

Diavik Diamond Mines (2012) Inc.
P.O. Box 2498
Suite 300, 5201-50th Avenue
Yellowknife, NT X1A 2P8 Canada
T (867) 669 6500 F 1-866-313-2754

Charlie Catholique, Chair
Environmental Monitoring Advisory Board
5006 Franklin, Room 204
Yellowknife, NT X1A 2P9

Kathy Unger, Manager
Environmental Assessment and Habitat
GNWT – Environment and Climate Change
PO Box 1320 Yellowknife, NT X1A 2L9

1 May 2023

Re: Diavik 2022 Wildlife Management and Monitoring Report

Attached is an electronic copy of the 2022 Wildlife Management and Monitoring Report (WMMR or Report) for Diavik Diamond Mines (2012) Inc. (DDMI). The WMMR aligns with the components and objectives of the Wildlife Management and Monitoring Plan (WMMP) and provides the analysis and reporting of data collected using the methods described for wildlife valued ecosystem components and other wildlife in the WMMP.

DDMI's responses to comments and recommendations from the Environmental Monitoring Advisory Board (EMAB) on the 2021 WMMR are provided in Appendix A. Additionally, DDMI's responses to parties' comments and recommendations on the 2021 WMMR and 2021 WMMP that had implications to the WMMR are provided in Table 1 of the Report.

DDMI requests that you review these documents and provide comments and recommendations by May 31, 2022. DDMI will provide responses by July 30, 2022. If you have any questions regarding the above, please contact the undersigned or Kyla Gray (kyla.gray@riotinto.com; 867-447-4922) at your convenience.

Yours sincerely,



Mark Nelson
Superintendent, Environment & Closure

Cc: John McCullum, EMAB
Mohannad Elsalhy, EMAB
EANorthNWT@ec.gc.ca, ECCC

Attachment: 2022 Wildlife Monitoring Report



REPORT

Diavik Diamond Mines (2012) Inc.

2022 Wildlife Management and Monitoring Report

Submitted to:

Diavik Diamond Mines (2012) Inc.

PO Box 2498
300 - 5201 50th Avenue
Yellowknife NT X1A 2P8
Canada

Submitted by:

WSP Canada Inc.

840 Howe Street, 10th Floor, Vancouver, British Columbia, V6Z 2M1 Canada

+1 604 685 9381

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26 April 2023



Distribution List

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Electronic Copy - WSP Canada Inc.

Executive Summary

The Diavik Diamond Mine (Mine) is located on East Island in Lac de Gras, Northwest Territories. As a requirement of the Environmental Agreement, Diavik Diamond Mines (2012) Inc. (DDMI or Diavik) has completed a Wildlife Monitoring Program (WMP) report each year since 2002. In 2019, the Government of the Northwest Territories (GNWT) issued guidelines for the development of a Wildlife Management and Monitoring Plan (WMMP) (GNWT-ENR 2019). Diavik prepared and submitted a Tier 3 WMMP to the GNWT in July 2020 (DDMI 2020a) in accordance with these guidelines, compliance with the Environmental Agreement, and the fundamental aspects of site monitoring and mitigation previously established and accepted in the WMP. The Tier 3 WMMP was conditionally approved by the GNWT-ENR on 15 July 2022 (GNWT-ENR 2022a). An updated Tier 3 2022 WMMP was prepared based on reviews by the Government of Northwest Territories, Department of Environment and Natural Resources (GNWT-ENR, now Government of Northwest Territories, Department of Environment and Climate Change [GNWT-ECC]), Environmental Monitoring Advisory Board (EMAB) and Environment and Climate Change Canada (ECCC) and submitted to the GNWT-ENR in October 2022 (DDMI 2022a). This Wildlife Management and Monitoring Report (WMMR) aligns with the components and objectives of the WMMP (DDMI 2022a), which consider wildlife issues of concern identified by communities and regulatory agencies. The WMMR provides the analysis and reporting of data collected using the methods described for wildlife valued ecosystem components and other wildlife in the WMMP (DDMI 2022a).

The objective of the WMMR is to collect and analyze information that will assist in determining if there are effects on wildlife in the study area and if these effects were accurately predicted in the Environmental Effects Report (EER). The WMMR also collects data to determine the effectiveness of site-specific mitigation practices and the need for any modifications through adaptive management. The following report documents the data collected and associated results for 2022. Where helpful, comparisons to the information gathered during the previous monitoring (2000 to 2021) and the pre-construction baseline (June 1995 to August 1997) have been included. This report also includes more comprehensive analyses for caribou and wolverine as outlined in the approved Tier 3 WMMP (DDMI 2022a). The last comprehensive analysis report for the Mine's operations phase will be prepared for 2025 as the closure phase is scheduled to begin in mid- 2026.

General observations for each 2022 program include the following:

Landscape Changes

In 2022, the Mine footprint increased by 0.04 square kilometres (km²). The total loss of terrestrial and aquatic habitats to date from mining activities (11.59 km²) is below that predicted in the EER. The current footprint is expected to be at its maximum now for operations. The footprint may expand slightly during progressive reclamation activities on the North Country Rock Pile.

Barren-Ground Caribou

- The total caribou summer habitat loss to date is 2.87 habitat units, which remains below the prediction made in the EER.
- Thirty-eight ground-based caribou behavioural scanning observations were completed in 2022. Observations occurred from March to August, with most occurring from 0 to 15 km from Mine infrastructure. Diavik will no longer monitor caribou behaviour beyond 2022. Future behavioural analyses will instead be informed by collared caribou data.

- There were no Mine-related caribou injuries or mortalities reported in 2022.
- During 2022, the caribou traffic advisory remained at “No Advisory” for the entire year. There were two instances where greater than 100 caribou were observed at one time; however, these sightings were not on or immediately adjacent to the Mine site.
- There were two instances where action was taken to deter caribou away from vehicle traffic and Mine infrastructure in 2022.

Grizzly Bear

- The total direct grizzly bear habitat loss to date is 8.38 km², which is below the amount predicted in the EER.
- In 2022, 75 instances of grizzly bears were recorded on East Island from 3 May to 21 October. Of these, 33 required deterrent actions and 42 did not require deterrent actions. There were no relocation events or mine-related mortalities in 2022.

Wolverine

- Since 2015, snow track monitoring for wolverine included surveys of 40 transects twice so that detection probability could be estimated and incorporated into analyses of relative presence and distribution in the study area. However, due to staff shortages resulting from COVID-19, only one round of snow track surveys has been completed per year from 2020 to 2022.
- A total of 16 wolverine tracks were detected at 12 of 37 transects (32% occurrence) during one sampling visit in 2022. The number of wolverine tracks identified among transects ranged from 0 to 2 tracks. The comprehensive analysis using data from 2008 to 2022 found that wolverine occupancy has remained relatively stable since 2008.
- There were no wolverine relocations or mine-related mortalities in 2022.

Raptors

- In 2022, the GNWT-ECC’s regional raptor nest monitoring surveys were not completed. These surveys are planned to occur every five years, with the next survey scheduled for 2025. The results of the last nest monitoring survey, completed in 2020, are included in a regional database that is managed by the GNWT-ECC.
- A total of 60 Pit Wall/infrastructure inspections were completed from 10 May until 19 September 2022 to determine use by raptors. During the inspections, one peregrine falcon (*Falco perigrinus anatum/tundrius*) nest was confirmed at the Site Services Line Up rock wall. Two nestlings were observed up until 20 August 2022, when no activity was recorded indicating both had successfully fledged. Common raven (*Corvus corax*) nested at the South Tank Farm while American robin (*Turdus migratorus*) nests were recorded at the A21 Portal and the North Inlet Water Treatment Plant.
- Two raptor mortalities of unknown cause occurred at the Mine in 2022. No other incidents involving raptors were reported at the Mine in 2022.

Waste Management

- In 2022, waste inspections at the Waste Transfer Area (WTA), Landfill, Underground waste bins, and at A21 were completed twice per week during the winter and once per week in the summer. During inspections staff identified and removed any improperly disposed waste and recorded all sign of wildlife and activity. Based on the results of inspections, workers are educated on waste management practices as part of adaptive management.
- Throughout 2022, aluminium and plastic containers were collected but have yet to be shipped off the Mine site for recycling. Copper wire was salvaged at the Mine with an approximate value of \$289,680 and donated to the Ragged Riders Snowsport Society, Foster Family Coalition, Bechoko Friendship Centre, Yellowknife Women's Society, Aboriginal Sports Circle, Northern Mosaic Network, and Tulita Land Corp., which supports a youth pre-trades training program in 2022. During 2022 a total of 234,204 litres of waste oil were collected and burned in waste oil heat-generating boilers.
- In 2022, the wind farm generated approximately 17,600 megawatt hours (MWh) of power, which represents an estimated diesel savings of 4.2 million litres.

Study Limitations

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1.0 INTRODUCTION

1.1 Background

Diavik Diamond Mines (2012) Inc. (DDMI or Diavik) completed 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 (Mine; DDMI 2002). Documents that were used in developing the WMP include 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 (EER), Wildlife, Diavik Diamonds Project (DDMI 1998b)
- Wildlife Baseline Report, Diavik Diamonds Project (Penner 1998)

Monitoring by DDMI during construction and operation of the Mine has been used to test impact predictions in the EER (DDMI 1998a,b), evaluate the effectiveness of mitigation, and provide feedback for adaptive management. In 2019, the Government of the Northwest Territories (GNWT) issued guidelines for the development of a Wildlife Management and Monitoring Plan (WMMP) (GNWT-ENR 2019). Diavik initially prepared and submitted a Tier 3 WMMP to the Government of Northwest Territories, Department of Environment and Natural Resources (GNWT-ENR, now Government of Northwest Territories, Environment and Climate Change [GNWT-ECC]) in July 2020 (DDMI 2020a) and subsequently submitted an updated Tier 3 WMMP in November 2021 (DDMI 2021) and October 2022 (DDMI 2022a) in accordance with these guidelines, compliance with the Environmental Agreement, and the fundamental aspects of monitoring and mitigation previously established and accepted in the WMP. This Wildlife Management and Monitoring Report (WMMR) aligns with the components and objectives of the approved WMMP, which consider wildlife issues of concern identified by communities and regulatory agencies. The WMMR provides the analysis and reporting of data collected using the objectives and methods described for wildlife valued ecosystem components (VECs) and other wildlife in the WMMP (DDMI 2022a), which was conditionally approved on 15 July 2022.

Based on reviews and discussions among DDMI, communities, and regulators, the WMMR has evolved under the principles of adaptive management since the original design of the WMP in response to trends observed in the data and changes to objectives, study designs, and methods. Rationale for changes were based on the effectiveness of data to test effects predictions, community concerns, adaptive management principles, and the establishment of regional monitoring programs. Further, community site visits occur annually and provide community members an opportunity to observe Mine operations. Six community visits occurred in 2022, with purposes including community member program participation, Lutselk'e First Nation youth site tour to see job opportunities, and a Lutselk'e First Nation Chief and Council visit to see closure activities.

Due to the large degree of natural variation inherent in ecosystems, it is often difficult to detect indirect effects with only one or two years of data. Therefore, a more comprehensive analysis and discussion of all data from the WMMR has been completed every three years and submitted as a separate report. Separate reporting began in 2004 following requests for more formal statistical analysis of monitoring data by the Environmental Monitoring Advisory Board (EMAB) (EMAB 2004) and GNWT-ENR (ENR 2004).

Since 2010, some WMP and WMMP studies for caribou, grizzly bear, and falcons have been suspended or removed through adaptive management and with consensus among communities, regulators, mine operators, and monitoring agencies after review of these programs at wildlife monitoring workshops (Marshall 2009; Handley 2010). The 2021 Diamond Mine Wildlife Monitoring Meetings hosted by the GNWT-ENR on 2 and 3 of February 2021 determined that the grizzly bear and wolverine hair snagging, and caribou behaviour monitoring programs can be discontinued. Discontinuation of monitoring through adaptive management precludes the need to complete statistical analyses. In 2014, waterfowl monitoring was discontinued following review and agreement by Environment and Climate Change Canada (EC 2013). Of the studies completed in the most recent two comprehensive analysis reports in 2020 and 2017, the wolverine snow track monitoring is the only program at site that remains active and evaluates regional EER predictions. In the context of reporting efficiencies, DDMI no longer completes an independent comprehensive analysis report for wildlife. Instead, all comprehensive statistical analyses related to active monitoring programs are included every three years in the annual WMMR. The last comprehensive analysis report was completed for 2019 (Golder 2020). The last comprehensive analysis during the Mine's operations phase will be prepared for 2025 as closure activities are scheduled to commence in mid-2026. Comprehensive analysis in the 2022 WMMR are provided for wolverine and caribou to fulfill approved WMMP requirements and commitments. For the intermediate years, the annual reports present findings from that year, and summarize cumulative data collected up to that year. If critical issues become apparent in the shorter term, then a discussion of these issues is presented in annual reports.

The objective of this technical report is to summarize results of surveys, inspections, and changes at the Mine in 2022, and include a comprehensive analysis of caribou behaviour and wolverine snow track data to examine indirect Mine-related effects on these VECs. Two caribou behavioural analyses were completed and included in this report. Group scan survey data from 2011 to 2022 were used in a pooled analysis and compared to a previous analysis of survey data from 1998 to 2010 and reported in 2011 (Golder 2011), which showed caribou behaviour changes with distance from Diavik. This caribou group scan analysis was completed to fulfil WMMP Approval Condition 6. The second analysis used caribou collar data from 2006 to 2022 to test for changes to caribou movement in relation to distance from Diavik and Ekati mines. The approach applied in this analysis is to fulfil a request by EMAB (MSES 2022). The caribou and wolverine analysis was designed to test for Mine and natural-related changes in indicator variables (e.g., animal distribution, movement and behaviour) through time (temporal trends) and across space (i.e., to test for a potential zone of influence [ZOI] around the Mine site).

Approval Condition 1 of the Mine's WMMP requires DDMI to provide a specific caribou ZOI analysis plan to the GNWT-ENR for review prior to implementation. DDMI submitted this plan to the GNWT-ENR on 20 February 2023. At the time of submission of this report, the review of the ZOI analysis plan was not complete. An addendum to this report will be submitted at a later date that includes caribou ZOI analyses using collar data from 2006 to 2022. The analysis plan included base habitat model extrapolation, ZOI modelling, and post-hoc comparisons. Telemetry data will be used to derive a base habitat model that accounts for natural variation in caribou distribution. Using the base habitat model, a comparison between predicted relative habitat selection and caribou telemetry locations will be made, with the ZOI inferred by habitat selection and avoidance by caribou. Finally, comparisons between the magnitude of annual-seasonal ZOIs and annual-seasonal indices of mine activity, such as the number of full-time equivalents and fuel consumption, will be completed to test if these variables are correlated.

1.2 Objectives

The overall objectives of the WMMR are to:

- Collect information that will assist DDMI to determine if there are effects on wildlife and if these effects were accurately predicted in the EER.
- Determine the effectiveness of mitigation practices intended to avoid and limit Mine-related effects on wildlife and whether or not these practices and policies require modification.
- Detect effects that were not predicted in the EER.

Objectives specific to wildlife VECs are presented in the following sections.

1.3 Study Area

The Mine is located on East Island in Lac de Gras (Figure 1). The wildlife study area is 1,200 square kilometres (km²) and includes the East and West islands, aquatic habitats, many smaller islands in the northeast portion of Lac de Gras, and the mainland along the southern, eastern, and northern shores of Lac de Gras. An extension to the northwest was made to include the Lac du Sauvage narrows, an important caribou migration corridor (Penner 1998). The local study area during baseline studies (Penner 1998) covered approximately 805 km².

The Mine includes accommodation facilities, operations buildings, haul roads, an airstrip, country rock piles, the A154 and A418 pits and dikes, and A21 dike, and all other infrastructure (Figure 2). In 2012, the Mine was expanded to include the wind farm and access roads to the wind farm. The majority of haul roads required for mining activities are complete. The current footprint is expected to be at its maximum now for operations but may expand slightly during progressive reclamation activities on the North Country Rock Pile.

1.4 Report Organization

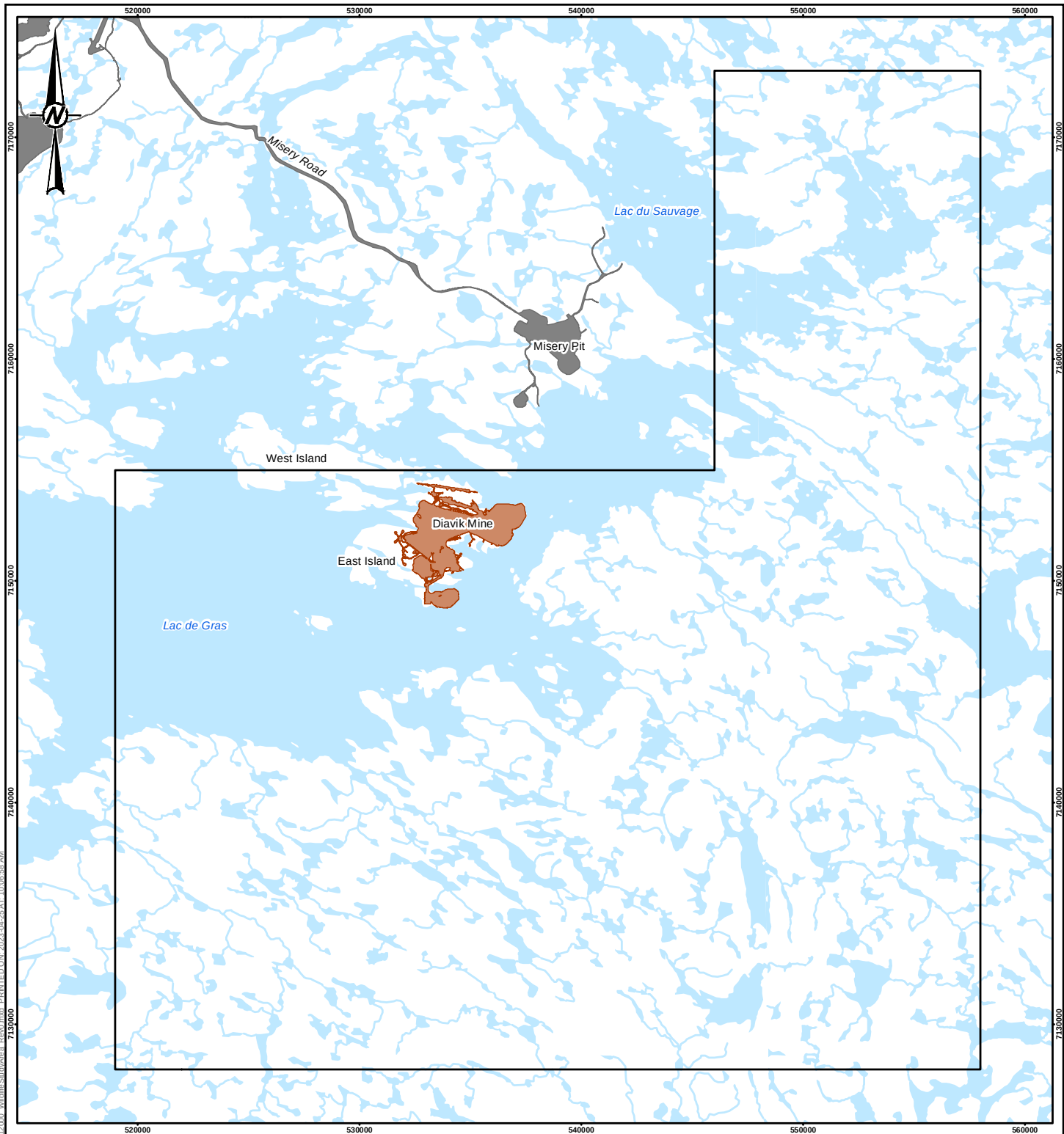
Within each section of this report, data are presented that will be tracked over the life of the Mine.

Recommendations for changes to the WMMR based on adaptive management are presented at the end of each section for consideration and may be incorporated into the WMMR for subsequent years. The WMMP is an evolving management plan that reflects recommendations during previous years, as well as advances in Mine development. Changes will be captured in revisions to the WMMP (DDMI 2022a) and future WMMRs.

The EMAB is an arm's length organization that reviews the WMMR annually and provides comments and recommendations to DDMI (EMAB 2022). WSP Golder (herein referred to as "WSP" with the exception of previous references) provided responses to EMAB comments on the 2021 WMMR (WSP Golder 2022a) in August 2022 (WSP Golder 2022b; Appendix A). Comments resulting in changes to the WMMR are summarized in Table 1.

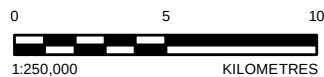
In addition to comments to the WMMR, EMAB also provided comments on the 2021 WMMR Addendum titled: Exploratory Collared Caribou Movement Analysis (WSP Golder 2022c). In response to those comments relevant to the WMMR, additional 3 km zones up to 30 km are being included in the caribou movement analysis, as described above and in Section 4.2.

The GNWT-ENR also provided comments and recommendations to DDMI on the 2022 WMMP (GNWT-ENR 2022b), some of which have implications for the WMMR. WSP provided responses to these comments in October 2022 (WSP Golder 2022d; Appendix B). Comments resulting in changes to the WMMR are summarized in Table 1.



LEGEND

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



REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

RioTinto

PROJECT
DIAVIK DIAMOND MINES INC.

TITLE
DIAVIK WILDLIFE STUDY AREA, 2022

CONSULTANT

wsp

YYYY-MM-DD	2023-04-25
DESIGNED	NM
PREPARED	ANK
REVIEWED	DC
APPROVED	JV

PROJECT NO.
22511717

PHASE
12000

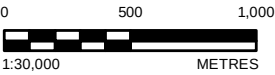
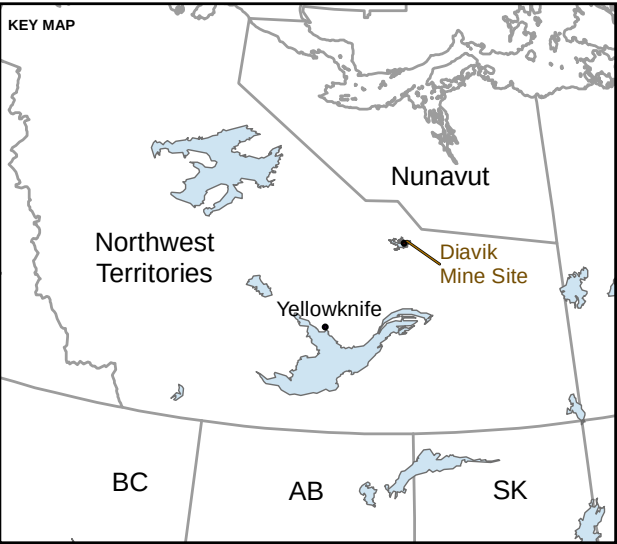
REV.
0

FIGURE
1



LEGEND

● INFRASTRUCTURE



REFERENCE(S)
1. 2022 SPOT IMAGE AND 2020 WORLDVIEW IMAGE OBTAINED FROM CLIENT
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

RioTinto

PROJECT
DIAVIK DIAMOND MINES INC.

TITLE
DIAVIK MINE SITE INFRASTRUCTURE, 2022

	CONSULTANT	YYYY-MM-DD	2023-04-25
	DESIGNED	NM	
	PREPARED	ANK	
	REVIEWED	DC	
	APPROVED	JV	

PROJECT NO.	PHASE	REV.	FIGURE
22511717	12000	0	2

Table 1: Comments on the 2021 WMMR and 2021 WMMP Relevant to the 2022 WMMR

Agency	Comment Identifier / Condition Number ^a	Recommendation / Approval Condition ^a	DDMI Response	WMMR Section
EMAB	DDMI-WMP-10	For reasons described below DDMI-WMP-48, we concur with ENR that Golder 2020 is not a conclusive test of ZOIs around the Mine. We note that in the 2021 WMR, DDMI states they will continue ZOI monitoring using alternative methods and data presented by the ZOI Technical Task Group (GNWT-ZOITTG, 2015). It will be helpful to see annual estimates of the ZOI once DDMI begins analyzing the collar data as closure approaches and activity winds down at the site.	ZOI monitoring and analyzes are described by Diavik's Tier 3 Wildlife Management and Monitoring Plan (WMMP). DDMI intends to examine annual ZOI patterns following ZOI Technical Task Group guidelines (ZOITTG 2015) based on collared caribou data as part of the 2022 Wildlife Management and Monitoring Report. DDMI will prepare a Tier 2 WMMP that will address monitoring during the closure phase. Annual ZOI estimates from collared caribou data (2009 to 2017) for the Diavik-Ekati mine complex are available in Boulanger et al. (2021). The annual ZOI patterns vary from year-to-year and range from negative (attractive) to positive (avoidance) estimates. In four of nine years a ZOI avoidance was not detected. The results of Boulanger et al. (2021) indicate that indirect habitat loss is not constant during mine operations as was assumed in the EER (DDMI 1998b). The presence of negative ZOIs (attraction) also suggests there are occasional increases in the suitability of habitat adjacent to the mines.	2022 WMMR Addendum (to be submitted at a later date)
EMAB	DDMI-WMP-54	To have a clearer understanding of potential wolverine population trends, as inferred by snow track occurrence, we recommend producing a figure annually in the WMMR that is similar to the one provided by DDMI in its' response, in order for reviewers to easily note potential trends by demonstrating the temporal trend in occurrence estimates. We recommend EMAB discuss regional wolverine population trends with ENR and what, if any triggers they have to undertake another round of regional DNA-based population surveys.	Correspondence concluded from Figure 2 (Golder 2021a) was qualitatively assessed from similar temporal trends (measured in the same years) between snow track monitoring designs (IQ = Inuit Qaujimagatuqangit, SRS = simple random sampling) and hair-snagging results (DNA = hair snagging). Figure 2 included demarcation of values in correspondence determination. The requested figure will be included in annual reports. Direct mine-related wolverine mortalities at Diavik continue be infrequent (WSP Golder 2022a), which is a key driver of population demography. Hair snagging is not necessary to determine presence. Snow track counts provide more than presence; the current design (two rounds) provides detection rate and relative abundance. DDMI will provide another copy of the DDMI (2007) to distribute to MSES.	Section 6.3
EMAB	DDMI-WMP-58	Please revise the text and table as necessary. In addition, please clarify what type of satellite imagery is used in this analysis as it provides an understanding of the data resolution used in the landscape analysis. Otherwise, the methods applied for this part of monitoring are adequate.	Thank you for identifying misspellings of "heath" in the 2021 WMMR. A SPOT satellite Image was used in Landscape Change analysis. The resolution of the imagery is 150 cm.	Section 3.1, Section 3.2
EMAB	DDMI-WMP-65	Active deterrence is not required every year; however, when it is reported, it would be helpful if the results included one statement placing them in historical context (e.g., when was the last time it was used? How frequently has it been deployed over the years?). Otherwise, the methods applied for this part of monitoring are adequate.	Historical context of active deterrence for caribou will be provided in the 2022 WMMR.	Section 4.6.2
EMAB	DDMI-WMP-70	The methods applied for raptor monitoring are adequate, no further recommendations. However, we recommend developing a figure showing the number of Mine-related incidents and mortalities by year in each future monitoring report. This will allow for easy interpretation of mortality trends over time and should be easy to update each year.	A figure showing annual Mine-related raptor mortalities will be included in the 2022 WMMR.	Section 7.2.2
GNWT-ENR	1	Given the lack of detail provided about the methods that will be used for ZOI analysis, DDMI will submit to ENR a detailed description of their proposed ZOI analysis methods, including which metrics of mine activity levels will be included as covariates in the analyses and how they will be derived, at least six months prior to the submission of the comprehensive WMMP report in 2023. ENR will circulate the description of proposed ZOI analysis methods for a 30-day review period, and DDMI will respond to reviewer comments and indicate how feedback will be incorporated in the comprehensive WMMP.	DDMI proposed that Condition 1 be changed to state that completion of the analysis and reporting will occur within 6 months following the review period and DDMI's responses. The ZOI analysis would be provided as an Addendum to the 2022 Wildlife Management and Monitoring Report (WMMR), which would be delivered by the 30 April 2023 deadline (as per Condition 7). The WMMR would include a description of the progress on the ZOI analysis.	Section 1.1

Table 1: Comments on the 2021 WMMR and 2021 WMMP Relevant to the 2022 WMMR

Agency	Comment Identifier / Condition Number ^a	Recommendation / Approval Condition ^a	DDMI Response	WMMR Section
GNWT-ENR	2	DDMI will ensure that Section 5.4.3 of the WMMP clarifies that, although comprehensive analysis and reporting of ZOI will occur in 2023 (which will include data up to the end of 2022), and at the end of closure and in post-closure, in each of these reporting periods annual estimates of ZOI will be reported for all intervening years in which an adequate sample is achieved. Analyses for ZOI will include a covariate(s) reflecting variation in the annual level of mine activity. The year for reporting in post-closure will be identified in the Tier 2 WMMP submitted for the closure/post-closure phase.	The ZOI analysis for the 2022 WMMR will include all applicable collar data up to the end of December 2022. The analysis will include mine activity indices (covariates). The analysis for closure and post-closure would include a covariate(s) for mine activity; further details to be provided in the Tier 2 WMMP for the closure/post-closure phases. Since a new Tier 2 WMMP will be required for the closure/post-closure period, DDMI's Tier 3 WMMP revision will remove reference to the closure/post-closure monitoring.	2022 WMMR Addendum (to be submitted at a later date)
GNWT-ENR	5	DDMI will increase the blast exclusion zone for caribou to a minimum of 1 km in Section in 4.1.2.	DDMI has revised the blast exclusion zone threshold to 1 km in the WMMP.	Section 4.7
GNWT-ENR	6	DDMI will collaborate with EMAB and submit a plan to ENR for approval within 120 days of receipt of this Reasons for Decision that will indicate how it will improve the ability of the caribou behaviour monitoring program, using both group scans and focal observations, to generate results that will contribute to the monitoring objective “to determine if caribou behaviour changes with distance from the mines.”	The 2021 Mine Wildlife Meeting minutes prepared by ENR (GNWT-ENR 2021), identify other approaches can be used to monitor caribou behaviour and suggest the use of geo-fence collars for behaviour analysis. DDMI will revise the WMMP to replace caribou group scan methods with collar behaviour analysis. Collaboration with EMAB on planning group scans is no longer necessary because DDMI is discontinuing group scan behavioural monitoring. DDMI will also use existing group scan data in a “pooled” analysis and compare to the 2011 results as part of the 2022 WMMR. Note that DDMI has never collected focal scan behaviour data.	Section 4.3

^a Comment Identifier and Recommendations refer to EMAB comments on the 2021 WMMR (EMAB 2022). Condition Number and Approval Conditions refer to GNWT-ENR conditions on the 2022 WMMP (GNWT-ENR 2022a) .

2.0 COMMUNITY ENGAGEMENT AND TRADITIONAL KNOWLEDGE

Diavik engages with local Indigenous communities and values community feedback and insights about how Diavik operates the Mine and monitors the environment or may be affecting the environment. As part of their commitment to the environment, Diavik incorporates available Traditional Knowledge in environmental plans and monitoring programs. For Diavik's WMMR, Traditional Knowledge has been incorporated through:

- study design
- wildlife ecology and the interpretation of monitoring results
- community participation with data collection

Incorporation of Traditional Knowledge into study design of monitoring programs has occurred for caribou habitat, grizzly bear, and wolverine. For caribou, Diavik and the Tłıchq Government carried out a Traditional Knowledge study in the summer of 2013 through a series of workshops and site visits where four participating elders from Tłıchq and Lutsel K'e shared stories and knowledge about caribou migration, preferred habitats (vegetation communities and landscape features), and traditional land use (Tłıchq 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, Traditional Knowledge shared in this study has also been considered in the interpretation of monitoring results (see Appendix I of Golder 2017). Elders in the 2013 Traditional Knowledge 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 has also been incorporated into the caribou scan surveys through means of a questionnaire. When elders are present, observed caribou are commented on from an animal health and traditional use perspective.

In 2012, the Diavik and Ekati mines collaborated on a new regional scale grizzly bear monitoring program because past mine-specific monitoring programs yielded inconclusive results from highly variable data (Handley 2010). The regional grizzly bear program involved hair snagging methods and included Traditional Knowledge holders to determine the best locations for hair snagging devices (Section 5; ERM 2014). From 2003 to 2006, the study design and data collection for wolverine snow track monitoring was based on the experience of Inuit Qaujimajatuqangit to locate transects and record wolverine snow tracks (Section 6).

Diavik's Traditional Knowledge Panel provides recommendations to Diavik. In 2021, the Traditional Knowledge Panel made recommendations to aspects of the caribou monitoring program, which included Rio Tinto Exploration recording caribou numbers, behaviour, and other metrics related to individual health (e.g., size, approximate weight) as well as implementing a wildlife scat collection program in and proximal to the Mine for purposes of dietary analysis (Det'on Cho Environmental 2022). DDMI provided responses to these recommendations in 2022. Caribou will be monitored to the fullest extent possible by DDMI Operations; however, it was noted that Rio Tinto Exploration does not have the expertise to assess the requested metrics. DDMI also noted that caribou scat is collected by the GNWT-ECC, and additional scat collection is outside of the scope of the monitoring program outlined in the WMMP (Det'on Cho Environmental 2022).

Where possible, Diavik tries to include community members in environmental monitoring annually. For example, Earnest (Patty) Lockhart from Lutsel K'e Dene First Nation participated in wolverine snow track surveys in 2022 (Section 6.3). Communities have participated in a variety of programs over the history of monitoring by Diavik (e.g., Golder 2018) and this has been documented in past reports. The WMMR is anticipated to evolve as Diavik receives input through community engagement, regulatory workshops, site visits, and Traditional Knowledge studies.

3.0 LANDSCAPE CHANGES

The scope of the landscape component of the WMMR is to determine if vegetation and surface water loss are within the magnitude or amounts predicted in the EER (DDMI 1998b). East Island vegetation cover is predominantly characterized by heath tundra, and tussock / hummock landscape classes, but Mine construction and operation have also resulted in the loss of shallow and deep water. The main change from the Mine on the landscape is direct disturbance, which will be a long-term effect as the recovery of vegetation is slow in Arctic environments (Burt 1997).

Diavik conducts ongoing monitoring to determine if dust from the Mine is affecting vegetation communities, and lichen and soil chemistry. 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. The 2021 Comprehensive Vegetation and Lichen Analysis Report indicated that the next cycle of vegetation monitoring should occur in three years (i.e., 2024) based on dustfall trigger exceedances (Golder 2019a, 2022).

The objective of this component of the WMMR is to:

- Determine if direct vegetation/habitat loss due to the Mine footprint exceeds the prediction of 12.67 km².

3.1 Methods

A Satellite pour l'Observation de la Terre (SPOT) satellite image with a resolution of 150 cm was obtained and used to update the area of the current Mine footprint. The image was laid over the Ecological Landscape Classification (ELC) developed by the GNWT-ENR (Matthews et al. 2001). Each ELC type disturbed by the Mine was selected and calculations were 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 1998a), the actual Mine footprint, and the ELC classification (Matthews et al. 2001). All analysis was completed in Geographic Information System software (GIS) (ArcGIS, Redlands, CA).

3.2 Results

As of December 2022, a total area of 11.59 km² has been altered since Mine construction in 2000. This represents a relative loss of 91.5% of predicted landscape disturbance (DDMI 1998a). Landcover types at or slightly exceeding the predicted loss include riparian shrub, birch seep and shrub, boulder complex, disturbed, and esker (Table 2). In 2022, the ELC types that changed included heath tundra (<0.01 km²), heath boulder (0.01 km²), health bedrock (0.01 km²), bedrock complex (0.01 km²), and sedge wetland (0.04 km²). The North Country Rock Pile footprint may increase slightly during operations as a result of progressive reclamation activities but the remainder of the footprint is not expected to increase during operation and remain at or below the prediction. The annual geographic extent of landscape disturbed from the Mine footprint is illustrated in Figure 3.

Table 2: Total and Predicted Ecological Landscape Classification Unit Loss (km²) Associated with Mine Development Phases, 2000 to 2022

ELC Type	Construction and Open Pit Mining (2000 to 2005)	Open Pit Mining (2006 to 2009)	Underground Mining (2010 to 2016)	A21 Pit Development (2017 to 2022) ^(a)	Predicted ^(b)
Heath Tundra	2.60	2.94	3.28	3.65	3.68
Heath Bedrock (30% to 80%)	0.45	0.56	0.61	0.65	0.78
Heath Boulder (30% to 80%)	1.06	1.47	1.64	1.77	1.89
Tussock/Hummock	1.19	1.41	1.50	1.61	1.64
Sedge Wetland	0.16	0.21	0.22	0.25	0.26
Riparian Shrub	0.03	0.03	0.03	0.04	0.03
Birch Seep and Shrub	0.08	0.09	0.10	0.11	0.11
Boulder Complex	0.03	0.04	0.05	0.05	0.05
Bedrock Complex	0.05	0.06	0.06	0.07	0.07
Esker Complex	0.17	0.17	0.17	0.17	0.16
Disturbed ^(c)	0.05	0.06	0.06	0.06	0.06
Shallow Water	0.29	0.34	0.40	0.44	0.48
Deep Water	1.93	2.12	2.63	2.71	3.46
Total ^(d)	8.10	9.50	10.75	11.59	12.67

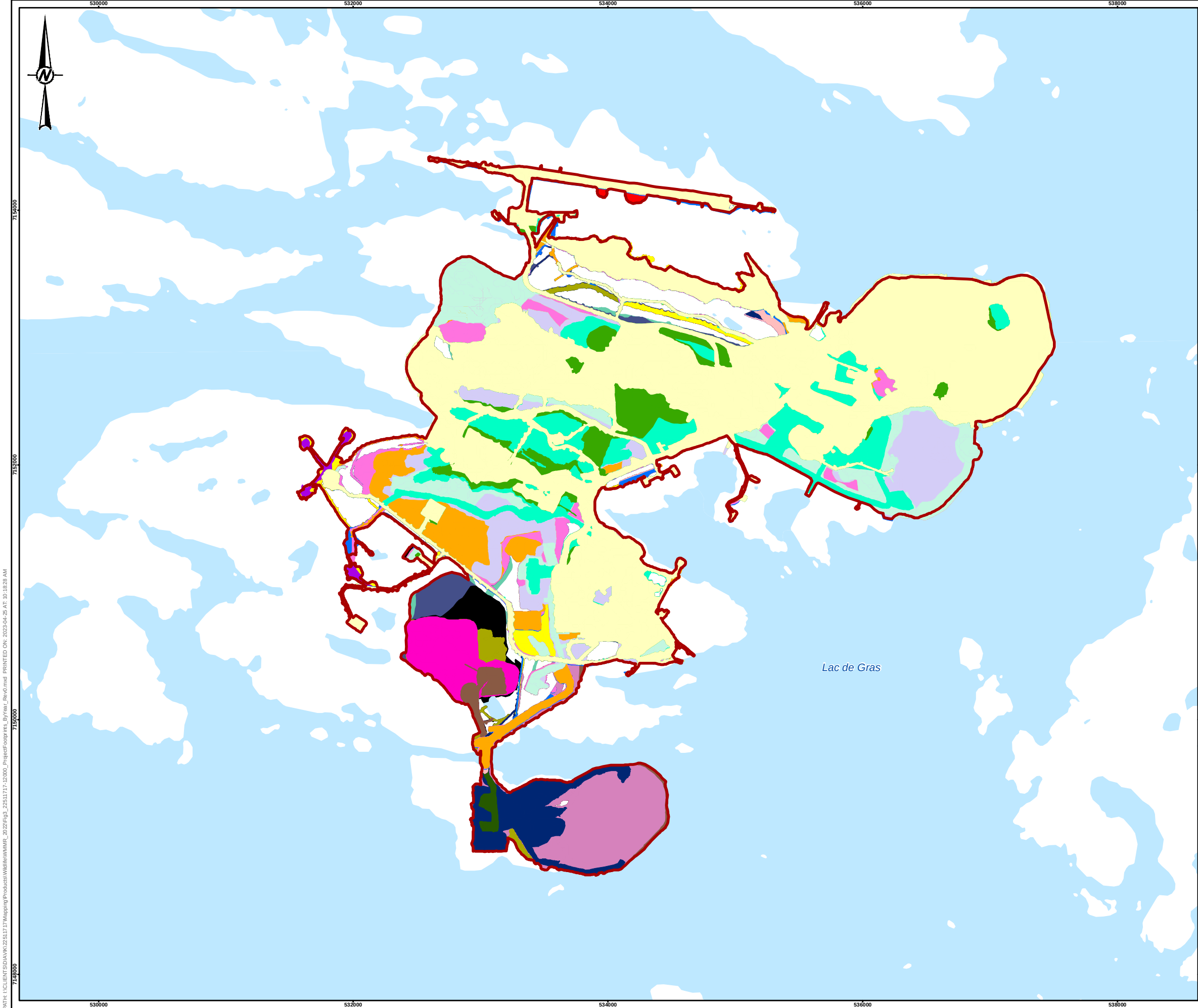
(a) Also represents cumulative loss to 2022.

