sheets**	**8-10**
Helicopter (Caribou Location)	**1**	**IPAD/camera**	**1-2**
Radio/ Sat Phone	**2**	**Field Work Permit**	**1**
Field Kits to include: GPS, Binoculars, Personal Gear, Survival Gear, Deterrents	**1**		
Stop Watch	**1**		

6.4 Procedural Steps

Caribou observations at site are called in by site employee's, pilots or observed by Environment personnel conducting inspections in various areas around the mine site. Upon receiving the report of Caribou presence, ensure all pertinent information is collected from the caller- who is calling the report in, where is the animal spotted, what direction is the animal moving, are there people working in that general area. This information should be documented in the Wildlife Incidental Sheet on the P: Drive.

Caribou monitoring is triggered when caribou are spotted on East Island or spotted during remote field work. The caribou monitoring required at the mine site will depend on the location of the caribou. If the caribou are not in a hazardous area of the mine site then caribou scanning can occur if two or more caribou are present, this will be the same action required if a herd of caribou is present away from the mine site. The caribou herding procedures are to be applied under three specific locations and circumstances, or where Environmental site personnel identify additional hazard areas or situations during ongoing monitoring and inspections.

6.5 Herding Action

6.5.1 6.5.1 Dikes

The caribou herding procedures are to be applied when caribou move onto the dikes of mine pits, either traveling over land or by swimming to the dike, and where they are vulnerable to:

A. Injury from flying rock during blasting operations;

B. Severe behavioural response to blasting or other operational sensory stimuli;

C. Entrapment on the dike, hazardous terrain and behavioural response to sensory stimuli from construction or operational activities.

Any number of caribou present on the mining dikes will trigger caribou herding action. This threshold is established to prevent injury from flying rock and disturbance from severe adverse response to blasting or equipment operation.

- Caribou herding on dikes and confined corridors will use a combination of a small truck and/or foot patrol as most appropriate to the local situation and terrain. The direction of herding will depend on their location on the dike or confined corridor relative to the escape routes to the shoreline buffer. The shortest escape route may not always be the most appropriate route.
- Maintain the necessary radio communication with Surface Operations Supervisor on Channel 7, for timing of the herding and personnel safety. Maintain the necessary radio communication with surface operations to facilitate any modification to traffic, and construction or operational activities where required to allow caribou escape to a shoreline buffer as planned in the previous step, and to announce the "All-Clear" at the completion of caribou herding procedures.
- Herding by vehicle and on foot will entail approaching caribou at a slow speed (i.e., < 5 km/hr for vehicles) and stopping when caribou show an alarmed response. When caribou stall, the patrol will slowly move forward to initiate a further alarmed response. Observation of caribou behaviour will provide cues on when to proceed. Herding should never stimulate a Very Alarmed-Panic Escape Response.

6.5.2 Constricted Corridors

The caribou herding procedures are to be applied when caribou are trapped in hazardous and constricted spaces such as corridors within the mine footprint where they are vulnerable to collisions with vehicles and severe behavioural response to sensory stimuli associated with vehicles and employee activities.

The criteria to trigger herding of caribou in confined corridor or other hazardous sites are dependent on a combination of factors. Good judgment is required to avoid disturbance and caribou injury, but the following should be considered: number of caribou present, distance of caribou from roads or other stimuli, the nature of the confining feature, the effectiveness of traffic control, duration of entrapment, and behavioral response by caribou in the confined space.

The steps for undertaking herding procedures in constricted corridors are the same as outlined in the section on Dikes, above.

6.5.3 Airstrip

The caribou herding procedures are to be applied when caribou are on or near the airstrip or at the water crossing west of the airstrip during aircraft landing or take-off where they are vulnerable to collisions with aircraft or severe behavioural response to sensory stimuli associated with aircraft during landing or take-off.

Any number of caribou present on the airstrip or are located within 100 m of the airstrip will trigger caribou herding action. This threshold is established to prevent any potential for caribou-aircraft collisions.

- A small truck will be used for patrol, and, if necessary, to move caribou off the airstrip. Vehicle patrols should proceed from east to west to encourage caribou to move to escape routes leading to the west island and to avoid herding the caribou to active construction and mining operations. Maintain communication with air traffic control. Vehicles can travel at normal site speed limits unless caribou are visible.
- When caribou are present on the airstrip, the vehicle will approach caribou at a slow speed (i.e., < 5 km/hr) and stop when caribou show an alarmed response. During airstrip patrols, the herder should wait no longer than 3 minutes for caribou to begin moving off the airstrip, before continuing the herding procedure. If the caribou stall, the patrol may slowly move forward to initiate an alarmed response. If caribou travel along the airstrip ahead of the patrol, the vehicle may proceed to move caribou from the airstrip surface.
- In the event that a herd of caribou remains within 100 m of the airstrip and exhibits behavior for returning or crossing the airstrip, the patrol may need to park at a push-out of the airstrip from where the patrol may proceed to continue the herding on foot. Environment personnel will be in contact with Diavik air traffic control if a delay in takeoff or landing must occur to ensure the animals are a safe distance from the runway.

6.5.4 Other Hazards or Entrapment Sites

The caribou herding procedures are to be applied when caribou are trapped in hazardous and constricted spaces and situations that are identified by Environmental site personnel during ongoing monitoring and inspections. These spaces and situations may include:

- Caribou trapped within the area of infrastructure and above-ground pipelines;
- Prolonged caribou entrapment in the area near the shallow bays;
- Caribou presence or entrapment on the islands adjacent to the mine pits during the brief period of thin ice hazard in October / early November.

6.6 Determining Caribou Hazards

- When caribou are present on the east island, Environment site personnel or other designated personnel (i.e. contractors or site services) are responsible for conducting the following searches and communications:
- Maintain radio contact with airport terminal operator and security personnel to receive reports of caribou on or near the runway and take management action if required. All Environment staff accessing the runway will need permission from Diavik Air traffic control in addition to completing the training to access this specific area.
- Maintain radio communication with security personnel, truck drivers, contractors, helicopter pilots and other site operators to receive reports of caribou on the dikes and confined road corridors. Verify reports of caribou to determine numbers and appropriate management action.
- Maintain communication and radio contact as necessary with area owners and/or air traffic controller as necessary to implement adjustments to vehicle traffic, construction and operations activities and/or aircraft traffic to expedite the herding of caribou from hazard sites.

6.7 Caribou Scanning

6.7.1 Scan Sampling of Caribou Groups

Scan sampling of caribou groups or individuals will be used to monitor caribou behaviour as a function of distance from the mine. Note: Include the direction and distance from Diavik on the field sheet in the space provided for location.

The method to be used is adapted from Curatolo and Murphy (1983). Individual caribou activities will be recorded as feeding, bedded, standing, alert, walking, trotting, or running. Individuals will be classified as feeding when they are actually foraging or searching for food (i.e., walking with head down).

GPS location will be recorded, and observations will be conducted when caribou are observed on-site or during remote field work, provided that scans can be completed in a safe manner. Group composition will be classified (see descriptor codes below), and the number of animals in the group will be recorded. Thus, response variable is caribou behaviour, while the potential stressors include distance from mine, season, and group composition. Habitat type and level of insect harassment will also be recorded.

The group will be scanned every 8 minutes for a minimum of 4 observations and a maximum of 8. For each scan, the number of animals exhibiting each type of behaviour will be recorded.

6.7.2 Response to Specific Stressors

For all caribou groups, instantaneous observations will be used to assess the response of caribou to different potential stressors as a function of distance. These observations will occur during scan sampling. In the event that a stressor is introduced during scan sampling, the observers will note the time (in the comments box) and record the response of caribou to stressors as "no reaction" or "exhibiting a reaction" (i.e., alert posture, walking or running away from disturbance; see data sheet). The reaction of the majority of the group will be used in selecting the category. Estimated distance (m) from the stressor will also be recorded. Stressors include type of aircraft, type of vehicle, and blasts from pits.

The observers will then wait until the animals resume previous behaviour, and begin scanning observations again.

Level of insect harassment will be recorded if possible for mosquitoes/black flies and for bot/warble flies. Bot and warble flies will be recorded simply as being present or absent during the observation period, based on observed reaction of caribou (sudden bolting, aberrant running, or rigid standing).

6.8 Analysis and Reporting

Data sheets will be transferred to the wildlife database. Data sheets and the database will also be checked for omissions and/or errors by Environment Supervisor to ensure accurate data entry. All data collected during caribou scanning will be used in the Annual Wildlife report that is released on March 31st of every year.

6.9 Description Codes

Habitat Codes	
BE	Bedrock (>80%)
BO	Boulders (>80%)
EC	Esker Complex
HT	Heath Tundra
RB	Riparian Birch
RS	Riparian Shrub
SW	Sedge Wetland
SF	Spruce Forest
SF/BE	Spruce Forest/Bed Rock
SW/HT	Wetland/Heath Tundra
HT/BE	Heath Tundra/Bedrock
HT/BO	Heath Tundra/Boulders
LA	Lake
IC	Ice

Composition Codes	
F	females
M	males
C	calf
Y	yearling
F/C	females and calves
F/M	females and males
F/M/C	females, males, calves

Activity Codes	
A	Alert
B	Bedded
F	Feeding
R	Running
S	Standing
T	Trotting
W	Walking

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

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Environment STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVI-912-0119**
		Revision:	**9**
Task Title:	**Wolverine Snow Track Survey**		
	Supersedes ENV SOP 521		
FOR DOCUMENT CONTROL USE ONLY:			
Next Review:	**1 year from Area Manager Authorized Signature Date below**		
Effective Date:	**See Area Manager Authorized Signature Date below**		

1 REFERENCES/RELATED DOCUMENTS

1.1 **ENVI-919-0119 - SOP Snowmobiles -** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.2 **ENVI-907-0119 – SOP Remote Field Safety -** Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.3 **ENVI-601-0916 – Snowmobile Pre-Op Inspection -** Located in: **-** P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Check Sheets

1.4 **ENVI-135-0112 - Remote Field Safety Permit Form -** Located in: **-** P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Remote Field Safety Plans

1.5 **WL500353 – Wildlife Monitoring Permit** Located in: **-** P:\DDMI Environment\2.0 Legal and Other Requirements\2.7 ENR (GNWT)\Wildlife Permits

1.6 **ENVI-362-0214 – Wolverine Snow Track Field Sheet –** Located in: P:\DDMI Environment\10.0 Operational Control\10.2 Forms\Current Forms\Approved\Wildlife Forms\Wolverine

Environment

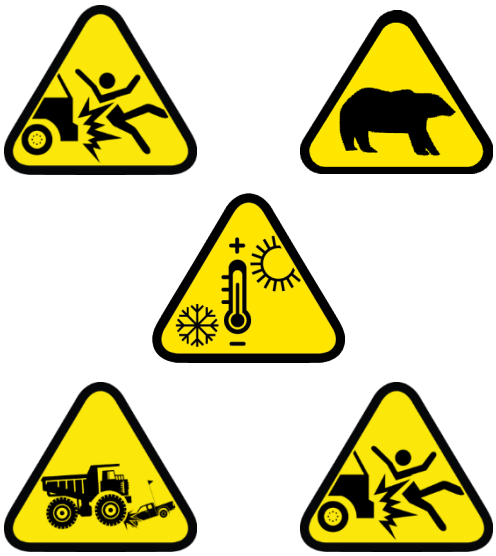
STANDARD OPERATING PROCEDURE

Wolverine Snow Track Survey

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	07-Sep-12	D. Meredith
1	Annual Update	20-Mar-13	K. Moore
2	Annual Update, Added Snowmobile check list, Wildlife Permit, Picture, Definitions, Task Hazard & Supplies, Tools and Equipment Tables	20-Feb-14	D. Dul
3	Reference Documents, 6.3 & 6.4	20-Nov-14	D. Dul
4	WL Permit Number, Reference numbers for Responsibilities and Hazards, Title	16-Jan-16	D. Dul
5	Updated Template including CRM	05-Nov-16	E. Neba
6	Annual Update	21-Mar-17	S. Skinner
7	Update to template and area manager	21-Oct-17	A. Hehn
8	Superintendent update	10-Mar-18	S. Skinner
9	Annual update	18-Jan-20	M. Nelson A. Hehn