(b) From DDMI 1998a.

(c) Disturbed includes areas that were already disturbed by exploration activities when the ELC was created.

(d) Any discrepancies in totals across the rows results from the rounding of numbers in annual columns for presentation purposes.

km² = square kilometres; % = percent.



LEGEND

MINE PERIMETER 2022

WATERBODY

DISTURBANCE (2002-2021)

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

2018

2019

2020

2021

2022

KEY MAP

REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

PROJECT

DIAVIK DIAMOND MINES INC.

TITLE

MINE FOOTPRINT EXPANSION BY YEAR, 2002 TO 2022

CONSULTANT

YYYY-MM-DD	2023-04-25
DESIGNED	NM
PREPARED	ANK
REVIEWED	DC
APPROVED	JV

PROJECT NO.	PHASE	REV.	FIGURE
22511717	12300	0	3

4.0 BARREN GROUND CARIBOU

The Mine is within the spring (northern migration), summer, and fall/rut seasonal ranges of the Bathurst caribou herd (Gunn et al. 2002) and more recently in the shifted winter range. Caribou of this herd may travel through the Lac de Gras area during the northern migration to the calving grounds, and forage and move through the area during the summer and fall periods, sometimes following shorelines and onto the West and East Islands. Caribou from the Ahiak and Beverly caribou herds may also have ranges that overlap with the Mine to a lesser extent based on collared animal locations. At the time of this report, wintering caribou were present in the study area and caribou collar locations suggest these animals were most likely from the Beverly/Ahiak and Bathurst herds. While caribou from different herds may interact with the Mine, mitigation used by the Mine is designed to protect all caribou from any herd.

In 1996, the mean population size ($\pm$ 95% confidence interval) of the Bathurst caribou herd was estimated at 349,000 $\pm$ 95,000 (Case et al. 1996; Gunn et al. 1997). The most recent population estimate determined by GNWT-ENR in 2021 was 6,240 animals (GNWT-ENR 2023). Although the Beverly and Ahiak herds are not monitored as intensively as the Bathurst herd, the last census for the Ahiak herd was in June of 2011 and estimated 71,340 individuals (COMA 2020). The population of the Beverly herd was estimated to be 103,372 individuals in 2018 (COMA 2020). 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).

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 2023). To support the recovery of all barren-ground caribou herds, the 2020 Recovery Strategy for Barren-Ground Caribou in the Northwest Territories was developed (COMA 2020). The overall goals of the strategy are to (COMA 2020):

- Maintain or restore self-sustaining, resilient populations of each barren-ground caribou herd, such that no herd is lost.
- Support and maintain the caribou-people relationship.
- Promote conditions that allow caribou to move and migrate across their historic ranges without barriers.
- Promote the conditions necessary for recovery.

The Conference of Management Authorities (COMA), which is comprised of wildlife co-management boards and governments in the NWT, has outlined five objectives to obtain this goal (COMA 2020):

- Partners collaborate on the development and implementation of management, monitoring, guardianship, and conservation plans for barren-ground caribou in the NWT.
- Monitor barren-ground caribou, their habitat, and key factors and threats that may be affecting the status and health of herds in the NWT.
- Fill knowledge gaps, using traditional, community, and scientific knowledge, to enhance responsible and respectful barren-ground caribou conservation.
- Conserve and protect barren-ground caribou populations and their habitat.
- Provide education and promote respect for barren-ground caribou, their habitat, and conservation initiatives.

The strategy outlined the need to monitor the effects of predators on caribou as predation was considered a factor that could be managed. Wolves are the most important year-round natural predator of barren-ground caribou and knowledge of wolf numbers could help understand fluctuations in caribou populations and provide information required to support management decisions. In 2019, GNWT-ENR developed a Bathurst Caribou Range Plan (GNWT-ENR 2019), 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 Bathurst Caribou Range Plan, which has a proposed moderate development level and status of cautionary. Mitigation included in the WMMP (DDMI 2022a) is consistent with mitigation prescribed in the Bathurst Caribou Range Plan for developments in Area 2.

4.1 Habitat Loss

Physical alteration of the landscape reduces available caribou forage (DDMI 1998b). 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). Habitats were rated on a scale of 0 to 1 HUs for their capability to support caribou, with values greater than 0.30 regarded as highly suitable habitat and values less than 0.25 rated as low suitability for caribou. The area of each habitat type on East Island was multiplied by its habitat suitability value to determine the number of foraging habitat units available to caribou.

One objective of the caribou component of the WMMR is to determine if direct summer habitat loss (in habitat units [HUs]) is greater than predicted. The impact prediction in the EER (DDMI 1998b) is:

- At full development, direct summer habitat loss from the project is predicted to equal 2.965 HUs.

Dust deposition can also alter the landscape either by positively influencing vegetation vigour through deposition of nutrients and increased snowmelt rates, or by reducing plant growth by coating leaves and adversely changing soil chemistry. Both mechanisms can lead to a change in plant communities, and forage quality and quantity for caribou. Diavik also monitors for the effect of dust deposition on vegetation (including lichen) and soil chemistry (Section 3.0).

4.1.1 Methods

Using the ELC unit loss (Table 2), the area (km²) of ELC lost was multiplied by its habitat suitability value (DDMI 1998b) to determine habitat units lost.

4.1.2 Results

Direct summer habitat loss to date from the Mine is approximately 2.867 HUs (Table 3). As noted above, ELC unit loss is below the level predicted in the EER (Table 2). Similarly, total direct losses of summer HUs for caribou are currently below that predicted in the EER (Table 3).

Table 3: Caribou Summer Habitat Unit Loss to 2022

ELC Type	Habitat Suitability Value	Cumulative ELC Loss to 2022 (km ²)	Cumulative Habitat Unit Loss to 2022
Heath Tundra	0.37	3.65	1.352
Heath Boulder	0.40	1.77	0.708
Riparian Shrub	0.46	0.04	0.020
Bedrock Complex	0.27	0.07	0.018
Tussock/Hummock	0.30	1.61	0.484
Sedge Wetland	0.28	0.25	0.069
Esker Complex	0.30	0.17	0.052
Birch Seep and Shrub	0.11	0.11	0.012
Boulder Complex	0.21	0.05	0.011
Heath Bedrock	0.23	0.65	0.150
Total^(a)	-	8.35	2.867

(a) Any discrepancies in totals result from the rounding of numbers for presentation purposes.

4.2 Changes to Movement

In this section of the WMMR, collar data from Beverly/Ahiak and Bathurst caribou herds, from 2010 to 2022, were analysed following Poole et al. (2021) to evaluate changes in caribou movement at differing distances from Diavik and Ekati mines. In 2021, Poole et al. provided the first exploratory analysis of geo-fence collar data and caribou interactions with the Ekati mine. DDMI committed to completing a similar analysis of geo-fence caribou collar data, following Poole et al.'s (2021) approach and in relation to the Diavik mine. These initial movement analyses were submitted as an addendum (WSP Golder 2022c) to the 2021 WMMR (WSP Golder 2022a). EMAB recommended that additional 3-km buffer zones (up to 30 km from the Diavik mine) be used to further quantify patterns of movements at further distances (MSES 2022). This section of the 2022 WMMR provides an update to the initial movement analyses conducted by Diavik (WSP Golder 2022c) and incorporates 3-km buffer zones, as recommended by EMAB (MSES 2022).

In the first portion of the caribou movement analyses presented herein, three movement metrics (i.e., residency, speed, and proportion of hard turns) are compared between caribou using 3-km buffer zones within 30 km of the Diavik-Ekati mine complex (or mine complex) and a Reference Group of caribou. The Reference Group includes caribou using areas 30 to 111 km from the Diavik-Ekati mine complex. In the second portion of the caribou movement analyses, two of these movement metrics (i.e., speed and proportion of hard turns) are evaluated using generalized linear mixed-effect models (GLMMs) and predictor variables such as ecological landcover classification and individual caribou attributes. The overall objectives of these movement analyses are to test for changes in caribou movement metrics between animals using areas adjacent to the mine complex and a Reference Group.

4.2.1 Methods

4.2.1.1 Cleaning Telemetry Data

Telemetry data from caribou in the Bathurst and Beverly/Ahiak herds from 11 April 1996 to 31 December 2022 were provided by the GNWT-ENR. Seasonal range information, based on telemetry data provided, are available in Appendix C. Telemetry data were collected from both male and female caribou from the Bathurst and Beverly/Ahiak herds; however, a higher proportion of female caribou were equipped with collars (Table 4). Satellite collars deployed from 1996 to 2005 were generally programmed to collect location data at fix rates greater than 24 hours. In some cases, satellite collars collected location data more frequently (i.e., 8 to 24-hour fix rates), but this was not common. Beginning in 2006, GPS collars were more commonly deployed, which typically provided more accurate and precise location estimates than satellite collars. Most collars deployed from 2008 to 2015 collected location data every 24 hours, while some had an 8-hour fix rate, and few had a fix rate of 1 to 3 hours during specific seasons. Almost all collars deployed after 2015 were geo-fence collars, which were programmed to collect location data at 8-hour fixes but increased to 1-hour fixes when a caribou triggered a 'geo-fence' by travelling within a 30 km radius of the Diavik-Ekati mine complex.

Multiple steps were taken to filter out imprecise and erroneous locations from the telemetry dataset. Duplicate telemetry data were identified and removed, which included entirely duplicated records as well as records with duplicated timestamps from the same individual despite varying information in other columns. Records missing location data were also removed. Further, records with a timestamp of "00:00:00 00:00:00" were flagged and removed based on guidance from the GNWT-ENR, because these records were improperly recorded (*email comm*, GNWT-ENR). Some data records had been assigned a collar type of 'GPS' but were imprecise locations that were calculated as doppler locations from collars according to the GNWT-ENR (*email comm*, GNWT-ENR). The first two weeks of data collected from each collar were removed to exclude locations that may have been influenced by behavioural effects from capture events (Werdel et al. 2021). All telemetry locations collected before 2010 were excluded from analyses and location data collected from collars with fix rates greater than 24 hours were also removed following Poole et al. (2001).

The field "Class" in the dataset was used to filter records collected with adequate precision and/or accuracy, where Classes "2", "3", "5", "GPS", and "A" were retained because these classes indicated that the location data was estimated with an accuracy of either a 500 m radius (Class "2"), 250 m radius (Class "3"), from a GPS collar where accuracy is better than 100 m (Class "5" and "GPS") or that the location was estimated from three or more messages, indicating higher accuracy (Class "A"). Remaining classes were removed, including Class "1", "B", "Z", and "NA". In addition, caribou-years with less than 10 records were excluded. The final cleaned dataset consisted of 674,786 records from the Bathurst herd and 456,707 from the Beverly/Ahiak herd. Unlike Poole et al. (2021), the movement analyses presented herein included male caribou. Inclusion of male caribou and satellite collar locations helped provide greater understanding of caribou movement behaviours around the Diavik-Ekati mine complex. Figure 4 presents the filtered telemetry locations from caribou in the Bathurst and Beverly/Ahiak herds from 2010 to 2022.

Telemetry data from a total of 358 caribou ($n = 213$ Bathurst caribou; $n = 145$ Beverly/Ahiak caribou) were used in the movement analyses, resulting in 794 caribou-years ($n = 485$ Bathurst caribou-years; $n = 309$ Beverly/Ahiak caribou-years; Table 4). The mean duration that data were collected from caribou during the study period (i.e., 2010–2022) was 1.3 years (standard deviation [SD] = 0.9) and 0.5 years (SD = 0.4) for the Bathurst and Beverly/Ahiak herds, respectively. The mean number of telemetry locations collected from collared caribou during the study period was 2,384 locations (SD = 2,061) in the Bathurst herd and 1,051 locations (SD = 1,200) the Beverly/Ahiak herd.

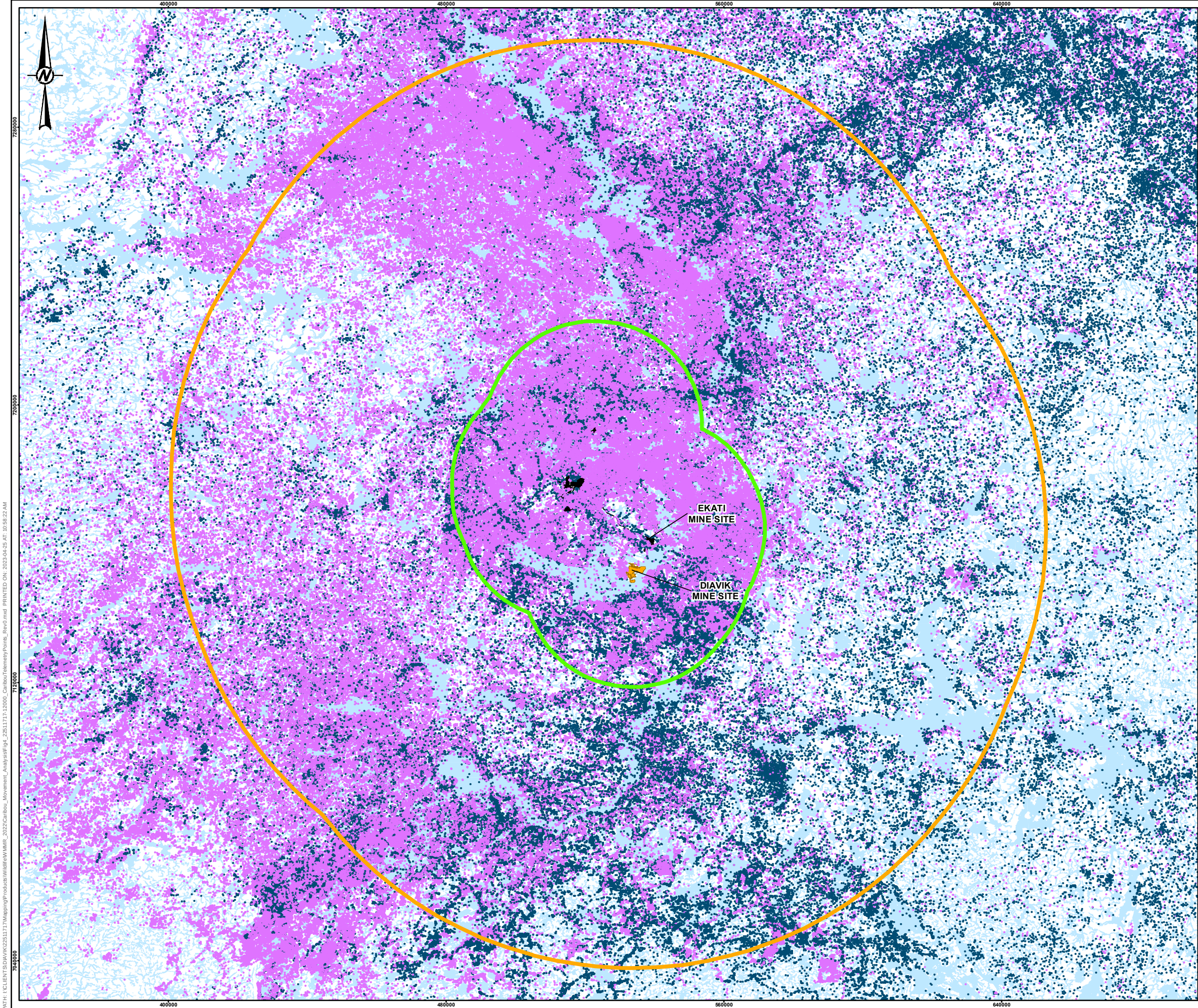
Table 4: Summary of Collared-Caribou Data from the Bathurst and Beverly/Ahiak Herds used in the Movement Analysis, 2010 to 2022

Herd	Count type	Count of collared caribou		
		Female	Male	Total
Bathurst	Caribou	153	60	213
	Caribou-years	352	133	485
Beverly/Ahiak	Caribou	89	56	145
	Caribou-years	179	130	309

After the telemetry data were filtered according to the criteria above, data records were assigned a biological year and season. A biological year was defined as the time from the start of spring migration until the end of winter the following year (e.g., 20 April 2020 to 19 April 2021). For example, a caribou location collected on 16 January 2021 would be classified into the 2020 biological year. Sorting by biological year rather than calendar year is important so that the data collected during the same winter season can be evaluated together, rather than being split into two separate years. Data were sorted into six seasons (Table 5), which were defined according to Poole et al. (2021).

Table 5: Caribou seasons, defined by Poole et al. (2021).

Season	Date Range
Spring migration	20 April – 1 June
Calving	2 June – 16 June
Post-calving	17 June – 28 June
Summer	29 June – 6 September
Fall	7 September – 30 November
Winter	1 December – 19 April



LEGEND

- BATHURST TELEMETRY LOCATION
- BEVERLY TELEMETRY LOCATION
- WATERCOURSE
- DIAVIK FOOTPRINT
- EKATI FOOTPRINT
- 30 KILOMETRE BUFFER ZONE AROUND THE DIAVIK AND EKATI MINE COMPLEX
- 111 KILOMETRE BUFFER ZONE AROUND THE DIAVIK AND EKATI MINE COMPLEX
- WATERBODY

INSET MAP

REFERENCE(S)

1. CARIBOU TELEMETRY DATA PROVIDED BY ENR, GNWT.
2. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

PROJECT

DIAVIK DIAMOND MINES INC.

TITLE

FILTERED TELEMETRY LOCATIONS COLLECTED FROM COLLARED BARREN-GROUND CARIBOU IN THE BATHURST AND BEVERLY/AHIAK HERDS, 2010 – 2022

CONSULTANT	YYYY-MM-DD	2023-04-25
	DESIGNED	SW
	PREPARED	NO/AK
	REVIEWED	DC
	APPROVED	JV

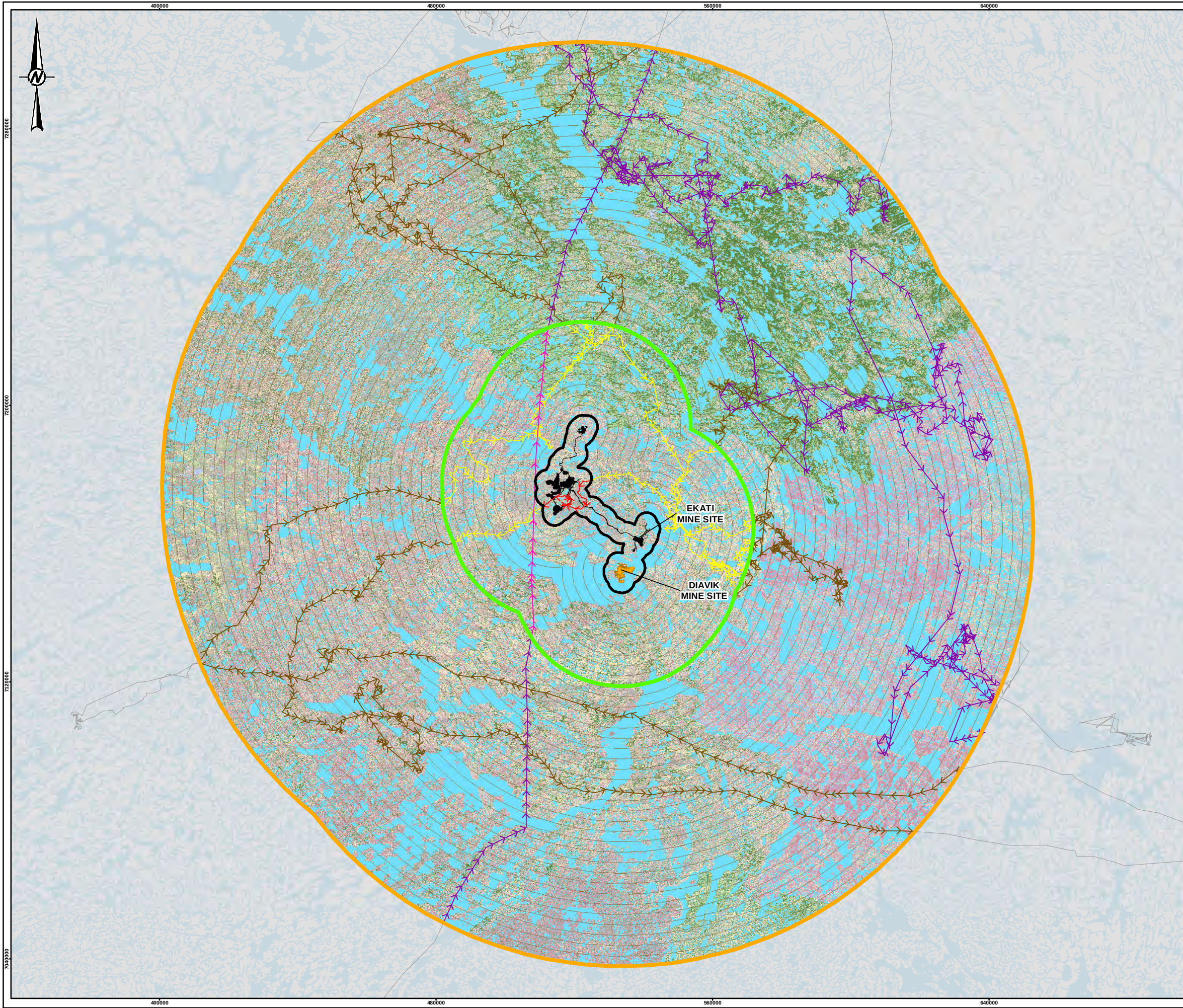
PROJECT NO.	PHASE	REV.	FIGURE
22511717	12000	0	4

4.2.1.2 Movement Metrics

A main goal of this analysis was to assess if caribou close to the Diavik-Ekati mine complex had substantially different movement metrics than caribou far from the mine. To test the effect of distance from the mine complex, 3 km wide 'test' buffers were generated surrounding the Diavik-Ekati mine complex, from a 0–3 km buffer zone to a 27–30 km buffer zone. The 30-km buffer zone was chosen as the outermost buffer zone for the test buffers following Poole et al. (2021), who chose this outermost buffer because it was approximately double the mean distance of the modelled zone of influence (ZOI) for the Diavik-Ekati mine complex on caribou (i.e., ZOI = 7–14 km; Boulanger et al. 2012, 2021). In addition, 3 km-wide 'reference' buffers were generated from 30–33 km to 108–111 km buffer zones. The 111-km buffer zone was chosen as the outermost 'reference' buffer, because this was the maximum spatial extent of existing landcover data, which was used in modelling movement metrics described in Section 4.2.2.3.

All caribou paths that were within the reference buffers (i.e., 30 to 111 km) were referred to as the Reference Group and were compiled by herd. As described below, movement metrics were calculated within the test buffer zones and the Reference Group of each herd, which allowed for comparisons between movement metrics of caribou within 30 km of the mine complex and caribou outside 30 km. It was assumed that movement metrics from the Reference Group (>30 km) would not be affected by activities at the Diavik-Ekati mine complex, which is consistent with Poole et al. (2021). Figure 5 shows the 3 km-wide test and reference buffer zones and demonstrates how movement paths were segmented within buffer zones, as described below.

PATH: I:\CLIENT\SONIK\2511717\Maping\Products\WML\ANMAR_2022\Caribou_Movement_Analysis\Fig_251171713000_CaribouTrajectories_Rev0.mxd PRINTED ON: 2023-04-25 AT 11:13:09 AM



LEGEND

WATERCOURSE

DIAVIK FOOTPRINT

EKATI FOOTPRINT

3 KILOMETRE BUFFER ZONE AROUND THE DIAVIK AND EKATI MINE COMPLEX

30 KILOMETRE BUFFER ZONE AROUND THE DIAVIK AND EKATI MINE COMPLEX

111 KILOMETRE BUFFER ZONE AROUND THE DIAVIK AND EKATI MINE COMPLEX

MULTIPLE RING 3 KM BUFFER TO 111 KM

WATERBODY

LANDCOVER

BRYOIDS

CONIFER

EXPOSED LAND/ROCK

LOW SHRUB/HERB

MIXED/DECIDUOUS

WATER/SNOW/ICE

WETLAND

PATH OUTSIDE OF 111 KILOMETRE BUFFER

BATHURST 2012 PATH BGCA12404

3 KM - 30 KM

30 KM - 111 KM

BATHURST 2021 PATH BGCA21702

0 KM - 3 KM

3 KM - 30 KM

30 KM - 111 KM

INSET MAP

03060

1:1,100,000KILOMETRES

REFERENCE(S)

1. PATHS DERIVED FROM CARIBOU TELEMETRY DATA PROVIDED BY ENR, GNWT.

2. EOSD LANDCOVER PROVIDED BY NRCAN.

3. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

PROJECT

DIAVIK DIAMOND MINES INC.

TITLE

EXAMPLES OF TWO CARIBOU-YEARS WITH MOVEMENT PATHS INSIDE BUFFER ZONES AROUND THE DIAVIK AND EKATI MINE COMPLEX, 2012 AND 2021

CONSULTANT

YYYY-MM-DD

2023-04-25

DESIGNED

GE

PREPARED

ANK

REVIEWED

DC

APPROVED

JV

PROJECT NO.

22511717

PHASE

12000

REV.

0

FIGURE

5

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The filtered telemetry dataset was input into a Geographic Information System (GIS; ESRI 2011), and movement paths (steps) were created for each caribou as spatial polylines using the XY to line tool in ArcGIS (ESRI 2011). Paths are the straight-line steps that connect consecutive caribou locations. Caribou paths were overlaid on top of the 3 km-wide test and reference buffer zones in a GIS (ESRI 2011), and if they crossed a buffer zone boundary, they were segmented at the buffer zone boundary and each segment was assigned to the applicable buffer zone. Figure 5 depicts how two movement paths from caribou-years were segmented within test and reference buffer zones.

All segmented paths were given a unique code (ID) that identified the original path it was derived from and the order of occurrence in the original path (e.g., “200-2” referred to the second segment of path 200). Segmented paths did not have a timestamp associated with them, so multiple steps were taken to assign each segmented path a revised timestamp. First, the length of each original path and segmented path were calculated in kilometres in a GIS. Then, the duration (time length) of each segmented path was calculated by dividing the distance of a segmented path by the total distance of its original path and multiplying the proportionate length by the fix rate of the original path. This calculation resulted in a duration (hours) for each segmented path. Next, segmented paths were grouped by their original path and then ordered using their unique ID, which ordered the segmented paths consecutively. A cumulative duration was calculated for each segmented path by summing the duration of each segmented path with the durations of the previous segmented paths from the original path. Finally, a new timestamp was estimated for each segmented path by adding its cumulative duration with the timestamp from the previous original path. These segmented paths represent the movement paths in the analysis.

Movement metrics calculated for this analysis included residency, speed (i.e., movement rate), and proportion of hard turns (i.e., calculated from turning angle), and were calculated for all movement paths within each of the 3 km-wide test and reference buffer zones. Movement metrics were calculated and summarized in R v. 4.0.3 (R Core Team 2022). Residency was calculated as the percent duration of a season (%). To do this, the total amount of time (i.e., duration [hours]) that each caribou's movement paths remained in a buffer zone was summed per year and season, and then was divided by the total hours within the corresponding season. Mean residency (%) per test buffer zone plus 2 standard deviations (SD) was estimated for each herd by season and year. Residency was also calculated for the Reference Group by herd and season as mean residency (plus 2 SD) across years and buffer zones (30 to 111 km).

Speed (i.e., movement rate) was calculated for each movement path, regardless of buffer zone, as the distance moved per hour (i.e., km/hr) by dividing the distance of each path (kilometres) by the duration (in hours) of each path (as described above). For each herd and season in a biological year, a mean speed (plus 2 SD) was also calculated by averaging caribou movement rate within each 3-km test buffer zone. Additionally, a mean speed (plus 2 SD) was calculated for the Reference Group by herd and season across years and reference buffer zones.

Turning angle was calculated as the relative difference in headings between two consecutive movement paths using the *adehabitatLT* package (Calenge 2006). If a sequential movement path was missing from the dataset (i.e., due to data cleaning and/or missed GPS fixes), a turning angle could not be calculated. Records without turning angles were removed from the dataset before summarizing turning angle information, resulting in a smaller sample size of turning angles (versus residency and speed datasets). Turning angles were first calculated in radians but were converted to degrees for easier interpretation. For simplicity, only the absolute value of turning angles were reported because it did not matter whether a caribou turned to the left or right but, rather, if they deviated from their heading (Poole et al. 2021). Following Poole et al. (2021), turning angles were identified as a ‘hard turn’ if the absolute turning angle was ≥ 60 degrees. The mean proportion of hard turns (plus 2 SD) were calculated for each herd within each of the 3 km-wide test buffer zones by season and year. The mean proportion of hard turns (plus 2 SD) were also calculated for the Reference Group by herd and season across biological years and buffer zones.

Comparisons between metrics calculated for test buffer zones with the Reference Group helped to determine if caribou movements near the mine complex varied substantially from caribou assumed to be not influenced by mining activity. Speed and proportion of hard turns were further evaluated using modelling approaches, as described below in 4.2.1.3.

4.2.1.3 Modelling

Generalized linear mixed-effect models (GLMM) were used to examine the relationship between distance from the mine complex and other explanatory variables on the speed (km/hr) and hard turns (≥ 60 degrees) of caribou paths. Speed (km/hr) was a positive, continuous response variable that was heavily right skewed. Various modelling approaches can be used to evaluate relationships between a continuous response variable and explanatory variables. To determine which type of model would be best to evaluate speed (i.e., generalized linear regression versus linear regression), the null model with a random effect of caribou ID (Appendix D) was fit with a GLMM with a gamma distribution with and without log-link, inverse gaussian regression, and a mixed-effect linear regression where speed was log-transformed. The GLMM with a gamma distribution with log-link was found to fit the distribution of the speed data and associated residuals the best, and thus was chosen as the type of model to evaluate speed. Hard turns were evaluated using GLMM with a binomial distribution because the response variable is binary, where hard turn was given a “1” if the relative turning angle was ≥ 60 degrees, or was given a “0” if the relative turning angle was < 60 degrees.

Explanatory variables evaluated in this analysis included landcover, buffered distance from the mine complex at (3-km buffer intervals), herd, sex, fix rate (hours), and path duration (hours). Further, hard turn (≥ 60 degrees) was a categorical variable that was considered as a possible covariate to include in the candidate model set that evaluated speed. Speed (km/hr) was evaluated as a potential covariate to be included in the models of proportion of hard turns.

Explanatory variables were developed from two spatial datasets, including a landcover layer and the caribou telemetry data from GNWT-ENR. First, 21 landcover classes from Earth Observation for Sustainable Development of Forests (EOSD; available at a 25 x 25 m resolution and developed by Natural Resources Canada [NRC] 2000) were reclassified into seven classes based on expected benefit to caribou and influence on caribou movements (Table 6). Then, landcover classes were included as a categorical variable with each of the seven target landcover classes, and a landcover class was assigned to each movement path based on the predominant landcover class that each path overlapped. Each movement path was assigned a discrete variable coding the outer distance of the 3-km buffer zone the path occurred in (i.e., “3 km”, “6 km”, “111 km”; Table 7). Buffer zone was included as a discrete variable to test for an effect of distance from the Diavik-Ekati mine complex on caribou speed and proportion of hard turns.

The remaining explanatory variables presented in Table 7 were related to individual caribou attributes (i.e., herd, sex, path duration) and a temporal variable (i.e., biological year). The reference assigned for herd was “Bathurst”, “Female” was the reference for sex, and “2012” was the reference assigned for biological year. It was necessary to use “2012” as the reference because no paths remained in years 2010 and 2011 after data cleaning and after removing years with low sample sizes of caribou (i.e., 2010 had $n = 1$ caribou).

Path duration was included as an explanatory variable to evaluate whether the length of time that a caribou remains in a buffer zone helps to predict variation in speed and proportion of hard turns. Like path duration, turning angle and speed are expected to help predict variation in the speed and proportion of hard turns exhibited by caribou. For example, if a caribou spends multiple days in a buffer zone foraging and bedding down, the animal should have paths with long durations, low speeds, and high proportions of hard turns. In contrast, if a caribou quickly travels through a buffer zone, the paths would have short durations, and should exhibit high speeds and a low proportion of hard turns.

The continuous effect of buffered distance from the mine complex, path duration, and speed were modelled as a natural cubic spline to allow for a non-linear temporal trend in relative weight; therefore, the estimated model coefficients were not useful for interpretation and are not shown. To determine the degrees of freedom (df) to use for each continuous variable, eight single-variable models were constructed for each of these continuous variables per season with the degrees of freedom of the variable ranging from 1 to 8. These models were compared using Akaike's Information Criteria (AIC), where the model with the lowest AIC and best fit to the data and associated residuals was identified as the top single-variable model for each continuous variable. Then, each continuous variable's top single-variable model was used to identify the optimal degrees of freedom to be used in its natural cubic spline (i.e., df ranged from 1 to 8).

A candidate model set with four candidate models plus a null model was applied to the speed and hard turn datasets for four of the six seasons, specifically spring migration, summer, fall and winter. Calving and post-calving were not included because data were limited during these seasons, particularly for the Beverly/Ahiak herd (Table 4). A global model (model with all explanatory variables) could not be included in the candidate model set for any season due to model failure to converge. The same candidate model set was applied to examine speed and hard turns, except speed was included as an additional explanatory variable in two of the candidate models for hard turns. The candidate model set is presented in Appendix D.

Explanatory variables were screened for collinearity using a Pearson's correlation test, as well as using their variance inflation factor (VIF). If two variables were found to be significantly correlated ($|r| > 0.6$ or $VIF > 3.0$), then only one of the correlated variables were included in the model. Path duration was correlated with hard turn, and thus, hard turn was not included in the candidate model set for speed. Additionally, fix rate was correlated with path duration and was also not included as an explanatory variable for modelling.

Movement paths from individuals were pooled across years, within buffer zones, so caribou ID was included as a random effect to account for temporal and spatial autocorrelation, which can arise when data from the same individuals are pooled. Random intercept models did not provide coefficient estimates for the random effects; these were treated as unobserved random variables (Bates 2010).

Model selection was based on an information-theoretic approach using AIC. The number of model parameters (K), log-likelihood, difference in AIC score (ΔAIC) relative to the lowest AIC score, and model weight (AICw) were estimated for each model. The model with the lowest AIC value was considered the top-ranking model (Burnham and Anderson 2002). Models with ΔAIC score less than or equal than 2.0 were considered competitive. The parameter estimates were presented from the competing models, which contained most or all variables that occurred across competing models and allowed for all parameter estimates to be evaluated that may influence the response variable.

The top model for each season was used for inference of statistical significance based on *P* values of effects. Variable significance was assessed using Type II *P* values (Langsrud 2003). Type III *P* values, which are commonly used in statistical analysis, allow for testing the statistical significance of main effects in the presence of significant interactions. When the interactions are significant, the effect sizes associated with interactions are of more interest than the *P* values of the main effects (e.g., Matthews and Altman 1996). In contrast, when the interactions are not significant, the Type II tests have more power than Type III tests (Lewsey et al. 2001). That is, a model with Type II *P* values provides a more powerful test for main effects in the absence of a significant interaction. In addition to testing model effects using Type II *P* values, parameter estimates from the top model of each season for speed and hard turns were evaluated and presented in Appendix E.

For effects that were found to be statistically significant, population-level model predictions (i.e., model prediction across all collared caribou, not by individual) were plotted against observed data averaged across individuals to visualize the estimated relationships between caribou speed or hard turns and the various explanatory variables. Since the model contained multiple predictor variables, the visualization of predictions relative to specific variables of interest required setting the other predictor variables to a constant value. These predictor values were given the value of their reference category if categorical or were given a zero if continuous. The following predictor values were used to visualize model predictions: “Bathurst” for herd, “Female” for sex, “2012” for biological year, “Water/Snow/Ice” for landcover, zero for buffered distance from the mine complex at (3 km buffer intervals), zero for path duration (hours), and zero for speed (km/hr) only in the models for proportion of hard turns.

Table 6: Landcover Classes and Associated Reclassified Landcover Classes from Earth Observation for Sustainable Development of Forests (EOSD) Landcover Data (NRC 2000) Within 111 Kilometre Buffered Area

Reclassified Landcover Class	EOSD Landcover Class ^(a)	Description ^(b)	Expected Benefit to Caribou	Expected Influence on Caribou
Bryoids	Bryoids	Bryophytes (mosses, liverworts, and hornworts) and lichen (foliose or fruticose; not crustose); minimum of 20% ground cover or one-third of total vegetation must be a bryophyte or lichen	Source of forage (year-round)	- Reduce speed - Many hard turns
Conifer Forest	Coniferous Dense	Greater than 60% crown closure; coniferous trees are 75% or more of total basal area.	- Source of forage - Thermal cover	- Reduce speed - Many hard turns
	Coniferous Open	26-60% crown closure; coniferous trees are 75% or more of total basal area.		
	Coniferous Sparse	10-25% crown closure; coniferous trees are 75% or more of total basal area.		
Exposed and Rock	Exposed Land	River sediments, exposed soils, pond or lake sediments, reservoirs, margins, beaches, landings, burned areas, road surfaces, mudflat sediments, cutbanks, moraines, gravel pits, tailings, railway surfaces, buildings and parking, or other non-vegetated surfaces.	No benefit expected	- Increase speed - Few hard turns
	Rock/Rubble	Bedrock, rubble, talus, blockfield, rubble mine spoils, or lava beds.		
Low Shrub and Herb	Shrub Low	At least 20% ground cover which is at least one-third shrub; average shrub height less than 2 m.	- Low shrub as source of forage (when lichen limited) - Herb as source of food in post-calving, summer, fall	- Reduce speed - Many hard turns
	Herb ^(c)	Vascular plant without woody stem (grasses, crops, forbs, graminoids); minimum of 20% ground cover or one-third of total vegetation must be herb.		
Mixed or Deciduous Forest	Broadleaf Dense	Greater than 60% crown closure; broadleaf trees are 75% or more of total basal area.	- No benefit expected - Trees may act as movement obstacles	- Reduce speed - Many hard turns
	Broadleaf Open	26-60% crown closure; broadleaf trees are 75% or more of total basal area.		
	Broadleaf Sparse	10-25% crown closure; broadleaf trees are 75% or more of total basal area.		
	Mixedwood Dense	Greater than 60% crown closure; neither coniferous nor broadleaf tree account for 75% or more of total basal area.		
	Mixedwood Open	26-60% crown closure; neither coniferous nor broadleaf tree account for 75% or more of total basal area		
	Mixedwood Sparse	10-25% crown closure; neither coniferous nor broadleaf tree account for 75% or more of total basal area.		

Table 6: Landcover Classes and Associated Reclassified Landcover Classes from Earth Observation for Sustainable Development of Forests (EOSD) Landcover Data (NRC 2000) Within 111 Kilometre Buffered Area

Reclassified Landcover Class	EOSD Landcover Class ^(a)	Description ^(b)	Expected Benefit to Caribou	Expected Influence on Caribou
Water/Snow/Ice	Water	Lakes, reservoirs, rivers, streams, or salt water.	■ Winter travel	■ Increase speed
	Snow/Ice	Includes glacier, snow, ice	■ Reduced predation risk	■ Few hard turns
Wetland	Wetland-Treed	Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes; the majority of vegetation is coniferous, broadleaf, or wetland or aquatic processes; the majority of vegetation is coniferous, broadleaf, or mixed wood.	■ Preferred grizzly bear habitat, may increase predation risk ■ Source of early emergent vegetation forage	■ Uncertain
	Wetland-Herb	Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes; the majority of vegetation is tall, low, or a mixture of tall and low shrub.		
	Wetland-Shrub	Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes; the majority of vegetation is herb.		
No Data	Cloud	No landcover data available for these classes; therefore, not included in modelling.		
	No Data			

(a) EOSD = Earth Observation for Sustainable Development of Forests.

(b) Descriptions provided by NRC (2000).

(c) Herb was investigated in a GIS and was found to be associated with the Shrub Low areas and, thus, was combined with Low Shrub.

Table 7: Explanatory Variables Considered in Candidate Model Sets

Variable Type	Explanatory Variable	Data Source	Definition
Landcover Class	Landcover	EOSD ^(a) landcover	Categorical variable coding for each landcover class a movement path occurred in. Seven landcover classes were reclassified from the EOSD ^(a) landcover (Table 6). Classes include: Bryoids, Conifer Forest, Exposed Land and Rock, Low Shrub and Herb, Mixed or Deciduous Forest, Water/Snow/Ice, and Wetland. No Data class was not included in the model because it was not expected to influence speed or hard turns.
Buffer Zone	Buffered Distance from Mine Complex	Diavik and Ekati mine complex footprint	Discrete variable ranging from 3 to 111 km that assigned each movement path to the buffer zone that it was in. The 3 km-wide buffers were calculated from the edge of the Diavik and Ekati mine complex footprint and developed in a GIS.
Caribou Attributes	Herd	GNWT collar data	Categorical variable coding Bathurst and Beverly/Ahiak herds.
	Sex		Categorical variable coding male and female caribou.
	Path Duration	Calculated from movement paths	Continuous variable ranging from 0–24 hours. Path duration is the length of each path in hours.
	Speed	Calculated from movement paths	Continuous variable ranging from 0–55 km/hr. Speed was calculated as the distance of a path (km) divided by the duration of the path (hour). Speed was only included as an explanatory variable in the candidate model set for hard turns.
Temporal Variable	Biological Year	GNWT collar data	Categorical variable coding the biological year the movement path occurred in. Biological years included all years from 2012 to 2022. Paths from 2010 were not included due to limited caribou ($n = 1$), and 2011 was not included because no paths remained after data cleaning.

(a) EOSD = Earth Observation for Sustainable Development of Forests; available from NRC (2000).

4.2.1.4 Results

The number of caribou with at least one movement path (i.e., caribou that contributed to movement analyses) varied by buffer zone, season, and herd (Table 8; Figure 6). Generally, the total number of caribou and caribou-years considered for movement analyses was highest in the Reference Group, when compared to each buffer zone (Table 8; Figure 6). The total number of caribou with at least one movement path increased as the buffer zone increased (Table 8; Figure 6). As buffers increase in distance from the mine complex, they also increase in area; thus, farther buffer zones have more available area for caribou to occupy. More caribou contributed movement paths to the analyses in successive buffer zones, which is also related to the high number of caribou and caribou-years in the Reference Group.

The post-calving season had the lowest number of collared caribou across all buffer zones and Reference Group (Table 8; Figure 6). This was expected due to Bathurst caribou being observed in the buffer zones more commonly in the fall season, followed by summer, while Beverly/Ahiak caribou were most observed in the winter, then fall. Overall, there were 189–217 caribou and 361–544 caribou-years with at least one movement path from the Bathurst herd, and 169–182 caribou and 299–426 caribou-years with at least one movement path from the Beverly/Ahiak herd (Table 8; Figure 6). Examples of the movement paths included in the analyses are presented in Figure 5.

Table 8. Number of caribou (n) and number of caribou-years (n-year), with at least one movement path, by buffer zone, herd, season, and Reference Group.

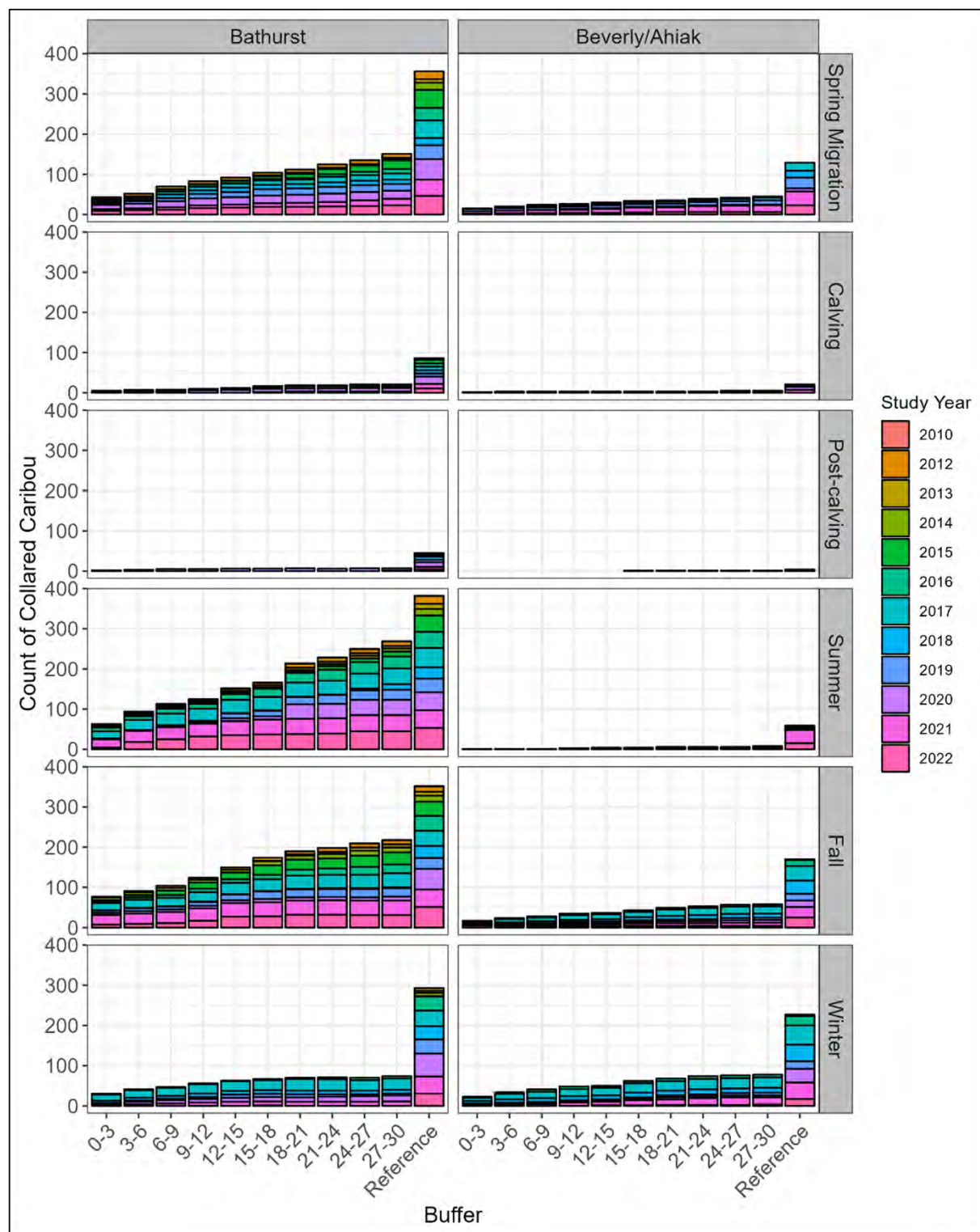
Herd	Buffer Zone ^(a) (km)	Caribou Counts											
		Spring Migration		Calving		Post-calving		Summer		Fall		Winter	
		<i>n</i>	<i>n-year</i>	<i>n</i>	<i>n-year</i>	<i>n</i>	<i>n-year</i>	<i>n</i>	<i>n-year</i>	<i>n</i>	<i>n-year</i>	<i>n</i>	<i>n-year</i>
Bathurst	0 – 3	40	43	40	43	2	2	55	63	67	77	28	30
	3 – 6	48	52	7	7	3	3	80	94	78	91	37	41
	6 – 9	63	70	8	8	5	5	92	113	86	104	40	47
	9 – 12	72	83	10	10	5	5	102	125	98	124	48	56
	12 – 15	80	92	12	12	6	6	117	152	113	150	54	63
	15 – 18	85	104	15	17	6	6	121	166	128	174	57	67
	18 – 21	92	112	17	19	7	7	140	214	133	190	59	70
	21 – 24	101	125	17	19	6	6	149	229	136	198	62	71
	24 – 27	106	135	18	21	7	7	155	250	139	210	62	70
	27 – 30	118	151	18	21	6	7	160	269	142	218	65	74
	Reference Group ^(b)	202	356	53	86	33	45	194	382	185	352	159	293
	Total Population ^(c)	216	436	213	419	211	416	211	416	189	361	217	544
Beverly/Ahiak	0 – 3	14	15	2	2	-	-	1	1	16	17	20	23
	3 – 6	18	20	3	3	-	-	1	1	23	24	30	34
	6 – 9	22	24	3	3	-	-	1	1	27	28	37	41
	9 – 12	24	26	3	3	-	-	3	3	33	35	44	48
	12 – 15	27	30	3	3	-	-	4	4	34	37	44	50
	15 – 18	30	34	3	3	1	1	4	4	38	43	50	62
	18 – 21	31	35	3	3	1	1	5	6	43	49	56	68
	21 – 24	35	39	3	3	1	1	5	6	47	53	62	74
	24 – 27	38	42	5	5	1	1	5	6	50	57	65	76
	27 – 30	40	45	5	5	1	1	7	8	50	58	66	78
	Reference Group ^(b)	95	129	19	21	4	4	48	59	117	170	132	227
	Total Population ^(c)	174	333	172	318	172	319	172	316	169	299	182	426

(a) Buffer zones are 3 km wide and surround the Diavik-Ekati mine complex.

(b) Reference Group refers to movement paths from caribou between 30 km and 111 km from the Diavik-Ekati mine complex.

(c) Total population is the sum of all caribou with at least one movement path included in analyses, by herd.

Abbreviations: F = female; M = male; km = kilometres. "-" = no caribou movement paths available within buffer for the corresponding season.



Note: Total count of collared caribou in the Reference Group is presented in each figure ('Reference'). Corresponding sample sizes for this figure are presented in Table 8. Corresponding movement paths are presented spatially in Figure 5.

Figure 6: Total count of collared caribou, with at least one movement path, by buffer zone ('Buffer'), season, herd, and study year (2010-2022).

4.2.1.5 Movement Metrics

Residency

Caribou residency time varied by buffer zone, herd, season, and year (Table 9; Figure 7). Mean residency outside test buffer zones (i.e., for Reference Group caribou) varied from 1.2% of spring to 4.6% of winter for Bathurst herd and 1.2% of fall to 2.5% of calving for Beverly/Ahiak herd (Table 9; Figure 7). Generally, residency was highest for Reference Group caribou during the calving or post-calving seasons, regardless of herd (Table 9; Figure 7). However, uncertainty surrounding residency estimates for the calving season was high (i.e., SD were high) for both herds and uncertainty surrounding the residency estimate for the post-calving season was high for the Bathurst herd (Table 9; Figure 7). It is also important to note that residency is a function of the duration of each season. For example, a mean residency of 7% for winter corresponds to 7% of 138 days (i.e., 10 days) whereas a mean residency of 7% for spring corresponds to 7% of 42 days (i.e., 3 days).

Most mean residency values were within two SD of the Reference Group for each herd and season (Table 9; Figure 7). There were a few exceptions for each herd. For instance, in the Bathurst herd, mean residency for two buffer zones (i.e., 24 – 27 km and 27 – 30 km) was outside two SD of the Reference Group during the 2021 calving season (Figure 7). Similarly, a small number of mean residency values were outside two SD of the Reference Group for fall, spring migration, and summer (Figure 7). In the Beverly/Ahiak herd, mean residency was usually within two SD of the Reference Group, except for spring migration when a few values were outside the Reference Group range (Figure 7).

Although some mean residency values were outside two SD of the reference group, no obvious trends were apparent (Figure 7). These results indicate that mean residency of caribou within 30 km of the Diavik-Ekati mine complex were generally similar to residency of Reference Group caribou outside the 30 km buffered zone.

Table 9: Mean residency, calculated as percent (%) duration of the season, by herd, buffer zone, season, and Reference Group.

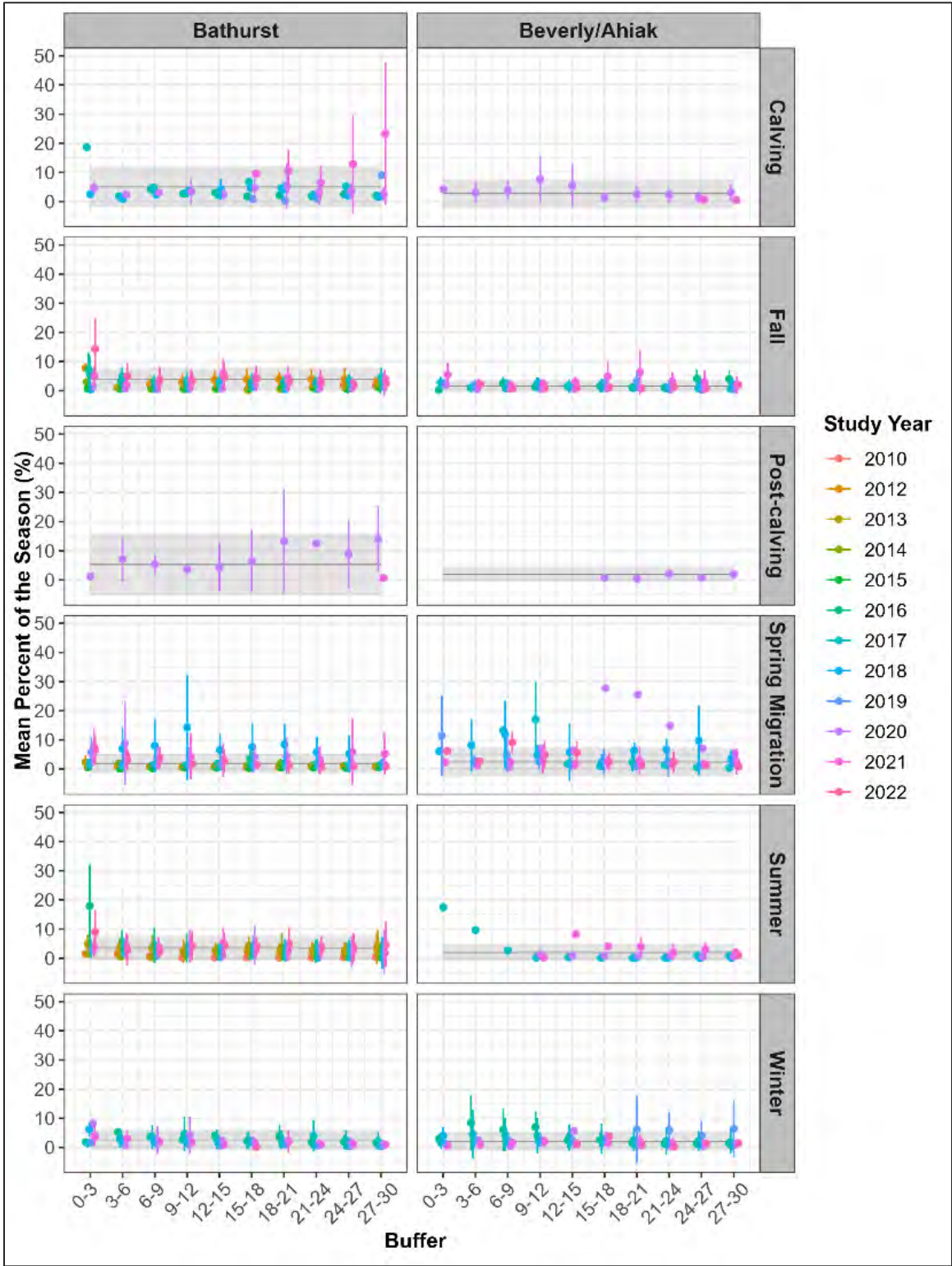
Herd	Buffer Zone ^(a)	Mean Residency (% duration of the season) ^(b)											
		Spring Migration		Calving		Post-calving		Summer		Fall		Winter	
		Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD
Bathurst	0 – 3	4.6	4.3	7.0	6.7	1.2	0.0	5.7	7.9	5.3	5.9	3.1	3.4
	3 – 6	4.1	7.8	1.9	1.1	7.1	7.8	3.5	4.0	2.7	2.9	2.5	2.6
	6 – 9	3.2	4.5	3.3	1.3	5.3	3.3	2.9	3.4	2.4	2.4	2.8	3.5
	9 – 12	3.5	7.5	3.3	3.6	3.6	1.6	3.4	3.8	2.5	3.0	3.3	4.7
	12 – 15	2.4	3.6	2.9	2.2	4.3	8.2	3.3	4.0	3.2	4.0	2.0	2.3
	15 – 18	2.6	4.1	4.9	4.6	6.5	10.7	3.1	3.2	2.7	3.3	2.0	2.2
	18 – 21	2.6	4.3	5.3	6.1	13.2	18.1	2.9	3.7	2.7	2.8	2.2	2.7
	21 – 24	2.0	3.2	3.2	3.8	12.6	24.1	3.0	5.0	2.3	2.5	2.2	3.8
	24 – 27	2.0	4.5	4.5	6.8	8.9	11.6	2.6	4.0	2.0	2.1	1.6	2.5
	27 – 30	1.6	2.9	5.9	11.1	12.1	11.4	2.6	5.1	2.7	2.9	1.4	2.1
	Reference Group ^(c)	1.2	2.4	3.7	5.9	4.6	9.4	1.9	2.6	2.3	2.6	1.8	2.6
Beverly/Ahiak	0 – 3	6.7	9.4	4.2	-	-	-	17.5	0.0	3.2	3.0	2.2	2.2
	3 – 6	3.3	4.5	3.1	3.5	-	-	9.7	0.0	1.5	1.3	3.8	6.5
	6 – 9	6.3	6.9	3.8	3.2	-	-	2.7	0.0	1.7	1.7	3.4	4.7
	9 – 12	5.2	6.7	7.6	8.2	-	-	0.6	0.7	1.8	1.7	3.4	4.5
	12 – 15	3.0	4.2	5.5	7.2	-	-	4.4	6.2	1.5	1.6	2.5	3.2
	15 – 18	3.8	9.0	1.4	0.9	0.7	0.0	2.3	2.3	2.0	2.7	2.5	3.5
	18 – 21	4.0	7.8	2.5	2.5	0.3	0.0	2.6	3.0	2.0	3.5	2.2	4.0
	21 – 24	3.2	4.6	2.4	2.4	2.0	0.0	1.4	2.0	1.2	1.6	1.8	3.4
	24 – 27	2.9	5.4	1.3	1.6	0.8	0.0	2.1	2.2	1.5	2.2	1.7	2.7
	27 – 30	2.3	3.3	2.6	2.6	1.9	0.0	1.5	1.1	1.5	1.9	1.9	3.9
	Reference Group ^(c)	2.0	4.4	2.5	4.9	1.9	2.5	1.7	2.6	1.2	1.7	1.6	2.7

(a) Buffer zones are 3 km wide and surround the Diavik-Ekati mine complex.

(b) Mean residency = percent (%) duration of the season, averaged across caribou-years. Standard deviations (SD) are provided when means are calculated from ≥ 3 caribou-years.

(c) Reference Group refers to movement paths from caribou between 30 km and 111 km from the Diavik-Ekati mine complex.

Abbreviations: SD = standard deviation; % = percent; "-" = no caribou movement paths available within buffer for the corresponding season, or <3 caribou-years in sample size and SD cannot be calculated.



Note: Error bars represent two standard deviations (SD) of the mean. Grey horizontal lines and light grey shading represents the mean plus/minus two SD for the Reference Group of each herd and season. SD are provided where sample sizes ≥ 3 caribou. Corresponding mean residency values by buffer zone, season, and herd (i.e., pooled over years) are presented in Table 9.

Figure 7: Mean percent of the season (i.e., residency) by herd, buffer zone ('Buffer'), season, and study area (2010-2022).

Speed

Mean caribou speed varied by buffer zone, herd, season, and year (Table 10). Mean speed outside buffer zones (i.e., for Reference Group caribou) varied from 0.6 and 0.7 km/hr during the winter, for Bathurst and Beverly/Ahiak herds, respectively, to 1.8 km/hr for Bathurst caribou during post-calving season and 2.2 km/hr for Beverly/Ahiak caribou during summer and fall (Table 10; Figure 8). Generally, speed remained similar across seasons and herds (Table 10; Figure 8). The uncertainty surrounding Reference Group caribou speed was similar across seasons and herds, except for Beverly/Ahiak caribou during post-calving, when the standard deviation was slightly higher (Figure 8).

Most mean speed values were within two SD of the Reference Group for each herd and season (Table 10; Figure 8). There were a few exceptions for each herd. For instance, Bathurst caribou in test buffer zones had consistently higher mean speeds in the 2015 spring migration season than the Reference Group (Figure 8). Further, Bathurst caribou exhibited higher speeds than the Reference Group for a few buffer zones and years during the calving season (Figure 8). Mean Beverly/Ahiak caribou speeds for three buffer zones (i.e., 21 – 24 km, 24 – 27 km, and 27 – 30 km) were more than two standard deviations from the Reference Group speed in summer 2020 (Figure 8).

Overall, the results indicate that the average speed of caribou within 30 km of the Diavik-Ekati mine complex from 2010 through 2022 were generally similar to the average speed of Reference Group caribou.

Table 10. Mean speed, calculated in kilometres per hour (km/hr), by herd, buffer zone, season, and Reference Group.

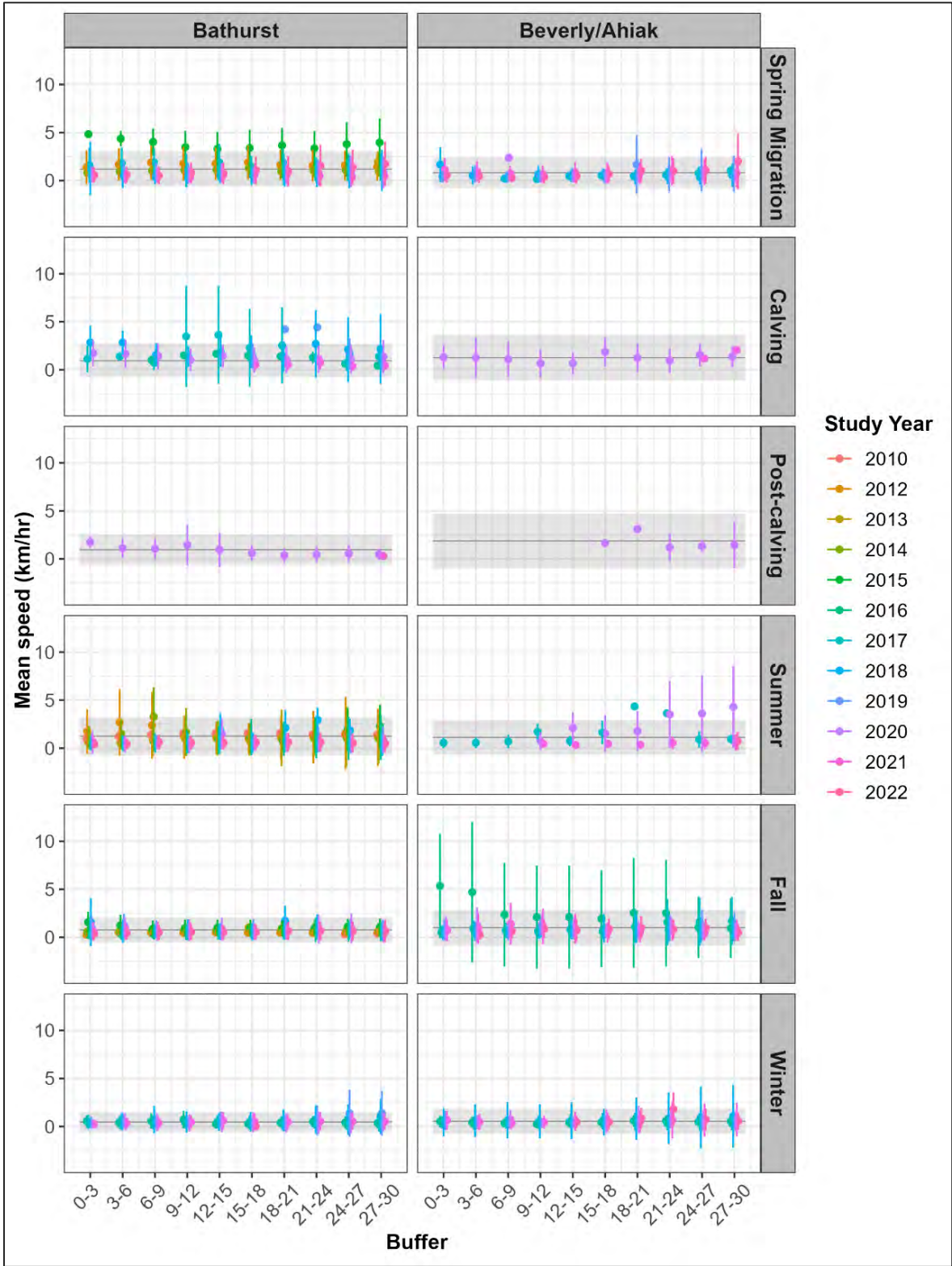
Herd	Buffer Zone ^(a)	Mean speed (km/hr) ^(b)											
		Spring Migration		Calving		Post-calving		Summer		Fall		Winter	
		Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD
Bathurst	0 – 3	1.3	1.7	1.8	0.7	1.8	0.0	0.9	1.7	0.8	0.9	0.7	0.6
	3 – 6	1.3	1.3	1.9	0.8	1.3	0.4	0.9	1.5	0.8	0.6	0.8	0.6
	6 – 9	1.4	1.4	1.4	0.5	1.2	0.7	1.1	1.5	0.8	0.5	1.0	2.5
	9 – 12	1.4	1.4	1.9	0.9	2.1	1.7	0.9	1.0	0.9	0.6	0.9	2.3
	12 – 15	1.5	1.3	2.1	1.2	2.7	2.5	1.0	1.2	0.8	0.6	1.1	2.2
	15 – 18	1.6	1.5	1.6	1.0	1.3	0.7	1.0	1.3	0.9	0.6	1.0	2.3
	18 – 21	1.7	1.6	1.8	1.2	1.2	1.1	1.2	1.9	0.9	0.6	1.1	2.3
	21 – 24	1.8	1.5	1.9	1.1	1.3	0.8	1.3	2.2	0.9	0.7	1.3	2.4
	24 – 27	1.9	1.8	1.6	1.4	0.9	0.6	1.3	2.0	0.9	0.8	1.3	1.8
	27 – 30	2.0	1.8	1.7	1.2	0.5	0.3	1.4	2.0	0.9	0.9	1.3	1.7
	Reference Group ^(c)	1.7	2.0	1.0	0.9	1.8	3.2	1.4	1.1	0.9	1.1	0.6	0.7
Beverly/Ahiak	0 – 3	1.1	0.9	1.9	0.0	-	-	0.5	0.0	1.4	2.4	1.6	4.9
	3 – 6	0.9	0.7	2.6	2.6	-	-	0.6	0.0	1.4	2.2	1.4	4.0
	6 – 9	0.8	0.6	2.1	2.2	-	-	0.7	0.0	1.4	2.6	1.2	3.7
	9 – 12	0.9	0.8	1.0	0.5	-	-	1.0	0.7	1.4	2.8	1.1	3.4
	12 – 15	0.9	0.7	1.6	1.2	-	-	0.9	0.8	1.4	2.7	1.3	3.4
	15 – 18	1.1	1.1	2.0	0.8	1.6	0.0	1.0	0.7	1.6	2.9	1.2	3.0
	18 – 21	1.3	1.3	1.9	1.6	3.1	0.0	7.8	15.7	1.6	2.7	1.3	3.0
	21 – 24	1.5	1.5	1.7	1.8	1.2	0.0	8.3	15.4	1.9	3.0	1.7	3.2
	24 – 27	1.5	1.8	1.8	1.0	1.3	0.0	7.6	15.7	1.9	2.9	1.4	3.0
	27 – 30	1.6	1.8	1.6	0.9	1.4	0.0	6.2	13.6	1.7	2.8	1.4	2.8
	Reference Group ^(c)	1.2	1.1	1.7	1.2	2.0	0.9	2.2	5.4	1.5	2.2	0.7	0.7

(a) Buffer zones are 3 km wide and surround the Diavik-Ekati mine complex.

(b) Mean speed = speed (km/hr), averaged across caribou-years. Standard deviations (SD) are provided when means are calculated from ≥ 3 caribou-years.

(c) Reference Group refers to movement paths from caribou between 30 km and 111 km from the Diavik-Ekati mine complex.

Abbreviations: SD = standard deviation; km = kilometre; hr = hour; "-" = no caribou movement paths available within buffer for the corresponding season, or <3 caribou-years in sample size and SD cannot be calculated.



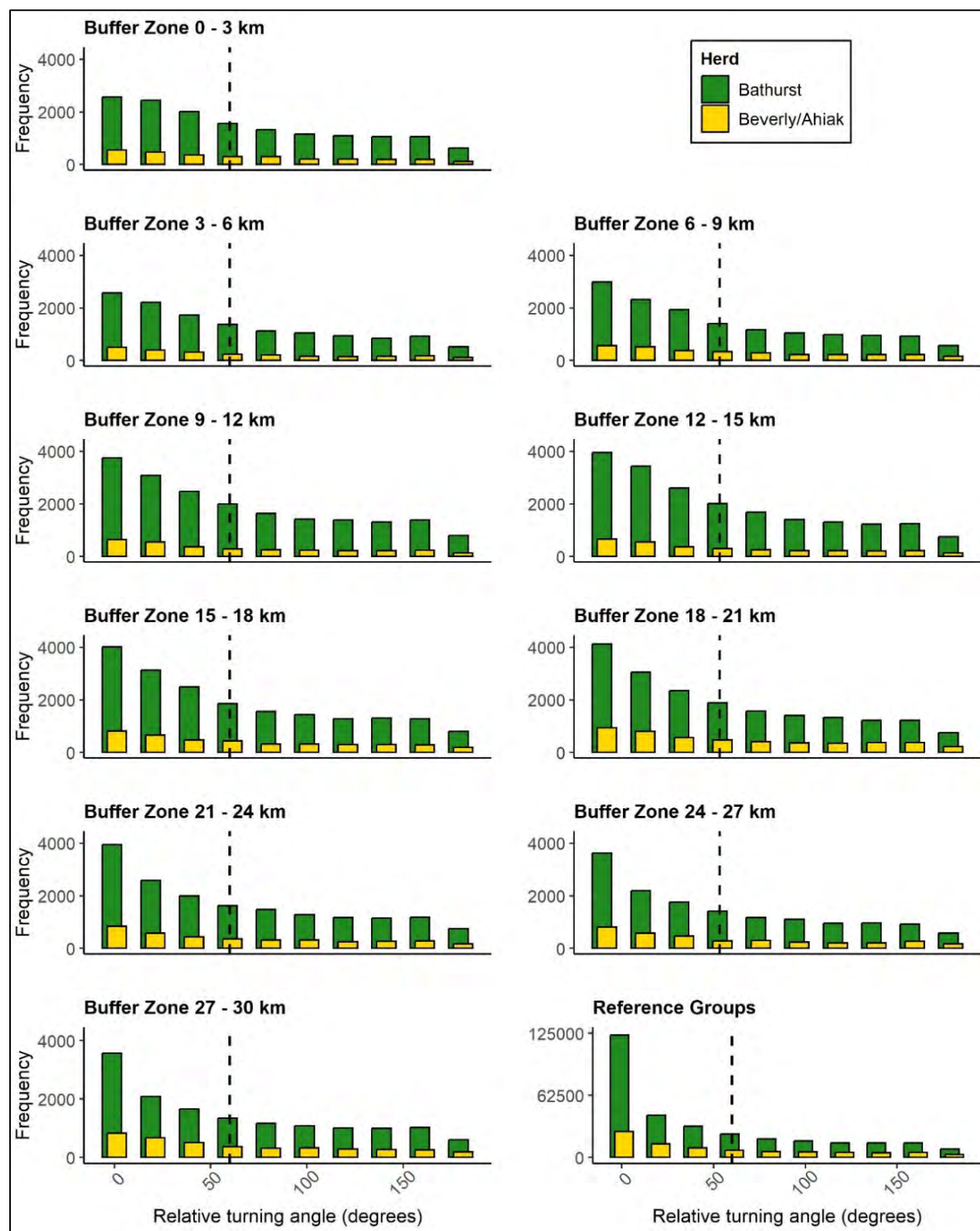
Note: Error bars represent two standard deviations (SD) of the mean. Grey horizontal lines and light grey shading represents the mean plus/minus two SD for the Reference Group of each herd and season. SD are provided where sample sizes ≥ 3 caribou. Corresponding mean speed values by buffer zone, season, and herd (i.e., pooled over years) are presented in Table 10.

Figure 8: Mean speed (km/hr) by herd, buffer zone ('Buffer'), season, and study year (2010–2022).

Proportion of Hard Turns

The distribution of relative turning angles for test buffer zones surrounding the Diavik-Ekati mine complex are compared for Bathurst and Beverly/Ahiak herds in Figure 9. The Reference Group for each herd had the highest sample size of turning angles, and the frequency was higher for Bathurst than Beverly/Ahiak caribou (Figure 9). Distribution of turning angles was similar across buffer zones and herds; however, some buffer zones had much lower sample sizes of turning angles, which resulted in smaller distributions (i.e., buffer zone 0 – 3 km vs. Reference Group; Figure 9). Buffer zones closer to the Diavik-Ekati mine complex typically had lower frequencies of turning angles because fewer caribou movement paths were available in smaller buffer zones.

Mean proportion of hard turns varied by buffer zone, herd, season, and year (Table 11; Figure 10). Mean proportion of hard turns was relatively constant for Reference Groups, regardless of herd, and ranged from 0.2–0.4 (Table 11; Figure 10). Thus, during most seasons and years, approximately one third of turns made by Reference Group caribou were hard turns ($\geq 60^\circ$; Table 11; Figure 10). In contrast, caribou within 30 km of the Diavik-Ekati mine complex appeared to have higher proportions of hard turns during spring migration, summer, and fall, regardless of herd, relative to the Reference Group (Figure 10). The proportion of hard turns was consistent across 3-km buffer zones within 30 km of the mine complex. In most cases, means were outside Reference Group values (Figure 10).



Note: The dashed line indicates the threshold for determining a hard turn (i.e., ≥ 60 degrees).

Figure 9: Frequency of relative turning angles (degrees) for Bathurst and Beverly/Ahiak caribou herds, by buffer zone, within 30 km of the Diavik-Ekati mine complex.

Table 11: Mean proportion of hard turns (calculated as proportion of turns greater than or equal to 60 degrees), by herd, buffer zone, season, and Reference Group.