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	D. Patterson

CRITICAL RISKS



Other potential critical risks not currently assessed as part of this SOP

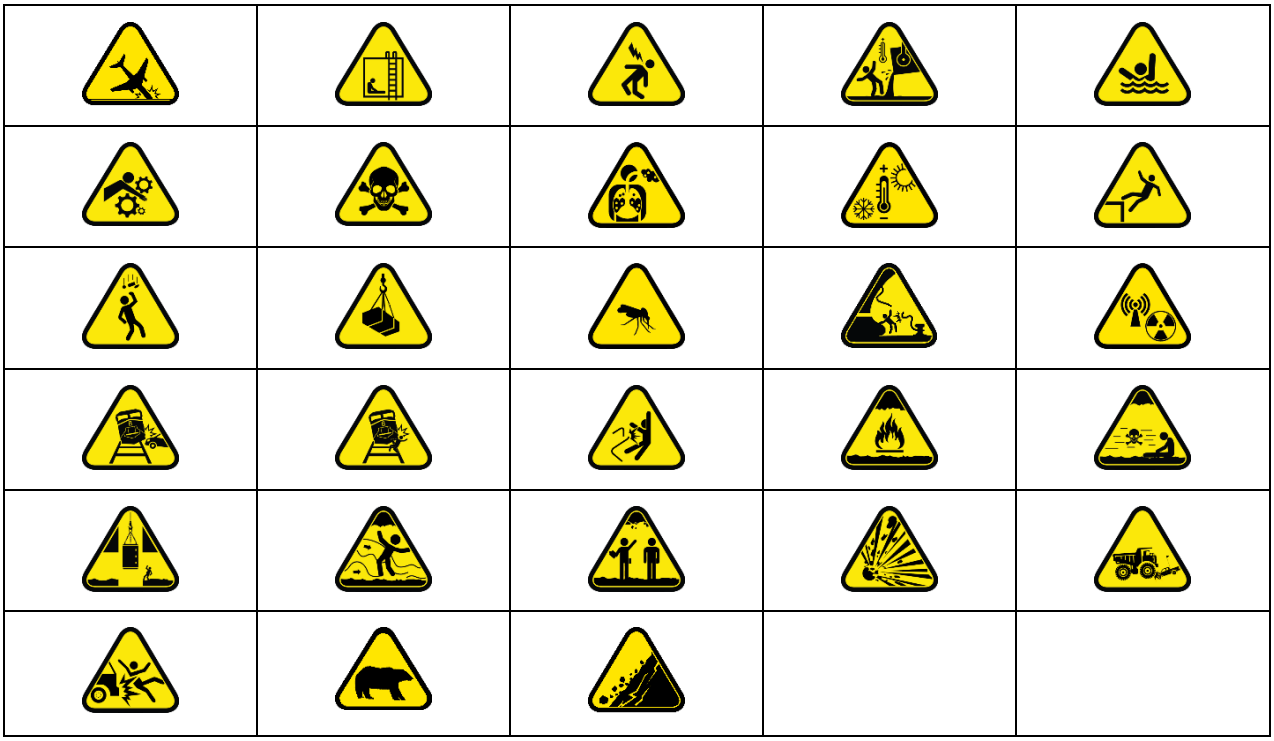


Figure 1. DDMI Wolverine Track Survey (2004-Mar-16)

Description

This Standard Operating Procedure (SOP) provides guidelines on procedures to follow when carrying out the wolverine snow track surveys.

2 PURPOSE

The main objective for this program is to determine if mining activities are influencing the presence of wolverine in the wildlife study area. The Wolverine Snow Track survey will provide insight if wolverine activity is higher closer to the mine versus further away. Monitoring for these surveys generally takes place once per year with assistance from a community member/assistant.

3 SCOPE

3.1 Scope of Procedure

The Standard Operating Procedure (SOP) describes the responsibilities and processes for surveying the various wolverine track locations within the DDMI study area. This procedure applies to all Diavik Diamond Mine personnel and contractors.

3.2 Scope of Activities

This procedure has been developed to conduct wolverine surveys along 40 transects distributed among key habitats and landscape features throughout the DDMI study area, and at varying distances from the mine.

4 DEFINITIONS

Definitions							
ACTS	✓	Groundwater		PROVE		SOP	✓
AEMP		JHA		QA		TSS	
COC		NTU		QC		TSP	
DI water		PAL		Remote work	✓	WHMIS	
DO		PFD		SDS		WLWB	
ELT		PPE		Seepage			
GPS		Problem bear		SNP			

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Aircraft		Extreme Weather	✓	Line of Fire		Snowmobile Operation	✓
Burns		Fall into Water		Manual Labour		Spills	
Chemical Contact		Falling		Noise		Sprain / Strain	✓
Confined Space		Fire		Overhead Objects		Stored Energy	
Cuts Scrapes	✓	Firearms / Deterrents		Perception	✓	Uneven Terrain / Ground	✓
Dehydration		Fumes / Gases		Pinch Points		Unfamiliar Area	✓
Electrical		Glass		Risk to Wildlife	✓	Visibility	✓
Entanglement		Heavy Equipment		Rotating Parts		Watercraft Operation	
Equipment Loss or Damage	✓	Lifting		Sample Loss or Damage		Wildlife	✓
Ergonomics	✓	Light Vehicle	✓	Slip, Trip, Fall	✓	Working Remotely	✓

See: ENVI-445-0415 - Environment Hazards Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Vehicle Collision or Rollover (between snow mobiles)	Positive communication, Defensive driving, Helmet
Vehicle Impact on Person	Positive communication, Defensive walking
Wildlife	Scan, Truck, Deterrents
Temperature extremes (cold)	Layers, Buddy check, Remote field safety permit

6.3 Tools Required

Supplies, Tools and Equipment

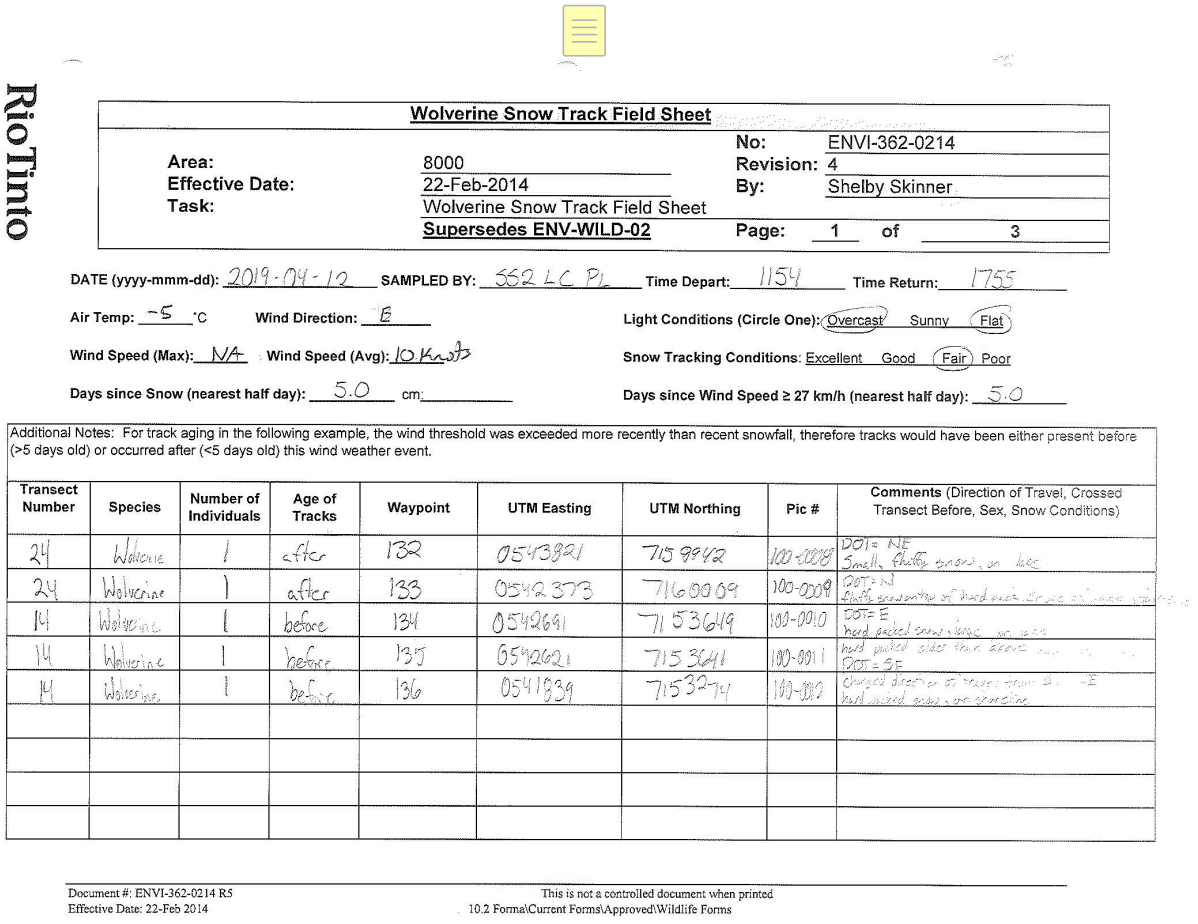
Tool / Equipment	Quantity	Supplies	Quantity
Snowmobile	per person	Winter Survival Gear (Set)	1
GPS/ Loaded Coordinates	per person	Spare Batteries	4
Satellite Phone	1	Personal Gear (per person)	1
Spot or Spot Tracker (per snowmobile)	1	Remote field safety permit	1
Camera	1	Map	2
Binoculars	1	Field Sheets	20
Radio with spare battery (per person)	1	Pencils and Pens	2

6.4 Procedural Steps

- Surveys are conducted once a year in the early spring by snowmobile. The surveys will be conducted twice per traverse - typically once in late March and once in mid April. Surveys are best conducted 2-6 days after a snowfall.
- Personnel will follow each transect from start to finish, using the GPS waypoints provided for each transect. **Drive the snowmobile slowly (between 10 km/h and 15 km/h) to ensure that all wolverine tracks are recorded.** The observer pair drives a distance of approximately 25 m apart with the transect line between them. This reduces the chance of missing any tracks.
- If weather conditions are deemed unsuitable for tracking (high winds or heavy snowfall) the survey should be postponed until conditions are favourable. The threshold for wind speeds capable of moving fallen snow is 27 km/h. If a survey needs to be postponed, personnel must wait at least 12 hours after unsuitable weather stops before resuming surveys. The effects of snow and wind will be estimated by determining the number of ½ days since the most recent snow or wind event.
- Each day of survey should include transects from a variety of distances from site. Ensure you include near and far field sites each day, if conditions allow.
- For each wolverine transect observation, record:
  - Date survey completed, who the transect was sampled by, and departure and return times for the day
  - Weather (temperature, wind direction, maximum and average wind speed, days since snow, light conditions, days since last threshold wind and snow tracking conditions)

    Excellent snow is characterized as being light/fluffy/easy to leave tracks and poor snow as being packed/hard to leave tracks
  - Transect Number
  - Number of wolverines: tracks within 200 m of each other are assumed to be a single individual unless tracks can be reliably distinguished as two separate individuals
  - Age of signs: did signs occur before or after the most recent snowfall or wind threshold event?
  - Waypoint
  - UTM coordinates
  - Photo of the sign/s with a reference object (i.e. GPS, pen, glove, etc.)

- Other important comments such as:
  - Sex (male or female)
  - Observation type (tracks, scat, hair, etc.)
  - Has individual crossed transect before?
  - Direction of travel
  - Wolverine dens on or off transect, waypoint of den, whether the den is active or inactive and photographs
  - Other wildlife sightings or signs: note in comments only, waypoint not required
- If no wolverine tracks are observed on a given transect, record this on the field sheet.
- A local community member generally comes to site for one (1) week to help out with this survey. This participation is extremely valuable and should be maintained. If tracks are seen discuss and document comments from the community member.