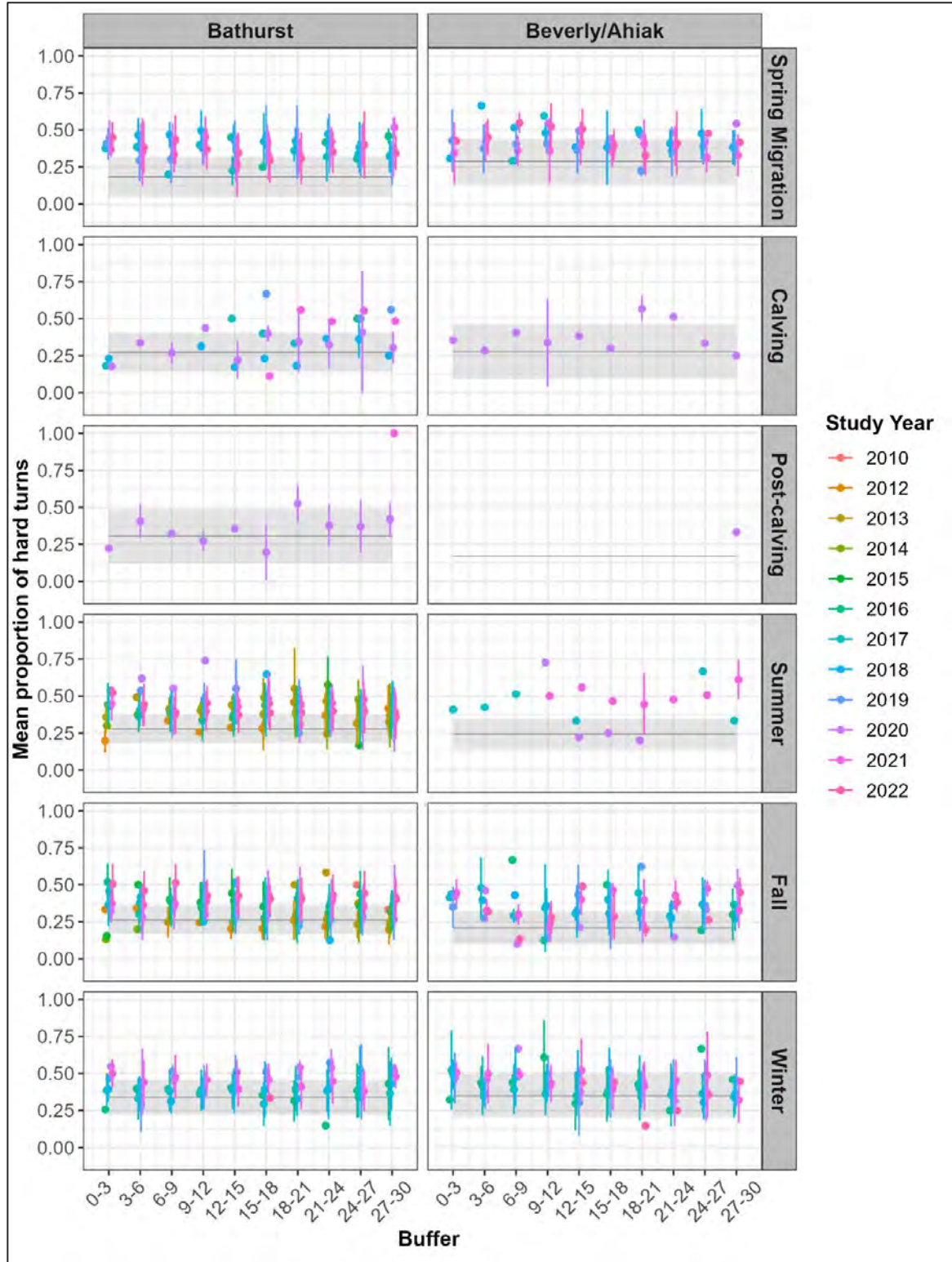
Herd	Buffer Zone ^(a)	Mean proportion of hard turns ^(b)											
		Spring Migration		Calving		Post-calving		Summer		Fall		Winter	
		Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD	Mean	2 SD
Bathurst	0 – 3	0.4	0.1	0.2	0.0	0.2	0.0	0.4	0.1	0.4	0.1	0.4	0.1
	3 – 6	0.4	0.1	0.3	0.0	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.2
	6 – 9	0.4	0.1	0.3	0.1	0.3	0.0	0.4	0.1	0.4	0.1	0.4	0.1
	9 – 12	0.4	0.1	0.4	0.1	0.3	0.1	0.4	0.1	0.4	0.1	0.4	0.1
	12 – 15	0.4	0.1	0.2	0.2	0.4	0.0	0.4	0.1	0.4	0.1	0.4	0.1
	15 – 18	0.4	0.2	0.3	0.1	0.2	0.2	0.4	0.1	0.4	0.2	0.4	0.2
	18 – 21	0.4	0.1	0.3	0.2	0.5	0.1	0.4	0.1	0.3	0.2	0.4	0.1
	21 – 24	0.4	0.2	0.4	0.2	0.4	0.1	0.4	0.1	0.3	0.2	0.4	0.2
	24 – 27	0.4	0.2	0.4	0.2	0.4	0.2	0.4	0.1	0.3	0.1	0.4	0.2
	27 – 30	0.3	0.2	0.3	0.1	0.4	0.1	0.3	0.1	0.3	0.1	0.4	0.2
	Reference Group ^(c)	0.2	0.1	0.3	0.1	0.3	0.2	0.3	0.1	0.3	0.1	0.3	0.1
Beverly/Ahiak	0 – 3	0.4	0.2	0.4	0.0	-	-	0.4	0.0	0.4	0.1	0.5	0.2
	3 – 6	0.5	0.2	0.3	0.0	-	-	0.4	0.0	0.4	0.1	0.4	0.2
	6 – 9	0.4	0.1	0.4	0.0	-	-	0.5	0.0	0.3	0.1	0.5	0.2
	9 – 12	0.5	0.2	0.3	0.3	-	-	0.6	0.0	0.3	0.2	0.4	0.2
	12 – 15	0.4	0.1	0.4	0.0	-	-	0.4	0.2	0.4	0.2	0.4	0.2
	15 – 18	0.4	0.1	0.3	0.0	-	-	0.4	0.1	0.3	0.2	0.4	0.1
	18 – 21	0.4	0.1	0.6	0.1	-	-	0.4	0.2	0.3	0.2	0.4	0.2
	21 – 24	0.4	0.1	0.5	0.0	-	-	0.5	0.0	0.3	0.1	0.4	0.2
	24 – 27	0.4	0.2	0.3	0.0	-	-	0.5	0.1	0.4	0.1	0.4	0.2
	27 – 30	0.4	0.1	0.3	0.0	0.3	0.0	0.5	0.2	0.3	0.1	0.4	0.2
	Reference Group ^(c)	0.3	0.2	0.3	0.2	0.2	0.0	0.2	0.1	0.2	0.1	0.4	0.1

(a) Buffer zones are 3 km wide and surround the Diavik-Ekati mine complex.

(b) Mean proportion of hard turns = the proportion of relative turning angles greater than or equal to 60 degrees, averaged across caribou-years. Relative turning angles were first transformed into positive absolute degrees. Standard deviations (SD) are provided when means are calculated from ≥ 3 caribou-years.

(c) Reference Group refers to movement paths from caribou between 30 km and 111 km from the Diavik-Ekati mine complex.

Abbreviations: SD = standard deviation; "-" = no caribou movement paths available within buffer for the corresponding season, or <3 caribou-years in sample size and SD cannot be calculated.



Note: Error bars represent two standard deviations (SD) of the mean. Grey horizontal lines and light grey shading represents the mean plus/minus two SD for the Reference Group of each herd and season. SD are provided where sample sizes ≥ 3 caribou. Corresponding mean proportion of hard turn values by buffer zone, season, and herd (i.e., pooled over years) are presented in Table 11.

Figure 10: Mean proportion of hard turns by herd, buffer zone ('Buffer'), season, and study year (2010–2022).

4.2.1.6 Modelling Speed

Generalized linear mixed-effects models were used to examine the relationship between speed (km/hr) and several explanatory variables, including buffered distance from the Diavik-Ekati mine complex, herd, sex, biological year, landcover, and path duration (Table 7). Models were fit using a gamma distribution with a log-link because it best fit the data based on an assessing the distribution of model residuals. Other model types that were evaluated for best fit were mixed-effect linear regression after log-transforming speed, mixed-effect gamma regression without a log-link, and mixed-effect inverse gaussian regression. Calving and post-calving seasons could not be modelled because data were limited during these seasons, particularly for the Beverly/Ahiak herd.

Model 4 was the top performing model ($\Delta AIC = 0.0$) for explaining variation in speed (km/hr) in all four seasons, and included herd, sex, path duration, and an interaction term between landcover and buffered distance from the mine complex (Table 12). The continuous effect of buffered distance from the mine complex and path duration (hours) were modelled as natural cubic splines, which allowed for non-linear relationships between the variables and for speed to be identified. Model 4 did not include biological year as a variable due to convergence issues, but biological year was present in other candidate models that performed better than the null model (Table 12). The top model does not account for annual effects, which may explain some variation in speed, but rather treats all paths as equal across years.

Table 13 presents the *P*-values for the effects of each model parameter, from the top model, on caribou speed. Beta estimates of model parameters from top model for each season are presented in Appendix E. Parameter estimates and *P*-values from the top model indicate that female caribou exhibited significantly faster speeds across all seasons than males (Table 13; Figure 11). Caribou in the Beverly/Ahiak herd were found to only have significantly lower speeds than Bathurst caribou in summer ($\chi^2 = 43.1$; $df = 1$; $P < 0.001$; Table 13; Figure 11). As expected, the duration of a path was found to have a significantly negative relationship with caribou speed, where speed of caribou decreased rapidly as the duration of a movement path within a buffer increased, for all seasons (Table 13; Figure 11).

Speed was significantly influenced by landcover, regardless of season (Table 13; Figure 12). Seasonal variation in speed was also observed. Caribou speed was usually highest during spring migration and lowest during winter, regardless of landcover and distance from mine complex (Figure 12). During spring migration, caribou speeds peaked approximately 50 km from the mine complex, regardless of landcover type; this peak was not observed during the other seasons (Figure 12). Caribou speeds near the mine complex (i.e., within 30 km) were lowest for landcover classes with suitable caribou forage (i.e., low shrub/herb, bryoids, and wetland; Figure 12). Further, speeds in low shrub/herb and bryoid landcover classes were approximately equal during summer, fall, and winter seasons, within 30 km of the mine complex (Figure 12). Other landcover classes that do not support suitable caribou forage (i.e., water/snow/ice, exposed land/rock, mixed/deciduous, and conifer) generally had higher caribou speeds than landcover classes with forage (Figure 12).

Table 12: Ranked model selection results for evaluating speed using generalized linear mixed-effect models for each season.

Season	Model Name	Model ^(a)	K	Log-Likelihood	Δ AICc	AICw
Spring Migration	Model4	Speed ~ Landcover * Distance from Mine^(b) + Herd + Sex + Path Duration^(b) + (1 id)	49	-41461.01	0.0	1
	Model3	Speed ~ Herd + Sex + Biological Year + Path Duration ^(b) + (1 id)	18	-44494.6	6005.2	0
	Model2	Speed ~ Landcover * Distance from Mine ^(b) + (1 id)	44	-50597.7	18263.3	0
	Model1	Speed ~ Landcover + (1 id)	9	-52182.1	21362.0	0
	Null	Speed ~1 + (1 id)	3	-54052.9	25091.6	0
Summer	Model4	Speed ~ Landcover * Distance from Mine^(c) + Herd + Sex + Path Duration^(b) + (1 id)	49	-123589.2	0.0	1
	Model3	Speed ~ Herd + Sex + Biological Year + Path Duration ^(b) + (1 id)	18	-134626.4	22012.4	0
	Model2	Speed ~ Landcover * Distance from Mine ^(c) + (1 id)	44	-146659.3	46130.0	0
	Model1	Speed ~ Landcover + (1 id)	9	-152261.0	57263.6	0
	Null	Speed ~1 + (1 id)	3	-154735.4	62200.3	0
Fall	Model4	Speed ~ Landcover * Distance from Mine^(b) + Herd + Sex + Path Duration^(b) + (1 id)	35	-88256.9	0.0	1
	Model3	Speed ~ Herd + Sex + Biological Year + Path Duration ^(b) + (1 id)	18	-95275.6	14003.3	0
	Model2	Speed ~ Landcover * Distance from Mine ^(b) + (1 id)	30	-110615.5	44707.3	0
	Model1	Speed ~ Landcover + (1 id)	9	-111787.6	47009.5	0
	Null	Speed ~1 + (1 id)	3	-115640.7	54703.7	0
Winter	Model4	Speed ~ Landcover * Distance from Mine^(b) + Herd + Sex + Path Duration^(b) + (1 id)	35	38559.8	0.0	1
	Model3	Speed ~ Herd + Sex + Biological Year + Path Duration ^(b) + (1 id)	18	30031.6	17022.3	0
	Model2	Speed ~ Landcover * Distance from Mine ^(b) + (1 id)	30	18257.4	40594.7	0
	Model1	Speed ~ Landcover + (1 id)	9	16999.6	43068.3	0
	Null	Speed ~1 + (1 id)	3	10021.3	57012.9	0

(a) Top models are indicated in bold. Descriptions of covariates can be found in Table 7. The reference category for categorical variables is "Water/Snow/Ice" for landcover; "Bathurst" for Herd; and "Female" for Sex. 1|id indicates a random effect for individual caribou, which accounts for variation in movement among individual caribou.

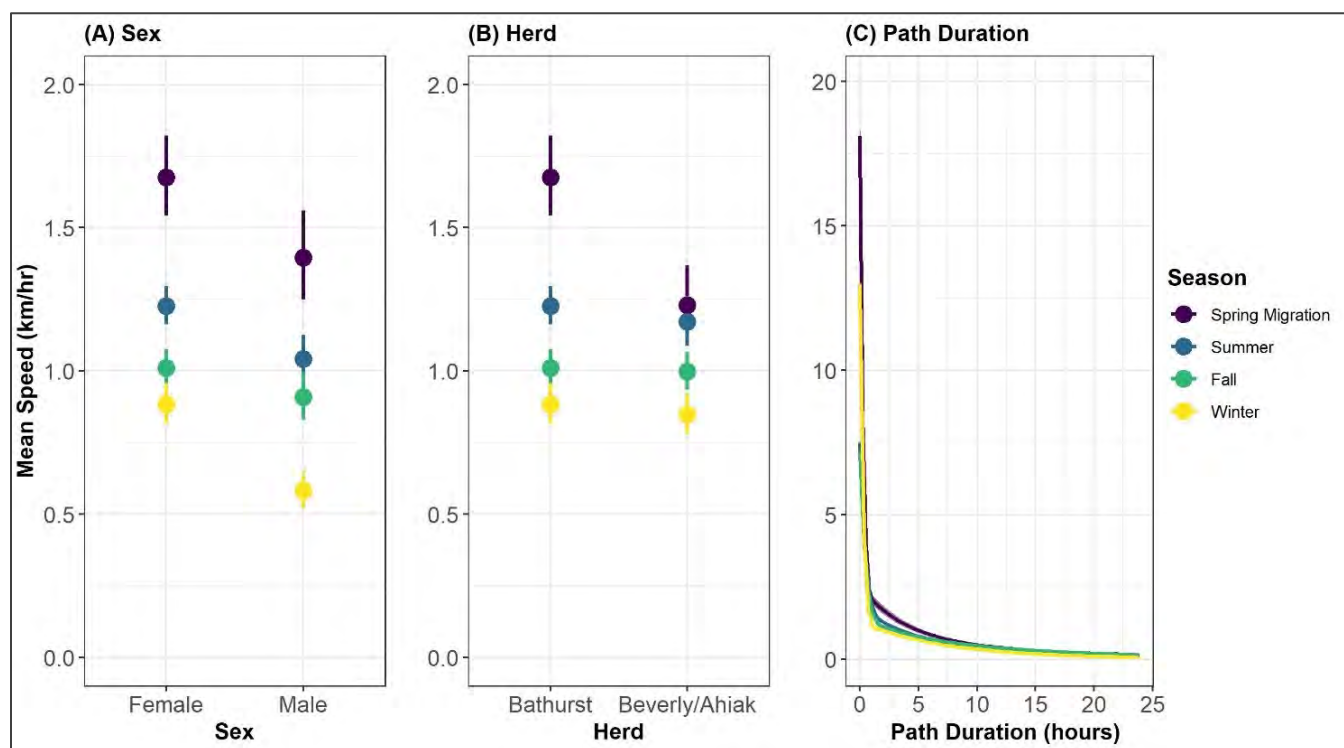
(b) Covariate was included as a spline with three degrees of freedom (df = 3).

(c) Covariate was included as a spline with five degrees of freedom (df = 5).

Table 13: Statistical results for model covariates included in the top speed model for each season.

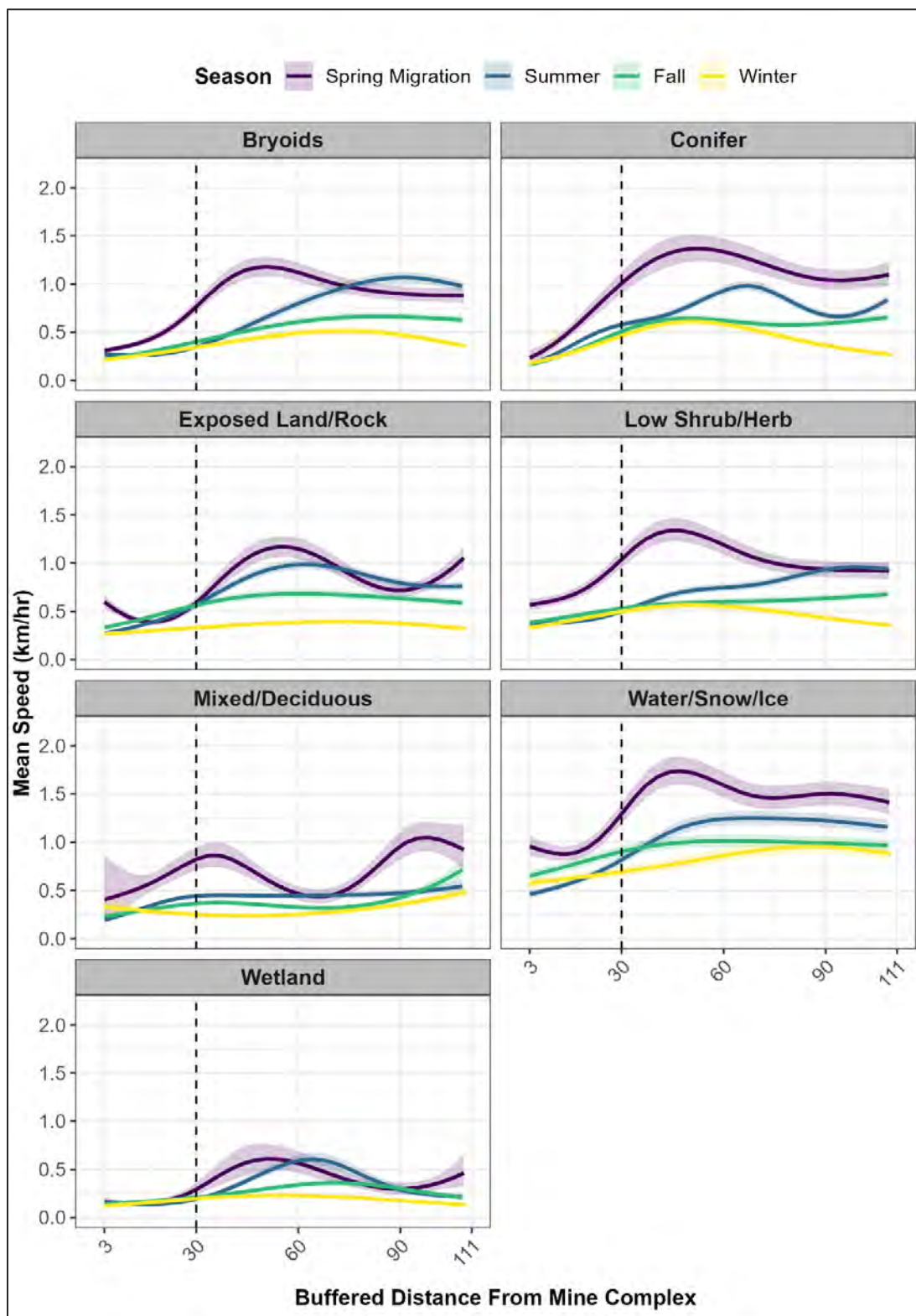
Season	Covariate	χ^2	df	P
Spring Migration	Landcover	14382.4	6	<0.001
	ns(dist.from.mine, df = 5)	2207.5	3	<0.001
	Herd	2.1	1	0.151
	Sex	38.6	1	<0.001
	ns(sub.duration.hours, df = 2)	36028.4	3	<0.001
	landcover.recl:ns(dist.from.mine, df = 5)	1540.6	18	<0.001
Summer	Landcover	4013.9	6	<0.001
	ns(dist.from.mine, df = 5)	2892.3	5	<0.001
	Herd	43.1	1	<0.001
	Sex	8.5	1	0.004
	ns(sub.duration.hours, df = 2)	17151.7	3	<0.001
	landcover.recl:ns(dist.from.mine, df = 5)	856.4	30	<0.001
Fall	Landcover	6520.5	6	<0.001
	ns(dist.from.mine, df = 6)	15143.8	5	<0.001
	Herd	2.3	1	0.133
	Sex	14.3	1	<0.001
	ns(sub.duration.hours, df = 2)	50945.1	3	<0.001
	landcover.recl:ns(dist.from.mine, df = 6)	3081.8	30	<0.001
Winter	Landcover	9810.4	6	<0.001
	ns(dist.from.mine, df = 6)	5088.7	3	<0.001
	Herd	0.3	1	0.565
	Sex	3.9	1	0.048
	ns(sub.duration.hours, df = 2)	45419.4	3	<0.001
	landcover.recl:ns(dist.from.mine, df = 6)	1729.7	18	<0.001

Abbreviations: χ^2 = Chi-square statistic; "ns" = indicates that a natural cubic spline was used; df = degrees of freedom; statistical significance determined using P, where $\alpha = 0.05$.



Note: Error bars represent 95% confidence intervals. Note that panel C shows a larger scale for speed than panels A and B.

Figure 11: Mean speed (km/hr) predicted from the top model, in response to (A) Sex, (B) Herd, and (C) Path Duration (hours).



Note: Shaded error bars represent 95% confidence intervals. The dashed vertical line indicates the outermost distance of the test buffers (0 to 30 km) and innermost buffer of the Reference Group (30 to 111 km).

Figure 12: Mean speed (km/hr) predicted by the top model for seven landcover classes and four seasons, at differing distances from the Diavik and Ekati mine complex.

Proportion of Hard Turns

Generalized linear mixed-effects models were used to examine the relationship between the proportion of hard turns and several explanatory variables, including buffered distance from the Diavik-Ekati mine complex, herd, sex, biological year, landcover, path duration, and speed (Table 7). Model 4 was the top performing model ($\Delta AIC = 0.0$) for explaining variation in proportion of hard turns for all seasons (Table 14). Model 4 included herd, sex, path duration, speed, and an interaction term between landcover and buffered distance from the mine complex (Table 14). The continuous effect of buffered distance from the mine complex and path duration (hours) were modelled as natural cubic splines, which allowed for non-linear relationships between the variables and for proportion of hard turns to be identified. Model 4 did not include biological year as a variable due to convergence issues, but biological year was present in other candidate models that performed better than the null (Table 14). The top model does not account for annual effects, which may explain some variation in hard turns, but rather treats all paths as equal across years.

Table 15 presents the *P*-values for the effects of each model parameter, from the top model, on proportion of hard turns. Beta estimates of model parameters from top model for each season are presented in Appendix E. Parameter estimates and *p* values from the top model indicate that females exhibited lower proportion of hard turns than males (Table 15; Figure 13). Caribou in the Beverly/Ahiak herd had significantly lower proportions of hard turns during all seasons except the fall, where there was no statistically significant difference ($\chi^2 = 0.10$; $df = 1$; $P = 0.753$; Table 15; Figure 13). As expected, path duration had a significantly positive relationship with proportion of hard turns, where proportion of hard turns increased as path duration within a buffer increased (Table 15; Figure 13). Speed and proportion of hard turns were also significantly related (Table 15); at low speeds, proportion of hard turns was high and at any speed exceeding 5 km/hr proportion of hard turns was zero (Figure 13).

Figure 14 presents the relationship between proportion of hard turns and landcover at differing distances from the Diavik-Ekati mine complex. Proportion of hard turns was significantly influenced by landcover class, regardless of season (Table 15). In general, proportion of hard turns was lowest during spring migration and highest during summer and winter (Figure 14). For many landcover classes (i.e., water/snow/ice, low shrub/herb, bryoids, exposed land/rock, and wetland), proportion of hard turns was lower in fall than winter and summer (Figure 14). However, for mixed/deciduous and conifer landcover classes, proportion of hard turns was similar to winter and summer during the fall (Figure 14). For landcover classes where suitable caribou forage was expected (i.e., bryoids, low shrub/herb, and wetland; Table 6), proportion of hard turns were highest within 30 km of the mine complex and decreased with distance from mine complex (Figure 14). This trend was consistent across seasons, although was most pronounced in the summer and least pronounced during spring migration (Figure 14).

Table 14: Ranked model selection results for evaluating proportion of hard turns using mixed-effect logistic regression for each season.

Season	Model Name	Model ^(a)	K	Log-Likelihood	Δ AICc	AICw
Spring Migration	Model4	Hard Turn ~ Landcover * Distance from Mine^(b) + Herd + Sex + Path Duration^(c) + Speed + (1 id)	48	-39690.8	0.0	1
	Model3	Hard Turn ~ Herd + Sex + Biological Year + Path Duration ^(c) + Speed + (1 id)	16	-39739.6	33.7	0
	Model2	Hard Turn ~ Landcover * Distance from Mine ^(b) + (1 id)	43	-44090.6	8789.8	0
	Model1	Hard Turn ~ Landcover + (1 id)	8	-44640.8	9820.0	0
	Null	Hard Turn ~ 1 + (1 id)	2	-44854.1	10234.7	0
Summer	Model4	Hard Turn ~ Landcover * Distance from Mine^(b) + Herd + Sex + Path Duration^(c) + Speed + (1 id)	48	-39690.8	0.0	1
	Model3	Hard Turn ~ Herd + Sex + Biological Year + Path Duration ^(c) + Speed + (1 id)	16	-39739.6	33.7	0
	Model2	Hard Turn ~ Landcover * Distance from Mine ^(b) + (1 id)	43	-44090.6	8789.8	0
	Model1	Hard Turn ~ Landcover + (1 id)	8	-44640.8	9820.0	0
	Null	Hard Turn ~ 1 + (1 id)	2	-44854.1	10234.7	0
Fall	Model4	Hard Turn ~ Landcover * Distance from Mine^(d) + Herd + Sex + Path Duration^(c) + Speed + (1 id)	55	-102631.7	0.0	1
	Model3	Hard Turn ~ Herd + Sex + Biological Year + Path Duration ^(c) + Speed + (1 id)	16	-103059.6	777.7	0
	Model2	Hard Turn ~ Landcover * Distance from Mine ^(d) + (1 id)	50	-109241.7	13210.0	0
	Model1	Hard Turn ~ Landcover + (1 id)	8	-110084.9	14812.3	0
	Null	Hard Turn ~ 1 + (1 id)	2	-110811.2	16253.0	0
Winter	Model4	Hard Turn ~ Landcover * Distance from Mine^(d) + Herd + Sex + Path Duration^(c) + Speed + (1 id)	55	-103785.2	0.0	1
	Model3	Hard Turn ~ Herd + Sex + Biological Year + Path Duration ^(c) + Speed + (1 id)	16	-103919.2	190.0	0
	Model2	Hard Turn ~ Landcover * Distance from Mine ^(d) + (1 id)	50	-110145.3	12710.3	0
	Model1	Hard Turn ~ Landcover + (1 id)	8	-110625.1	13585.8	0
	Null	Hard Turn ~ 1 + (1 id)	2	-111004.5	14332.7	0

(a) Top models are indicated in bold. Descriptions of covariates can be found in Table 7. The reference category for categorical variables is "Water/Snow/Ice" for landcover; "Bathurst" for Herd; and "Female" for Sex. 1|id indicates a random effect for individual caribou, which accounts for variation in movement among individual caribou.

(b) Covariate was included as a spline with five degrees of freedom (df = 5).

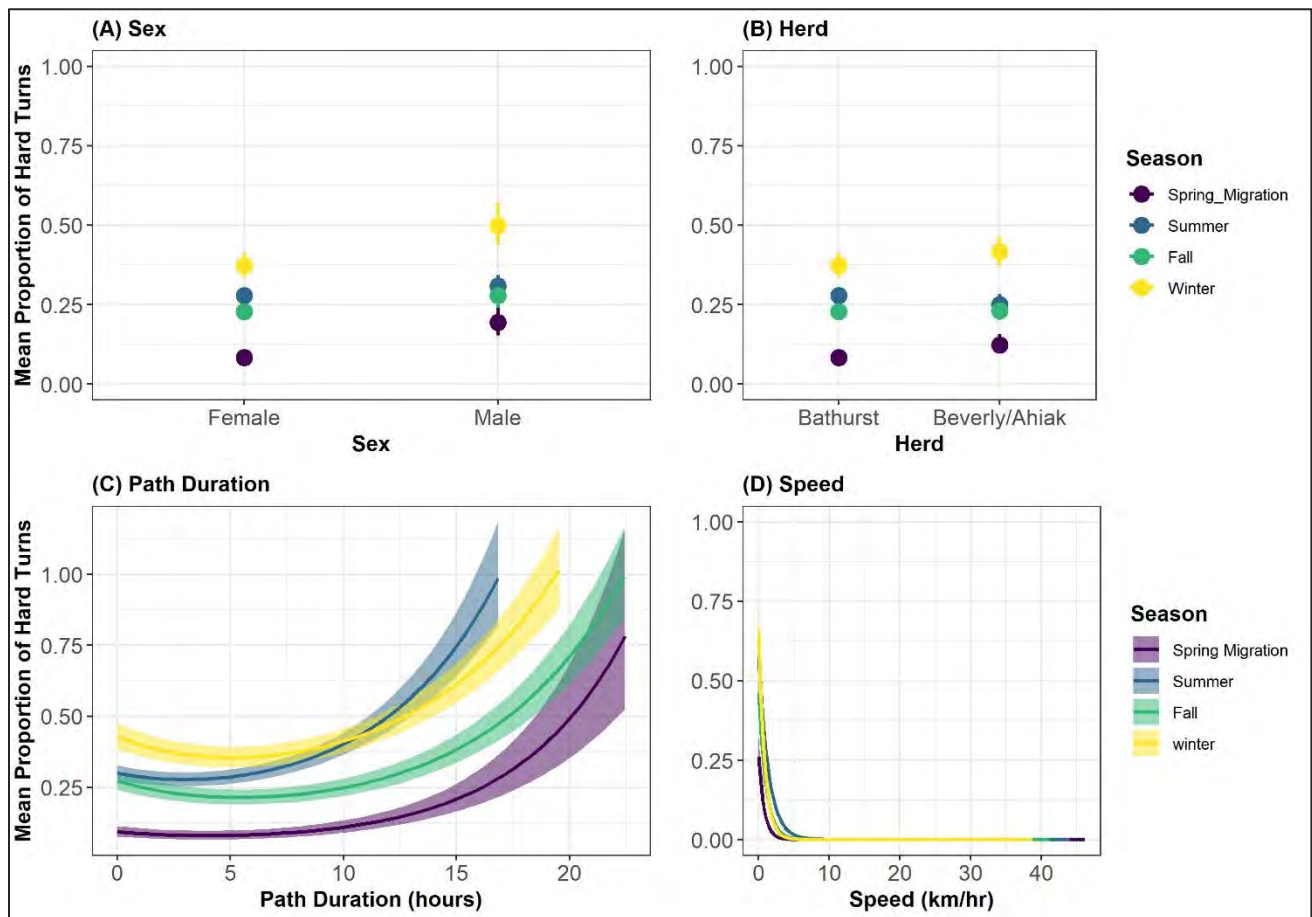
(c) Covariate was included as a spline with two degrees of freedom (df = 2).

(d) Covariate was included as a spline with six degrees of freedom (df = 6).

Table 15: Statistical results for model covariates included in the top proportion of hard turns model for each season.

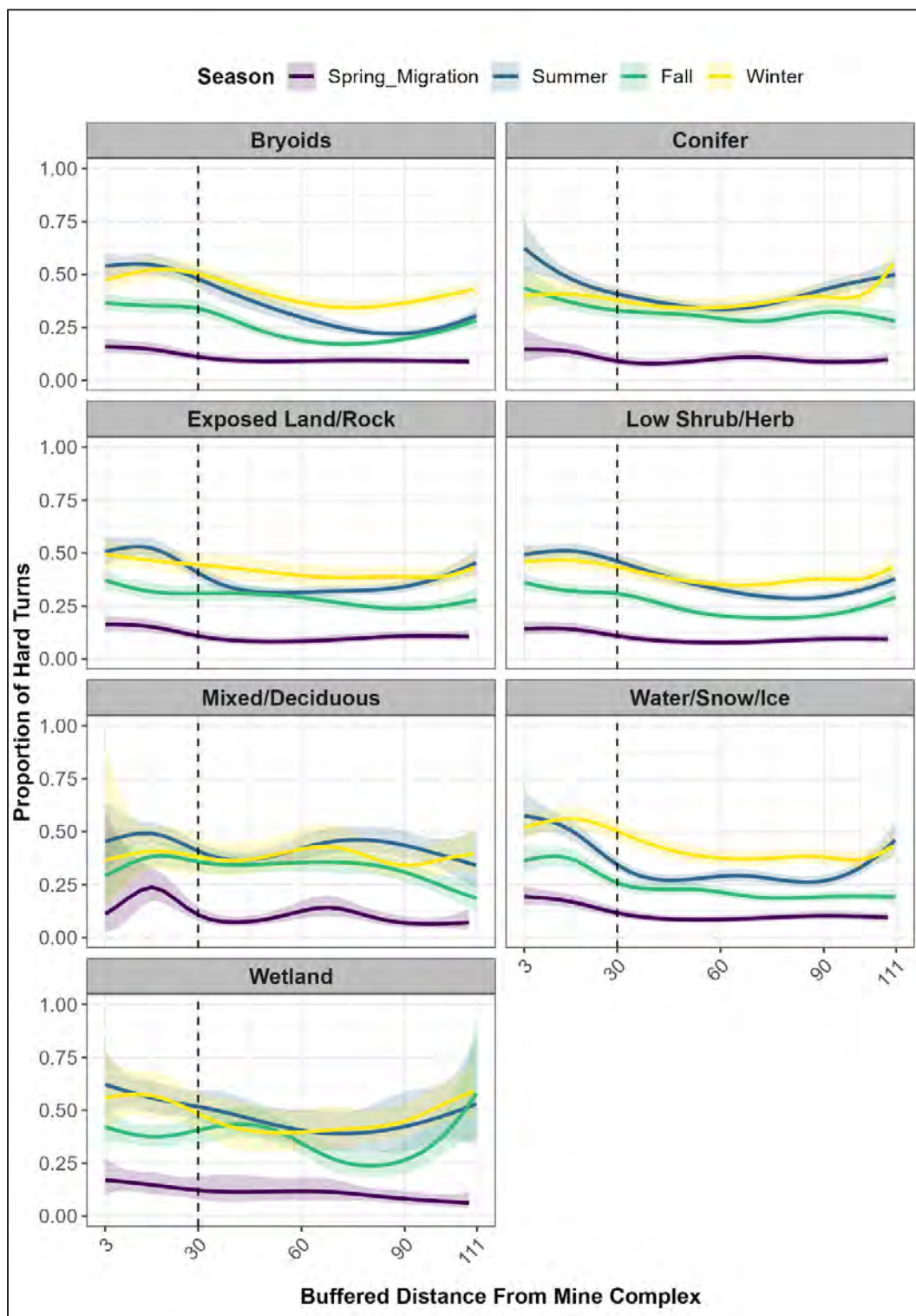
Season	Covariate	χ^2	df	P
Spring Migration	Landcover	31.5	6	<0.001
	ns(dist.from.mine, df = 5)	295.8	5	<0.001
	Herd	13.6	1	<0.001
	Sex	39.2	1	<0.001
	ns(path duration, df = 2)	136.7	2	<0.001
	Speed	4811.9	1	<0.001
	Landcover:ns(dist.from.mine, df = 5)	60.5	30	0.001
Summer	Landcover	31.5	6	<0.001
	ns(dist.from.mine, df = 5)	295.8	5	<0.001
	Herd	13.6	1	<0.001
	Sex	39.2	1	<0.001
	ns(path duration, df = 2)	136.7	2	<0.001
	Speed	4811.9	1	<0.001
	Landcover:ns(dist.from.mine, df = 5)	60.5	30	0.001
Fall	Landcover	414.0	6	<0.001
	ns(dist.from.mine, df = 6)	697.9	6	<0.001
	Herd	0.1	1	0.753
	Sex	7.4	1	0.006
	ns(path duration, df = 2)	698.9	2	<0.001
	Speed	7730.1	1	<0.001
	Landcover:ns(dist.from.mine, df = 6)	293.7	36	<0.001
Winter	Landcover	54.0	6	<0.001
	ns(dist.from.mine, df = 6)	305.8	6	<0.001
	Herd	6.0	1	0.014
	Sex	20.4	1	<0.001
	ns(path duration, df = 2)	361.2	2	<0.001
	Speed	7446.2	1	<0.001
	Landcover:ns(dist.from.mine, df = 6)	114.0	36	<0.001

Abbreviations: χ^2 = Chi-square statistic; "ns" = indicates that a natural cubic spline was used; df = degrees of freedom; statistical significance determined using P, where $\alpha = 0.05$.



Note: Error bars represent 95% confidence intervals for each season.

Figure 13: Proportion of hard turns ($\geq 60^\circ$) predicted from the top model from each season in response to (A) Sex, (B) Herd, (C) Path Duration (hours) and (D) Speed (km/hr).



Note: Shaded error bars represent 95% confidence intervals for each season. Dashed vertical line indicates the outermost distance of the test buffers (0 to 30 km) and innermost buffer of the Reference Group (30 to 111 km).

Figure 14: Proportion of hard turns (≥ 60 degrees) predicted from the top model from each season in response to the interaction between landcover class and buffered distance from the Diavik and Ekati mine complex.

4.2.2 Conclusions

The movement analyses presented and evaluated changes to caribou residency, speed, and proportion of hard turns at different distances from the Diavik-Ekati mine complex. Generally, caribou residency, speed, and proportion of hard turns for caribou within test buffers (i.e., the ten 3-km buffer zones established within 30 km of the mine complex) were within two standard deviations of movement values estimated for reference caribou (i.e., animals further than 30 km from the mine complex). Overall, the results indicate that similar trends in residency, speed, and proportion of hard turns were observed for caribou at increasing distance within 111 km of the mine complex.

Model results revealed that caribou speed and proportion of hard turns varied as a function of sex, herd, season, path duration, and distance from mine complex. The inclusion of an interaction between landcover and distance from mine complex with herd, sex, and path duration covariates significantly improved model fit. These results indicate the importance of these five variables for predicting speed and hard turns and that caribou may be responding to the mine complex.

Females moved at faster speeds and had a lower proportion of hard turns than males, suggesting that females had more directional movement than males, which aligned with *a priori* expectations. During spring migration, female caribou move directionally and quickly to reach calving grounds. Following parturition, females with young move slowly and less directionally (i.e., higher proportion of hard turns). Because calving and post-calving seasons were not included in these analyses due to small sample sizes, the periods when females move slowly and non-directionally are excluded from analysis, which may also contribute to the significant differences between speed and proportion of hard turns for male and female caribou.

Caribou in the Beverly/Ahiak herd moved at slower speeds than caribou in the Bathurst herd during summer only and had significantly lower proportions of hard turns during all seasons except fall. The Beverly/Ahiak herd may have higher intra-herd variation in migratory behaviour than the Bathurst herd, with some Beverly/Ahiak individuals migrating less far south for winter than other Beverly/Ahiak individuals. Higher intra-herd variation could contribute to the inter-herd differences in proportion of hard turns during winter.

Path duration also significantly influenced caribou speed and proportion of hard turns. Caribou with long path durations (i.e., caribou that spent a long time in each buffer zone) moved at slower speeds and had higher proportion of hard turns. These results align with *a priori* expectations and support that increased time spent in an area is related to non-directional movement and slow speeds, which supports foraging and/or bedding behaviour. Finally, speed was a significant predictor of proportion of hard turns; figures with predictive values suggest that at speeds exceeding 5 km/hr, caribou will have a low proportion of hard turns.

Caribou moved fast and had a low proportion of hard turns during spring migration, regardless of landcover and distance from the Diavik-Ekati mine complex. These results align with expectations for the spring migration season, when caribou are moving directionally and quickly from their over-wintering grounds in the south to calving grounds in the north. Caribou speeds peaked approximately 50 km from the mine complex, regardless of landcover class. Because this peak was only evident for the spring migration and across all landcover classes, it is likely that the peak is related to a highly used migration route(s) occurring approximately 50 km from the mine complex (Figure 4).

Caribou speed during spring migration was lowest in habitats with suitable forage (e.g., low shrub/herb and bryoids) and highest in habitats that were expected to function as travel corridors (e.g., water/snow/ice) or that were not expected to provide suitable forage (e.g., mixed/deciduous and conifer). Caribou speeds were relatively low in exposed land/rock and wetland landcover classes, suggesting that these habitats may also provide foraging and/or bedding opportunities during spring migration. The proportion of hard turns was low across all landcover classes, regardless of season, suggesting that caribou maintain some directional movement, despite slowing down in suitable habitats.

In contrast, caribou moved slow and had high a proportion of hard turns during winter, compared to other seasons. Again, these findings align with *a priori* expectations and support that caribou reduce energy expenditure by moving slowly and purposefully (i.e., with intent to access forage) to conserve energy during the winter. Caribou moved especially slow in some habitats (i.e., low shrub/herb, bryoids, exposed land/rock, mixed/deciduous, and wetlands) during winter, which suggests that favourable conditions (e.g., suitable forage, bedding sites, security/predator detection distance and/or thermal cover) are available in these habitats during winter. Likewise, caribou moved slow with a high proportion of hard turns during summer, which supports fewer directional, long-distance movements and more searching for quality food. In summer, caribou are expected to take advantage of new plant growth and thus exhibit short, slow movements with high proportions of hard turns while foraging. In comparison to winter and summer, caribou usually moved faster and had a lower proportion of hard turns during fall.

Modelled speed and proportion of hard turns varied as a function of landcover and distance from mine complex. Caribou moved slower and had higher proportion of hard turns within 30 km of the mine complex, compared to farther than 30 km from the mine complex. These results were supported by the comparison of observed turning angles within 30 km of the mine complex to the Reference Group. Overall, caribou vary their movement behaviour in response to the Diavik-Ekati mine complex and, specifically, exhibit slower and less directional movements near the mine complex.

Caribou were predicted to move slower and less directionally in selected habitats (e.g., habitats that provide a particular value to caribou, such as available forage or lower predation risk). Thus, slow and less directional movement near the mines may be indicative of an attraction to habitats near the mine complex, related to high forage availability, lower predation risk, or both. Because the availability of landcover classes was not assessed as a function of distance from mine complex, it is unknown whether the availability of certain landcover classes are responsible for the slow speeds and high proportions of hard turns close to the mines. Ungulates may also use habitats near anthropogenic disturbances to take advantage of prey refuges associated with developments (e.g., Hebblewhite and Merrill 2007, Shannon et al. 2014). Therefore, caribou may be moving slowly and less directionally near the Diavik-Ekati mine complex to take advantage of lower predation risk. In contrast, slow and less directional movement near the mines might be indicative of caribou that are uncertain how to safely navigate their way through or around the mine footprint.

The movement analyses should not be used to infer the presence and/or magnitude of a ZOI surrounding the Diavik-Ekati mine complex, nor should 30 km (where 3-km buffer zones switch from 'test' to 'reference') be inferred as the ZOI surrounding the mine complex. Boulanger et al. (2021) investigated second order habitat selection (Johnson et al. 1980) within 40 km of mines and found that the ZOI around the Diavik-Ekati mine complex varied by year and ranged from 6.1 to 18.7 km from 2003 through 2017. The movement analyses presented here investigated movement behaviour within 3 km intervals (i.e., at a finer scale, or third order scale; Johnson et al. 1980). Thus, if caribou residency, speed, and turning angles differ within the ZOI estimated by Boulanger et al. (2021), these differences would not be easily detectable using the movement analyses completed here. Further analyses addressing the presence and/or magnitude of a ZOI will be undertaken as an addendum to the 2022 WMMR.

4.3 Changes to Behaviour

Ground-based behavioural observations, or scan sampling, were completed to provide data on changes in caribou behaviour (e.g., time spent feeding, bedded, walking) as a function of distance from the Mine. Some historical monitoring has been completed cooperatively with the Ekati mine as caribou are often close to the Ekati mine infrastructure. The monitoring objective from Handley (2010) is:

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

To meet GNWT-ENR WMMP Approval Condition 6 (Table 1), a “pooled” analysis of 2011 to 2022 data was proposed for inclusion in the 2022 WMMR to compare to the results presented in the 2011 report (i.e., 1998-2010; Golder 2011). However, to characterize the relationship between caribou activity budgets with distance from mine complex footprints and environmental variables, data from all years (1998-2022) needed to be prepared and analyzed together in the pooled analysis to avoid potential biases from sampling differences occurring across both individual years and broader time periods. For example, most of the 1998 to 2010 surveys were conducted in closer proximity to Ekati, whereas data from more recent years (2011-2022) are mainly concentrated around Diavik. Therefore, the cumulative assessment includes analyses of all years of caribou group scan survey data, including pooled regression analyses and a qualitative assessment of differences across years and time periods. This type of analysis exceeds the analysis originally proposed to meet Approval Condition 6.

4.3.1 Methods

4.3.1.1 Caribou Group Scans

Caribou groups were scanned every eight minutes for a minimum of four observations and a maximum of eight observations. For each scan, the number of animals exhibiting each type of behaviour was recorded (Murphy and Curatolo 1987). Individual caribou activities were recorded as feeding, bedded, standing, alert, walking, trotting, or running. Individuals were classified as feeding when they were actually foraging or searching for food (i.e., walking with head down), and the GPS location was recorded. Group composition was classified (e.g., males, males and females, males, females, and calves), and the number of animals in the group was recorded. If a group was too large to record the behaviour of each individual, the total group size was noted, and a subset of the group was observed for behaviour. The response variable is caribou behaviour, while the covariates include distance from either mine, group composition, and weather variables (wind speed, temperature, precipitation).

Caribou observations during snow-free periods were performed in one habitat type (tundra with <30% bedrock or boulders). During recent years, caribou have been present during winter and far-field monitoring of caribou behaviour increases human health risks and would require the use a snowmobile instead of a helicopter. Such changes influence continuity with historical data and may increase disturbance to caribou. During winter months, only incidentally encountered caribou groups were monitored to avoid these issues. In winter months, habitat types are not observable, and scans are completed on caribou groups irrespective of habitat type.

Response of caribou to stressors (natural or anthropogenic) was also assessed. In the event that a stressor was introduced during scan sampling, the observers noted the time and recorded the response of caribou to stressors as either no response, looked in the direction of the stressor, trotted or ran away. The reaction of the majority of the group was used in selecting the category. Estimated distance (m) from the stressor was also recorded. Stressors included type of wildlife, type of aircraft, type of vehicle, and blasts from pits. The observers then waited until the animals resumed their previous behaviour (usually 1 to 2 minutes) and would begin scanning observations again.

Focal scans, which are different than group scans, have been collected by the Ekati mine but were not part of the historical caribou behaviour monitoring completed at the Diavik mine and are not included in the WMMP (DDMI 2020a, 2021, 2022a). In 2016, DDMI agreed to perform focal scans to support cumulative effects caribou behaviour monitoring completed by GNWT-ENR but only after Diavik collected sufficient group scans for the Mine's monitoring requirements. Low and inadequate annual group scan samples have been communicated with EMAB and documented in annual reports (Golder 2018, 2019b, 2020a, 2021b; WSP Golder 2022a). Focal scans are not included in the caribou behavioural analysis.

4.3.1.2 Group Scan Behavioural Analysis

Caribou group scan data from 1998 to 2022 were summarized by year, group composition (i.e., non-nursery and nursery), and distance from Diavik and Ekati mine footprints (i.e., mine complex) to understand the variation in the data across these three parameters. Groups surveyed were classified as nursery or non-nursery groups based on the presence or absence of calves. Each survey location was assigned to one of 11 distance categories or buffers (<0.5 km, 0.5 – 1 km, 1-3 km, 3-5 km, 5-7 km, 7-9 km, 9-11 km, 11-13 km, 13-15 km, 15-30 km, and >30 km) based on the nearest distance to the mine complex footprint. These distance buffers align with the 2011 caribou group scan analyses (Golder 2011).

To understand the variation in caribou behaviour explained by distance to the mine complex, as well as explanatory variables, a regression analysis was completed using three different response variables: the proportion of time spent feeding, the proportion of time spent feeding and resting (feeding/resting), and the proportion of time spent alert and moving (alert/running). The response variable for feeding/resting was calculated as the sum of proportions of feeding and bedded behaviours, and the response variable for alert/moving was calculated as the sum of proportions for alert, walking, running, and trotting behaviours. The response variables were arcsine transformed prior to statistical analyses. Environmental variables included mean weekly estimates of temperature (°C), wind speed (metres/second), and insect activity index, as well as the weekly sum of precipitation (mm). Temperature, wind speed, and precipitation data were assigned using Diavik weather station data. The insect activity index was calculated as the average of index values for mosquito and oestrid fly activity as predicted from temperature and wind speed based on the procedure outlined in Russell et al. (1993). For the purpose of regression analyses, distance to mine complex was included as a continuous variable.

All continuous variables were standardized by setting the mean and standard deviations equal to 0 and 1, respectively, which improves model convergence (Zuur et al. 2009). Explanatory variables were screened for collinearity using a Pearson's correlation test, as well as variance inflation factors (VIF). If two variables were found to be significantly correlated ($|r| > 0.6$ or $VIF > 3.0$), then only one of the correlated variables was included in the model (Zuur et al. 2009, 2010). Five surveys occurred at temperatures below -35°C and were excluded to improve model fit issues related to the small samples size. Year was not included as an explanatory variable as it was expected that annual variation in caribou behaviour would be correlated with environmental variables, which provide a more ecologically meaningful interpretation of the results. Additionally, any year effects observed through modeling could be confounded with annual variation in monitoring (e.g., observers, seasons) rather than caribou behaviour. The relationship between response and predictor variables were evaluated based on model fit, and in cases with non-linear relationships, predictor variables were modeled as a natural cubic spline to allow for the relationship to vary across the range of the predictor. For non-linear relationships modeled with natural cubic splines, multiple slopes (i.e., beta coefficients) were calculated.

Nursery and non-nursery group survey data were modeled separately, and a candidate set of ten models was selected and applied for each combination of group composition (i.e., nursery or non-nursery) and response variable (i.e., proportion of time feeding, proportion of time feeding/resting, and proportion of time alert/moving). Candidate sets were designed based on recommendations from Burnham and Anderson (2002). For instance, Burnham and Anderson (2002) recommend small candidate sets (i.e., 10-15 models) designed to test alternative hypotheses and caution against iteratively searching the data for patterns (i.e., data dredging) by testing all combinations of covariates or using intermediate results to dictate additional models for consideration.

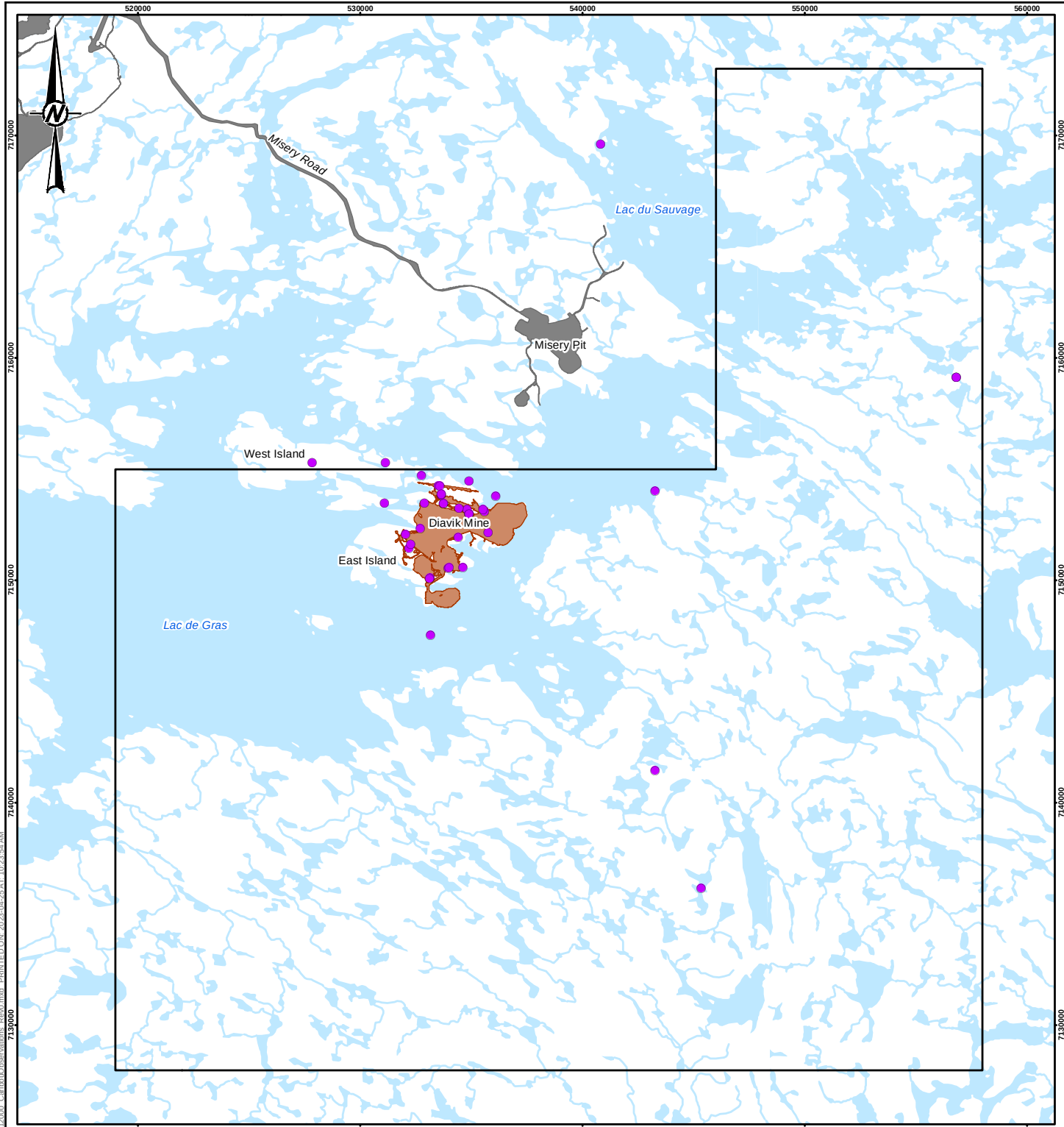
The candidate model set applied for each response variable included a global model (Model 10), and the ten candidate models were ranked and compared against a null model (Model 0). Each model in the candidate set was fit using a generalized linear model (GLM) with a Gaussian distribution, and analyses were performed in R (R Core Team 2022). Information-theoretic approaches were used to select a top model for each caribou group and response variable. Akaike's Information Criterion corrected for small sample size (AICc) and Akaike weights (w_i) (Burnham and Anderson 2002) were calculated for each model in the candidate set. Akaike weights provide the relative likelihood of a model being the top model given the candidate set, where an Akaike's weight closer to 1 indicates a high likelihood that the model is the top model (Burnham and Anderson 2002). Models with $\Delta AICc < 2.0$ were considered competitive (Burnham and Anderson 2002), but the top model was selected based on the competitive model with fewest parameters (i.e., most parsimonious competitive model) as well as model weight.

4.3.2 Results

4.3.2.1 Caribou Group Scans 2022

From 5 March to 10 August 2022 behaviour scans were completed on 38 caribou groups from 0 km to 15 km from the Diavik mine (Figure 15; Appendix F). These caribou were potentially from the Beverly/Ahiak and Bathurst herds based on collar locations. The total number of caribou observed was 702. Group size ranged from 1 to 400 with the average group size of 18 animals (1SD=67 animals). The estimated mean proportion ($\pm$ 2SE) of caribou behaviour observed is as follows; bedded 14% ($\pm$ 12%), feeding 55% ($\pm$ 17%), standing 6% ($\pm$ 8%), alert 2% ($\pm$ 5%), walking 15% ($\pm$ 12%), trotting 3% ($\pm$ 6%), and running 5% (7%).

The number of caribou groups observed in 2022 remained below the 55 groups in different distance strata required to detect a 15% change in behaviour derived from past summer and autumn results. If seasonal variation in behaviour is present, it would increase sample size requirements for these data to be combined with observations collected during summer/autumn (because most caribou were not present in past winters). Seasonal variation in female and male behaviour is expected due to differences in energetic and nutritional demands and environmental conditions (e.g., milk production for calves, autumn rut, insect harassment, and snow depth and hardness).



LEGEND

- LOCATION OF SCANNING OBSERVATIONS
- ▭ DIAVIK WILDLIFE STUDY AREA BOUNDARY
- ▭ DIAVIK FOOTPRINT
- ▭ EKATI FOOTPRINT
- WATERCOURSE
- WATERBODY

REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

RioTinto

PROJECT

DIAVIK DIAMOND MINES INC.

TITLE

LOCATIONS OF CARIBOU BEHAVIOUR SCANNING OBSERVATIONS, 2022

CONSULTANT

YYYY-MM-DD

2023-04-25

DESIGNED

NM

PREPARED

AK/NO

REVIEWED

DC

APPROVED

JV

PROJECT NO.

22511717

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4.3.2.2 Caribou Group Scans - Cumulative

Behaviour scan surveys were conducted from 1998 to 2022, although there were no surveys conducted during 2000 and 2011. Ekati contributed to survey effort up to 2010, completing behaviour scans on a total of 322 groups of caribou. A total of 1,219 surveys were summarized for the cumulative analysis. The total number of individual caribou observed across all behaviour scan surveys totaled 36,650 caribou. Note that some individuals may have been observed in more than one survey. Each observation group ranged in size from 1 to 2,000 animals, with an average group size of 32.6 (1SD = 132 animals) across all observation years.

The behaviour scans included variation in the group composition surveyed, with non-nursery groups including adults and nursery groups including a combination of adults and calves. The observed groups surveyed were made up of 638 non-nursery groups, 401 nursery groups, and 180 groups had an unknown group composition. The number of nursery and non-nursery groups varied across years (Figure 16). Group composition data were unavailable for 2012 and 2013, which included 86 and 90 unknown group compositions, respectively. A summary of group composition and total observations from 1998 to 2022 is provided in Table 16.

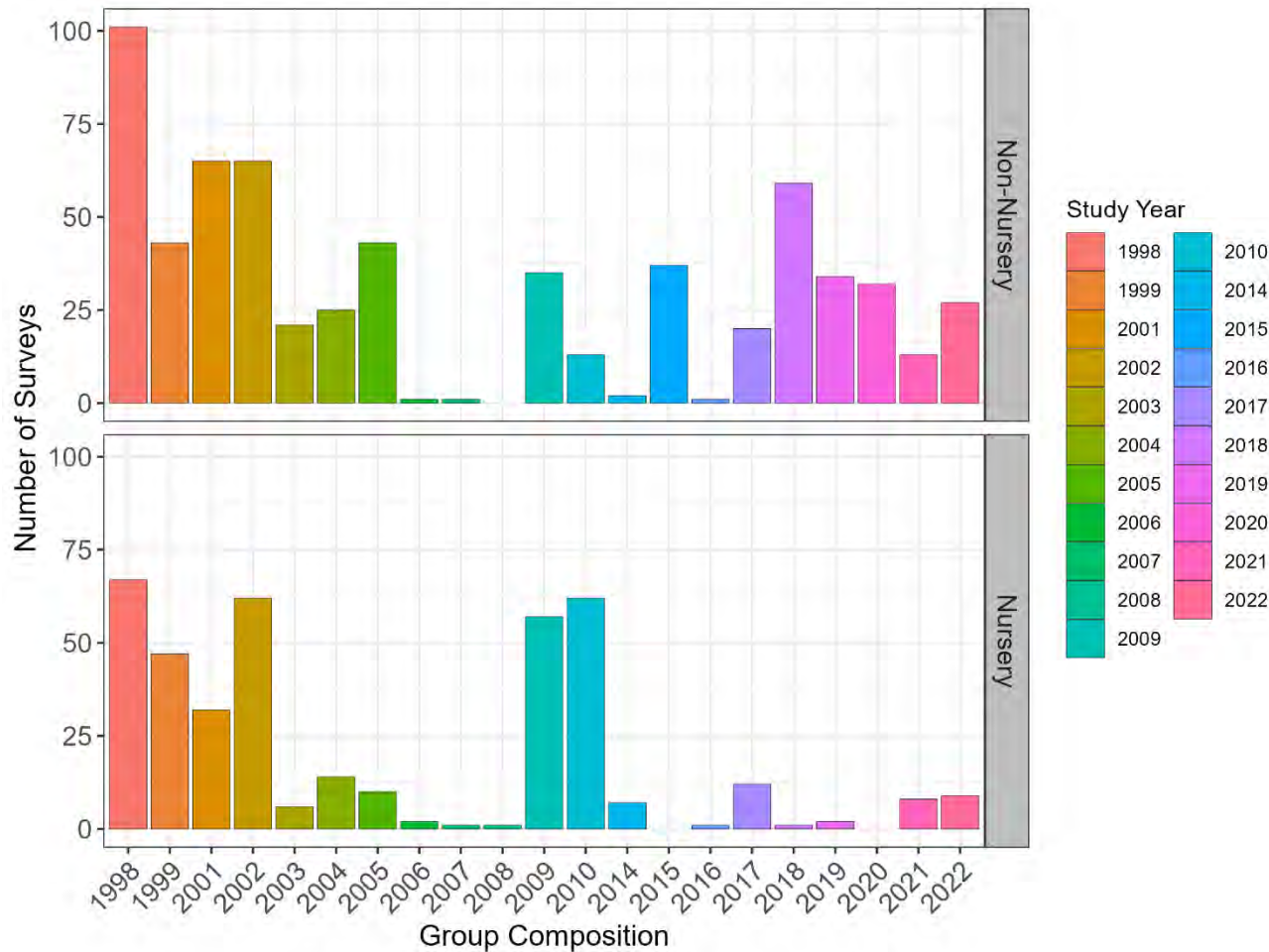


Figure 16: Number of Group Scan Surveys for Non-nursery and Nursery Groups by Year and Group Composition, 1998-2022

Table 16: Number of Group Scan Surveys by Year and Group Composition

Year ¹	Group Composition			
	Non-nursery	Nursery	Unknown	Total
1998	101	67	0	168
1999	43	47	0	90
2001	65	32	0	97
2002	65	62	0	127
2003	21	6	0	27
2004	25	14	0	39
2005	43	10	0	53
2006	1	2	0	3
2007	1	1	0	2
2008	0	1	0	1
2009	35	57	0	92
2010	13	62	0	75
2012	0	0	86	86
2013	0	0	90	90
2014	2	7	0	9
2015	37	0	1	38
2016	1	1	0	2
2017	20	12	0	32
2018	59	1	0	60
2019	34	2	0	36
2020	32	0	1	33
2021	13	8	0	21
2022	27	9	2	38

¹ Annual scan totals from 1998 to 2010 include 322 scans completed by Ekati, which were reported on in the 2011 comprehensive analysis report (Golder 2011). All scans from 2012 to 2022 have been completed by DDML.

The number of surveys within each distance buffer varied across years (Figure 17, Figure 18). During the majority of survey years, most caribou group scan surveys occurred within 0.5 km of the Diavik and Ekati mine complex. However, during 2009, 2012, 2013, and 2015, the majority of group scan surveys were collected beyond 15 km from Diavik and Ekati. The number of surveys for each year and distance buffer are presented in Table 17. Survey locations varied across years in terms of proximity to Diavik and Ekati mine footprints, with the majority of group scan surveys from 1998 to 2010 occurring closer to the Ekati mine footprint and the majority of group scan surveys from 2011 to 2022 occurring near the Diavik mine footprint (Figure 18).

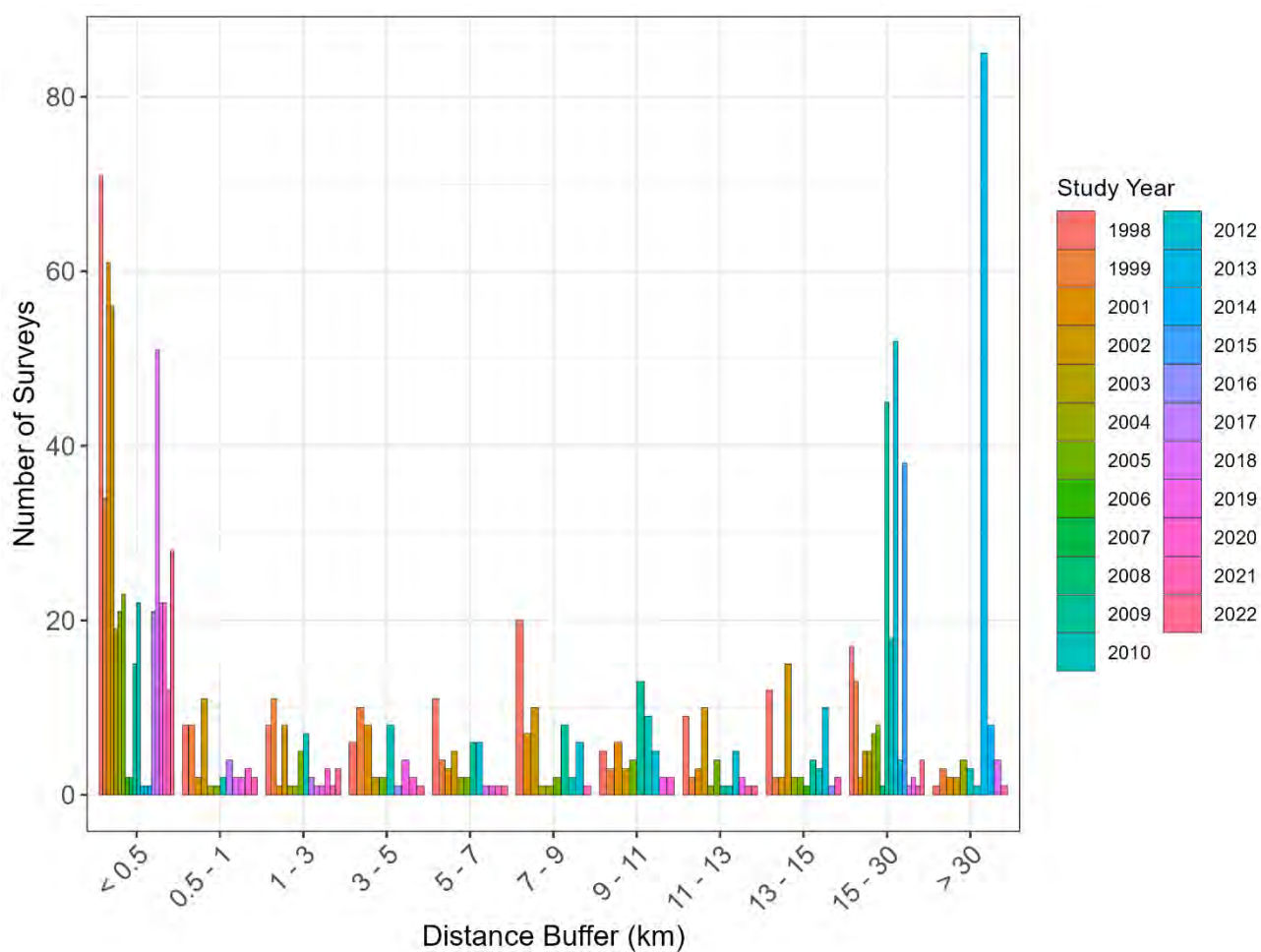
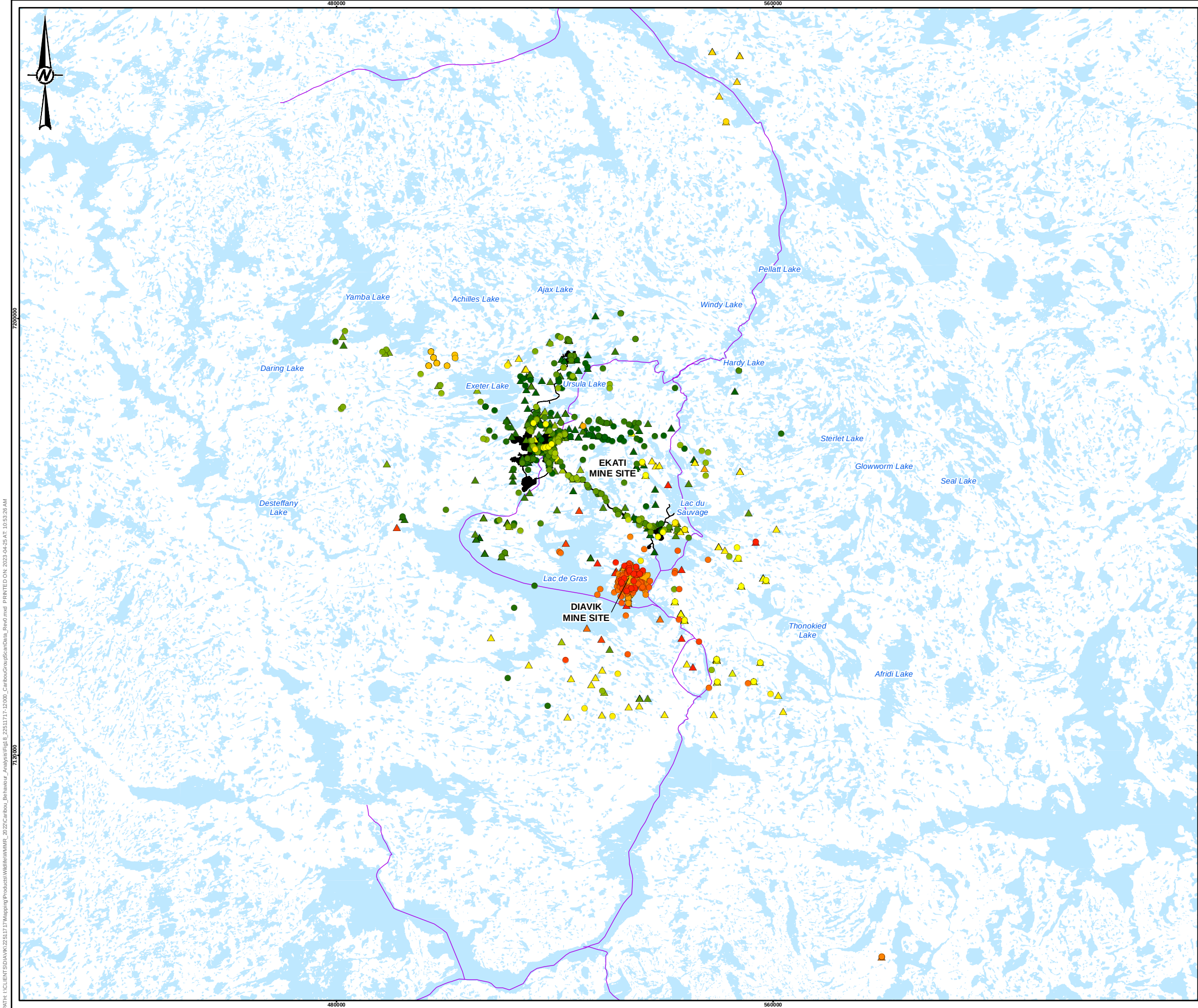


Figure 17: Number of Surveys within each Distance Buffer for each Group Composition Class (Non-nursery, Nursery, and Unknown), 1998-2022



LEGEND

WINTER ROAD

DIAVIK FOOTPRINT

EKATI FOOTPRINT

WATERBODY

NON-NURSERY CARIBOU GROUP SCAN

●	1998
●	1999
●	2001
●	2002
●	2003
●	2004
●	2005
●	2006
●	2007
●	2009
●	2010
●	2014
●	2015
●	2016
●	2017
●	2018
●	2019
●	2020
●	2021
●	2022

NURSERY CARIBOU GROUP SCAN

▲	1998
▲	1999
▲	2001
▲	2002
▲	2003
▲	2004
▲	2005
▲	2006
▲	2008
▲	2010
▲	2014
▲	2016
▲	2017
▲	2018
▲	2019
▲	2021
▲	2022

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REFERENCE(S)

1. HYDROLOGY OBTAINED FROM CLIENT.

PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

PROJECT

DIAVIK DIAMOND MINES INC.

TITLE

LOCATIONS OF CARIBOU BEHAVIOUR SCANNING OBSERVATIONS, 1998-2022

CONSULTANT

YYYY-MM-DD 2023-04-25

DESIGNED JF

PREPARED ANK

REVIEWED DC

APPROVED JV

PROJECT NO. 22511717

PHASE 12000

REV. 0

FIGURE 18

Table 17: Number of Group Scan Surveys by Year and 3 km Distance Buffer

Year	Distance Buffer (km)										
	<0.5	0.5 - 1	1 - 3	3 - 5	5 - 7	7 - 9	9 - 11	11 - 13	13 - 15	15 - 30	>30
1998	71	8	8	6	11	20	5	9	12	17	1
1999	34	8	11	10	4	0	3	2	2	13	3
2001	61	2	1	8	3	7	6	3	2	2	2
2002	56	11	8	2	5	10	3	10	15	5	2
2003	19	1	1	0	0	1	0	0	0	5	0
2004	21	0	1	0	2	1	0	1	2	7	4
2005	23	1	5	2	2	2	4	4	2	8	0
2006	2	0	0	0	0	0	0	0	1	0	0
2007	2	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	1	0
2009	15	0	0	0	6	8	13	1	4	45	0
2010	22	2	7	8	0	2	9	1	3	18	3
2012	1	0	0	0	6	6	5	5	10	52	1
2013	1	0	0	0	0	0	0	0	0	4	85
2014	1	0	0	0	0	0	0	0	0	0	8
2015	0	0	0	0	0	0	0	0	0	38	0
2016	0	0	0	1	0	0	0	0	1	0	0
2017	21	4	2	0	0	0	0	0	0	0	0
2018	51	2	1	0	1	0	0	0	0	1	4
2019	22	2	1	4	1	0	2	2	0	2	0
2020	22	3	3	2	1	0	2	0	0	0	0
2021	12	2	1	0	0	1	0	1	2	1	1
2022	28	0	3	1	1	0	0	1	0	4	0
Total	485	46	53	44	43	58	52	40	56	223	114

Activity proportions for non-nursery and nursery groups were summarized for each year (Table 18) and each distance buffer (Table 19). Additionally, activity proportions were calculated for non-nursery and nursery groups, pooling across all years and distance buffers. Surveys with an unknown group composition were excluded from activity proportion summaries.

Feeding behaviour was the most frequently recorded behaviour across all years in both groups; mean non-nursery group feeding behaviour ($46 \pm 1\%$) was equal to the mean nursery group feeding behaviour ($46 \pm 1\%$; Table 18). Across all years and both groups, alert, running, and trotting behaviours appeared low on average ($\leq 2 \pm 1\%$; Table 18). Observation years (1998-2022) sometimes included surveys only near or far from the mines, or only nursery (2008) or non-nursery group observations (2015, 2020; Table 18). To analyse behaviour budgets more consistently, results were pooled into distance buffers as indicated in Table 19.

The patterns of pooled values appeared consistent across both nursery and non-nursery groups. For instance, the highest proportion of feeding appeared within the 11-13 km (57% non-nursery, 67% nursery) and 13-15 km buffers (57% non-nursery, 55% nursery) in both non-nursery and nursery groups, respectively (Table 19; Figure 19). In both groups, the most common activity of observed caribou across all distance buffers appeared to be feeding (32-57% non-nursery, 38-67% nursery) and walking (15-41% non-nursery, 22-40% nursery; Table 19; Figure 19). The least common activities of caribou in both groups and across all distance buffers were alert, running, and trotting (<5% across all buffers). Bedding (5-29%) and standing (4-13%) were observed as the most intermediate activities of caribou across both groups. Bedding occurred more frequently in the non-nursery group (between 10-30% across all buffers), while the nursery group showed differentiation across distance (i.e., less frequent bedding [$\leq 18\%$] in distance buffers <7 km, while >7 km indicate greater variation in caribou bedding behaviour [5-33%]; Table 19; Figure 19).