RioTinto

Wolverine Snow Track Field Sheet

Area:	8000	No:	ENVI-362-0214
Effective Date:	22-Feb-2014	Revision:	4
Task:	Wolverine Snow Track Field Sheet	By:	Shelby Skinner
	Supersedes ENV-WILD-02	Page:	1 of 3

DATE (yyyy-mmm-dd): 2019-MA-12 SAMPLED BY: SS2 LC PL Time Depart: 1154 Time Return: 1755

Air Temp: -5 °C Wind Direction: E Light Conditions (Circle One): Overcast Sunny Flat

Wind Speed (Max): NA Wind Speed (Avg): 10 Knots Snow Tracking Conditions: Excellent Good Fair Poor

Days since Snow (nearest half day): 5.0 cm: Days since Wind Speed ≥ 27 km/h (nearest half day): 5.0

Additional Notes: For track aging in the following example, the wind threshold was exceeded more recently than recent snowfall, therefore tracks would have been either present before (>5 days old) or occurred after (<5 days old) this wind weather event.

Transect Number	Species	Number of Individuals	Age of Tracks	Waypoint	UTM Easting	UTM Northing	Pic #	Comments (Direction of Travel, Crossed Transect Before, Sex, Snow Conditions)
24	Wolverine	1	after	132	0543821	7159942	100-0008	DOT= NE Small, fluffy snow on top
24	Wolverine	1	after	133	0542373	7160009	100-0009	DOT= N Fluffy accumulation of hard packed snow on top
14	Wolverine	1	before	134	0542691	7153649	100-0010	DOT= E hard packed snow/ice
14	Wolverine	1	before	135	0542621	7153641	100-0011	hard packed older snow above DOT= SE
14	Wolverine	1	before	136	0541939	7153274	100-0012	changed direction of travel from SE to E hard packed snow/ice

Document #: ENVI-362-0214 R5 This is not a controlled document when printed
Effective Date: 22-Feb 2014 10.2 Forms\Current Forms\Approved\Wildlife Forms

Figure 2. Example: Wolverine Snow Track Field Sheet

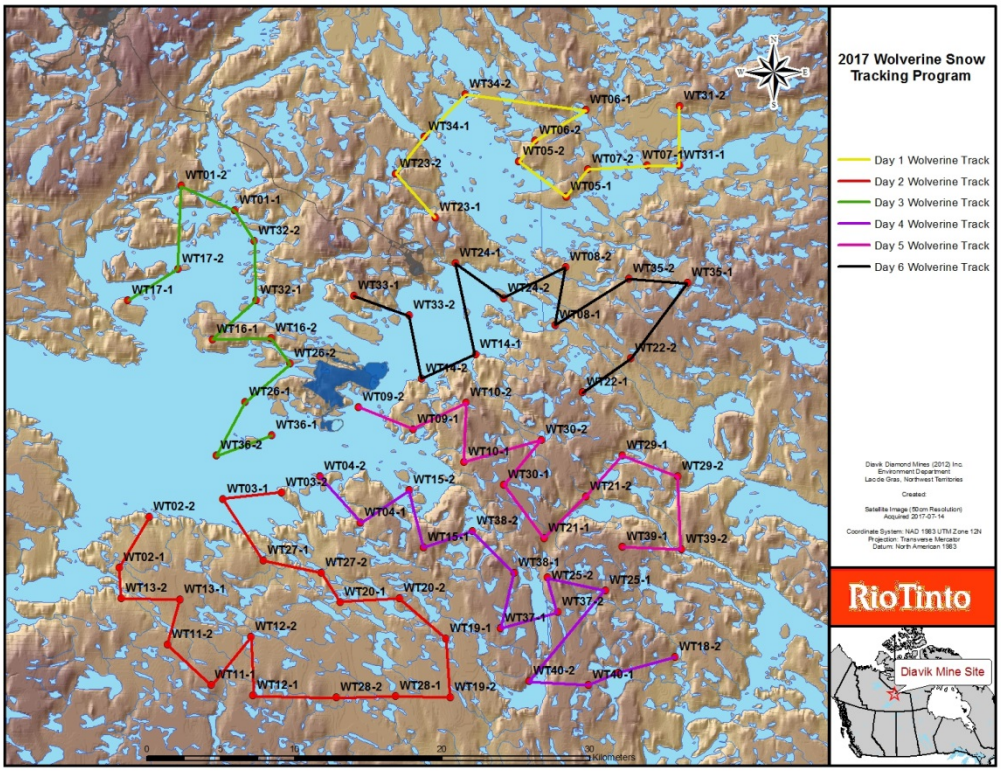


Figure 3. Wolverine Snow Track Routes

Table 1. Waypoint (UTM) for Wolverine Snow Track Survey

Snow Tracking Waypoints					
WT01-1	527154	7163751	WT21-1	548095	7141561
WT01-2	523512	7165406	WT21-2	550923	7144389
WT02-1	519342	7139565	WT22-1	550687	7151420
WT02-2	521368	7143014	WT22-2	553948	7153738
WT03-1	526328	7144222	WT23-1	540709	7163249

WT03-2	530303	7144664	WT23-2	538041	7166229
WT04-1	535664	7142603	WT24-1	542106	7160157
WT04-2	532915	7145764	WT24-2	545336	7157797
WT05-1	549587	7164671	WT25-1	552216	7138023
WT05-2	546387	7167072	WT25-2	548311	7138891
WT06-1	550907	7170519	WT26-1	527842	7150759
WT06-2	547487	7168446	WT26-2	530871	7153372
WT07-1	555053	7166771	WT27-1	529069	7140045
WT07-2	551061	7166521	WT27-2	532979	7139200
WT08-1	548820	7155990	WT28-1	538013	7130889
WT08-2	549549	7159924	WT28-2	534015	7130780
WT09-1	539233	7148932	WT29-1	553364	7147169
WT09-2	535527	7150438	WT29-2	557110	7145764
WT10-1	542646	7146716	WT30-1	545338	7145166
WT10-2	542813	7150713	WT30-2	547899	7148239
WT11-1	525536	7131632	WT31-1	557247	7166783
WT11-2	522605	7134354	WT31-2	557247	7170783
WT12-1	528374	7130906	WT32-1	528595	7157671
WT12-2	528241	7134904	WT32-2	528477	7161669
WT13-1	523442	7137411	WT33-1	535199	7157975
WT13-2	519443	7137516	WT33-2	538964	7156624
WT14-1	543434	7154009	WT34-1	539971	7168745
WT14-2	539789	7152362	WT34-2	542765	7171607

WT15-1	539934	7140921	WT35-1	557801	7158832
WT15-2	538964	7144802	WT35-2	553810	7159099
WT16-1	525618	7154997	WT36-1	529663	7148505
WT16-2	529616	7155111	WT36-2	525904	7147138
WT17-1	519913	7157646	WT37-1	545145	7135483
WT17-2	523292	7159785	WT37-2	548999	7136553
WT18-1	553120	7132451	WT38-1	546054	7139224
WT18-2	556972	7133530	WT38-2	543225	7142052
WT19-1	541434	7134770	WT39-1	553388	7140989
WT19-2	541713	7130780	WT39-2	557384	7140815
WT20-1	534286	7137244	WT40-1	551067	7131638
WT20-2	538276	7137516	WT40-2	547074	7131880

6.5 Analysis and Reporting

Upon return from the field, check the data sheets for completeness and accuracy and enter the data into the Excel workbook in P:\DDMI Environment\15.0 Data & Records Management\15. Wildlife Database\Wolverine Track Survey.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 Safely complete the tasks outlined in this SOP, without incident.

7.2 No or minimal safety or environmental incidents during program.

7.3 No or minimal error in conducting survey.

7.4 Thorough documentation of field data.

RioTinto

ENVIRONMENT STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVI-913-0119**
		Revision:	**9**
Task Title:	**Waste Inspection**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVI-444-0415 R4 – Environment Roles and Responsibilities- Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs\Current

1.2 ENVI-445-0415 R3 – Environment Hazard Definitions – Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs\Current

1.3 ENVI-443-0415 R3 – Environment Term Definitions – Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs\Current

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	03-Mar-00	
1	Updated	Mar-05	R.Eskelson/S. Oystryk
2	Updated - related documents, review date	Oct-06	C. English
3	Biennial update, frequency amended	Jan-09	C. English
4	Updated - Format, Description, Pictures, 2, 3.1, 3.2, 6.2, 6.3	16-Oct-14	K. Gray
5	Format Update	08-Dec-15	G. Reid

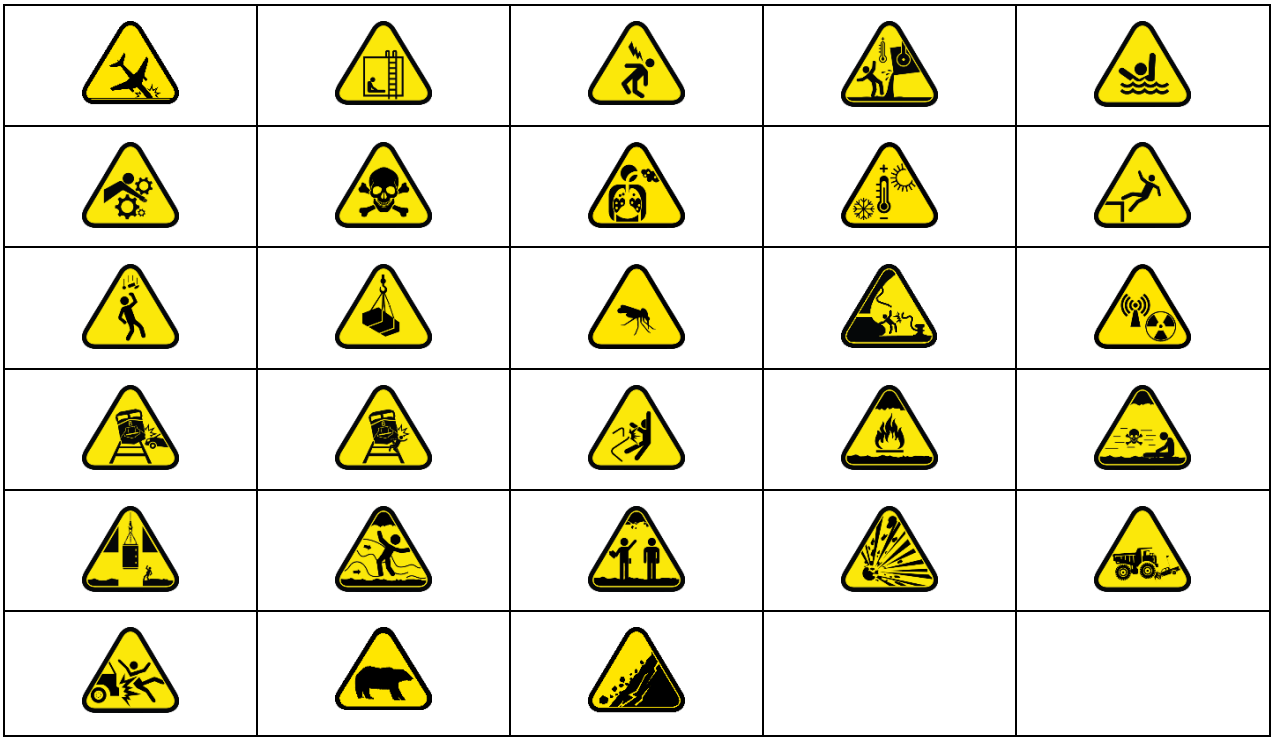
6	Updated Template including CRM Critical risk	05-Nov-16	E. Neba
7	Update to template and area manager	21-Oct-17	A. Hehn
8	Superintendent update	11-Mar-18	S. Skinner
9	Annual update	30-Mar-19	M. Nelson

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	D. Patterson

(Document owners will be prompted annually to update content; however, changes may or may not result.)

CRITICAL RISKS

Other potential critical risks not currently assessed as part of this SOP



Landfill

Waste Transfer Area burn pit

Waste Transfer Area waste storage

Figure 1. Landfill (top) and Waste Transfer Area Burn Pit/Waste Storage (bottom)

Description

This SOP covers the undertakings involved with weekly/semi-weekly monitoring visits to Diaviks Landfill and Waste Transfer Area to ensure that the collection, storage and disposal of all wastes are being done in a safe, efficient, and environmentally compliant manner. This is to avoid environmental contamination and wildlife occurrences /interactions, as some waste can be an attractant if not disposed of correctly.

2 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide direction for monitoring the Waste Transfer Area (WTA) and the Landfill to ensure proper waste disposal, as well, for both attractants to wildlife and wildlife that may visit these sites. Wildlife can potentially be very dangerous by becoming habituated to human activity. This situation can pose a threat to the safety of both the personnel on site and to the animal itself.

3 SCOPE

3.1 Scope of Procedure

This procedure applies to all Diavik Diamond Mines personnel and contractor personnel.

3.2 Scope of Activities

This procedure describes the monitoring procedure of the waste piles/burn pit and storage areas for improperly disposed/stored waste and looking for presence or signs of wildlife.

4 DEFINITIONS

Definitions							
ACTS		**Groundwater**		**PROVE**		**SOP**	✓
AEMP		**JHA**		**QA**		**TSS**	
COC		**NTU**		**QC**		**TSP**	
DI water		**PAL**		**Remote work**		**WHMIS**	
DO		**PFD**		**SDS**		**WLWB**	
ELT		**PPE**		**Seepage**			
GPS		**Problem bear**		**SNP**			

See: ENVI-443-0415- Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415 - Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

Task Hazards							
Aircraft		Extreme Weather		Line of Fire		Snowmobile Operation	
Burns		Fall into Water		Manual Labour		Spills	
Chemical Contact		Falling		Noise		Sprain / Strain	✓
Confined Space		Fire		Overhead Objects		Stored Energy	
Cuts Scrapes	✓	Firearms / Deterrents		Perception		Uneven Terrain / Ground	✓
Dehydration		Fumes / Gases		Pinch Points		Unfamiliar Area	✓
Electrical		Glass		Risk to Wildlife		Visibility	✓
Entanglement		Heavy Equipment	✓	Rotating Parts		Watercraft Operation	
Equipment Loss or Damage		Lifting		Sample Loss or Damage		Wildlife	✓
Ergonomics		Light Vehicle	✓	Slip, Trip, Fall	✓	Working Remotely	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Vehicle collision or Rollover	Seatbelts, segregation, Positive communication/Defensive driving, follow road signs/rules
Vehicle Impact on Person	Positive communication/defensive walking
Wildlife	Scan, Truck

6.3 Tools Required

Supplies, Tools and Equipment

Tool / Equipment	Quantity	Supplies	Quantity
iPad	**1**		

6.4 Procedural Steps

Monitoring will be happen every three days in summer and twice per week in winter.

Prior to leaving the office, download the “Waste Inspection” monitoring schedule from the MP-Field program on the iPad. Press: **Download Current Visits.**

Find and press the Waste Inspection visit for that day, the visit will automatically download onto the day’s schedule (make sure to manually change date if inspection was completed on a different day, record reasoning in comments)

6.4.1 Landfill Inspection

Upon arrival, note time visited on iPad and use drop down menu to highlight Sample Taken.

***Note: If the inspection was not completed, select Sample Not Taken and leave reasoning in the sample comments.

Scan area for wildlife.

Identify new waste piles since last visit, inspect those first.

Inspect waste piles for any attractants such as food/food product/oil contaminated items/paints/gloves, as well for things such as batteries, bulbs containing mercury, chemicals, and aerosol cans that can be hazardous to the environment (Figure 2). Everything in the landfill should be inert and pose no risk to the safety of the environment, people, or wildlife.

Figure 2. These items do not belong in the Landfill

Look for signs of wildlife i.e. scat/tracks/chewed garbage.

Record all findings on the iPad, example shown below (Figure 3).

Report any concern of improperly stored material to the Environment Supervisor. Provide pictures and coordinates if possible.

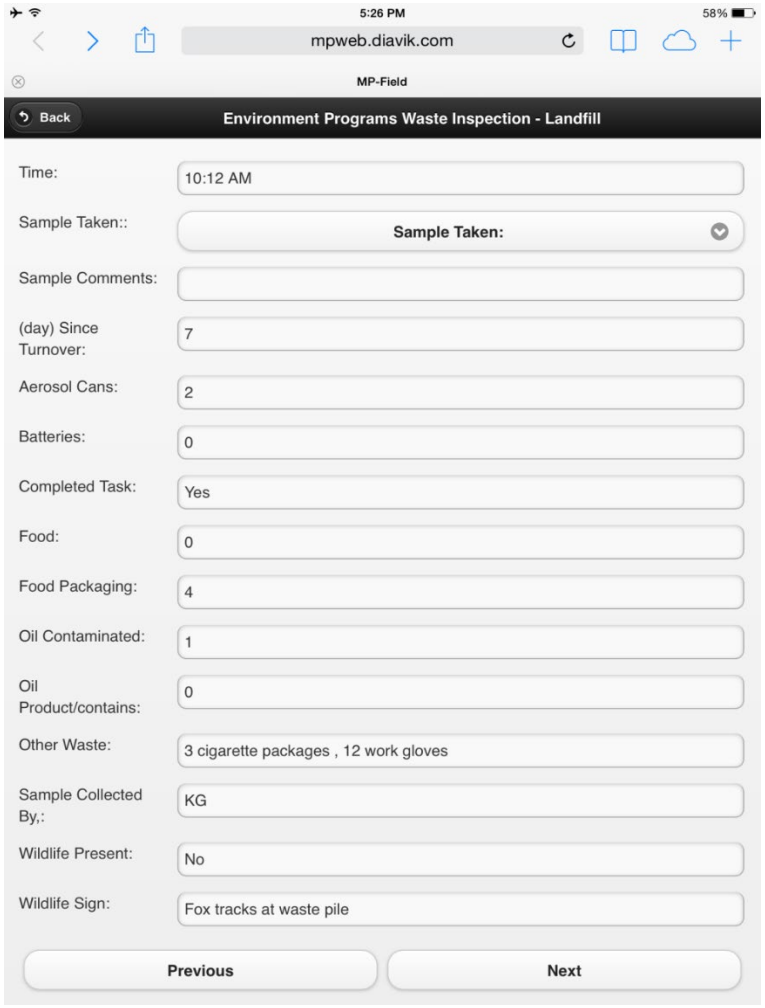


Figure 3. Screenshot of Landfill inspection in MP Field

6.4.2 Waste Transfer Area

Announce when entering/leaving Waste Transfer Area CH.5, the gate should remain closed all times to reduce the chance of wildlife entering the area. Contact the operator if gate is open.

Note time visited on iPad and use drop down menu to highlight **Sample Taken.**

***Note: If the inspection was not completed, select Sample Not Taken and leave reasoning in the sample comments.

Inspect waste storage containers and drums alongside fence for anything out of place/leaking/broken. Placards on fence clearly mark what is to be stored in each section.

Visually inspect fence for any potential entry points for wildlife.

Inspect burn pit area. If burn pit is active with a fire do not enter. The burn pit should only contain burnable waste such as wood, paper, paper products, and cardboard.

Look for signs of wildlife i.e. scat/tracks/chewed garbage.

Record all finding on iPad.

Report any concern of improperly stored material, wildlife and entry points to the environment supervisor. Provide pictures if possible.

6.4.3 A21 and Underground Waste Bins

Note time visited on iPad and use drop down menu to highlight **Sample Taken.**

***Note: If the inspection was not completed, select Sample Not Taken and leave reasoning in the sample comments.

Check burn bin and note any materials present that are not burnable

Check non-burn bin and note any materials present that should not be reporting to the Landfill such as food and drink containers, PPE, and chemicals.

6.4.4 Uploading Completed Inspections

**Remember to check that date is correct before uploading. Once inspections are complete the Waste Inspection visit will read 100% and is now ready to upload to MP5 from the iPad. Connect to ddmiipad and press upload visit. The visit will disappear when upload is complete.

7 QUALITY OUTCOMES AND EXPECTATIONS

7.1 To safely complete the tasks outlined in this SOP, without incident.

7.2 Producing quality, accurate and repeatable results.

RioTinto

ENVIRONMENT STANDARD OPERATING PROCEDURE			
Area No.:	**8000**	**Document #:**	**ENVI-914-0119**
		Revision:	**9**
Task Title:	**Wildlife Monitoring (Carnivores)**		
Next Review:	**1 Year from Final Approval in Documentum**		
Effective Date:	**Date on approved stamp in footer.**		

1 REFERENCES/RELATED DOCUMENTS

1.1 ENVI-916-0119 - SOP Helicopter - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.2 ENVI-919-0119 – SOP Snowmobiles - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.3 ENVI-907-0119 – SOP Remote Field Safety - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.4 ENVI- - SOP Firearms - Located in: P:\DDMI Environment\10.0 Operational Control\10.1 SOPs\Working SOPs

1.5 Wildlife Report Template - Located in: iAuditor on iPad1 and iPad2

1.6 Wildlife Awareness Presentation - Located in: Diavik Intranet – HSEQ – Operational Control - Environment

Revision History			
Revision	**Revision Description**	**Date of Revision**	**Author**
0	Original Issue	01-Aug-12	D. Grabke
1	Annual Review and Update	20-Aug-13	K. Moore
2	Template Update and Annual Review	17-May-14	K. Moore

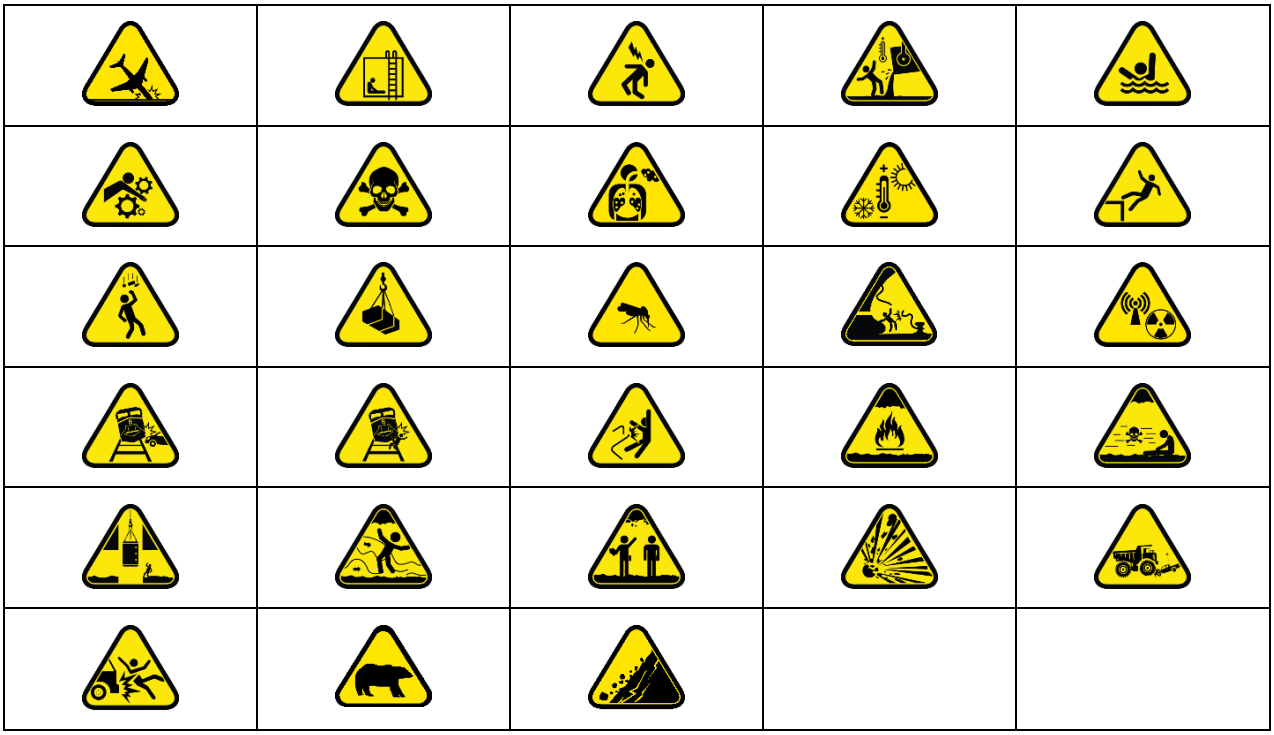
3	Format update	20-July-15	G. Reid
4	Format update	06-Dec-15	G. Reid
5	Updated template including CRM Critical risk	05-Nov-16	E. Neba
6	Security check-in at night	24-Sep-17	S. Sinclair
7	Update to template and area manager	21-Oct-17	A. Hehn
8	Superintendent update	11-Mar-18	S. Skinner
9	Annual update	2-Feb-19	M Nelson

Authorized Electronically in Documentum By:	
Area Superintendent:	S. Sinclair
Area Manager:	J. Kozian

(Document owners will be prompted annually to update content, however, changes may or may not result.)