Table 18: Mean ($\pm$ SE) Proportion (%) of Time Spent per Activity (Bedded, Feeding, Standing, Walking, Running, Trotting) by Non-Nursery and Nursery Groups Among Years

Year	Non-Nursery Mean Activity Proportions (%)								Nursery Mean Activity Proportions (%)							
	n	Bedded	Feeding	Standing	Walking	Alert	Running	Trotting	n	Bedded	Feeding	Standing	Walking	Alert	Running	Trotting
1998	101	22 $\pm$ 3	40 $\pm$ 3	16 $\pm$ 2	18 $\pm$ 2	2 $\pm$ 0	1 $\pm$ 0	2 $\pm$ 0	67	17 $\pm$ 3	48 $\pm$ 3	9 $\pm$ 1	22 $\pm$ 2	1 $\pm$ 1	1 $\pm$ 0	3 $\pm$ 1
1999	43	10 $\pm$ 3	37 $\pm$ 4	14 $\pm$ 3	32 $\pm$ 4	2 $\pm$ 1	1 $\pm$ 1	4 $\pm$ 2	47	7 $\pm$ 2	37 $\pm$ 3	18 $\pm$ 2	36 $\pm$ 3	1 $\pm$ 0	1 $\pm$ 1	1 $\pm$ 1
2001	65	20 $\pm$ 4	57 $\pm$ 4	8 $\pm$ 2	13 $\pm$ 2	0 $\pm$ 0	0 $\pm$ 0	1 $\pm$ 1	32	6 $\pm$ 2	58 $\pm$ 5	8 $\pm$ 2	20 $\pm$ 3	0 $\pm$ 0	1 $\pm$ 1	7 $\pm$ 4
2002	65	23 $\pm$ 4	54 $\pm$ 4	6 $\pm$ 1	15 $\pm$ 2	1 $\pm$ 0	1 $\pm$ 1	1 $\pm$ 0	62	16 $\pm$ 3	57 $\pm$ 3	3 $\pm$ 1	22 $\pm$ 3	1 $\pm$ 1	1 $\pm$ 1	0 $\pm$ 0
2003	21	23 $\pm$ 6	48 $\pm$ 8	7 $\pm$ 3	20 $\pm$ 6	0 $\pm$ 0	0 $\pm$ 0	1 $\pm$ 1	6	0 $\pm$ 0	45 $\pm$ 6	0 $\pm$ 0	50 $\pm$ 6	0 $\pm$ 0	0 $\pm$ 0	4 $\pm$ 4
2004	25	19 $\pm$ 7	44 $\pm$ 6	3 $\pm$ 1	28 $\pm$ 5	3 $\pm$ 2	0 $\pm$ 0	4 $\pm$ 2	14	21 $\pm$ 9	42 $\pm$ 7	3 $\pm$ 1	33 $\pm$ 7	0 $\pm$ 0	0 $\pm$ 0	2 $\pm$ 1
2005	43	17 $\pm$ 4	56 $\pm$ 4	10 $\pm$ 3	13 $\pm$ 2	2 $\pm$ 1	1 $\pm$ 1	2 $\pm$ 1	10	6 $\pm$ 3	45 $\pm$ 3	13 $\pm$ 2	29 $\pm$ 6	6 $\pm$ 2	0 $\pm$ 0	0 $\pm$ 0
2006	1	0*	48*	35*	17*	0*	0*	0*	2	0 $\pm$ 0	55 $\pm$ 0	3 $\pm$ 3	42 $\pm$ 4	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0
2007	1	51*	39*	4*	7*	0*	0*	0*	1	0*	33*	30*	35*	0*	0*	2*
2008	0	NA	NA	NA	NA	NA	NA	NA	1	0*	54*	0*	11*	10*	0*	25*
2009	35	36 $\pm$ 6	39 $\pm$ 5	6 $\pm$ 2	14 $\pm$ 4	3 $\pm$ 1	0 $\pm$ 0	1 $\pm$ 1	57	30 $\pm$ 4	44 $\pm$ 3	6 $\pm$ 1	16 $\pm$ 3	3 $\pm$ 1	1 $\pm$ 0	0 $\pm$ 0
2010	13	32 $\pm$ 9	25 $\pm$ 6	3 $\pm$ 1	34 $\pm$ 9	3 $\pm$ 2	1 $\pm$ 1	2 $\pm$ 1	62	26 $\pm$ 4	41 $\pm$ 3	6 $\pm$ 1	24 $\pm$ 3	2 $\pm$ 1	0 $\pm$ 0	1 $\pm$ 1
2014	2	12 $\pm$ 11	63 $\pm$ 25	19 $\pm$ 6	7 $\pm$ 7	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0	7	27 $\pm$ 12	33 $\pm$ 7	0 $\pm$ 0	39 $\pm$ 15	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0
2015	37	30 $\pm$ 5	46 $\pm$ 5	10 $\pm$ 2	13 $\pm$ 2	1 $\pm$ 0	1 $\pm$ 0	0 $\pm$ 0	0	NA	NA	NA	NA	NA	NA	NA
2016	1	69*	19*	12*	0*	0*	0*	0*	1	16*	84*	0*	0*	0*	0*	0*
2017	20	31 $\pm$ 9	46 $\pm$ 8	4 $\pm$ 2	16 $\pm$ 6	3 $\pm$ 1	0 $\pm$ 0	0 $\pm$ 0	12	29 $\pm$ 10	50 $\pm$ 10	2 $\pm$ 1	17 $\pm$ 7	2 $\pm$ 1	1 $\pm$ 1	0 $\pm$ 0
2018	59	27 $\pm$ 4	52 $\pm$ 4	3 $\pm$ 1	13 $\pm$ 3	3 $\pm$ 1	0 $\pm$ 0	3 $\pm$ 1	1	10*	34*	11*	45*	0*	0*	0*
2019	34	23 $\pm$ 6	42 $\pm$ 7	8 $\pm$ 3	21 $\pm$ 6	3 $\pm$ 1	0 $\pm$ 0	3 $\pm$ 2	2	3 $\pm$ 3	0 $\pm$ 0	9 $\pm$ 9	79 $\pm$ 16	0 $\pm$ 0	10 $\pm$ 9	0 $\pm$ 0
2020	32	30 $\pm$ 7	41 $\pm$ 6	5 $\pm$ 1	19 $\pm$ 4	2 $\pm$ 1	2 $\pm$ 1	2 $\pm$ 2	0	NA	NA	NA	NA	NA	NA	NA
2021	13	21 $\pm$ 10	52 $\pm$ 11	7 $\pm$ 2	16 $\pm$ 8	1 $\pm$ 1	3 $\pm$ 2	0 $\pm$ 0	8	25 $\pm$ 8	32 $\pm$ 10	10 $\pm$ 4	24 $\pm$ 7	4 $\pm$ 3	6 $\pm$ 3	1 $\pm$ 1
2022	27	19 $\pm$ 6	51 $\pm$ 7	5 $\pm$ 2	16 $\pm$ 4	1 $\pm$ 1	4 $\pm$ 2	5 $\pm$ 2	9	4 $\pm$ 3	58 $\pm$ 13	10 $\pm$ 6	13 $\pm$ 6	6 $\pm$ 4	8 $\pm$ 4	0 $\pm$ 0
Pooled	638	23 $\pm$ 1	46 $\pm$ 1	8 $\pm$ 1	18 $\pm$ 1	2 $\pm$ 0	1 $\pm$ 0	2 $\pm$ 0	401	18 $\pm$ 1	46 $\pm$ 1	7 $\pm$ 1	24 $\pm$ 1	2 $\pm$ 0	1 $\pm$ 0	2 $\pm$ 0

n = number of group scan surveys; NA = no data available; * = no standard deviation available because mean is based on a single group scan survey.

Table 19: Mean ($\pm$ SE) Proportion (%) of Time Spent per Activity (Bedded, Feeding, Standing, Walking, Running, Trotting) by Non-Nursery and Nursery Groups Among Distance Buffers (km), 1998 to 2022

Distance Buffer (km)	Non-Nursery Mean Activity Proportions (%)								Nursery Mean Activity Proportions (%)							
	n	Bedded	Feeding	Standing	Walking	Alert	Running	Trotting	n	Bedded	Feeding	Standing	Walking	Alert	Running	Trotting
<0.5	351	25 $\pm$ 2	47 $\pm$ 2	9 $\pm$ 1	14 $\pm$ 1	2 $\pm$ 0	1 $\pm$ 0	2 $\pm$ 0	129	18 $\pm$ 2	46 $\pm$ 2	8 $\pm$ 1	23 $\pm$ 2	2 $\pm$ 0	1 $\pm$ 0	3 $\pm$ 1
0.5 - 1	24	21 $\pm$ 7	32 $\pm$ 7	10 $\pm$ 3	32 $\pm$ 6	1 $\pm$ 1	0 $\pm$ 0	3 $\pm$ 2	22	10 $\pm$ 4	49 $\pm$ 7	7 $\pm$ 3	31 $\pm$ 6	2 $\pm$ 1	1 $\pm$ 1	0 $\pm$ 0
1 - 3	21	11 $\pm$ 6	40 $\pm$ 7	3 $\pm$ 1	41 $\pm$ 8	1 $\pm$ 1	2 $\pm$ 1	2 $\pm$ 1	32	11 $\pm$ 4	40 $\pm$ 4	10 $\pm$ 2	34 $\pm$ 5	2 $\pm$ 1	1 $\pm$ 1	1 $\pm$ 1
3 - 5	25	17 $\pm$ 4	39 $\pm$ 6	13 $\pm$ 3	29 $\pm$ 5	1 $\pm$ 0	0 $\pm$ 0	3 $\pm$ 2	19	12 $\pm$ 5	42 $\pm$ 6	13 $\pm$ 4	28 $\pm$ 4	1 $\pm$ 1	2 $\pm$ 2	1 $\pm$ 0
5 - 7	19	13 $\pm$ 4	47 $\pm$ 6	8 $\pm$ 2	28 $\pm$ 6	2 $\pm$ 1	1 $\pm$ 1	2 $\pm$ 1	18	16 $\pm$ 4	51 $\pm$ 6	8 $\pm$ 3	23 $\pm$ 6	1 $\pm$ 1	0 $\pm$ 0	0 $\pm$ 0
7 - 9	27	18 $\pm$ 6	50 $\pm$ 5	11 $\pm$ 3	19 $\pm$ 5	1 $\pm$ 0	1 $\pm$ 1	1 $\pm$ 1	25	33 $\pm$ 6	42 $\pm$ 5	4 $\pm$ 1	18 $\pm$ 4	1 $\pm$ 0	1 $\pm$ 1	1 $\pm$ 0
9 - 11	21	28 $\pm$ 7	48 $\pm$ 5	4 $\pm$ 1	15 $\pm$ 3	3 $\pm$ 1	0 $\pm$ 0	2 $\pm$ 1	26	27 $\pm$ 6	41 $\pm$ 6	4 $\pm$ 2	24 $\pm$ 4	2 $\pm$ 1	1 $\pm$ 1	1 $\pm$ 1
11 - 13	22	11 $\pm$ 5	57 $\pm$ 6	6 $\pm$ 2	22 $\pm$ 6	3 $\pm$ 2	2 $\pm$ 1	0 $\pm$ 0	13	5 $\pm$ 1	67 $\pm$ 4	6 $\pm$ 2	19 $\pm$ 3	2 $\pm$ 1	0 $\pm$ 0	0 $\pm$ 0
13 - 15	20	14 $\pm$ 5	57 $\pm$ 6	7 $\pm$ 3	17 $\pm$ 4	1 $\pm$ 1	4 $\pm$ 3	1 $\pm$ 1	26	11 $\pm$ 4	55 $\pm$ 5	8 $\pm$ 2	19 $\pm$ 4	1 $\pm$ 1	3 $\pm$ 2	3 $\pm$ 1
15 - 30	89	29 $\pm$ 3	45 $\pm$ 3	8 $\pm$ 1	15 $\pm$ 2	2 $\pm$ 1	0 $\pm$ 0	1 $\pm$ 1	77	21 $\pm$ 3	47 $\pm$ 2	6 $\pm$ 1	22 $\pm$ 2	1 $\pm$ 0	1 $\pm$ 0	2 $\pm$ 1
>30	14	13 $\pm$ 7	43 $\pm$ 5	7 $\pm$ 2	36 $\pm$ 6	0 $\pm$ 0	0 $\pm$ 0	1 $\pm$ 1	14	15 $\pm$ 7	38 $\pm$ 6	5 $\pm$ 2	40 $\pm$ 8	0 $\pm$ 0	1 $\pm$ 1	0 $\pm$ 0
Pooled	638	23 $\pm$ 1	46 $\pm$ 1	8 $\pm$ 1	18 $\pm$ 1	2 $\pm$ 0	1 $\pm$ 0	2 $\pm$ 0	401	18 $\pm$ 1	46 $\pm$ 1	7 $\pm$ 1	24 $\pm$ 1	2 $\pm$ 0	1 $\pm$ 0	2 $\pm$ 0

n = number of group scan surveys.

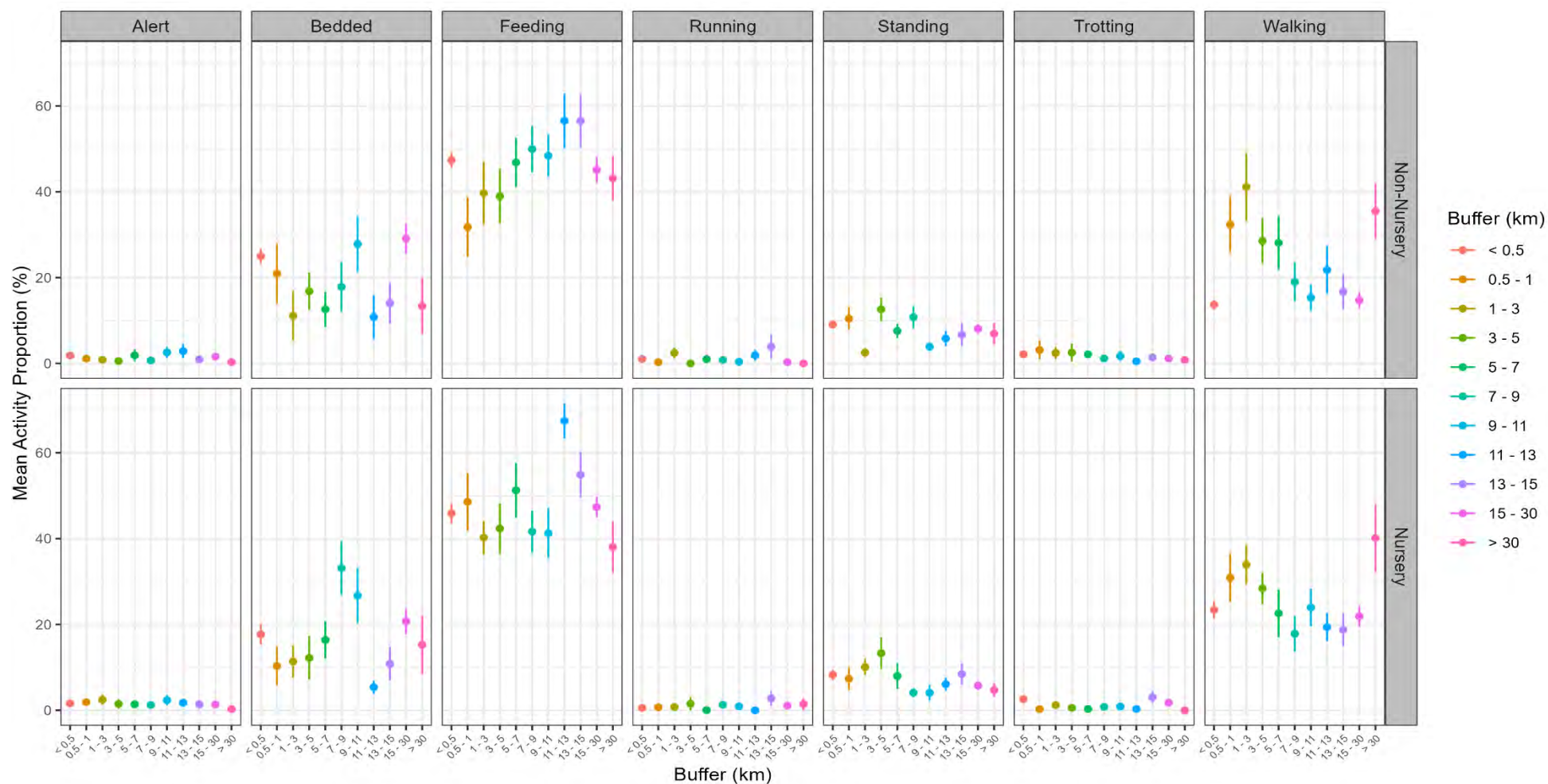


Figure 19: Average Proportion (%) of Time Spent per Activity (Alert, Bedded, Feeding, Running, Standing, Trotting, and Walking) by Non-Nursery and Nursery Groups Among Distance Buffers (km), 1998-2022

Group Scan Behavioural Analysis

Nursery and non-nursery group survey data were modeled separately, and a candidate set of ten models was selected and applied for each combination of group composition (i.e., nursery or non-nursery) and response variable (i.e., proportion of time feeding, proportion of time feeding/resting, and proportion of time alert/moving). Based on availability of covariate data, 566 surveys were included in regression analyses for non-nursery groups and 357 surveys were included in regression analyses for nursery groups.

Proportion of Time Spent Feeding

The candidate model set was run for proportion of time spent feeding for non-nursery and nursery groups, separately. The top model for non-nursery groups was model 6 (Table 20) based on a ΔAICc of 2.0. The proportion of time spent feeding for non-nursery groups was associated with distance from mine footprints and temperature, both modelled as natural cubic splines ($\text{df}=3$) (Table 20; Appendix G). The relationship between distance to mine complex and proportion of time spent feeding was non-linear with the proportion of time spent feeding appearing to decrease between approximately 0-3 km, increase between 3-13 km, and then decrease beyond 13 km. The relationship between temperature and proportion of time spent feeding was non-linear, and proportion of time spent feeding appeared to decrease between -40 to -15°C, increased from -15 to 5°C, and decreased for temperatures above approximately 5°C. Parameter estimates and P-values from the top model indicate that the relationship between distance to mine complex and the response variable was statistically significant ($\chi^2 = 10.312$, $\text{df} = 3$, $P = 0.016$). The relationship between temperature and the response variable was statistically significant ($\chi^2 = 24.779$, $\text{df} = 3$, $P < 0.001$). Values for beta coefficients and 95% confidence intervals for the top model can be found in Appendix G.

For nursery groups, the top model for feeding was also model 6, which contained parameters for distance to mine footprints and temperature modelled with a natural cubic spline ($\text{df}=3$) (Table 20; Appendix G). The relationship between temperature and proportion of time spent feeding was non-linear and statistically significant ($\chi^2 = 17.435$, $\text{df} = 3$, $P < 0.001$). The proportion of time spent feeding for nursery groups appeared to be relatively consistent below -10°C, increased between -10 and approximately 8°C, and decreased between 8 and 20°C. Distance to mine complex was slightly positive, indicating higher proportion of time spent feeding further from mine footprints; however, the 95% confidence interval overlapped zero (Appendix G), and the parameter (mine distance) was not statistically significant ($\chi^2 = 1.929$, $\text{df} = 1$, $P = 0.165$). Values for beta coefficients and 95% confidence intervals for the top model can be found in Appendix G.

Table 20: Model selection results for proportion of time spent feeding for non-nursery and nursery groups. Top models are indicated in bold.

Model	Model Structure	K	Log-Likelihood	ΔAICc	AICw
Non-Nursery					
Model 6	P_Feeding ~ DistMine^(a) + Temp^(a)	8	-304.93	0.000	0.778
Model 9	P_Feeding ~ DistMine ^(a) + Insect	6	-308.90	3.842	0.114
Model 10	P_Feeding ~ DistMine ^(a) + Temp ^(a) + Wind + Precip ^(a) + Insect	13	-302.33	5.212	0.057
Model 2	P_Feeding ~ Temp ^(a) + Wind + Precip ^(a)	9	-307.31	6.836	0.026
Model 5	P_Feeding ~ Temp ^(a) + Wind + Precip ^(a) + Insect	10	-307.13	8.539	0.011
Model 4	P_Feeding ~ Precip ^(a) + Insect	6	-311.69	9.424	0.007
Model 3	P_Feeding ~ Insect	3	-314.95	9.831	0.006
Model 8	P_Feeding ~ DistMine ^(a) + Precip ^(a)	8	-311.45	13.046	0.001
Model 1	P_Feeding ~ DistMine ^(a)	5	-317.20	18.398	0.000
Model 7	P_Feeding ~ DistMine ^(a) + Wind	6	-316.91	19.852	0.000
Null	P_Feeding ~ 1	2	-322.04	22.000	0.000

Table 20: Model selection results for proportion of time spent feeding for non-nursery and nursery groups. Top models are indicated in bold.

Model	Model Structure	K	Log-Likelihood	Δ AICc	AICw
Nursery					
Model 6	P_Feeding ~ DistMine + Temp^(a)	6	-71.30	0.000	0.761
Model 2	P_Feeding ~ Temp ^(a) + Wind + Precip	7	-72.11	3.703	0.120
Model 10	P_Feeding ~ DistMine + Temp ^(a) + Wind + Precip + Insect	9	-70.84	5.354	0.052
Model 5	P_Feeding ~ Temp ^(a) + Wind + Precip + Insect	8	-71.93	5.434	0.050
Model 3	P_Feeding ~ Insect	3	-79.79	10.808	0.003
Model 1	P_Feeding ~ DistMine	3	-79.93	11.087	0.003
Null	P_Feeding ~ 1	2	-80.95	11.101	0.003
Model 9	P_Feeding ~ DistMine + Insect	4	-79.08	11.432	0.003
Model 7	P_Feeding ~ DistMine + Wind	4	-79.45	12.169	0.002
Model 4	P_Feeding ~ Precip + Insect	4	-79.66	12.592	0.001
Model 8	P_Feeding ~ DistMine + Precip	4	-79.68	12.626	0.001

(a) Covariate was included as a spline with three degrees of freedom (df=3).

P_Feeding = proportion of time spent feeding (arcsine transformed); DistMine = distance to mine footprint (m; scaled), Temp = mean weekly temperature (°C; scaled), Wind = mean weekly wind speed (m/s; scaled), Precip = sum of weekly precipitation (mm; scaled), Insect = mean weekly insect activity index (Russel et al. 1993; scaled).

Proportion of Time Spent Feeding and Resting

The candidate model set was run for proportion of time spent feeding/resting for non-nursery and nursery groups, separately. For non-nursery groups model 9 was selected as the top model, which includes distance from mine footprints modelled as a natural cubic spline (df=3) and insect activity (Table 21; Appendix G). The relationship between distance to mine complex and proportion of time spent feeding/resting was non-linear, with relatively high proportion of time spent feeding/resting observed near mine footprints (within approximately 2 km), a decline in time spent feeding/resting until approximately 5 km, and then an increase in proportion of time spent feeding/resting beyond 5 km which then levelled off at approximately 15 km. The high prediction values for proportion of time spent feeding and resting near mine footprints aligns with observed behaviours from summaries calculated per distance buffer (Figure 19). These values may be due in part to habituated animals taking advantage of resources in close proximity to the mines. Proportion of time spent feeding/resting slightly decreased between 20 and 30 km; however, samples sizes were limited for distances farther from the mine complex, and these results should be interpreted with caution. The parameter for insect activity was negative, indicating that caribou spend less time feeding/resting as insect activity increased. Parameter estimates and P-values from the top model indicate that distance from mine complex ($\chi^2 = 23.561$, df = 3, $P < 0.001$) and insect activity ($\chi^2 = 41.289$, df = 1, $P < 0.001$) were statistically significant and were valuable for explaining some of the variation in proportion of time spent feeding/resting. Values for beta coefficients and 95% confidence intervals for the top model can be found in Appendix G.

For nursery groups, there were two competing models for the proportion of time spent feeding/resting, including model 5 and model 10 (Table 21). Model 5, which included the parameters for temperature, wind speed modelled as a natural cubic spline (df=3), precipitation, and insect activity, was selected as the top model based on model weight and having the lowest number of parameters of competing models. Like the non-nursery model, the parameter for insect activity was negative, indicating that caribou spend less time feeding/resting as insect activity increases (Appendix G). The effect of insect activity was significant ($\chi^2 = 6.034$, df = 1, $P = 0.014$).

The parameters temperature and precipitation had 95% confidence intervals overlapping zero indicating a weaker relationship (Appendix G). Both temperature ($\chi^2 = 0.882$, df = 1, $P = 0.348$) and precipitation ($\chi^2 = 0.021$, df = 1, $P = 0.886$) were not statistically significant. The relationship between proportion of time spent feeding/resting and wind speed was non-linear, and time spent feeding and resting appeared to decrease between 0 to 4 m/s, increase between 4 to 6 m/s, and then decrease for wind speeds greater than 6 m/s. The parameter for wind speed was statistically significant ($\chi^2 = 17.994$, df = 3, $P < 0.001$). Values for beta coefficients and 95% confidence intervals for the top model can be found in Appendix G.

Table 21: Model selection results for proportion of time spent feeding/resting for non-nursery and nursery groups. Top models are indicated in bold.

Model	Model Structure	K	Log-Likelihood	Δ AICc	AICw
Non-Nursery					
Model 9	P_FeedRest ~ DistMine^(b) + Insect	6	-262.43	0.000	0.598
Model 6	P_FeedRest ~ DistMine ^(b) + Temp ^(b)	8	-260.86	0.957	0.371
Model 10	P_FeedRest ~ DistMine ^(b) + Temp ^(b) + Wind ^(a) + Precip ^(c) + Insect	15	-256.04	5.939	0.031
Model 4	P_FeedRest ~ Precip ^(c) + Insect	7	-269.75	16.681	0.000
Model 3	P_FeedRest ~ Insect	3	-274.08	17.178	0.000
Model 2	P_FeedRest ~ Temp ^(b) + Wind ^(a) + Precip ^(c)	11	-266.77	18.993	0.000
Model 5	P_FeedRest ~ Temp ^(b) + Wind ^(a) + Precip ^(c) + Insect	12	-266.48	20.496	0.000
Model 7	P_FeedRest ~ DistMine ^(b) + Wind ^(a)	7	-278.56	34.307	0.000
Model 8	P_FeedRest ~ DistMine ^(b) + Precip ^(c)	9	-277.76	36.828	0.000
Model 1	P_FeedRest ~ DistMine ^(b)	5	-282.53	38.152	0.000
Null	P_FeedRest ~ 1	2	-291.84	50.680	0.000
Nursery					
Model 5	P_FeedRest ~ Temp + Wind^(b) + Precip + Insect	8	-98.77	0.000	0.515
Model 10	P_FeedRest ~ DistMine ^(c) + Temp + Wind ^(b) + Precip + Insect	12	-95.20	1.364	0.260
Model 7	P_FeedRest ~ DistMine ^(c) + Wind ^(b)	9	-99.47	3.510	0.089
Model 2	P_FeedRest ~ Temp + Wind ^(b) + Precip	7	-101.82	4.009	0.069
Model 9	P_FeedRest ~ DistMine ^(c) + Insect	7	-102.29	4.962	0.043
Model 6	P_FeedRest ~ DistMine ^(c) + Temp	7	-103.13	6.642	0.019
Model 3	P_FeedRest ~ Insect	3	-109.56	11.249	0.002
Model 4	P_FeedRest ~ Precip + Insect	4	-108.71	11.582	0.002
Model 1	P_FeedRest ~ DistMine ^(c)	6	-107.50	13.292	0.001
Model 8	P_FeedRest ~ DistMine ^(c) + Precip	7	-107.21	14.793	0.000
Null	P_FeedRest ~ 1	2	-115.75	21.589	0.000

(a) Covariate was included as a spline with three degrees of freedom (df=2).

(b) Covariate was included as a spline with three degrees of freedom (df=3).

(c) Covariate was included as a spline with three degrees of freedom (df=4).

P_FeedRest = proportion of time spent feeding and resting (arcsine transformed); DistMine = distance to mine footprint (m; scaled), Temp = mean weekly temperature (°C; scaled), Wind = mean weekly wind speed (m/s; scaled); Precip = sum of weekly precipitation (mm; scaled), Insect = mean weekly insect activity index (Russel et al. 1993; scaled).

Proportion of Time Spent Alert and Moving

The candidate model set was run for proportion of time spent alert/moving (i.e., walking, running, and trotting) for non-nursery and nursery groups, separately. For non-nursery groups, model 9 and model 10 were competing top models, and model 9 was selected as the top model based on AICc weight and number of parameters (Table 22). Model 9 included distance from mine footprints modelled as a natural cubic spline ($df=3$) and insect activity (Table 22; Appendix G). The relationship between distance to mine complex and proportion of time spent alert/moving was non-linear. While alert/moving behaviours appeared relatively rare adjacent to the mine footprints (<0.5 km, Figure 19), the model predicted a sharp increase in alert/moving behaviours within a few km of the mines, followed by a decrease in the proportion of time spent alert/moving between approximately 3 km and 20 km. Between 20 and 30 km, there was no obvious relationship between distance and time spent alert/moving; however, samples sizes were limited for distances greater than 25 km from the mine complex, and these results should be interpreted with caution. The parameter for insect activity was positive, indicating that caribou in non-nursery herds spend more time alert/moving as insect activity increases (Appendix G). Parameter estimates and P-values from the top model indicate that distance from mine complex ($\chi^2 = 29.390$, $df = 3$, $P < 0.001$) and insect activity ($\chi^2 = 8.680$, $df = 1$, $P = 0.003$) were statistically significant. Values for beta coefficients and 95% confidence intervals for the top model can be found in Appendix G.

For nursery groups, there were multiple competing top models for time spent alert/moving, including model 2, model 5, and model 7 (Table 22). Models 2 and 5 were similar and contained mostly overlapping parameters, and model 2 was chosen as the top model based on both weight and having the lowest number of parameters. Model 2 included temperature, wind speed modelled as a natural cubic spline ($df=3$), and precipitation (Table 22). The relationship between temperature and proportion of time spent alert/moving was positive indicating that caribou spend more time alert/moving as temperature increases; however, 95% confidence intervals for temperature overlapped zero, indicating a weaker relationship with the response variable (Appendix G). Temperature was not statistically significant ($\chi^2 = 3.026$, $df = 1$, $P = 0.082$).

The relationship between wind and proportion of time spent alert/moving was non-linear for nursery groups, with alert/moving behaviours increasing between wind speeds of 0 and approximately 3-4 m/s, decreasing between wind speeds of 4-6 m/s, and increasing for wind speeds above 6 m/s. This relationship may be due to the influence of wind speed on insect activity with caribou spending less time moving at intermediate wind speeds due to less favourable conditions for insect harassment. Parameter estimates and P-values from the top model indicate that the parameter wind speed was statistically significant for explaining variation in proportion of time spent alert/moving ($\chi^2 = 16.255$, $df = 3$, $P = 0.001$). The parameter estimate for precipitation was negative, though the estimate had 95% confidence intervals overlapping zero (Appendix G), and precipitation was not statistically significant ($\chi^2 = 0.931$, $df = 1$, $P = 0.335$). Values for beta coefficients and 95% confidence intervals for the top model can be found in Appendix G.

Table 22: Model selection results for proportion of time spend alert and moving for non-nursery and nursery groups. Top models are indicated in bold.

Model	Model Structure	K	Log-Likelihood	Δ AICc	AICw
Non-Nursery					
Model 9	P_AlertMove ~ DistMine^(a) + Insect	6	-208.12	0.000	0.639
Model 10	P_AlertMove ~ DistMine ^(a) + Temp + Wind + Precip + Insect	9	-205.90	1.734	0.269
Model 6	P_AlertMove ~ DistMine ^(a) + Temp	6	-210.86	5.492	0.041
Model 1	P_AlertMove ~ DistMine ^(a)	5	-212.46	6.647	0.023
Model 8	P_AlertMove ~ DistMine ^(a) + Precip	6	-211.64	7.051	0.019
Model 7	P_AlertMove ~ DistMine ^(a) + Wind	6	-212.33	8.437	0.009
Model 3	P_AlertMove ~ Insect	3	-222.57	22.794	0.000
Model 4	P_AlertMove ~ Precip + Insect	4	-222.41	24.519	0.000
Model 5	P_AlertMove ~ Temp + Wind + Precip + Insect	6	-220.80	25.364	0.000
Model 2	P_AlertMove ~ Temp + Wind + Precip	5	-222.38	26.484	0.000
Null	P_AlertMove ~ 1	2	-225.71	27.050	0.000
Nursery					
Model 2	P_AlertMove ~ Temp + Wind^(a) + Precip	7	-83.37	0.000	0.337
Model 5	P_AlertMove ~ Temp + Wind ^(a) + Precip + Insect	8	-82.42	0.185	0.308
Model 7	P_AlertMove ~ DistMine ^(b) + Wind ^(a)	9	-81.76	0.984	0.206
Model 10	P_AlertMove ~ DistMine ^(b) + Temp + Wind ^(a) + Precip + Insect	12	-79.65	3.146	0.070
Model 6	P_AlertMove ~ DistMine ^(b) + Temp	7	-85.53	4.322	0.039
Model 9	P_AlertMove ~ DistMine ^(b) + Insect	7	-86.25	5.756	0.019
Model 1	P_AlertMove ~ DistMine ^(b)	6	-87.75	6.679	0.012
Model 8	P_AlertMove ~ DistMine ^(b) + Precip	7	-87.70	8.652	0.004
Model 3	P_AlertMove ~ Insect	3	-92.37	9.737	0.003
Model 4	P_AlertMove ~ Precip + Insect	4	-92.17	11.385	0.001
Null	P_AlertMove ~ 1	2	-94.25	11.462	0.001

(a) Covariate was included as a spline with five degrees of freedom (df=3).

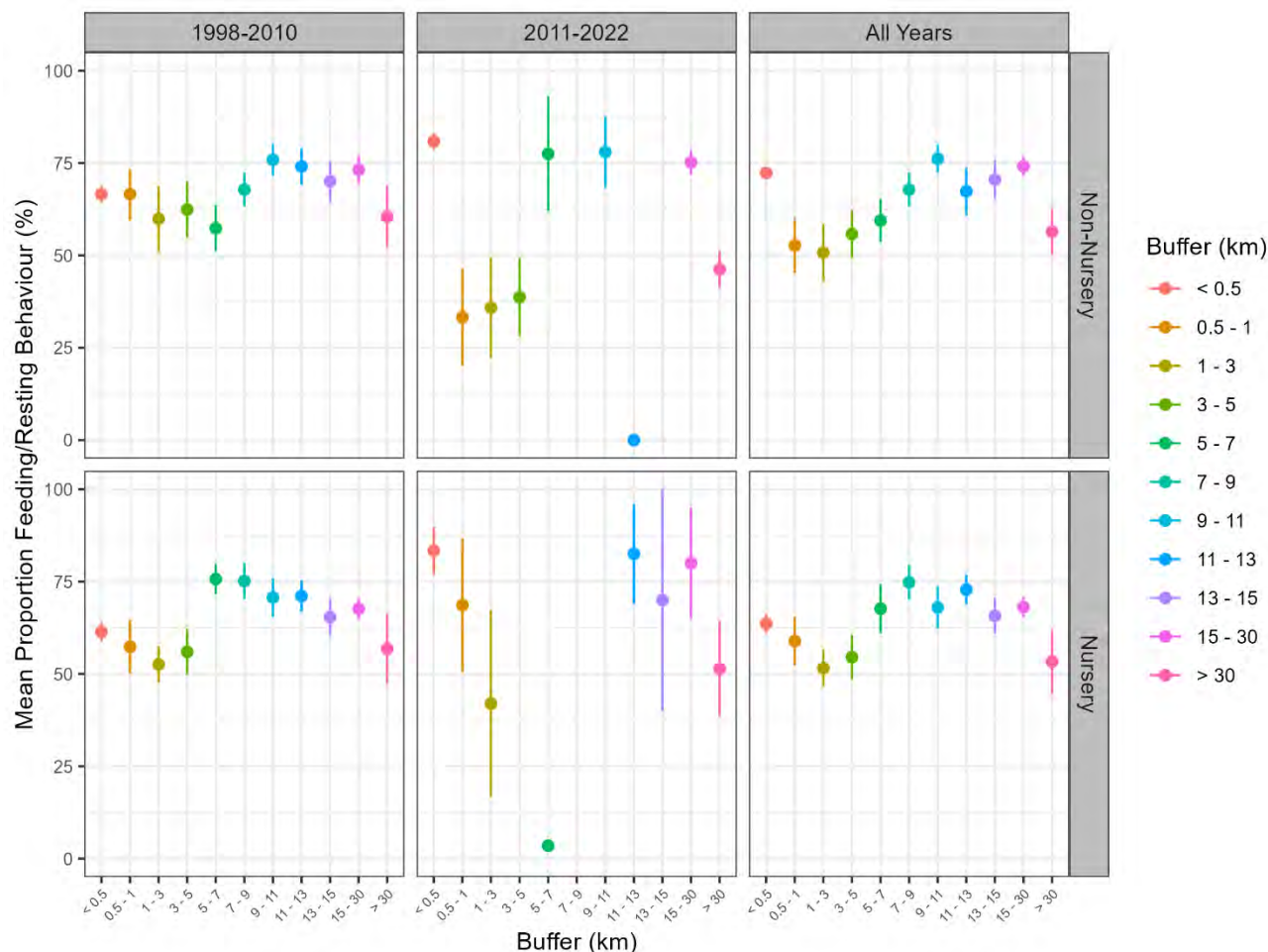
(b) Covariate was included as a spline with two degrees of freedom (df=4).

P_AlertMove = proportion of time spent alert and moving (arcsine transformed); DistMine = distance to mine footprint (m; scaled), Temp = mean weekly temperature (°C; scaled), Wind = mean weekly wind speed (m/s; scaled); Precip = sum of weekly precipitation (mm; scaled), Insect = mean weekly insect activity index (Russel et al. 1993; scaled).

Comparison of Caribou Behaviour Across Time Periods

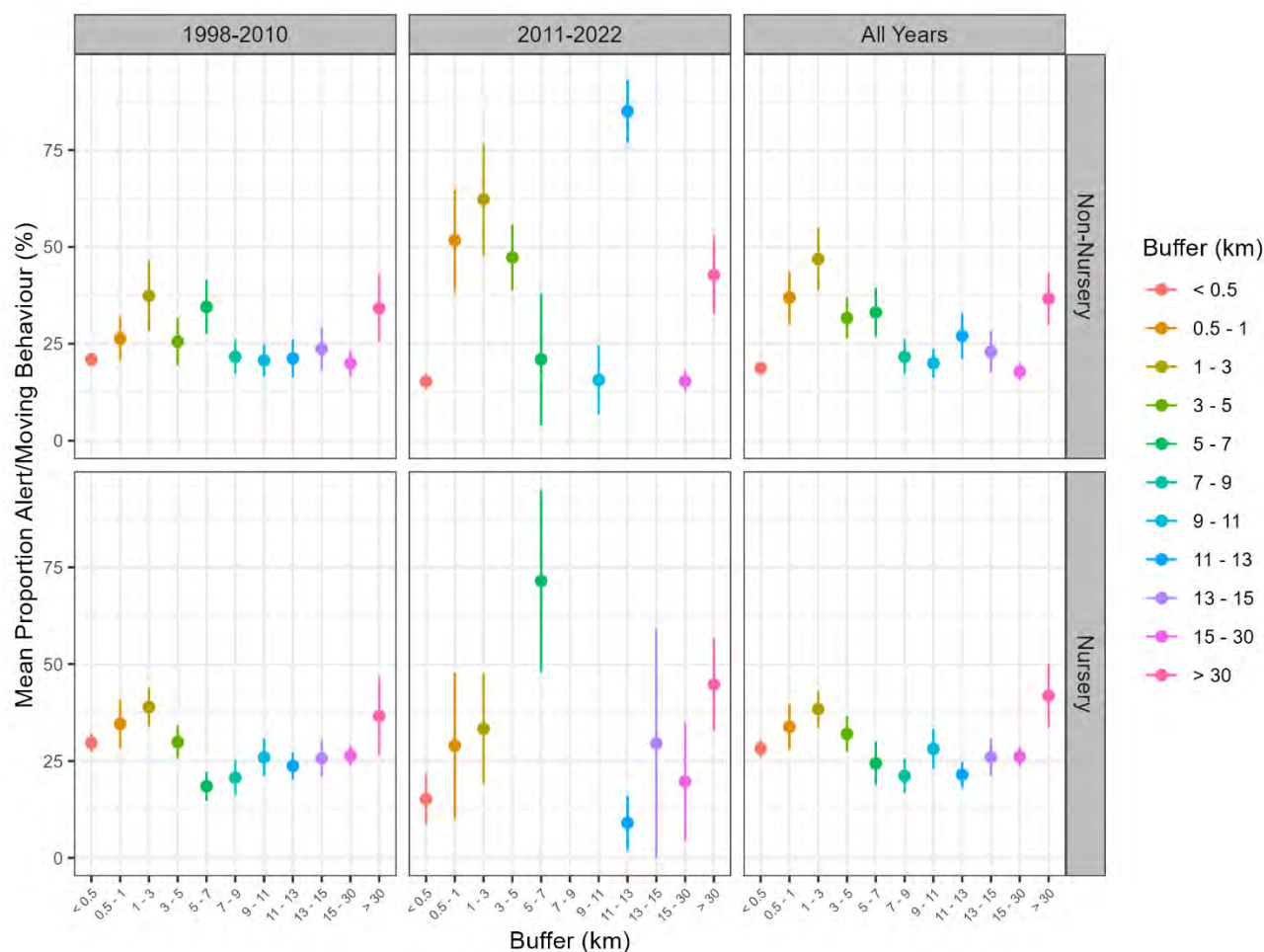
To further examine the relationship between caribou behaviour, distance from the mine complex, and differences between data available from different time periods, the proportion of time spent feeding/resting and proportion of time spent alert/moving were summarized by these three parameters (Figure 20, Figure 21). Data collection for nursery and non-nursery groups in each distance buffer varied between the two time periods (e.g., 1998-2010 and 2011-2022). Patterns observed using all years of data were similar to the results reported in 2011 (1998-2010 in Figure 20; Golder 2011), though after including the additional years of data, there is a less pronounced break or change point in the proportion of time spent feeding/resting at 5 km from the mine complex.