CRITICAL RISKS

Other potential critical risks not currently assessed as part of this SOP



ENVIRONMENT

STANDARD OPERATING PROCEDURE

Wildlife Monitoring (Carnivores)

Description

This SOP has been developed to provide guidance when responding to bear/wildlife calls at the Diavik site.

2 PURPOSE

This Standard Operating Procedure (SOP) provides a guideline to follow when responding to wildlife (bears, wolves, wolverines, and foxes) at the Diavik (DDMI) site. This procedure applies to all DDMI personnel, contractors, and visitors' at the mine site. However, wildlife control is managed by trained Environment personnel. Grizzly bears and other carnivores are frequently sighted at the mine site; therefore, worker safety is a priority. There will be situations when management actions will be required to deter problem wildlife away from the mine site.

3 SCOPE

3.1 Scope of Procedure

This SOP outlines the step-by-step procedure for managing bear and other carnivores observed at the mine site.

3.2 Scope of Activities

The activities involved in this SOP outlines the Environment Department's role for deterring bears/ wildlife away from the mine site along with initiating site wide Wildlife Alerts to notify site employees of the animal presence. This SOP also outlines the responsibilities and accountabilities of updating crews on wildlife locations. Activities covered by the SOP include monitoring, deterrence, relocation, and destruction.

4 DEFINITIONS

Definitions							
ACTS	✓	**Groundwater**		**PROVE**	✓	**SOP**	✓
AEMP		**JHA**		**QA**		**TSS**	
COC		**NTU**		**QC**		**TSP**	
DI water		**PAL**		**Remote work**		**WHMIS**	

DO		**PFD**		**SDS**		**WLWB**	
ELT		**PPE**	✓	**Seepage**			
GPS	✓	**Problem bear**	✓	**SNP**			

See: ENVI-443-0415 - Environment Term Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

5 RESPONSIBILITIES

See: ENVI-444-0415-R0- Environment Roles and Responsibilities - Located in: Diavik Intranet – SOPs – Environment Folder

6 PROCEDURE

6.1 Key HSEQ Aspects

This SOP references the use of helicopters and snowmobiles as potential deterrents or options for remote relocation. These critical risks and hazards are not routine for this task and the appropriate SOPs should be consulted to address hazards and risks associated with those modes of transportation.

Task Hazards							
Aircraft		**Extreme Weather**		**Line of Fire**	✓	**Snowmobile Operation**	
Burns		**Fall into Water**		**Manual Labour**		**Spills**	
Chemical Contact		**Falling**		**Noise**	✓	**Sprain / Strain**	
Confined Space		**Fire**		**Overhead Objects**		**Stored Energy**	

Cuts Scrapes		**Firearms / Deterrents**	✓	**Perception**	✓	**Uneven Terrain / Ground**	✓
Dehydration		**Fumes / Gases**		**Pinch Points**	✓	**Unfamiliar Area**	✓
Electrical		**Glass**		**Risk to Wildlife**	✓	**Visibility**	✓
Entanglement		**Heavy Equipment**	✓	**Rotating Parts**		**Watercraft Operation**	
Equipment Loss or Damage		**Lifting**		**Sample Loss or Damage**		**Wildlife**	✓
Ergonomics	✓	**Light Vehicle**	✓	**Slip, Trip, Fall**	✓	**Working Remotely**	

See: ENVI-445-0415 - Environment Hazard Definitions - Located in: Diavik Intranet – SOPs – Environment Folder

6.2 CRM Critical Risks

Critical Risk	Critical Control
Uncontrolled release of energy (flares or firearms)	Scan, positive communication, training, ACTS and PROVE, lock-out mechanisms
Vehicle collision or rollover	Seat belts, segregation, positive communication, defensive driving
Vehicle impact on person	Positive communication, defensive walking
Wildlife	Scan, truck or means of egress, deterrents

6.3 Tools Required

Supplies, Tools and Equipment			
Tool / Equipment	**Quantity**	**Tool / Equipment**	**Quantity**
Light Vehicle	**1**	**iPad with iAuditor**	**1**
Aircraft (pending location/ behavior of bear)	**1**	**GPS**	**1**
Field kit equipped with deterrents	**1**	**Camera**	**1**
Shot gun and ammunition kit	**1**	**Radio (Blue Stripe Antennae)**	**1**

6.4 Procedural Steps

The following flow chart (Figure 1) outlines the steps to be taken when wildlife (carnivores) have been observed on site:

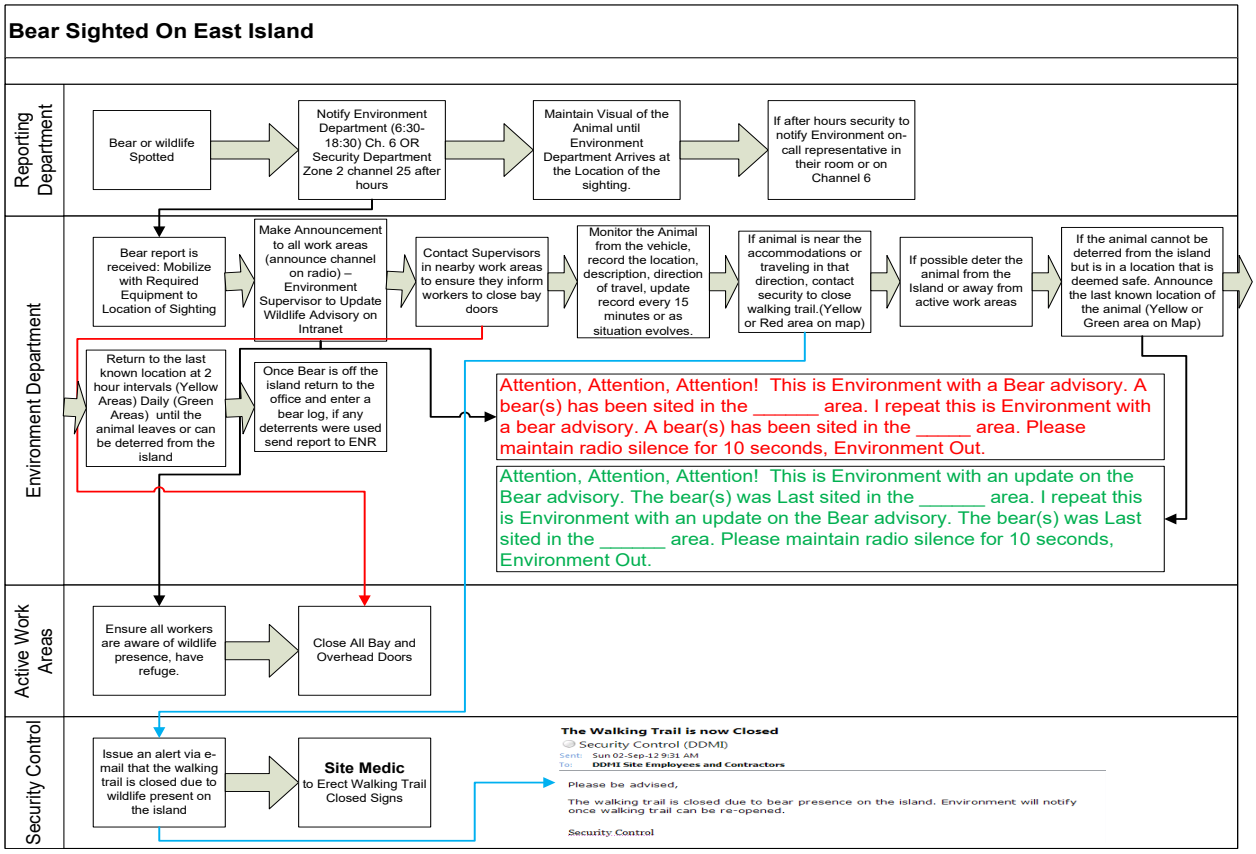


Figure 1: Procedural steps for wildlife monitoring

Figure 2: Monitoring Criteria for Problem Carnivores

6.4.1 Additional Information

Pertinent information to collect upon receipt of wildlife call

- Name and contact information of individual reporting the sighting;
- Number of animals; and
- Last known location and ask to maintain visual until Environment arrives at the scene.

Contact sequence for after hour callouts

- Environment Technician(s)
- Environment Term Technician(s)
- Environment Supervisor

NOTE: Environment staff who are on after hour callouts shall check in with security control every 2 hours and inform security control when the callout is complete.

6.4.2 Controls to protect workers

- Supervisors of work areas adjacent to the sightings need to be contacted to inform them to close any open doors to ensure the animals do not enter any mine infrastructure.
- The walkway between south camp and the main accommodations will remain open, unless Environment determines a need to close it. Environment will check with security to see if anyone is using the walkway. Environment will do a sweep of the walkway if there are people using the walkway. Environment will be responsible for arranging closure.
- If an alert occurs during shift change, Environment, with input from Site Services, will determine the need for buses to move personnel.

6.4.2.1 Wildlife Inside Buildings or Corridors

Special consideration should be taken if wildlife is reported inside buildings. Most wildlife will not remain in buildings and corridors; however, problem carnivores can become food conditioned and may seek to enter structures inhabited by workers.

When contacted by Security Control or individuals, the responding Environment personnel should ensure:

- The individual(s) reporting the animal have informed the area supervisor.
- People working in the structure have evacuated the building to the nearest vehicle.
- Where possible leave exterior structure doors open so that the wildlife can exit the structure and close and latch interior doors to prevent the animal moving into other areas of the structure, the idea is to provide the animal one or two obvious exits.
- Structure exits are monitored until Environment personnel arrive at the scene to understand when the animal has left the building.

After confirming that the reporting individual(s) are secure and structure doors are open and monitored the on-call Environment personnel should activate additional resources:

- At a minimum the Environment Supervisor or their designate should be made aware of the situation
- Emergency Response Team Advisor
- Security Control

As the problem carnivore is in a structure, deterrent options are limited to air horns and fire extinguishers. No bear spray, banger, or firearm should ever be used in a structure.

On arrival at the structure, Environment personnel will determine if there is a safe way to enter the structure and use air horns to encourage the animal to move toward an open exterior door. Personnel should never enter a building if entering the building would place the employee between the animal and the only open exit.

Problem wildlife in structures can be trapped and relocated if they are reluctant to move on. DDMI should have two traps:

- A larger drum-style trap owned by the Environment Department, and
- A smaller cage trap owned by Underground Operations.

Depending on the trap style and the animal in the trap a minimum of two people are required to pick up and move the trap, in many instances three people are required. The style of trap used is dictated by the structure, the animal involved in the disturbance, and the availability of help to move the trap. Once set and baited the trap should be checked every hour; additionally, the structure exit should be monitored continually to know when the animal has left the building.

Once trapped the animal should be moved to the Environment Field Lab for temporary storage until ENR can be contacted and a plan for relocation generated – see relocation under remedial actions.

6.4.3 Duties of supervisors

- All supervisors are responsible to monitor the radio for changes or updates on the bear's movement on site.
- Supervisors are responsible to account for and notify their staff. If necessary, supervisors are responsible to restrict work in certain areas, depending on the problem carnivore's location.

6.4.4 Criteria for Lifting Advisory (See Figure 2):

6.4.4.1 Green

Bear/ problem carnivore can be left in this area, use discretion where the animal is close to infrastructure.

6.4.4.2 Yellow

Bear/ problem carnivore can be left at the discretion of the person monitoring the animal.

Things to consider:

- Is the bear moving around?
- Is the bear bedded down, if so for how long?
- Do you have a visual on the animal and how long have you had the visual for?
- How active has the animal been?
- What time of day is it?
- Are there people in the area?
- Have you assigned alternate monitor(s) (night…who??)
- What is the distance from active work areas?
- Have you contacted area supervisors to ensure they are aware a problem carnivore is close?

- Can security monitor the animal with their cameras?

Ensure the alert has been updated.

6.4.4.3 Red

Bear/ problem carnivore needs to be monitored continuously while in the red zone.

- In the event there is an unconfirmed wildlife sighting (i.e., reported by workers but not seen by Environment), the search can be abandoned after 1 hour with no sighting.
- The alert will stay in effect until the bear or other carnivore has left the red zone.

6.4.5 Remedial Action for Problem Wildlife

Preventing the attraction for wildlife through proper food storage, garbage disposal and camp maintenance is the most effective way of avoiding problem carnivores in general. Management action will be carried out if bears or other carnivores pose a threat to people and/or property.

Occasional visitations by grizzly bears, wolverines, and wolves to the mine site are anticipated. Procedures for dealing with problem wildlife are outlined below.

The Environment Superintendent and the Environment Supervisor will work with Environment Natural Resources (ENR), GNWT to deal with problem wildlife at site. There is a hierarchy of options for control of problem wildlife that poses a nuisance or danger to human safety; the three levels of increased effort to deal with problem wildlife are:

- Level I: Deterrence
- Level II: Relocation
- Level III: Destruction

The Environment Supervisor will maintain effective communication with ENR in reporting problem carnivores and in evaluating options for wildlife control.

6.4.5.1 Level I: Deterrence

A method or device, either physical or chemical, designed to chase the animal away. This could involve one or a combination of the following approved and recommended methods by ENR:

- Use of vehicles
- Bear Bangers
- Noise crackers
- Rubber bullets
- Bean bag marking cartridge
- Aircraft
- Pepper spray

Each member in the Environment Department has been trained and are responsible to ensure they have deterrents with them while on a wildlife call-out. Firstly, the Environment representative must do an inventory of the number of bangers, screamers, they have present in their field kits. They must keep track and log the number of deterrents they use on the animal (documented on the iPad in iAuditor and Ammunition Used Log). If any discrepancies are noticed (i.e., lost live bangers or other deterrents), notify the Environment Supervisor and an incident report will be generated. Each member in the Environment Department is accountable for their field kits containing bear bangers and screamers. The Technician must ensure kits are stored adequately for the duration of their shift. All discharged deterrents must be brought back to the environment office and placed in a zip lock bag with the technician initials and date of use. These bags will be stored in the firearms cabinet for periodic reconciliation.

Individuals using methods of deterrence must properly assess the situation that they are in and the following points must be considered:

- Vehicles are an acceptable method of deterring bears, wolves, wolverines, and foxes; however, ensure that the animal is moved away from project activities and not scared towards camp infrastructure or toward unsuspecting people. This is the preferred method of deterring wildlife as they move adjacent to the mine site, and for moving problem carnivores off site.
- Increase the level of deterrent accordingly, based on the behaviour of the animal: vehicles & their horns, air horns, bear bangers, cracker shells, rubber bullets, and helicopter.
- No shooting of a bear banger towards buildings or fuel sources.
- Ensure that the bear banger is shot between you and the problem carnivore so that the animal is not scared towards you. If using an air horn, ensure that it is directed towards the animal.
- If a helicopter is available on or near the site, it may be used to deter the problem carnivore off the island **if other methods of deterrents are unsuccessful**. Ideally, an attempt should be made to move the animal onto the small islands, west of the airstrip - thereby encouraging the animal to move off East Island onto the mainland. Note: This method of deterrence can only be conducted at the discretion of pilot and all DDMI personnel will follow the procedures laid out in the helicopter usage SOP (ENVI-916-0119). A qualified DDMI Environment personnel should be onboard the aircraft or on the ground with visual (and radio) contact to provide the pilot with guidance. Ground to air radio contact with the helicopter can be maintained using Zone 7 – Great Slave Helicopters Channel.
- The pilot should:
    - Stress the animal as little as possible. A stressed bear running for a distance can overheat and die.
    - Keep the helicopter well back from the animal. The minimum distance between the helicopter and the bear is 100 m (320 ft) back and 30 m (100 ft) up from the ground.

  - Keep the animal in visual contact. This should be done by taking the helicopter to a higher altitude rather than getting closer than the minimum distance.
  - Only get close enough to the bear to make it move, not fly over it. A carnivore moving at a 'fast walk' can cover a lot of ground quickly and efficiently; there is no need to run the animal.
  - DO NOT push a bear for more than 10 minutes or 3 km (2.2 miles).
- Documentation of all deterrent actions must be completed. This includes all notes made in the iPad iAuditor and uploaded to 15.3 Wildlife Database → Wildlife Deterrence Used → Year. In this final copy, be sure to include as much detail as possible. This includes the description of the animal (colour, build, stature and approx: age), behaviour of the animal, response to stressor (deterrent), the number of each deterrents used, location (coordinates) and any movement that occurred with the animal. Any additional pictures will be helpful to identify the animal in the future.

Note: If you are required to deter problem carnivores from the site, a deterrence report must be completed. This report should be e-mailed to Adrian Lizotte Adrian_Lizotte@gov.nt.ca

6.4.5.2 Level II: Relocation

DDMI Environment will work with ENR; GNWT to determine if/when a problem carnivore should be relocated. A completed relocation permit is usually required by ENR prior to starting relocation. Relocation is completed under the authority of ENR, and would be supported by DDMI Environment. Relocation typically involves remote work (ENVI-907-0119) and helicopters (ENVI-916-0119) or snow machines (ENVI-919-0119). Prior to undertaking relocation the relevant SOPs should be reviewed and a JHA completed.

If a problem carnivore is trapped inside a structure the trap containing the animal will be stored in the Environment Field Lab until an action plan is formulated with ENR. The following are potential options:

- Smaller animals, e.g., foxes, can be relocated to Pond 3 or the Wind Farm
- If Lac de Gras is frozen or the winter ice road is open the animal can be relocated away from East Island, release of the animal should occur at least 75km from site and preferably in an environment that is attractive to the carnivore
- If it is summer the animal may have to be tranquilized and transported via helicopter as far as possible

If possible, relocation should be in an environment that is attractive to the carnivore (e.g., caribou herds for wolf and wolverine). Otherwise, it is recommended to relocate the wildlife to the north or northwest of the mine site as this region is typically upwind of the mine site.

Prior to releasing the problem carnivore an attempt should be made to mark the animal with a bright colour spray paint. This is to help identify repeat offenders.

Individuals involved in the release of animals from traps at the relocation site should be as close to a means of safe egress as possible. The most likely response of a released animal is to run away from the trap; however, it could turn and attack.

If the problem carnivore repeatedly offends after relocation, contact ENR and discuss destruction options.

6.4.5.3 Level III: Destruction

The destruction of problem carnivores will only be implemented as a last resort deterrence method if all the above methods have failed. ENR wildlife officials will make this decision upon recommendation and discussions with designated biologists and DDMI Environment personnel. However, if an emergency arises where there is direct danger to an individual then it may be necessary to destroy problem carnivores immediately. **Note: Unless the wildlife poses an immediate threat to life or safety, approval to destroy an animal must come from ENR prior to destruction.**

Only Environment personnel holding a valid Possession and Acquisition License (PAL) are to handle any firearm or to destroy problem carnivores, if the situation arises. Direct permission must be obtained from **ENR using their 24-hr emergency contact phone number: (867) 873-7181**. Prior to destroying problem carnivores the responsible person will complete a JHA and will follow the firearm SOP (ENVI-920-0119) when performing the destruction. The one exception to this policy is if an indigenous trapper has been hired to trap and destroy the animal. In this instance, the trapper will hold a valid PAL and will only shoot the animal after it has been trapped.

If destruction of an animal occurs, a detailed incident report must be prepared and submitted to ENR officials. This report would also be included as an appendix in the annual wildlife monitoring report.

If an animal is destroyed, the hide must be preserved in such a manner that it will not be allowed to spoil. ENR will require the head along with any other requested samples which will change from year to year dependent on research priorities.

7 QUALITY OUTCOMES AND EXPECTATIONS

To safely complete the tasks outlined in this SOP, without incident.

Producing quality, accurate and repeatable results.

GOLDER

DIAVIK DIAMOND MINES (2012) INC.

TECHNICAL MEMORANDUM

DATE 21 July 2020

GOLDER REFERENCE No.20136424-1968-TM-Rev0-2000

DIAVIK WORK PLAN No. 652 Rev.1

DIAVIK PO No. 3104086439

TO Sean Sinclair
Diavik Diamond Mines (2012) Inc.

FROM Dan Coulton and John Virgl

EMAIL Daniel_Coulton@golder.com; John_Virgl@golder.com

RESPONSE TO EMAB RECOMMENDATIONS FOR THE 2020 WMMP

On 17 June 2020, the Environmental Monitoring Advisory Board (EMAB) issued recommendations for Diavik Mine's Wildlife Management and Monitoring Plan. As per your request and in review of the recommendations by EMAB, Golder Associates Ltd. (Golder) has prepared the following responses for your consideration in Table 1.

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Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
DDMI-WMP-18	Vegetation and Wildlife Habitat (Landscape Changes)	Prediction: Determine if direct vegetation/habitat loss due to the Mine footprint exceeds the prediction of 12.67 km^2. Data Collected: Ecological Land Classification (ELC) unit loss (area km^2). Collection Method: Landcover image analysis. Status: Conditions remain at or below predicted levels. Last tested in 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.
DDMI-WMP-19	Caribou Habitat Loss	Prediction: At full development, direct summer habitat loss from the project is predicted to equal 2.965 Habitat Units (HU). Data Collected: ELC unit loss (area km^2) X habitat suitability value. Collection Method: Landcover image analysis. Status: Conditions remain at or below predicted levels. Last tested in 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.
DDMI-WMP-20	Caribou Movement	Prediction: To determine whether the zone of influence changes in relation to Mine activity (Handley 2010). Data Collected: Caribou presence from aerial surveys and locations of satellite-collared caribou. Collection Method: Aerial surveys of caribou and radio-collar monitoring/data collection. Status: A ZOI of 14 km was detected using aerial survey data and a weaker 11 km ZOI was detected using the satellite-collar location data (Boulanger et al. 2012). Caribou aerial surveys have not been completed since 2012 because a request to omit the ZOI requirement for caribou monitoring in 2013 was approved by ENR. Aerial survey data was re-analyzed in 2019 with a conclusion of no ZOI.	ZOI monitoring should continue as a component of the WMP. We recommend utilizing multiple lines of evidence (i.e., aerial survey, satellite collar data) to confirm the presence/absence and potential size of a ZOI. We recommend that the ZOI Technical Task Group (TTG) reconvene to discuss and determine the approach to future ZOI monitoring, including the need for additional aerial surveys. Should the TTG determine the need for additional aerial surveys, we recommend revising sampling methods to address some of the data analysis issues found using the old design (e.g., geometric phenomena (Golder 2020, pg.33)).	The Wildlife Management and Monitoring Plan (WMMP) indicates that DDMI will continue ZOI monitoring using caribou collar data as a new sampling method. DDMI does not see the benefit of continuing to use aerial surveys for ZOI monitoring when analysis of 13 years of aerial survey data was unable to detect a ZOI. As well, the current abundance of the Bathurst caribou herd results in a limited number of caribou moving through the study area and disturbing sensitive herds when the herds are already tracked through satellite collars does not add value. Therefore DDMI has removed aerial surveys from the WMMP.
DDMI-WMP-21	Caribou Behaviour	Prediction: To determine if caribou behaviour changes with distance from the mines. Data Collected: Focal and group scan behaviour data. Collection Method: Ground-based behavioural observations. Status: Caribou groups with calves spend less time feeding and resting within 5 km of the mine than farther away. Last tested in 2011. DDMI continues to conduct group scan behavioural surveys in cooperation with the Ekati mine. The combination of walking with running and trotting in the 2011 behavioural analysis may be diluting the effect of trotting and running (higher energy activities).	We recommend that DDMI continue their efforts to collect caribou behaviour data. Regarding caribou activities other than foraging, we recommend DDMI evaluate whether the data can be pooled and analyzed while considering covariates such as year, gender, and distance to the Mine. We recommend DDMI compare caribou running bouts as a function of distance. Please also consider grouping or separating running and trotting activities for the analysis.	The WMMP indicates that caribou behaviour will be monitored and that the analyses will be performed to test for the effects of year (Mine activity), habitat, group composition, and distance from the Mine on the proportion of time caribou spend feeding, resting, and moving. Environmental variables such as wind speed, rainfall, and level of insect activity may be included as factors in the statistical models. Appendix D of the 2019 WMP includes running in accordance to the distance strata (i.e., <15 km and >15 km) requested by EMAB. The results show no discernible pattern between distance strata and that caribou spend very little time running.