Patterns for caribou behaviour as displayed in Figure 20 and Figure 21 should be interpreted with the understanding that the values presented do not control for other sources of variation. In other words, an observed pattern may be due to both distance to mine footprints and insect activity (as was seen for the non-nursery feeding/resting top model), and values shown in Figure 20 do not control for the influence of insect activity. Both the data summaries (Figure 20, Figure 21) and the model results indicate that the relationship between caribou behaviour and distance from mine footprints is complicated, non-linear, and confounded with other variables such as habitat could not be observed during winter and season (autumn and winter). See Section 4.2.1.6 for evidence provided using caribou collar data that describes the relationship between caribou behaviour (i.e., movement metrics) and the interaction between distance to the mine complex and habitat.



Note: Error bars represent the standard error of the means.

Figure 20: Average Proportion (%) of Time Spent Feeding/Resting by Non-Nursery and Nursery Groups Among Distance Bands (km) and time periods (1998-2010, 2011-2022, and all years).



Note: Error bars represent the standard error of the means.

Figure 21 : Average Proportion (%) of Time Spent Alert/Moving by Non-Nursery and Nursery Groups Among Distance Bands (km) and time periods (1998-2010, 2011-2022, and all years).

4.3.3 Conclusions

Caribou group scan behaviour surveys conducted from 1998 to 2022 were included in a cumulative analysis to satisfy WMMP Approval Condition 6. The number of surveys for each group composition and distance buffer varied across years, therefore data were analyzed using a “pooled” approach across years as well as time periods (1998-2010 and 2011-2022) to examine the relationships between caribou behaviour with distance to the Diavik-Ekati mine complex and environmental factors rather than examining potential effects related to sampling methods.

Analysis of activity budgets using linear regression revealed that behavioural responses in non-nursery groups were related to a combination of environmental factors and distance to mine complex. Proportion of time spent feeding was non-linearly related to distance to mine footprints and temperature. The proportion of time spent feeding decreased from 0-3 km from the mine complex, increased between 3-13 km, and then decreased beyond 13 km. The proportion of time spent feeding appeared to decrease between -40 to -15°C, increased from -15 to 5°C, and decreased for temperatures above approximately 5°C. For non-nursery groups, the proportion of time spent feeding/resting and the proportion of time spent alert/moving caribou behaviour were associated with distance from mine footprints and amount of insect activity, with opposite patterns observed. For both response variables, the relationship with distance to mine complex was non-linear. Near the mine footprints (within approximately 1 km) proportion of time spent feeding/moving was predicted to be relatively high, then declined until about 5 km before increasing and leveling off at approximately 15 km. The opposite was observed for alert/moving, with relatively low proportion of time spent alert/moving close to the mine, followed by a sharp increase in alert/moving behaviours within approximately 3 km of the mines, and then a decrease in alert/moving behaviours between 3-20 km before leveling off. These results reinforce the trade-off between feeding/resting behaviours and alert/moving behaviours and align with 2011 summaries for feeding/resting behaviours of non-nursery groups summarized by distance buffer (Golder 2011).

Analysis of activity budgets for nursery groups revealed that behavioural responses were primarily related to environmental variables, contrary to results of the 2011 report. For proportion of time spent feeding, distance to mine footprints was present in the top model; however, the relationship was weak and not statistically significant. The model for proportion of time spent feeding for nursery groups was instead driven by temperature, and the relationship was non-linear. Feeding appeared to be relatively consistent below -10°C, increased between -10 and approximately 8°C, and decreased between 8 and 20°C. In the 2011 report, the proportion of time spent feeding by nursery groups significantly increased with distance from the mine complex (Golder 2011).

The proportion of time spent feeding/resting and the proportion of time alert/moving for nursery groups was also influenced by environmental variables. The proportion of time spent feeding/resting was primarily driven by wind speed and insect activity (temperature and precipitation were present in the top model but not statistically significant). Time spent feeding/resting was negatively associated with insect activity and the effect was significant, which aligns with expected patterns (Helle and Tarvainen 1984, Russel et al. 1993, Weladji and Holland 2003) and with predictions from the 2011 report (though the relationship was not found to be significant; Golder 2011). The relationship between proportion of time spent feeding and wind speed was non-linear, and time spent feeding/resting decreased between 0 to 4 m/s, increased between 4 to 6 m/s, and then decreased for wind speeds greater than 6 m/s. The proportion of time spent alert/moving for nursery groups was primarily related to wind speed (temperature and precipitation were present in the top model but not statistically significant) and the relationship was non-linear and was opposite of the pattern observed for feeding/resting, highlighting the trade-off between these behaviours. This result aligns with insect avoidance behaviours.

To further examine the relationship between caribou behaviour, distance from mines, and different time periods (1998-2010 and 2011-2022), the proportion of time spent feeding/resting and proportion of time spent alert/moving were summarized. Data collection for nursery and non-nursery groups in each distance buffer varied between the two time periods, though patterns observed using all years of data were similar to the results reported in 2011 (Golder 2011). However, after the inclusion of additional years of data (2011-2022), there was a less pronounced change point in the proportion of time spent feeding/resting at 5 km from the mine complex as previously observed (Golder 2011; Figure 20).

Overall, the results indicate that caribou behaviour changes in relation to distance from mine footprints, but the relationships are non-linear and vary based on group composition and time period of data collection. Additionally, these relationships are likely to be influenced by variables that could not be included in this analysis such as habitat during winter, seasons, and distance sampled among years. Section 4.2.1.6 also demonstrates how movement behaviour is related to sex, seasons, and the interaction between habitat and distance from the mine complex. Caribou group behaviour scans are not a method used in the WMMP, so this represents the final analysis of these data fulfilling Approval Condition 6. Changes in caribou behaviour in relation to distance to mine footprints can continue to be assessed using fine-scale caribou collar data; an alternative to behavioural scanning observations.

4.4 Incidents and Mortalities

Mineral development in the Bathurst caribou herd range created concerns about increased mortality, which includes vehicle collisions, aircraft collisions, and accidents associated with caribou in hazardous areas around mining activities (DDMI 1998b). Mitigation practices and policies have been implemented to avoid and reduce the potential for mortalities such as, review of collared caribou maps provided regularly by the GNWT-ECC to detect approaching caribou, wildlife have the right-of-way on all roads, communicating the presence of caribou via radio, and the caribou traffic advisory. The objective for this component is to determine the number of caribou deaths or injuries associated with the Mine. The following section summarizes the methods and results from incident reporting and road observations. The impact prediction in the EER (DDMI 1998b) is:

- Mine-related mortality is expected to be low (i.e., less than 1% change from baseline conditions [DDMI 1998b]).

4.4.1 Methods

Mine-related incidents and mortalities are reported to the Environment Department for documentation in a detailed incident investigation for immediate follow-up (Appendix H). All caribou mortalities are reported immediately to the GNWT-ECC, and the GNWT-ECC is consulted for follow-up mitigation and disposal procedures. The information is tabulated and provided for annual comparisons.

4.4.2 Results

In 2022, there were no known Mine-related caribou injuries or mortalities recorded, which has been the case for the past 18 years (Table 23). The only Mine-related caribou mortality reported to date occurred in 2004. On 27 April 2022, a single severed caribou leg was discovered at the top of a snowbank adjacent to Dump 7 near the A154 surface area. Although no wildlife or wildlife sign (e.g., scat, tracks) were seen at or proximal to the leg, it is assumed this was the result of natural mortality. No other natural mortality events were recorded in 2022.

Table 23: Caribou Mortalities on East Island, Baseline to 2022

	Baseline ^(a)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Natural Caribou Mortalities on East Island	8	7	1	1	0	2	0	0	1	0	0	0	1	1	1	1	0	0	1	0	0	1	0	1
Mine-related Mortalities	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(a) Includes data from 1995 to 1997.

Caribou Advisories

The objective of the caribou advisories 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. This raises general awareness so that employees are alert to the likelihood that mitigation could be triggered. The number of animals on East Island and in specific areas dictates the type of mitigation practices that will be undertaken (e.g., haul road closure, speed reduction).

4.4.3 Methods

Various methods were used to determine whether or not animals were present in the vicinity of East Island, which included incidental observations reported from pilots and workers, and using the satellite collar locations provided by GNWT-ECC. Caribou road surveys, and PKC and rock pile monitoring surveys were discontinued on a scheduled basis in 2014 (Golder 2020).

4.4.4 Results

In 2022, caribou numbers on the East Island reported by staff ranged from 1 to 31 animals. Caribou were most likely from the Beverly/Ahiak and Bathurst herds based on collared caribou data. Photos of caribou taken at the Mine are included in Appendix I. There were two instances where groups of 100 caribou or more were observed; however, these occurred at distances over 11 km from the Mine. In total there were 32 different incidental observations reported from 5 March to 19 October (Appendix J). Individual caribou were spotted on or in proximity to haul roads five times in 2022, with all cases resulting in traffic control measures being implemented, such as speed reductions, road closures, and radio wildlife advisories on local channels. Two site-wide communications were distributed notifying workers of caribou presence on the East Island.

Two separate events involving an individual caribou occurred in 2022, which resulted in deterrence measures being implemented (see Section 4.5.2). Caribou were also observed near the airport on two occasions but did not trigger deterrent actions.

4.5 Deterring Caribou from Hazardous Areas

When caribou are present on East Island their movements are monitored so that Mine personnel are aware of their presence and location. Of particular importance from a safety perspective (both human and animal), is caribou presence near hazardous areas (such as the airstrip and blast areas). When caribou are sighted adjacent to potentially hazardous areas, DDMI implements its Standard Operation Procedure for deterring caribou from these areas.

4.5.1 Methods

The method used to move caribou away from hazardous areas consists of the slow advancement of Environment Department staff behind the caribou, encouraging the movement of the animals in a safe direction.

4.5.2 Results

In 2022, two instances of caribou deterrence occurred.

On 13 June, a single caribou was observed at ROM Hill near the Process Plant. The Environment Department was notified, and traffic control measures implemented, which included all vehicles to remain alert for caribou presence, maintain a large distance, and give caribou right-of-way, if observed. After travelling from the ROM Hill to a tundra patch adjacent the A21 Portal via Pond 12, the Environmental Department positioned a truck along the bypass road between Pond 12 and the A21 Haul Road to discourage the caribou from moving onto the A21 Haul Road. The caribou eventually moved away from the area towards natural habitat near the E21 Sump.

The second instance of caribou deterrence occurred on 8 July when a single caribou was observed along the A21 Haul Road. The Environmental Department were notified and positioned a truck along the road near the Storage Tank Farm area, moving the caribou north away from its current high-traffic area. The caribou moved towards the Communication Shack and grazed in nearby vegetation. Later in the day, the same individual was observed walking down the road near the BB Dormitory. The Environment Department notified all personnel to maintain awareness, reduce speed, and give the caribou right-of-way, if observed. The caribou eventually moved off the road towards natural habitat proximal to Pond 10.

Deterrence of caribou away from hazardous areas within the Mine continue to be low. Since 2002, there have been 37 instances where caribou were deterred from hazardous areas, with 26 of these occurring in 2002 (Table 24). Of these 37 instances, 35 were completed by positioning light vehicles to block caribou access, and two were completed by staff on foot. The majority (81.1%) of these instances have occurred at the airstrip.

Table 24: Instances of Caribou Deterrence, 2002-2022

Year	Type of Deterrence	Number of Caribou Involved	General Location
2002	truck	2	Airstrip
2002	truck	150-200	Airstrip
2002	truck	40-50	Airstrip
2002	truck	2	Airstrip
2002	truck	2	Airstrip
2002	truck	4	Airstrip
2002	truck	1	Airstrip
2002	truck	3	Airstrip
2002	truck	4	Airstrip
2002	truck	8	Airstrip
2002	truck	10	Airstrip
2002	truck	6	Airstrip
2002	truck	1	Airstrip
2002	truck	1	Airstrip
2002	truck	8	Airstrip
2002	truck	3	Airstrip
2002	truck	4	Airstrip
2002	truck	4	Airstrip
2002	truck	3	Airstrip
2002	truck	1	Airstrip
2002	truck	5	Airstrip
2002	truck	2	Airstrip
2002	truck	3	Airstrip
2002	truck	1	Airstrip
2002	truck	100	Airstrip
2002	truck	Unreported	Airstrip
2009	truck	27	Airstrip
2009	truck	1	Type I Rock Pile
2011	truck	100+	Airstrip

Table 24: Instances of Caribou Deterrence, 2002-2022

Year	Type of Deterrence	Number of Caribou Involved	General Location
2011	truck	12	ROM Road and South Haul Road
2011	truck	3	Processed Kimberlite Containment area
2014	staff on foot	1	Processed Kimberlite Containment area
2016	truck	1	Airstrip
2016	staff on foot	1	Airstrip
2021	truck	1	South Haul Road
2022	truck	1	ROM Hill

4.6 Adaptive Management and Recommendations

The February 2021 Diamond Mine Wildlife Monitoring Meetings (GNWT-ENR 2021) suggested that aerial surveys for caribou ZOI monitoring are likely no longer needed. Instead, DDMI will focus on using collared caribou data for ZOI monitoring as an alternative line of evidence.

The 2021 Diamond Mine Wildlife Monitoring Meetings (GNWT-ENR 2021) also concluded that caribou behaviour monitoring is no longer necessary. As per the WMMP (DDMI 2022a), caribou group scan summaries will no longer be collected and will be replaced by caribou collar data to inform future caribou behavioural analyses (Section 4.2). As such, group scans and resulting summaries will no longer be discussed in future reports.

Additional mitigation measures were included in the 2021 WMMP (DDMI 2021). The WMMP describes how approaching caribou will be detected, identifies trigger levels to initiate action, and introduces tiered mitigations that may be undertaken to avoid and reduce sensory disturbance to caribou and avoid mortality or injury risks (DDMI 2021). Tiered mitigation considers proximity of caribou to East Island and Mine areas, (e.g., within 5 km of East Island, reported on East Island) and corresponding mitigation and monitoring measures that will be implemented, including traffic control and reduced speed limits. Two site-wide communications were distributed notifying workers of caribou presence on the East Island. One road closure occurred, with Environmental staff dispatched to monitor traffic and ensure caribou safety. A 500 m exclusion zone was implemented during blasting activities, consistent with the Northern Land Use Guidelines for Northwest Territories Seismic Operations (GNWT-DoL 2015), along with already established blasting procedures, such as blasting taking place within a 12 m deep charge hole and blasts being directed upward rather than outward (DDMI 2021). Based on Condition 5 provided by GNWT-ENR after their review and conditional approval of the 2022 WMMP, the blast exclusion zone for caribou was extended to 1 km (WSP Golder 2022d). No caribou were identified within the 1 km exclusion zone immediately prior or during blasting operations in 2022. Above ground blasting will continue in 2023 at the A21 open pit until mid-year, after which, blasting will be fully underground except for infrequent surface blasts at the South Country Rock Pile throughout the remainder of operations.

5.0 GRIZZLY BEAR

The barren-ground grizzly bear (*Ursus arctos*) ranges throughout most of the NWT. The western population of grizzly bear is currently designated as Special Concern under Schedule 1 of the *Species at Risk Act* (SARA; GOC 2023) and listed as Special Concern under the NWT General Status Rank (NWT SAR 2023).

Grizzly bears have low population densities, low reproductive rates and are sensitive to human activity (DDMI 1998b; McLoughlin et al. 1999). While some grizzly bears may avoid mineral developments, others may be attracted to human activity through odours associated with development (Gau and Case 1999; Johnson et al. 2005).

Effects to grizzly bears from mining may occur through direct habitat loss, habitat suitability reduction, and direct mortality. The focus of the monitoring program is to estimate direct habitat loss, monitor grizzly bear presence and distribution, and report Mine-related mortalities.

5.1 Habitat Loss

Grizzly bears use a wide variety of vegetation and habitat 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 objective of this component of the WMMR is to determine if direct habitat loss for grizzly bear from the Mine footprint is within the prediction in the EER (DDMI 1998b):

- At full development, direct terrestrial habitat loss for grizzly bear from the project is predicted to be 8.67 km².

5.1.1 Methods

Methods used to determine grizzly bear habitat loss are similar to that described in Section 4.1; grizzly bear habitat is assumed to include all terrestrial habitats (i.e., all landscape types in Table 2 except for deep water, shallow water, and disturbed areas).

5.1.2 Results

Cumulative direct grizzly bear habitat loss resulting from the Mine up to 2022 was 8.38 km², which is below that predicted in the EER.

5.2 Incidents and Mortalities

Although there is some interaction between the Mine and grizzly bears, every effort is made to immediately report any animals that come into contact with the Mine. Bear awareness instruction is provided to employees and has contributed to the timely reporting of bears approaching site, which limits interactions. Despite mitigation, Mine activities may lead to grizzly bear mortalities, injuries, or relocations. The specific impact prediction in the EER (DDMI 1998b) is:

- Mortalities associated with mining activities are predicted to be 0.12 to 0.24 bears per year.

5.2.1 Methods

Incidental observations of grizzly bears are recorded and are usually made by Mine staff and reported to the Environment Department. Each independent grizzly bear observation is recorded because it is usually not known if different observations are of the same bear. As the number of incidental observations, deterrence actions, and removals (i.e., relocations and mortalities) may be partially related to the number of people on site, these variables were compared to the camp population. Additionally, these same variables were compared to amount of waste rock hauled and total material moved to ascertain if relationships between these variables exists. Total materials moved include waste rock, till, ore, processed kimberlite, and other re-mined materials.

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 GNWT-ECC, and GNWT-ECC 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.

5.2.2 Results

There were 75 reported instances of grizzly bears on East Island in 2022, and a total of 164 grizzly bears were observed (Table 25; Appendix K). Grizzly bears were observed on 57 days from 3 May to 21 October. While these observations are not collected systematically, and contain repeated observations, incidental observations provide an indication of the potential for wildlife incidents or problem wildlife.

In 2022 there was an average of 578 people at the Mine and a total of 4,920,765 tonnes of waste rock hauled (Table 25). The number of incidental observations of grizzly bears does not appear to be related to the number of people on site (Spearman correlation $\rho = 0.09$, $P = 0.70$); however, staff reporting incidental observations does foster an awareness of wildlife issues at the Mine. The number of incidental observations of grizzly bears appear to be moderately negatively related to the amount of waste rock hauled (Spearman correlation $\rho = -0.67$, $P = <0.01$) and total material moved (Spearman correlation $\rho = -0.58$, $P = <0.01$).

Of the 164 grizzly bears seen (75 observation instances), 72 animals (33 observation instances) involved deterrent actions and 92 animals (42 observation instances) did not involve deterrent actions (Table 26). Deterrents used to encourage bears to move away from infrastructure included trucks, air horns, bear bangers, rubber bullets, gun cycles (noise), yelling, and clapping (Appendix L). The number of deterrents used does not appear to be related to the number of people on site (Spearman correlation $\rho = 0.13$, $P = 0.56$); however, they do appear to be moderately negatively related to the amount of waste rock hauled (Spearman correlation $\rho = -0.62$, $P = <0.01$) and total material moved (Spearman correlation $\rho = -0.57$, $P = <0.01$).

No grizzly bear relocations or mortalities occurred in 2022. The calculated Mine-related mortality rate over the 23-year monitoring period is 0.13 bears per year, which is within the range predicted in the EER. The number of grizzly bear relocations (Spearman correlation $\rho = -0.04$, $P = 0.87$) or mortalities (Spearman correlation $\rho = -0.20$, $P = 0.38$) do not appear to be related to the number of people on site. The number of grizzly bear relocations (Spearman correlation $\rho = -0.33$, $P = 0.14$) or mortalities (Spearman correlation $\rho = 0.25$, $P = 0.26$) do not appear to be significantly related to the amount of waste rock hauled. Further, the number of grizzly bear relocations (Spearman correlation $\rho = -0.35$, $P = 0.12$) or mortalities (Spearman correlation $\rho = 0.28$, $P = 0.21$) do not appear to be significantly related to the total amount of material moved.

Table 25: Average Camp Population, Total Waste Rock Moved, and Number of Incidental Grizzly Bear Observations, 2002 to 2022

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Average Camp Population	1100	470	397	646	716	747	979	562	579	630	629	537	484	524	625	641	578	586	585	558	557
Total Waste Rock Moved (millions of tonnes) ^(a)	2.39	19.88	28.73	26.90	23.32	18.13	19.98	17.23	18.24	9.02	0.40	0.39	1.88	0.45	0.35	0.39	6.23	7.44	8.33	8.81	4.92
Total Materials Moved (millions of tonnes) ^(a)	6.74	25.99	33.46	31.31	27.99	25.72	25.81	20.10	22.30	13.34	4.38	5.11	7.55	7.65	7.33	5.65	12.66	12.98	14.73	15.45	11.55
Grizzly Bear Reported instances on East Island	5	19	24	43	21	41	5	22	44	56	97	65	69	77	137	89	90	80	95	80	75

(a) Values have been rounded for presentation purposes.

Table 26: Grizzly Bear Deterrent Actions, Incidents, and Mine-related Mortalities, 2000 to 2022

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Days with Bear Visitations on East Island	15	14	5	15	24	34	20	34	5	22	44	41	77	47	59(a)	56(b)	94(c)	73(d)	70(e)	70(f)	79(g)	60(h)	57(i)
Days Deterrent Actions were Utilized	10	8	2	6	20	23	8	20	3	18	40	31	65	40	39	27	50	51	36	45	50	41	33
Relocations	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	0	0
Mortalities	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0

- (a) Over 59 separate days, 69 grizzly bear observations were recorded.
(b) Over 56 separate days, 77 grizzly bear observations were recorded.
(c) Over 94 separate days, 137 grizzly bear observations were recorded.
(d) Over 73 separate days, 89 grizzly bear observations were recorded.
(e) Over 70 separate days, 90 grizzly bear observations were recorded.
(f) Over 70 separate days, 125 grizzly bear observations were recorded.
(g) Over 79 separate days, 169 grizzly bear observations were recorded.
(h) Over 60 separate days, 89 grizzly bear observations were recorded.
(i) Over 57 separate days, 164 grizzly bear observations were recorded.

Adaptive Management and Recommendations

Diavik participated in regional grizzly bear hair snagging monitoring in collaboration with BHP Billiton and De Beers Canada Inc. in 2012 and 2017. The results through 2017 indicated that the regional grizzly bear population is stable or increasing and not adversely affected by the Diavik and Ekati mines (ERM 2018). Program partners at the 2021 Diamond Mine Wildlife Monitoring Meetings (GNWT-ENR 2021) concluded that the grizzly bear hair snagging program will be discontinued. Diavik continues to use deterrent actions that keep grizzly bears and Mine personnel safe.

6.0 WOLVERINE

6.1 Introduction

Wolverine (*Gulo gulo*) are annual residents in the Lac de Gras region (DDMI 1998b). Wolverines are federally listed as Special Concern under Schedule 1 of the SARA (GOC 2023) and are considered Not at Risk in the NWT (NWT SAR 2023, Species at Risk Committee 2014).

Wolverine home ranges have been estimated at 126 km² for adult females and 404 km² for adult males (Mulders 2000). The feeding behaviour of wolverine may result in their attraction to camps and habituation if they receive a food reward, which has been demonstrated during baseline, construction, and operations in the Lac de Gras area. Wolverines in the tundra have been shown to depend primarily on scavenging barren-ground caribou for their diet (Mattisson et al. 2016) particularly in the winter (Magoun 1987) and may travel long distances in search of carrion (NWT SAR 2023).

6.2 Presence and Distribution

The initial objective of this component of the WMMR was to determine if mining activities are influencing the presence of wolverines in the study area. The revised monitoring objective determined in Handley (2010) is to:

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

To meet this objective, DDMI participated in a joint wolverine DNA hair sampling research program in cooperation with Dominion Diamond Mines and the GNWT from 2004 to 2014. Program partners present at the Diamond Mine Wildlife Monitoring Meetings hosted by the GNWT in February 2021 determined to discontinue hair sample monitoring for wolverine. The initial monitoring objective on wolverine presence noted previously will be resumed.

Wolverine presence around the Mine is monitored using the following systematic and anecdotal methods:

- snow track surveys
- incidental observations at site

6.3 Snow Track Surveys

6.3.1 Background

Surveys designed to detect organisms on the landscape are important for understanding factors influencing population dynamics and species ranges. Many surveys stratify the landscape into sampling locations (i.e., sites) and seek to determine whether a site is occupied by a given species or not. To estimate patterns of site occupancy, methods either assume perfect detection in the sampling methods or statistically control for imperfect detection in the analysis. Snow-track surveys are a popular non-invasive method for surveying mammalian communities with better detectability than alternative methods (Bayne et al. 2005). In snow-track surveys, the site occupancy of an animal is inferred by the presence of tracks in snow; however, the assumption of perfect detection is rarely met (Whittington et al. 2015); but see Squires et al. (2012) for an example where near perfect detection is achieved through sampling design for Canada lynx (*Lynx canadensis*). For the length of a transect to be occupied by an animal, the tracks of that animal must intersect with the transect at some point and leave behind distinguished, identifiable tracks. Detection depends on the observer(s) visually detecting the track and correctly identifying the source of the track. There is a non-zero probability that a transect be occupied by an animal and its tracks go undetected either through failure to see the track, or misidentification. To test hypotheses relating to the spatial distribution of animals on the landscape by way of contrasting occupied sites against unoccupied sites, the analysis must concurrently account for the probability that a site was occupied but the animal was not detected (MacKenzie et al. 2002).

In some circumstances the parameter of interest is not site occupancy itself, but rather the change in occupancy over time. For example, long-term monitoring programs might be more interested in the temporal variation in occupancy and factors influencing the probability of a site changing state (e.g., from occupied to unoccupied). These multi-season analyses require parameterization of the extinction probability and the colonization probability; that is an occupied site becoming unoccupied, and an unoccupied site becoming occupied, respectively. In this context 'extinction' refers to a site becoming unoccupied and not the extinction of a species. MacKenzie et al. (2003) developed a statistical approach to model these processes along with site occupancy (at time $t = 1$) while correcting for the imperfect detection of a species in multi-season datasets. The multi-season occupancy model (MSOM), or dynamic occupancy model, allows for the parameterization of covariate effects on any of these four processes, and at the scale of either the visit, the season (i.e., typically year), or the site. An MSOM approach was used to analyse the snow-tracking data for wolverines in the study area.

6.3.2 Methods

Snow track surveys began in 2003 and have been completed with the assistance of a community member, when available. From 2003 to 2006, the study design and data collection used the experience of Inuit Qaujimagatuqangit 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 km² area. 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 Inuit Qaujimagatuqangit), including heath tundra and heath tundra boulder habitats.

Each transect is driven by a snowmobile in March and/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 presence and distribution in the study area, with the exception of those from 2020 to 2022 where the second round of surveys were cancelled due to staff shortages resulting from COVID-19.

The detection of snow tracks can be influenced by wind or snowfall. The effect of snowfall was estimated by determining the number of days from the survey date since the most recent snowfall. A wind threshold index was estimated by determining the number of days prior to the survey date that the mean hourly wind speed eclipsed 7.7 metres per second (m/s) because a wind speed of 7.7 m/s is sufficient to move dry snow along the ground (Li and Pomeroy 1997). For each transect, a track density index (TDI) was calculated as the number of wolverine tracks per transect length per number of days since recent snowfall or threshold wind speed.

6.3.2.1 Multi-season Occupancy Model

The MSOM approach uses the detection history at a given site (i.e., transect) to estimate changes in occupancy over time while accounting for imperfect detection (MacKenzie et al. 2003). Primary sampling periods, in this case years, are used to estimate occupancy, colonization and extinction rates, while secondary sampling periods, (i.e., repeat visits within a year) are used to estimate the detection probability. The MSOMs were developed in R version 4.2.1 (R Core Team 2022) using the `colext` function in the package 'unmarked' (Fiske and Chandler 2011).

A forward stepwise model selection procedure was conducted to produce the final model. Models were compared using the Akaike information criterion (AIC) as recommended by Kery and Chandler (2016) to produce the best model without overfitting variables. Initially a null model was tested with no covariate effects on occupancy, colonization, estimation, or detectability, and then covariates were added based on *a priori* hypotheses. If no covariate effects improved model fit, the null model was retained to the next step. Covariates were retained in the model if they resulted in an improved model fit given the criteria $\Delta AIC \leq 2.0$ relative to the competing candidate models, thus multiple competing covariates could be retained at each step. Covariate effects were first tested on detectability, followed by occupancy, colonization, and extinction in the stepwise model selection procedure. Once a covariate was deemed significant based on AIC model selection, it was included in all future candidate models. The previous comprehensive analyses included distance of the autumn range centroid of the Bathurst caribou herd from the treeline as a covariate (Golder 2020). This covariate was not included in the current analysis as the winter range of the Bathurst herd has shifted and now overlaps the Mine making the autumn range variable no longer relevant. The covariates tested in the MSOMs are summarized in Table 27, and the associated process for which an effect was hypothesized are summarized in Table 28.

Table 27: Covariates Tested in the Multi-Season Occupancy Modeling Framework

Covariate Name ^(a)	Description ^(b)	Scale ^(c)	Process
thresh	The minimum number of days since the last snowfall or high wind event, whichever was more recent	Secondary	Detection
snow	The number of days since the last snowfall	Secondary	Detection
wind	The number of days since the last windy day (hourly average >7.7m/s)	Secondary	Detection
year	Scaled year of survey (years since first survey in 2008)	Primary	Extinction, Colonization, Occupancy
habitat	Exponent of mean resource selection function score, previously produced for Slave Geological Province (Johnson et al. 2005). for each transect	Site	Occupancy
distance	Distance (in kilometres) from transect centre point to nearest Mine infrastructure	Site	Occupancy
FTE	Full-time equivalents; the number of full time staff at the Mine in March when winter tracking surveys were conducted, to serve as a proxy measure for Mine activity level	Primary	Extinction

(a) Covariates are hereafter referred to by these names rather than their descriptions.

(b) All covariates were scaled from 0-1 to improve convergence of the maximum-likelihood routine (Kery and Chandler 2012).

(c) Primary = yearly covariate constant across sites; Secondary = visit level covariate; site = site-level covariate constant across years.

Table 28: Hypotheses Tested with Each Covariate and Process in the Multi-season Occupancy Model

Covariate	Process	Hypothesis Test
wind snow thresh	Detectability	The effects of weather on the ability for observers to detect a track if one is present. Snowfall effects may be bidirectional, as fresh snow creates opportunities for easy to identify tracks, but will also cover pre-existing tracks, whereas wind effects should only have a negative effect on detectability.
year	Detectability	Annual variation in detectability could be due to observer ability.
habitat	Detectability	Different habitat conditions may produce variable snow conditions, which could influence track detectability and identification.
distance	Occupancy	The occurrence of wolverines may be influenced by proximity to the Mine.
habitat	Occupancy	The occurrence of wolverines is driven by habitat quality as determined by a resource selection function previously produced for Slave Geological Province (Johnson et al. 2005).

Table 28: Hypotheses Tested with Each Covariate and Process in the Multi-season Occupancy Model

Covariate	Process	Hypothesis Test
distance*habitat	Occupancy	Wolverine occurrence in response to habitat quality is mediated by the distance to the Mine. This interaction tests whether habitat availability is a stronger driver than selection.
year	Colonization	Wolverines are moving into areas due to intrinsic population dynamics and/or range expansion over the course of the study.
FTE	Colonization	Wolverines are attracted to increased mining activity and are moving into areas in response.
habitat	Colonization	Wolverine habitat selection is changing over time, and they are colonizing areas with varying habitat quality.
FTE	Extinction	Increasing mining activity is forcing wolverines out of areas they previously occupied.
year	Extinction	Wolverines are abandoning areas previously occupied due to intrinsic population dynamics and/or range contraction over the course of the study.

6.3.3 Results

One round of snow track surveys was completed between 29 March and 14 April 2022. Of the 40 transects, 37 were surveyed. In addition to wolverine, Artic fox (tracks), wolf (tracks and individual), caribou (tracks and individuals) were observed during snow track surveys.

Wolverine tracks were identified at 12 of 37 (32% occurrence) transects (Appendix M). The number of wolverine tracks identified among transects ranged from 0 to 2 tracks. One wolverine was sighted on 29 March off transect during surveys, and one was sighted on 13 April on transect WT27 (Figure 22). Weather-adjusted measures of track density index (TDI) yielded a mean TDI ($\pm$ 2SE) of 0.064 ± 0.042 tracks/km/day since the last weather threshold (Table 29). Mean TDI in 2022 was slightly higher than in 2021 (0.040 ± 0.020 ; Table 29). However, fewer wolverine tracks were observed overall (2021 – 24 tracks; 2022 – 16 tracks; Table 29). The last comprehensive analysis of long-term wolverine snow tracking data found that occupancy rates have remained stable during the study program (Golder 2020).

Table 29: Wolverine Track Index and Mean Days Since Snow Fall, 2003 to 2022

Year	Survey Period	Number of Tracks	Distance Surveyed (km)	Mean Days Since Snowfall ^(a)	Mean Days Since Threshold Wind Speed ^(a)	Track Index (Tracks/km)	Mean Track Density Index ($\pm 2SE$) ^(b)
2003	10 – 12 Apr	13	148	2.2	2.1	0.09	0.05 $\pm$ 0.04
2004	16 – 24 Apr	22	148	4.0	4.6	0.15	0.06 $\pm$ 0.04
2004	2 – 8 Dec	10	148	3.9	2.5	0.07	0.05 $\pm$ 0.04
2005	30 – 31 Mar	7	148	7.5	3.9	0.05	0.03 $\pm$ 0.02
2005	7 – 12 Dec	18	148	2.4	3.5	0.12	0.11 $\pm$ 0.04
2006	30 Mar – 1 Apr	5	148	1.0	2.5	0.03	0.03 $\pm$ 0.01
2007 ^(c)	-	-	-	-	-	-	-
2008 ^(d)	30 Apr – 2 May	15	160	17.1	4.1	0.09	0.02 $\pm$ 0.01
2009	2 – 4 Apr	11	156	31.0	9.0	0.07	0.01 $\pm$ 0.01
2010 ^(e)	-	-	-	-	-	-	-
2011	30 Mar – 3 Apr	23	156	0.9	6.7	0.15	0.17 $\pm$ 0.07
2012	28 Mar – 3 Apr	22	160	2.8	4.4	0.14	0.10 $\pm$ 0.06
2013	2 – 6 Apr	26	156	3.1	2.9	0.17	0.08 $\pm$ 0.04
2014	23 – 26 Mar	25	160	6.7	1.0	0.13	0.16 $\pm$ 0.08
2015	24 – 29 Mar	21	160	5.3	11.0	0.13	0.06 $\pm$ 0.05
	14 – 17 Apr	17	160	2.1	1.6	0.11	0.17 $\pm$ 0.13
2016	22 – 27 Mar	50	160	6.5	5.5	1.25	0.19 $\pm$ 0.13
	8 – 13 Apr	50	160	6.7	3.1	1.25	0.21 $\pm$ 0.10
2017	22 Mar – 4 Apr	10	160	4.1	2.5	0.06	0.02 $\pm$ 0.01
	9 – 19 Apr	42	160	2.4	2.7	0.26	0.26 $\pm$ 0.01
2018	23 Mar – 11 Apr	10	132	4.5	1.8	0.08	0.08 $\pm$ 0.06
	13 – 22 Apr	4	132	3.2	1.7	0.03	0.03 $\pm$ 0.03
2019	23 Mar – 2 Apr	14	160	1.6	1.2	0.09	0.14 $\pm$ 0.11
	13 – 21 Apr	32	160	2.1	2.3	0.20	0.21 $\pm$ 0.11
2020 ^(f)	01 Apr – 18 Apr	21	160	2.0	3.6	0.13	0.14 $\pm$ 0.10
2021 ^(f)	26 Mar – 4 Apr	24	156	4.6	4.8	0.15	0.04 $\pm$ 0.02
2022 ^(f)	29 Mar – 14 Apr	16	148	5.9	4.3	0.11	0.06 $\pm$ 0.04

(a) Presented as a summary of the data used to calculate track densities. Wind threshold speed = 7.7 metres per second.

(b) For each transect, a track density index (TDI) was calculated as the number of wolverine tracks per transect length per number of days since recent snowfall or threshold wind speed. TDI is reported as mean Track Density Index $\pm$ 2 times the standard error (Appendix M).

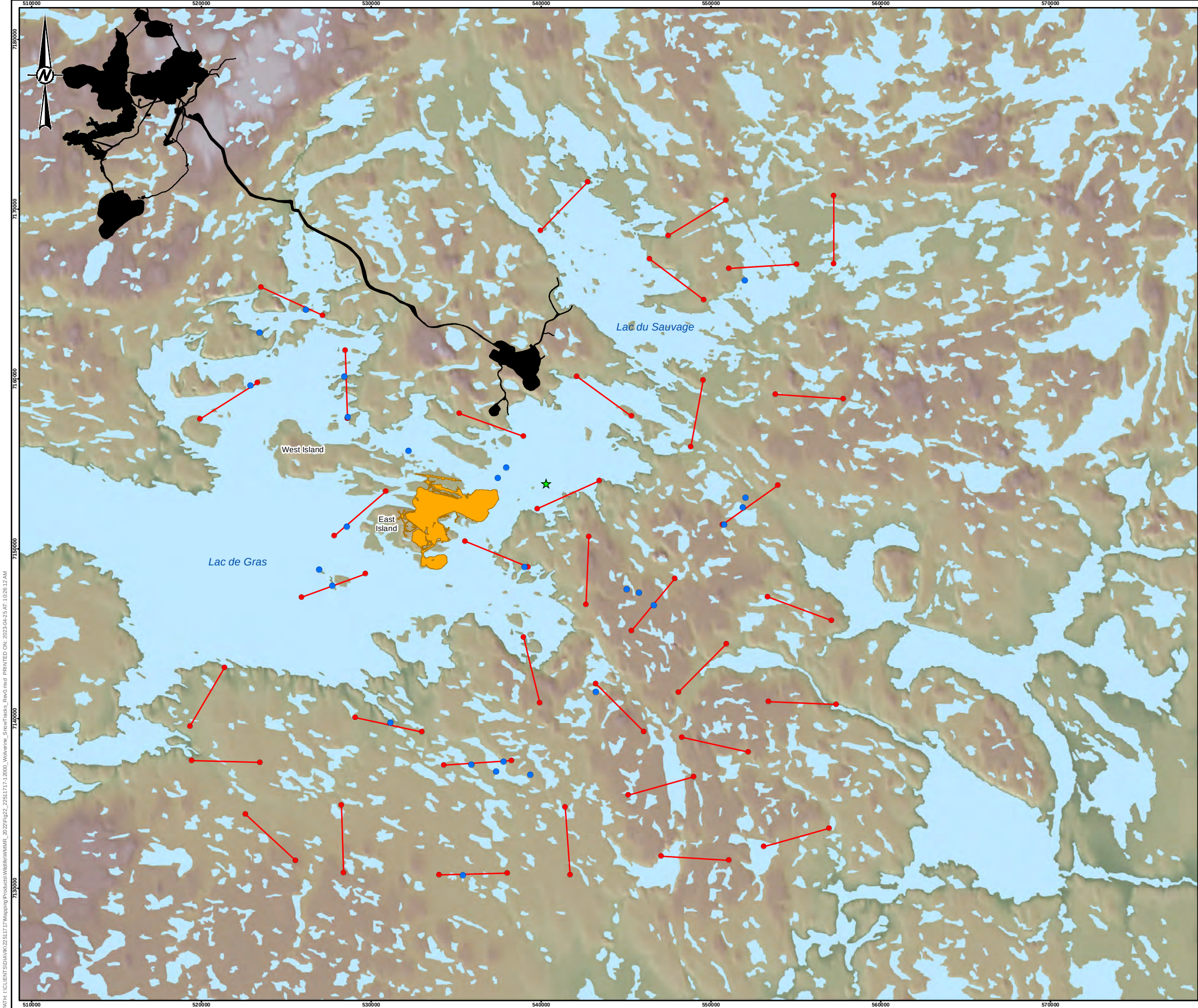
(c) Survey was not completed in 2007 because a Wildlife Research permit was not acquired in time.