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
DDMI-WMP-22	Caribou Distribution	Prediction: During the northern (spring) migration, caribou would be deflected west of East Island and during the southern migration (fall), caribou would move around the east side of Lac de Gras. Data Collected: Locations of satellite-collared caribou. Collection Method: Radio-collar monitoring of cows and bulls (proportion travelling east vs. west of the mine). Status: The northern migration is following predictions; however, the southern migration deviates from predictions in the last several years of monitoring. DDMI concludes that over all years there has not been a significant deviation from the predictions. Last tested in 2018. DDMI has requested to remove this monitoring component from the WMP. Further data collection and analysis is required to understand clearly why the impact prediction in the EER was incorrect regarding the southern (fall) migration. The methods applied to this component may not be appropriate. If the monitoring results do not follow the prediction for the southern migration (as for 7/8 of the most recent years of monitoring; between 2011 and 2018) but one can still conclude the population is connected, then it seems that an incorrect test is being applied in the WMRs. Migration predictions were based on a least-cost path (friction) analysis. As such, DDMI should consider whether changes in the southern migration have a consequence for caribou energetics. DDMI should consider an approach that evaluates the energetic cost of migration (e.g., “cost-of-movement index”).	We recommend caribou distribution monitoring continue to be a component of the WMP. We recommend DDMI consider an approach to monitoring that evaluates the energetic cost of migration (e.g., "cost-of-movement index").	The key reasons for monitoring are to test impact predictions, determine mitigation effectiveness, reduce uncertainty of effects and mitigation, and/or provide feedback for adaptive management. The impact prediction in the WMP regarding caribou movement during the southern migration (and northern migration) was initially generated from baseline observations and the effects analysis using a friction model to estimate the energetic cost of movement. Baseline data collected during two years observed that most caribou coming onto East Island from the north retreat northward and move around the east end of Lac de Gras rather than swimming across to the eastern or southern shores (Penner and Associates 1998). Baseline data also indicated that during the southern migration, caribou would typically move back off the East Island onto the mainland and then travel either west or east around Lac de Gras. The friction model assessed the energetic cost of caribou using different migration routes through the Lac de Gras area, including the known route from the mainland to the East Island to the mainland (i.e., East Island crossing). Under the Diavik mine full development scenario the pathway of least resistance shifted from the East Island crossing to routes at the narrows between Lac du Sauvage and Lac de Gras, which is east of Lac de Gras (DDMI 1998). The increase in cost of movement was calculated to be 3.9% relative to baseline conditions, but was likely overestimated because caribou rarely use the East Island crossing. In other words, the frequency of caribou shifting from the East Island crossing to routes at the narrows east of Lac de Gras was purposefully inflated (a precautionary approach was applied). Furthermore, it was anticipated that if movements onto East Island are deterred by Mine-related activities, caribou would select the most common movement corridors (west and east) around the lake. Deflections during the ice-free season would have little influence on regional patterns of movement, and may benefit caribou by limiting risks of interacting with Mine-related hazards (page 6-15: DDMI 1998). In retrospect, the prediction in the WMP regarding the movement of caribou during the southern migration is not well developed and likely incorrect (and perhaps was not warranted) because the change associated with the loss of the East Island route was overstated to maximize energetic cost and not be reflective of both west and east movements observed during baseline. Baseline data observations and the results of the friction model and assumptions do not strongly indicate that the Mine would cause caribou to be consistently deflected east of Lac de Gras during the southern migration. In contrast, the information predicts that if the Mine prevents caribou from selecting the rarely used East Island crossing, then movement would be largely

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
				around the west and/or east side of Lac de Gras. The analysis of Bathurst collar data in the 2019 WMP report (and previous reports) supports this prediction. Collared caribou have travelled east and/or west around Lac de Gras from 1996 to 2018 with no strong difference in direction. The results from the EER (DDMI 1998) and long-term monitoring data indicate that any changes in caribou migration around Lac de Gras from the Mine during the southern migration would likely have no measurable effect on the population. Similarly, the prediction for caribou movement around East Island during the northern migration was premised on baseline data and the friction model. Briefly, baseline observations suggested that caribou spring migration movement paths were widely distributed across and around Lac de Gras (DDMI 1998). One predevelopment travel route skirted the east side of East Island and this pathway was used to examine effects on spring movement costs. At the full development, disturbance from the Mine was predicted to cause caribou to divert from this path around the west side of East Island (DDMI 1998). The increased movement cost relative to baseline conditions was 2% (or 0.12% relative to the total cost of spring migration). However, the spring migration corridor is wide relative to the East Island and the number of individuals influenced by the Mine would be small. Long-term monitoring data has shown that caribou movement around East Island is highly consistent with the prediction in the EER. Importantly, the data also indicate that northern movement on either side of East Island is correlated with the location of the winter range (Golder 2017), which has largely been west of Diavik since the decline of the Bathurst herd. Support for the prediction during the northern migration may be largely spurious and more related to the location of the collared caribou on the winter range than the influence of the Mine. In conclusion, a retrospective evaluation of the development and strength of the predictions concerning caribou movement, and analysis of long-term collar data supports removing this component from the WMP. The predictions, particularly during the southern migration, were not well developed and perhaps incorrect, and likely included as a precautionary approach to manage uncertainty in effects predictions in the EER. Since 2002 when the WMP was implemented, the analysis of 23 years of collar data has provided confidence that caribou movement around Lac de Gras during the southern migration has not deviated from baseline observations. However, the monitoring data are not consistent with an assumption of the friction model concerning removal of the East Island crossing route and a shift to a least resistant route east of Lac de Gras. This does not imply that there is

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
				an effect on caribou, particularly as the friction model was stated to overestimate effects because caribou rarely use the East Island crossing and typically migrate west or east around Lac de Gras. Although the prediction for the northern migration has been more strongly supported by the monitoring data, which also provides confidence in the predicted effects, the result is more likely related to location of caribou on the winter range than the potential influence of the Mine. Overall, the Diavik mine has likely had little influence on the variation in caribou northern and southern migration movements through the Lac de Gras region. The analysis above demonstrates unequivocally that the precautionary approach applied to the WMP because of uncertainty in effects predictions for caribou migration movements is no longer required and this component can be removed from the monitoring program. Therefore DDMI has removed deflection analysis from the WMMP.
DDMI-WMP-23	Caribou Incidents and Mortality	Prediction: Mine-related mortality is expected to be low. Data Collected: Number of incidents and mortalities reports. Collection Method: Incident and mortality reports. Status: No Mine-related mortalities were reported in 2019, and one natural mortality was reported on East Island. Conditions remain at or below predicted levels. Last tested 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.
DDMI-WMP-24	Caribou Advisory	Objective: The objective of the Caribou Advisory Monitoring program is to make certain that workers are aware of the approximate numbers of caribou on and near East Island, which is related to the potential for interactions between caribou and mining activities. Data Collected: Number of animals on the island and specific location. Collection Method: Incidental observations from pilots and workers, the use of satellite collar locations provided by ENR, and ground surveys. Status: No deterrent actions or elevation from “No Advisory” was required in 2019. Last completed in 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.
DDMI-WMP-25	Caribou Herding	Objective: When caribou are present on East Island their movements are monitored so that Mine personnel are aware of their presence and location and so that caribou can be herded away from potentially hazardous areas. Data Collected: Location of caribou on East Island. Collection Method: slow advancement of personnel behind caribou to encourage movement in a safe direction. Status: There were no reported incidents involving caribou in 2019 and there was no need for herding of caribou away from hazardous areas. Last completed in 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
DDMI-WMP-26	Grizzly Bear Habitat Loss	Prediction: At full development, direct terrestrial habitat loss for grizzly bear from the project is predicted to be 8.67 km^2. Data Collected: ELC unit loss (area km^2) for all terrestrial habitats. Collection Method: Landcover image analysis. Status: Conditions remain at or below predicted levels. Last tested 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.
DDMI-WMP-27	Grizzly Bear Presence and Distribution	Current Prediction: Provide estimates of grizzly bear abundance and distribution in the study area over time (GNWT 2013). Data Collected: Sex and number of individuals in the study area (DNA samples). Collection Method: Grizzly bear hair snagging. Status: There is a stable or increasing abundance of grizzly bears. Last completed in 2017. Results of the 2012 and 2013 hair snagging program can be found in ERM Rescan (2014) and results of 2012, 2013, and 2017 can be found in ERM (2018) (Appendix J of 2018 WMR). We continue to support DDMI's involvement in the GNWT hair snagging program but recognize that annual surveys may not be necessary given the stable regional grizzly bear populations and no apparent negative demographic effects associated with the presence of the Mines.	The methods applied for this part of monitoring are adequate. We recommend the future of this program be a joint decision by all program partners.	Acknowledged and DDMI awaits a joint decision by all program partners.
DDMI-WMP-28	Grizzly Bear Incidents and Mortality	Prediction: Mortalities associated with mining activities are predicted to be 0.12 to 0.24 bears per year. Data Collected: Number of incidents and mortalities reports. Collection Method: Incident and mortality reports. Status: There were zero bear mortalities in 2019, but there were 45 days that deterrent actions were used, which is an increase from 36 in 2018. Conditions remain at or below predicted levels. Last tested 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
DDMI-WMP-29	Wolverine Presence and Distribution	Prediction: Provide estimates of wolverine abundance and distribution the study area over time (GNWT 2013). Data Collected: • Wolverine site occupancy. • Sex and number of individuals in the study area (DNA samples). Collection Method: • Snow track surveys. • Wolverine hair snagging. Status: • Wind had the biggest effect on wolverine snow track detectability. There is a weak positive effect of habitat on wolverine track occurrence. Distance has a weak positive effect on the probability on wolverine occupancy, which suggests that transects closer to the Mines are less likely to be occupied. Larger sample sizes are required to allow for the simultaneous analysis of distance and habitat effects on wolverine occupancy. Last tested in 2019. • Stable wolverine population growth rate through time across study areas, except for Daring Lake, which showed a slight decline. Apparent survival was similar across study areas (Afford and Boulanger 2018). Last completed in 2014. Given the findings of the MSOM which shows distance to the Mines effects wolverine occupancy, ongoing monitoring of population size and stability would be prudent to ensure negative impacts of the Mines on wolverines do not contribute to population extinction.	The methods applied for the snow track component of the monitoring program are adequate. We recommend the continuation of the snow tracking program to monitor impacts of the mine on wolverine detectability, occupancy, colonization and extinction. The methods applied for the hair snagging component of the monitoring program are adequate. We recommend that the schedule for future hair snagging be determined in collaboration with GNWT-ENR.	Acknowledged and snow track surveys have been retained in the WMMP. DDMI awaits a joint decision by all program partners on the benefit of additional hair snagging.
DDMI-WMP-30	Wolverine Incidents and Mortality	Prediction: Mine-related mortalities, if they occur, are not expected to alter wolverine population parameters in the Lac de Gras area. Data Collected: Number of incidents and mortalities reports. Collection Method: Incident and mortality reports. Status: Conditions remain at or below predicted levels. The 2019 WMR reported zero mortalities, two relocations, and seven deterrent actions for wolverine on-site. Last tested 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.
DDMI-WMP-31	Raptors Nest Occupancy	Current Prediction 1: Determine if pit walls or other infrastructure are utilized as nesting sites for raptors. Data Collected: Nest location, species identification, activity status (presence of eggs or chicks). Collection Method: Pit wall/infrastructure inspections are completed twice weekly. Status: Two active peregrine falcon nests were observed, one was located at the Site Services Building and one at the Process Plant. No observations of fledglings were recorded. Last tested 2019.	The methods applied for this part of monitoring are adequate. We support DDMI's continued Pit Wall/Mine Infrastructure monitoring for nesting raptors. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
DDMI-WMP-32	Raptors Nest Occupancy	Current Prediction 2: Determine nest success in areas of development and document effectiveness of deterrent efforts that may be employed for nest relocations. Data Collected: Nest use and success (presence of hatchlings). Collection Method: Helicopter surveys of known nest sites in early and late summer. Status: Nest monitoring data contributed to ENR every 5 years. It was last completed in 2015 and next due in 2020.	The methods applied for this part of monitoring are adequate. We support DDMI's continued contribution to regional nest monitoring. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.
DDMI-WMP-33	Raptors Incidents and Mortalities	Current Prediction 3: Document and determine the cause of direct Mine-related mortalities of raptors. Data Collected: Mine-related incidents. Collection Method: Incident reports submitted by mine staff. Status: No raptor incidents or mortalities were reported at the Mine in 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.
DDMI-WMP-34	Waste Management	Objective: Create a system for proper disposal of waste, minimize adverse impacts on physical and biological environment, and comply with Federal and NWT legislation. Data Collected: Type and number of misdirected waste items and wildlife species and sign. Collection Method: Inspections of Waste Transfer Area (WTA) and the Landfill conducted twice weekly. Status: In general, the number of wildlife observations in the WTA and the Landfill were lower in 2019 than in 2018, and roughly the same in the A21 Area and the Underground. The overall outcome of waste management appears to be positive. Last evaluated in 2019.	The methods applied for this part of monitoring are adequate. Keep this component of the monitoring program.	Acknowledged and this has been retained in the WMMP.

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
DDMI-WMP-35	Adaptive Management	Applies to all components of the WMP.	We recommend DDMI continue to discuss how the information gained from the various wildlife datasets could be used in terms of mitigation and adaptive management for the Diavik Mine in particular and for other future projects in the region in general.	As responded to 16 January 2012 on Comprehensive Analysis Report comments and again in Golder (2016), DDMI continues to review the results of annual monitoring programs in an effort to determine any management actions that can be implemented at the Mine to reduce impacts to caribou, other wildlife, and the terrestrial and aquatic environments. For example, adaptive management of mitigation policies and practices has resulted in the successful avoidance and minimization of direct mine-related mortality of caribou and other wildlife from collisions with vehicles and aircraft, open pits, mine rock piles and processed kimberlite containment areas. A screening level risk assessment confirmed that mine-related contaminants in lichen should have no adverse health effects for caribou (Golder 2011a). Results from the 2013 Comprehensive Vegetation and Lichen Monitoring Program (Golder 2014) also showed that dust deposition has been decreasing on the Mine site over time, effects are localized to the immediate area within the Mine footprint and adjacent habitat, and metal concentrations in lichen were lower in 2013 than in 2010, which may reflect a change from open pit to underground mining operations. Results from the analysis of behavioural scanning observations in the 2010 Comprehensive Analysis of Effects from the Diavik Diamond Mine on Wildlife in the Lac de Gras Region (Golder 2011b) showed that caribou groups with calves spent about 10% less time feeding/resting within 5 km of the Ekati-Diavik mines. Analysis of aerial survey data has estimated a zone of influence of 14 km from the Ekati-Diavik mines (Boulanger et al. 2012). These studies demonstrate the importance of mitigating the influence of mine-related mechanisms (e.g., dust and noise) on caribou behaviour and distribution. Mitigation used by the Mine to limit sensory disturbances includes housing the crusher inside, the vehicle reduction program, watering roads during summer, and the use of ultra-low sulfur diesel (DDMI 2012). The switch from surface to underground mining also limited sensory disturbance, however with the start of A21 surface mining potential sensory disturbance has increased (still below peak levels). Therefore, results from the monitoring programs at Diavik and at other operating diamond mines can be used by government to analyze and manage cumulative effects, in future environmental assessments to increase confidence in impact predictions, and applied to future projects to mitigate effects. The overall Monitoring Framework and Adaptive Management process is described in the WMMP.

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
DDMI-WMP-36	Traditional Knowledge	Recommendation to be considered for **this version (expected in June 2020)** of the Wildlife Monitoring Program Description.	Diavik should include TK monitoring components for all species studied under the WMP (caribou, grizzlies, wolverine, raptors). Diavik should use previous recommendations from the TK panel to inform where they can incorporate TK into the monitoring of each species.	The TK Panel represents the primary source of TK integration into Diavik mine operation. The TK Panel determines its own agenda, which has focused on Mine closure. DDMI has incorporated TK Panel recommendations for operation monitoring such as recording the caribou behaviour category of “curious” during scan surveys. DDMI has included TK in monitoring programs and has provided examples of these in Section 2.0 of the 2019 WMP report. DDMI does not intend to have separate and parallel scientific and TK monitoring programs. Section 3.0 of the WMMP covers Engagement and TK integration at the Diavik mine.
DDMI-WMP-37	Traditional Knowledge	Recommendation to be considered for **this version (expected in June 2020)** of the Wildlife Monitoring Program Description.	Similarly to wolverine snow track monitoring, Diavik should regularly include community members in monitoring activities for caribou and grizzly bear. Diavik should report on the individuals involved and the activities they were engaged in.	DDMI does ask communities to participate in monitoring. DDMI will consider asking communities to participate in regular site monitoring of wildlife, although wildlife presence at site is unpredictable. Up to 2013, communities, including Elders, were regular participants in caribou monitoring. Participation has decreased since then because of the Bathurst caribou herd decline and subsequent low numbers of caribou in the study area. Hair snagging surveys for grizzly bear included community participants. As noted by EMAB communities regularly participate in the wolverine snow track monitoring. Section 3.0 of the WMMP describes the framework for integration of community participants in Diavik programs.
DDMI-WMP-38	Traditional Knowledge	Recommendation to be considered for **this version (expected in June 2020)** of the Wildlife Monitoring Program Description.	The TK Panel recommended that Diavik should hire TK holders on a seasonal basis to work with Diavik Staff on caribou monitoring. As a part of the response, Diavik indicated they would investigate options for behaviour monitoring by communities. EMAB recommends that Diavik include TK holders in caribou behaviour monitoring. Diavik should include a report on the results of the investigation of options for community behaviour monitoring in an appendix to the Program Description.	Section 3.0 of the WMMP describes the framework for integration of community participants in Diavik programs. At this time Diavik is not considering hiring additional full time staff on a seasonal basis to work on caribou monitoring. Up to 2013, communities, including Elders, were regular participants in caribou monitoring. Participation has decreased since then because of the Bathurst caribou herd decline and subsequent low numbers of caribou in the study area. Without sufficient caribou to monitor, further investigation of options is not beneficial.
DDMI-WMP-39	Traditional Knowledge	Recommendation to be considered for **this version (expected in June 2020)** of the Wildlife Monitoring Program Description.	The TK panel made a number of recommendations for changes to caribou behavior monitoring that Diavik said it was reviewing. Diavik should report on this review as an appendix to the program description, and incorporate the recommendations from the TK panel into the WMP program description, or explain why they did not include them.	Diavik is aware of two specific recommendations for caribou behaviour monitoring, which Diavik has responded. One included recording the behaviour category of “curious” and another was to take photos, both of which DDMI has adopted. It would be helpful if EMAB could be more specific about the TK Panel recommendations they believe have not been considered if others exist.

Table 1: Recommendations by EMAB on the 2020 WMMP

2019 Comment Identifier	Category	Comment	Recommendation	Response by DDMI
DDMI-WMP-40	Traditional Knowledge	Recommendation to be considered for **this version (expected in June 2020)** of the Wildlife Monitoring Program Description.	The TK Panel recommended that Diavik should use visual tools (e.g., taking pictures) as a part of caribou behaviour scans. Diavik's response indicated they took photos in 2012 and 2013 and are evaluating them. EMAB recommends that Diavik report on the results of the evaluation (as an appendix to the program description). Those results should be incorporated into the behaviour monitoring section of the Program Description, where appropriate.	Per the previous response, Diavik does take photos of caribou during behaviour group scans and at other times when caribou are observed (e.g., cover photo of the 2020 WMMP). Methods for incorporation of photographs are described throughout the WMMP.
DDMI-WMP-41	Traditional Knowledge	Recommendation to be considered for **this version (expected in June 2020)** of the Wildlife Monitoring Program Description.	Diavik should incorporate side-by-side comparison tables in the Program Description and future annual WMP reports. The tables should show where TK and Western Science are used in the Wildlife Monitoring Program. For Example: Column A -TK Wildlife Monitoring components: List all TK monitoring under the WMP Column B - Scientific Monitoring Components: List all scientific monitoring under the WMP	A section in the annual WMP report (Section 2.0) regarding community engagement and TK was added in the 2018 WMP report as recommend by EMAB. The WMMP also includes a section on community engagement and TK (Section 3.0). Section 3.0 of the WMMP includes tables that show linkage between TK components and wildlife monitoring.
DDMI-WMP-42	Traditional Knowledge	Recommendation to be considered for **future versions** of the Wildlife Monitoring Program Description.	EMAB recommends that Diavik regularly consult with TK holders on wildlife monitoring methods, activities and results. Yearly consultations about annual WMP reports would be ideal. These consultations should include collecting feedback from TK holders about their thoughts on the results.	The TK Panel is the primary way that DDMI gathers TK for the Mine and the TK Panel meets at least once per year. DDMI already incorporates TK and local knowledge through community participation in wildlife monitoring programs. DDMI does share the annual WMP report with communities but has received no feedback to date. DDMI understands that EMAB also engages with communities annually to keep communities informed about the environment and Diavik monitoring programs (emab.ca). EMAB also holds workshops that bring together community members, regulators, experts and others to reach a better understanding of Diavik-related environmental issues (emab.ca). DDMI suggests this is another valuable avenue to solicit community feedback.
DDMI-WMP-43	Traditional Knowledge	Recommendation to be considered for **future versions** of the Wildlife Monitoring Program Description.	EMAB recommends that Diavik hold a TK panel session which focuses on Wildlife Monitoring during the Closure and Post-Closure phases. This session should inform future versions of the Wildlife Monitoring Program Description.	DDMI has already held TK Panels that deal with closure concepts (Panels 10, 11 and 12). DDMI does not dictate the content of the TK Panel Sessions, each Panel establishes an agenda that is agreed on by the participants ahead of the TK Panel Session. DDMI could suggest such a topic as part of a future TK Panel Session but there is no assurance that participants will agree on the subject. TK Panel Sessions on closure and post-closure monitoring will inform the Closure and Reclamation Plan. The WMMP is not the appropriate place to dictate the framework and duties of the TK Panel.

CLOSURE

We trust the above meets your present requirements. If you have any questions or requirements, please contact the undersigned.

Golder Associates Ltd.

ORIGINAL SIGNED

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Attachment 1: Model Selection Results for Caribou Distribution Recommended by EMAB

https://golderassociates.sharepoint.com/sites/120632/project files/6 deliverables/issued/1968-tm-rev0-2000-response to emab comments on 2020 wmmp/20136424-1968-tm-rev0-2000-response_to_emab_comments_on_2020_wmmp.docx

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ATTACHMENT 1

Model Selection Results for Caribou Distribution Recommended by EMAB

Table 1: Model Section Results from Golder (2020) and A Model Recommended by EMAB

Model Code	Model Structure	K	AIC	ΔAIC	Model Likelihood	AIC Weight	-Log Likelihood
M2	design survey area + distance + preferred habitat + month + autumn range	8	54898.60	0.00	1.00	0.64	-27441.30
M1	design survey area + distance + preferred habitat + distance*habitat + month + autumn range	9	54899.72	1.12	0.57	0.36	-27440.86
M3	design survey area + preferred habitat + month + autumn range	7	54948.03	49.43	0.00	0.00	-27467.02
EMAB	**design survey area + distance + month + autumn range**	**7**	**55179.24**	**280.64**	**0.00**	**0.00**	**-27582.60**
Null	y-intercept only	3	55264.71	366.11	0.00	0.00	-27629.35