(d) The new survey technique was introduced in 2008. Only data hereafter was included in the multi-season occupancy analysis.

(e) Survey was not completed in 2010 due to community assistant not being available to participate in survey.

(f) Second round of surveys was not completed due to site access restrictions or staffing issues resulting from the COVID-19 pandemic.

km = kilometres; tracks/km = tracks per kilometre; SE = standard error.



LEGEND

WOLVERINE SURVEY

- ★ WOLVERINE SIGHTING
- WOLVERINE TRACK
- TRANSECT
- DIAVIK FOOTPRINT
- EKATI FOOTPRINT
- WATERBODY

KEY MAP

REFERENCE(S)

1. DEM AND HILLSHADE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

2. HYDROLOGY OBTAINED FROM CLIENT.

PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

PROJECT

DIAVIK DIAMOND MINES INC.

TITLE

SNOW TRACK TRANSECTS AND WOLVERINE OCCURRENCES IN 2022

	CONSULTANT	YYYY-MM-DD	2023-04-25
	DESIGNED	SW	
	PREPARED	ANK	
	REVIEWED	DC	
	APPROVED	JV	

PROJECT NO.	PHASE	REV.	FIGURE
22511717	12000	0	22

PATH: I:\CLIENT\SI\DIAMOND\25117\IT\MapInfo\Products\Wolverine\2022\Fig02_22511717_12000_Wolverine_SnowTracks_Peak.mxd PRINTED ON: 2023-04-25 AT 10:28:12 AM

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6.3.3.1 Multi-season Occupancy Model

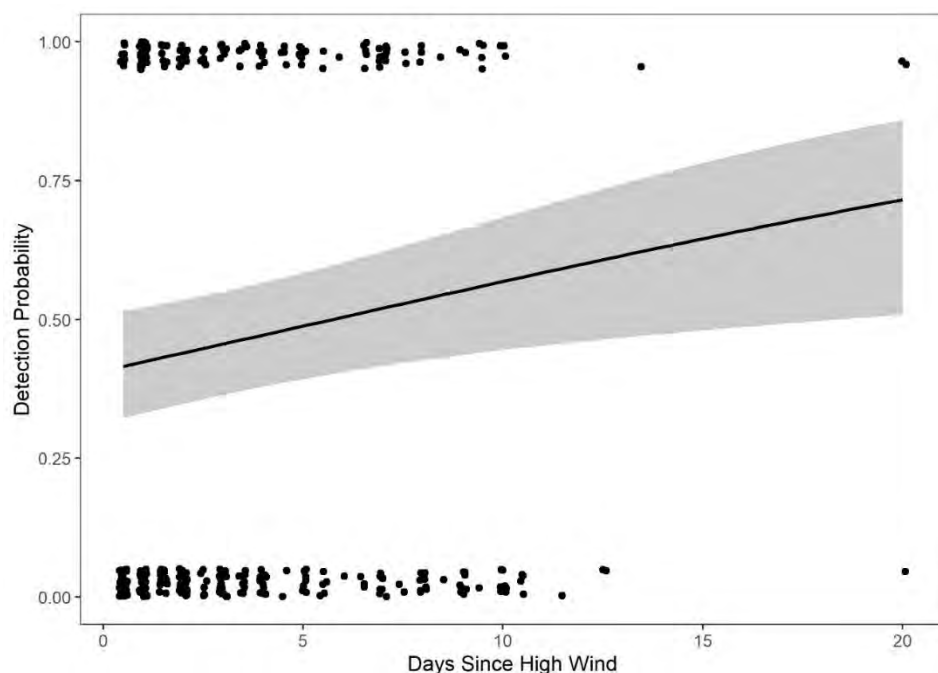
Detectability

Five covariates with potential effects on the detection process were tested against the null model to determine factors affecting wolverine snow track detectability. The following variables were assessed: year, habitat, wind, snow, and thresh. The best fitting variable was wind (Table 30). The number of days since the last wind event had a positive effect on detectability ($\beta = 1.26$, $Z = 2.64$, $P = 0.01$; Figure 23), indicating that detectability improves as the number of days since the last high wind event increases. The number of days since snowfall was a weaker predictor of detectability, which supports the hypothesis that snow has a bidirectional effect on detectability: fresh snowfall creates ideal tracking conditions making it easy to detect new tracks, while covering and eliminating previously accumulated tracks reduces detectability. However, wind has a unidirectional effect in that it only negatively influences detectability by blowing snow and distorting existing tracks. This result highlights the importance of continuing to account for imperfect detection due to wind events in future analyses. Wind was carried forward as the detection process in modelling subsequent processes (i.e., occupancy, colonization, and extinction).

Table 30: Candidate Models for Detectability

Model	AIC	Δ AIC	p (detection)	
			Intercept	OR
p.wind	941.64	0.00	0.42	3.54
p.thresh	945.42	3.78	0.43	1.97
p.null	947.47	5.83	0.49	-
p.snow	948.08	6.44	0.46	1.72
p.habitat	949.01	7.37	0.45	1.30
p.year	949.28	7.64	0.51	0.82

Note: The intercept is presented as a probability and is interpreted as the probability of detection when the associated covariate values is set to '0'. The covariate is presented as the odds ratio (OR) and is the predicted change in the odds of a detection when the covariate value is set to '1' (i.e., the max). Bold text indicates the top model.



Note: Observed Points are Plotted with Jitter to Show all Points, but Always Exist at 0 or 1 (not observed or observed).

Figure 23: Effect of Days Since Wind (Mean Hourly Wind >7.7m/s) on the Detectability of Wolverine Tracks with 95% Confidence Intervals in Grey Ribbon.

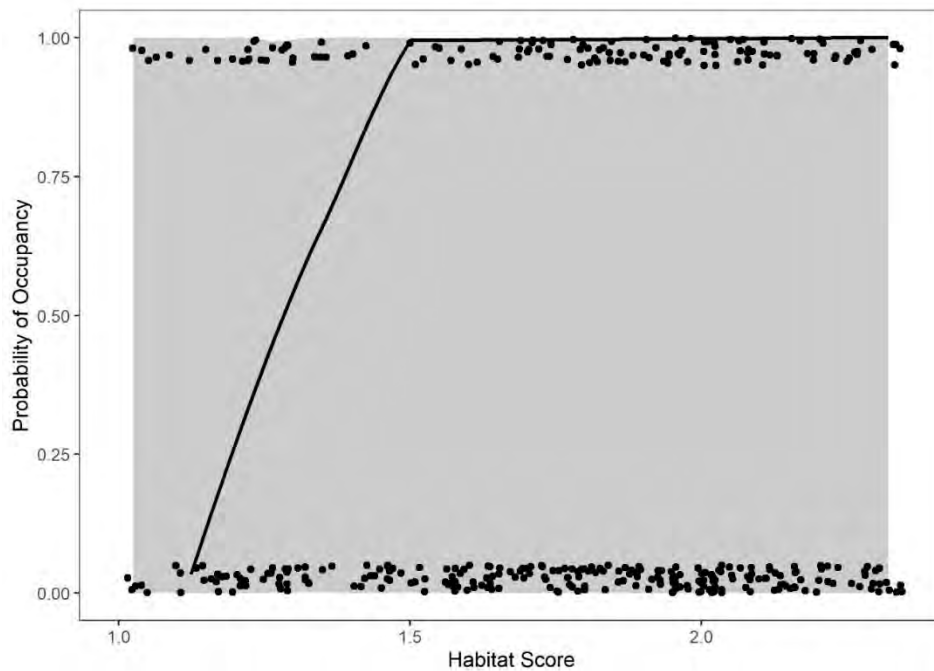
Occupancy

The effects of distance to the Mine (distance) and habitat were tested on the initial probability of site occupancy of wolverines in the study area. An interaction was also tested between distance and habitat to tease apart the potential confounding effect of habitat availability across the distance gradient. The model testing for the effect of habitat on occupancy yielded the best fit (Table 31). Habitat had a large positive effect on the probability of occupancy ($\beta = 68.2$, $Z = 0.78$, $P = 0.44$; Figure 24). This suggests that transects located in high quality wolverine habitat (based on a previously developed resource selection model [Johnson et al. 2005]), are likely to be occupied. However, the uncertainty around this estimate (i.e., standard error) is large (Figure 24). The initial probability of site occupancy is based on the first year of data collection (2008), which was a single-visit survey and the lack of recapture data, may partially explain the large standard error. Habitat was carried forward as the occupancy process in modelling subsequent processes (i.e., colonization, and extinction).

Table 31: Candidate Multi-Season Models for Occupancy

Model	AIC	Δ AIC	<i>psi</i> (occupancy)	
			Intercept	OR
psi.habitat	939.07	0.00	3.35×10^{-7}	4.00×10^{29}
psi.null	941.64	2.56	0.66	-
psi.distance*habitat	943.00	3.93	2.30×10^{-8}	1.26×10^{-4}
psi.distance	943.56	4.49	0.60	1.80

Note: the intercept is presented as the probability of occupancy when covariate values are set to '0', and covariate effect is presented as the odds ratio (OR) when covariate value is set to '1' (i.e., the max). Bold text indicates the top model.



Note: Grey Ribbon Shows 95% Confidence Intervals. Observed Points are Plotted with Jitter to Show all Points, but Always Exist at 0 or 1 (not observed or observed).

Figure 24: The Effect of Habitat Quality as Estimated by a Resource Selection Function Model (Johnson et al. 2005) on the Probability of Wolverine Occurrence at the Start of the Study In 2008.

Colonization

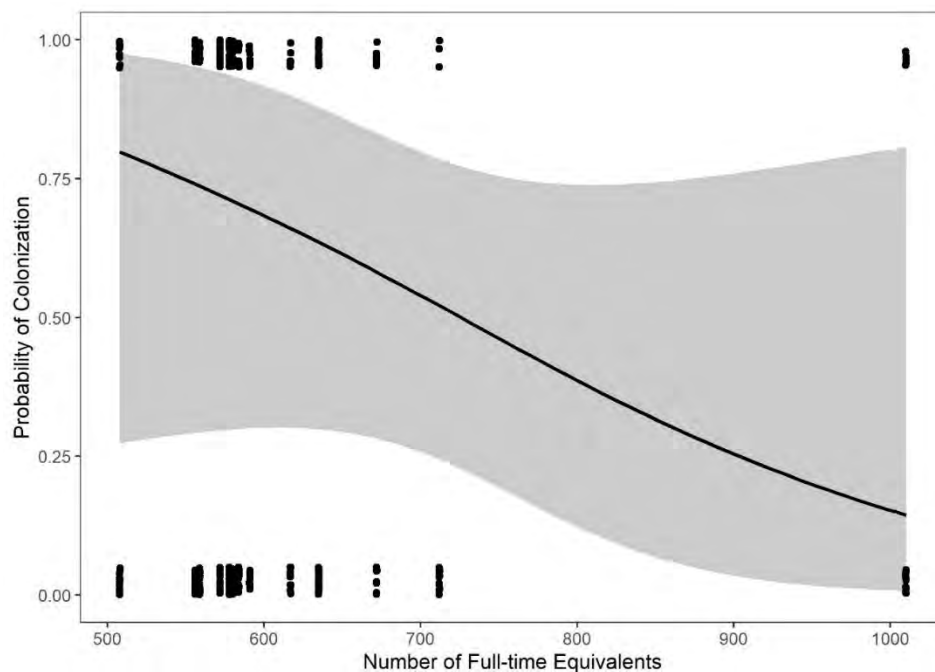
The effects of year, FTE, and habitat were tested on site colonization, or the probability that a previously unoccupied transect will become occupied in the following year. Colonization effects tests for any changes over time that may cause previously unoccupied transects to become occupied by wolverines in the study area. A negative colonization effect is therefore interpreted as a lower probability of colonization at higher levels of a covariate. For example, a negative mean annual temperature effect would be interpreted as wolverines are likely to colonize areas when annual temperatures are lower but does not indicate whether wolverines would leave the area when temperatures increase (this has to be inferred by the extinction process).

Two models received equal support for the effect on colonization probability: FTE, and the null model for colonization. For both models, habitat was included as the process for occupancy, and wind was included for the process on detectability (Table 32). Models testing the effect of year and habitat on colonization probability did not converge. The number of full-time equivalents had a negative effect on colonization ($\beta = -3.12$, $Z = -1.24$, $P = 0.22$; Figure 25), indicating that colonization events were less likely as the number of staff on site, a proxy for Mine activity level, increased. This result suggests that wolverines can tolerate low activity levels but may start to decrease their use of the area as Mine activity increases.

Table 32: Candidate Multi-Season Occupancy Models for Colonization Effects

Model	Detection	Occupancy	Colonization	AIC	Δ AIC	<i>gamma</i> (colonization)	
						<i>Intercept</i>	<i>OR</i>
gamma.h.fte	wind	habitat	FTE	938.81	0.00	0.80	0.04
gamma.h.null	wind	habitat	1	939.08	0.27	0.60	-

Note: The intercept is presented as the probability of occupancy when covariate values are set to '0', and covariate effect is presented as the odds ratio (OR) when covariate value is set to '1' (i.e., the max). Bold text indicates the top competing models.



Note: Observed Points are Plotted with Jitter to Show all Points, but Always Exist at 0 or 1 (not observed or observed).

Figure 25: Effect of the Number of Full-time Equivalents on Wolverine Colonization in the Study Area with 95% Confidence Intervals Shown in Grey Ribbon.

Extinction

The effects of year and FTE were tested on site extinction, or the probability that an occupied transect becomes unoccupied in the following year. The two competing models from the colonization analysis step were tested with extinction parameters: the null model, and FTE effect on colonization. Therefore, six candidate models were tested. Only models that converged are presented in Table 33. Two models including the effect of FTE on colonization on colonization did not converge. All models included habitat as the process for occupancy, and wind for the process on detectability. The covariate effects are presented in a separate table in the 'final models' section below for purposes of clarity (Table 34).

Table 33: Competing Candidate Models in Final Step of Multi-Season Occupancy Model Selection

Model Name	Occupancy	Extinction	Colonization	Detection	AIC	ΔAIC
epsilon.h.f.null	habitat	1	FTE	wind	938.81	0.00
epsilon.h.null	habitat	1	1	wind	939.08	0.27
epsilon.h.fte	habitat	FTE	1	wind	940.41	1.60
epsilon.h.year	habitat	year	1	wind	941.01	2.20

Notes: The top competing models are indicated with bold text. '1' indicates the null process; no covariate effects were tested on this process.

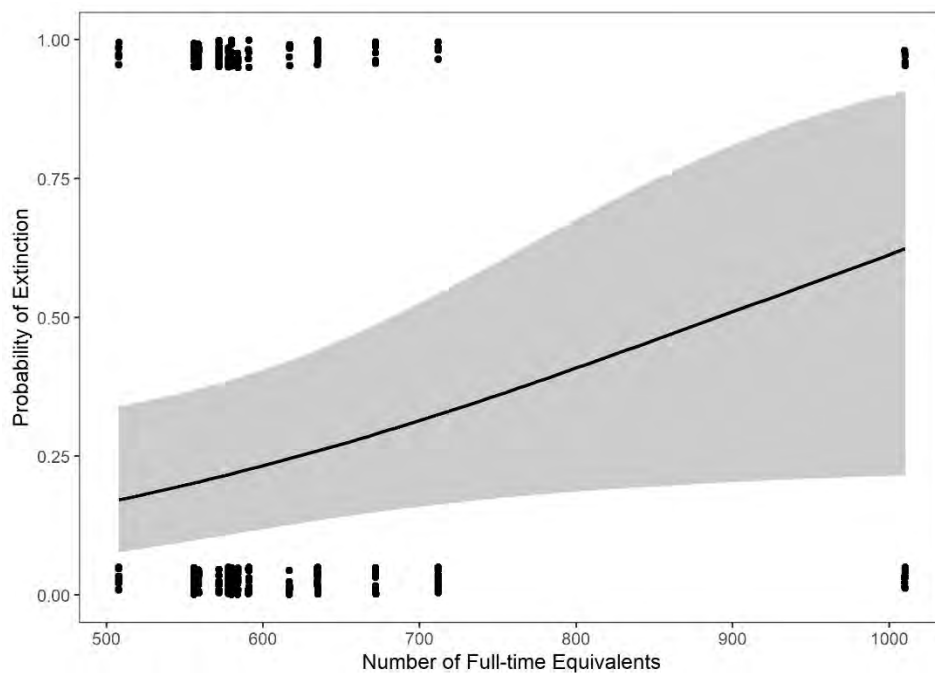
Final Models

There were three models that received support in the final model selection (Table 33). One model included FTE as the colonization process, one model included FTE as the extinction process, and one model included no parameter influencing the colonization or extinction process. All three models included habitat influencing occupancy, and wind influencing detection (Table 34). The number of FTEs on site had a positive effect on wolverine extinction ($\beta = 2.07$, $Z = 2.02$, $P = 0.04$; Figure 26). In other words, as the number of FTEs increased on site, wolverines were more likely to abandon previously occupied transects. These results complement the colonization results (Table 32; Figure 25). The number of FTEs on site appear to influence patterns of wolverine occupancy in the study area. However, null models with no parameter influencing colonization or extinction also received support in model selection.

Table 34: Final Multi-Season Occupancy Models and Associated Covariate Effects and Intercept Values for Each Process

Model	Occupancy (ψ)		Colonization (γ)		Extinction (ϵ)		Detection (p)	
	Intercept	OR	Intercept	OR	Intercept	OR	Intercept	OR
$\psi(\text{habitat})\gamma(\text{fte})\epsilon(.)p(\text{wind})$	4.16×10^{-6}	3.17×10^{23}	0.79	4.40×10^{-2}	0.22	-	0.39	3.56
$\psi(\text{habitat})\gamma(.)\epsilon(.)p(\text{wind})$	3.35×10^{-7}	4.00×10^{29}	0.60	-	0.19	-	0.39	3.36
$\psi(\text{habitat})\gamma(.)\epsilon(\text{fte})p(\text{wind})$	0.50	3.98	0.60	-	0.17	7.94	0.42	4.20

Note: The intercept is presented as the probability of occupancy when covariate values are set to '0', and covariate effect is presented as the odds ratio (OR) when covariate value is set to '1' (i.e., the max).



Note: Observed Points are Plotted with Jitter to Show all Points, but Always Exist at 0 or 1 (not observed or observed).

Figure 26: The Effect of Number of Full-time Equivalents on the Probability of Site Extinction of Wolverines in the Study Area with 95% Confidence Intervals Shown in Grey Ribbon.

Probability of Occupancy over Time

To track changes in wolverine occupancy over the course of the study, the average occupancy rates and standard errors from the three competing top final MSOMs for each year were calculated (Figure 27). Predicted occupancy rates of wolverines remained stable over the course of the study with around 64 to 79% of transects occupied. The number of incidental wolverine observations on East Island (Table 35) was correlated with average predicted occupancy (Spearman correlation $\rho = 0.58$, $P = 0.03$).

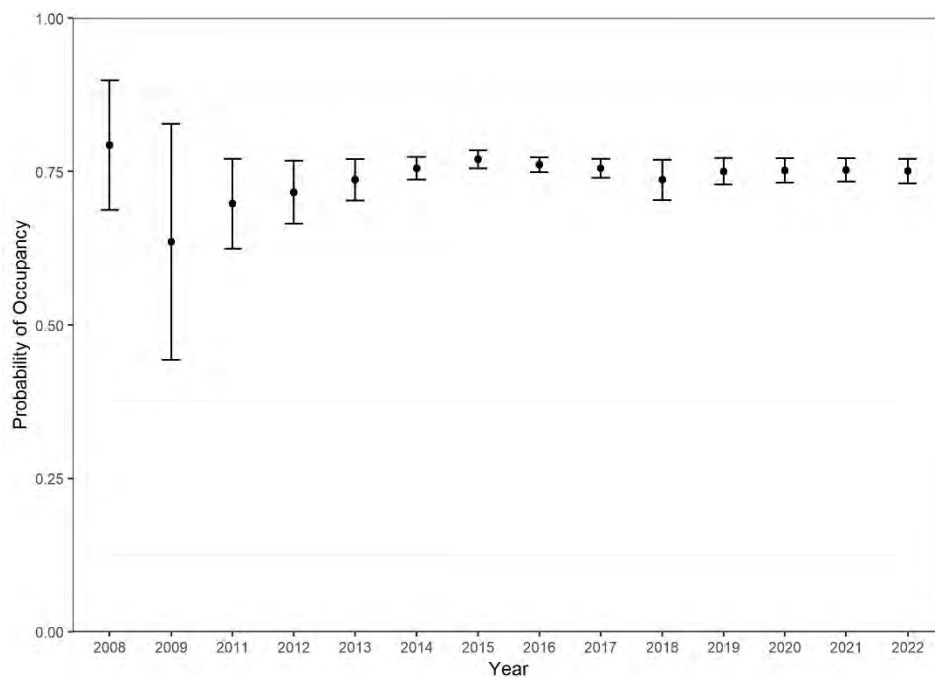


Figure 27: Average Predicted Occupancy Rates Over Time as Estimated from the Top Multi-Season Occupancy Models.

Conclusions

There are many factors contributing to wolverine site occupancy in the study area. The data shows that conducting multiple snow tracking surveys within a year is integral to correctly estimating these occupancy rates, as wolverine detectability is relatively low at around 40%. Continued collection of wind and snow conditions will also help make accurate and unbiased estimates of detectability, and subsequently occupancy, in future years. The data and analyses showed a small variation in wolverine occupancy over time that rarely exceeded the amount of variation expected within a given year, based on predictions from the top model (Figure 27). Although there are only two years of overlap with wolverine density estimates at Diavik from 2005 to 2014, a similar trend was reported (Efford and Boulanger 2018).

The number of FTE was shown to influence the extinction and colonization parameters. However, null models with no parameter influencing colonization and extinction also received support during model selection. Diavik will continue to monitor the occupancy of wolverines in the study area and the relationship with the level of Mine activity. Year effects were tested but did not receive strong support, suggesting that wolverine occupancy rates in this study are influenced by external factors rather than internal demographics. It is important to continue working with local communities to obtain TK to understand other factors that may influence wolverines in this region and possibly incorporate those variables into future analyses.

There are assumptions of the MSOM that may not have been met by the snow track data, which are important to acknowledge. The model requires that all parameters are constant across sites at any given time (MacKenzie et al. 2013). In general, the data meet this assumption as both temporal and site-level factors were identified and modeled directly. Other potential sources of unaccounted variation include prey availability, interspecific interactions (Rød-Eriksen et al. 2023), and site-specific Mine disturbance (e.g., noise or other disturbance that may be greater at one transect than another) that can influence occupancy rates. Another assumption is that the transect is “closed” within a primary sampling period (i.e., year). The closure assumption is important because it determines how the detection probability is calculated. If a wolverine track is detected at a transect in one visit within a primary sampling period but not the other, then occupancy is deemed a false negative. It is possible that during the interval between survey visits, a wolverine home range either included or excluded a transect (within-year colonization and extinction). This discrepancy may cause the detection probability to be under-estimated, which can subsequently inflate the occupancy estimates. The best way to control for this potential bias is to reduce the amount of time between survey visits as much as possible so that the closure assumption can be met (i.e., the site remains occupied or unoccupied over the duration of the primary sampling period). Since the last comprehensive analysis, only one survey was completed per year due to COVID-19. Effort should be made in future years to complete both survey rounds. However, wind and snow conditions, and other logistics can influence the ability to limit the duration between survey visits.

6.4 Incidents and Mortalities

Mortalities can occur if wolverines become habituated to mining activities resulting from efforts to locate food or shelter (DDMI 1998b). Diligent waste management and strictly enforced speed limits and immediate reporting of wildlife sightings on East Island have limited the mortality of wolverine during the operation phase of the Mine. To date, efforts have been focused on limiting Mine-related mortalities and associated changes to wolverine population parameters.

The prediction made in the EER was:

- Mine-related mortalities, if they occur, are not expected to alter wolverine population parameters in the Lac de Gras area.

6.4.1 Methods

Incidental observations of wolverine by Mine staff are reported to the Environment Department. Mine-related incidents and mortalities are also reported to the Environment Department for documentation in a detailed incident investigation and through incident reports submitted by Mine staff (Appendices D and E). All wolverine mortalities are reported immediately to GNWT-ECC, and GNWT-ECC 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. Correlation analysis was completed for wolverine observations, use of deterrence, and removals to ascertain if relationships exist between these variables and the number of individuals on site, total waste rock hauled, and total material moved.

6.4.2 Results

In 2022, there were nine reported instances when wolverines were observed on East Island, and a total of 10 wolverines (Table 35; Appendix N). These sightings were reported during nine days from 12 January to 16 December. These observations are collected incidentally and may contain repeated observations of the same animal. Incidental observations provide an indication of the potential for wildlife incidents or problem wildlife. Wolverine incidental observations increased in 2022 from 2021. There is no significant correlation between the number of incidental observations of wolverine and the number of people on site (Spearman correlation $\rho = 0.39$, $P = 0.08$); however, staff reporting incidental observations does foster an awareness of wildlife issues at the Mine. The number of incidental observations of wolverine do not appear to be related to the amount of waste rock hauled (Spearman correlation $\rho = 0.13$, $P = 0.58$) or significantly related to the total amount of material moved (Spearman correlation $\rho = 0.28$, $P = 0.23$).

There were nine observations of wolverines on East Island in 2022 and no incidents. Of the nine observations, one required deterrent action when a truck horn was used to attempt to move a wolverine off of Mine infrastructure (Appendix L). The number of deterrents used appears to be moderately related to the number of people on site (Spearman correlation $\rho = 0.49$, $P = 0.02$), while not appearing to be related to the amount of waste rock hauled (Spearman correlation $\rho = 0.08$, $P = 0.71$) or significantly related to the total amount of material moved (Spearman correlation $\rho = 0.20$, $P = 0.39$).

Since 2000, seven wolverines have been relocated and five Mine-related mortalities have occurred at the Mine (Table 36). No wolverine relocations or Mine-related mortalities occurred in 2022, which continue to be uncommon at the Mine, and are not expected to have a measurable influence on wolverine population survival and reproduction rates. The number of wolverine relocations does not appear to be related to the number of people on site (Spearman correlation $\rho = 0.19$, $P = 0.93$). Further, no significant correlation was detected between the number of relocations and the total amount of waste rock moved (Spearman correlation $\rho = -0.35$, $P = 0.12$) or the total amount of material moved (Spearman correlation $\rho = -0.21$, $P = 0.37$). There is no significant correlation between the number of wolverine mortalities and the number of people on site (Spearman correlation $\rho = 0.38$, $P = 0.09$), the total amount of waste rock moved (Spearman correlation $\rho = -0.24$, $P = 0.30$), or the total amount of material moved (Spearman correlation $\rho = -0.25$, $P = 0.28$).

Table 35: Average Camp Population and Number of Incidental Wolverine Observations, 2002 to 2022

Year ^(a)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Average Camp Population	1100	470	397	646	716	747	979	562	579	630	629	537	484	524	625	641	578	586	585	558	557
Total Waste Rock Moved (millions of tonnes) ^(b)	2.39	19.88	28.73	26.90	23.32	18.13	19.98	17.23	18.24	9.02	0.40	0.39	1.88	0.45	0.35	0.39	6.23	7.44	8.33	8.81	4.92
Total Material Moved (millions of tonnes) ^(b)	6.74	25.99	33.46	31.31	27.99	25.72	25.81	20.10	22.30	13.34	4.38	5.11	7.55	7.65	7.33	5.65	12.66	12.98	14.73	15.45	11.55
Wolverine Observation instances on East Island	4	38	14	43	31	19	46	21	28	4	11	3	6	118	105	44	28	21	17	6	8

(a) Monthly average camp population is not available for 2000 and 2001.

(b) Values have been rounded for presentation purposes.

Table 36: Wolverine Observations, Deterrents, Relocations and Mortalities, 2000 to 2022

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Days with Wolverine Visitations on East Island	25	36	4	38	14	43	31	19	46	21	28	4	11	3	6	83 ^(b)	73 ^(c)	36 ^(d)	23 ^(e)	21 ^(f)	16 ^(g)	6 ^(h)	8 ⁽ⁱ⁾
Days Deterrent Actions were Utilized	9	10	0	1	1	5	2	1	17	1	0	0	1	0	0	4	6	4	0	7	4	0	1
Relocations	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	2	1	0	0
Mortalities	0	1	0	0	0	0	0	0	1	0	0	0	2 ^(a)	0	0	0	1	0	0	0	0	0	0

(a) Two wolverine mortalities occurred in 2012 at an off-site fish compensation program undertaken by DDMI.

(b) Over 83 separate days, 118 independent wolverine observations were recorded. It is believed that the majority of these observations were for the same wolverine which was relocated on 23 March 2015.

(c) Over 73 separate days, 105 independent wolverine observations were recorded.

(d) Over 36 separate days, 44 independent wolverine observations were recorded.

(e) Over 23 separate days, 28 independent wolverine observations were recorded.

(f) Over 19 separate days, 21 independent wolverine observations were recorded.

(g) Over 16 separate days, 17 independent wolverine observations were recorded.

(h) Over six separate days, six independent wolverine observations were recorded.

(i) Over nine separate days, ten independent wolverine observations were recorded.

Adaptive Management and Recommendations

Future monitoring of wolverine snow tracks will continue to attempt two rounds of surveys to determine whether detection rates of snow tracks vary over longer periods of time. Results from the analysis of long-term snow track monitoring indicate consistent presence of wolverine since 2008. The Environment Department will continue to encourage staff to report wolverine and other wildlife sightings as these promote awareness at site and help to prevent and limit incidents. The Environment Department will continue to work with site departments as a reminder about the importance of waste segregation and securing waste bins to prevent wildlife access. Program partners at the 2021 Diamond Mine Wildlife Monitoring Meetings (GNWT-ENR 2021) determined that the wolverine hair snagging program will be discontinued.

7.0 RAPTORS

Raptors (birds of prey) present in the study area include peregrine falcon (*Falco peregrinus anatum/tundrius*), gyrfalcon (*Falco rusticolus*), rough-legged hawk (*Buteo lagopus*), snowy owl (*Bubo scandiacus*), and short-eared owl (*Asio flammeus*). The federal SARA considers the peregrine falcon as Special Concern; however, they currently have no status under NWT species at risk legislation but have a general species rank of sensitive (NWT SAR 2023). In 2017, COSEWIC re-assessed the status of the *anatum/tundrius* peregrine falcon as Not at Risk (NWT SAR 2023). Short-eared owls are designated as Special Concern under Schedule 1 of the SARA, assessed as threatened by COSEWIC, and currently have no status under NWT species at risk legislation (GOC 2023; NWT SAR 2023).

Habitat loss, sensory disturbance, and changes to prey populations may influence raptors nesting in the Lac de Gras area. Mining activities may cause raptors to avoid the area and surrounding habitats. Mine-related changes in habitat quality can influence the presence and distribution of raptors. Impact predictions related to raptors (DDMI 1998a) were:

- Disturbance from the Mine and the associated zone of influence is not predicted to result in measurable impacts to the distribution of raptors in the study area.
- The Mine is not predicted to cause a measurable change in raptor presence in the study area.

Analysis of Diavik and Ekati peregrine falcon and gyrfalcon nest data from 1998 to 2010 determined that sensory disturbance was not influencing nest occupancy and success (Coulton et al. 2013). Instead, the study concluded that the patterns of use and success were associated with the spatial distribution of nest site quality and the age of nest sites, respectively, which is consistent with findings from another long-term study (Wightman and Fuller 2005). The results confirmed the decisions at the 2010 Diamond Mine Wildlife Monitoring Workshop that annual collection of raptor nest occupancy and success in the study area should be discontinued, and data collection should be focused on mitigating effects to raptors nesting in open pits and on Mine infrastructure.

The monitoring objectives presented in Handley (2010) are to:

- Determine if pit walls or other infrastructure are utilized as nesting sites for raptors.
- Determine nest success in areas of development and document effectiveness of deterrent efforts used.
- Document and determine the cause of direct Mine-related mortalities of raptors.

Another objective related to monitoring the regional status of raptor populations includes:

- Support GNWT-ECC in regional monitoring of raptor nest occupancy and productivity to determine long-term population trends.

Note that the Handley (2010) objective for regional monitoring of raptor nest occupancy for the Canadian Peregrine Falcon Survey (CPFS) has been changed because the CPFS has been discontinued. Instead, monitoring is contributed to a regional database administered by GNWT-ECC.

7.1 Nest Site Occupancy

7.1.1 Methods

The Canadian Peregrine Falcon survey is no longer completed; however, DDMI will still support surveys of nest use and success in the study area for regional monitoring by GNWT-ECC and other researchers. Nest monitoring for inclusion in regional and national databases is scheduled for every five years and was last completed in 2020. The monitoring was completed by GNWT-ECC biologists and included surveys of known nest sites in early and late summer to determine nest use and the presence of hatchlings. The monitoring approach included a helicopter survey using fly-by techniques to minimize disturbance to nesting birds.

Falcons and other raptors have been known to nest on Mine infrastructure and within the vertical rock faces of open pits at both the Mine and the Ekati Mine. Pit wall/infrastructure inspections at the Mine are completed at least once per week during the nesting season. Pit walls and other infrastructure are inspected for nests and falcon nesting behaviour. If nests are found, DDMI attempts to determine the species occupying the nest along with the presence of eggs and/or chicks. Nests are only considered active if eggs or young are observed. Deterrent actions are only considered in consultation with GNWT-ECC if the nest is in an area hazardous to the birds but not if eggs or young are observed.

Pit wall/infrastructure inspections are completed at eight locations on the Mine: A21 Pit area (Lookout #1, #2, #3 and A21 South Ramp), A154 Pit area (Lookout #1 and #2), A418 Pit area (Lookout #1 and #2), South Tank Farm, Process Plant, Powerhouse #1 and Powerhouse #2, Site Services Building, Boiler House, and Backfill Plant. The survey is completed by stopping at a clear vantage point and thoroughly scanning the area for any potential nesting locations.

7.1.2 Results

Regional nest monitoring was not completed in 2022, with the next scheduled survey to occur in 2025.

A total of 60 Pit Wall/infrastructure inspections were completed from 10 May until 19 September to determine use by raptors (Appendix O).

One peregrine falcon nest was recorded in 2022 at the Site Services Lineup area. An individual adult was observed on 3 June on the rock wall where nesting has previously occurred. Two nestlings were observed on 24 July, with observations occurring until mid-August. On 14 August, one nestling was observed still in the nest, while the other had fledged and was perched on rocks above. Both were presumed to have fledged from the nest by 20 August as no other activity was recorded (Appendix O).

Potential nesting of a rough-legged hawk was recorded at the A21 south ramp between 14 to 29 May. Mating behaviour was noted on 14 May with one adult landing at a constructed nest along the south wall. On 14 May, an adult was observed landing at the nest briefly, then flying off. On 29 May, an adult was observed flying over the A21 pit, but no interactions with the nest were observed. No other observations of rough-legged hawk nesting were recorded at the site after this last observation.

Although not considered “raptors”, common ravens (*Corvus corax*) are functional raptors and were confirmed nesting on the southeast fuel tank in the South Tank Farm. Additionally, multiple American robin (*Turdus migratorius*) were recorded nesting within the entrance of the A21 Portal as well as on the outside stairs of the North Inlet Water Treatment Plant (Table 37).

Table 37: Active Nests Observed on Mine Infrastructure, Open Pits, and Equipment in 2022

Area	Species	Date	Observations
Site Services Line Up Wall	Peregrine falcon	3 June to 14 August	A potential nest was first observed on 3 June where a single adult was observed perched on the rock wall where previous nesting has been observed. The nest was deemed successful as one juvenile had fledged from the nest and was observed on 14 August perched on rocks above the nest. Both juveniles had presumably fledged by 20 August.
South Tank Farm	Common raven	10 May to 21 June	An active common raven nest was recorded on 10 May through to 21 June. Four nestlings were visible on 8 June. The nest was deemed successful as one juvenile had fledged from the nest and was observed perched on top of the diesel tank on June 19. No bird activity was recorded after June 21.
A21 Portal	American robin	11 to 15 June	Multiple active American robin nests were recorded on 11 June through to 15 June. Nest success was not recorded.
North Inlet Water Treatment Plant	American robin	11 June	One active American robin nest with four eggs was recorded on the outside stairs of the North Inlet Water Treatment Plant on 11 June. Nest success was not recorded.

No deterrent actions were used to prevent raptor nesting in 2022.

7.2 Incidents and Mortalities

7.2.1 Methods

Mine-related incidents that occur are reported to Environment Department staff through incident reports submitted by Mine staff. Environment Department staff follow up on any incident and complete the necessary documentation, GNWT-ECC is consulted for mitigation and disposal procedures. This information is tabulated and provided for annual comparisons.

7.2.2 Results

Two raptor mortalities occurred in 2022. On 30 August, a dead rough-legged hawk was discovered along the roadway on top of the A21 dike, near a previously recorded rough-legged hawk nest on the south ramp of the A21 pit. A second dead rough-legged hawk was discovered on 4 September in the middle of the road on the A21 dike. The causes of both mortalities are unknown; however, due to the proximity to Mine roads, both mortalities could have been the result of collisions with vehicles.

Since 2002, nine Mine-related or Mine-suspected raptor mortalities have occurred. The majority of these mortalities have occurred in proximity to Mine roads (Figure 28).

7.3 Adaptive Management and Recommendations

Diavik will continue Pit Wall/infrastructure monitoring for nesting raptors and support regional nest monitoring. The next regional nest monitoring is scheduled to occur in 2025 and assumed to be completed by GNWT-ECC.



LEGEND
RAPTOR MORTALITY

- PEREGRINE FALCON (2012)
- PEREGRINE FALCON (2013)
- PEREGRINE FALCON (2016)
- ROUGH-LEGGED HAWK (2021)
- ROUGH-LEGGED HAWK (2022)
- SHORT-EARED OWL (2010)
- SHORT-EARED OWL (2021)

KEY MAP

NOTE(S)

CAUSE OF DEATH, EXCLUDING THE PEREGRINE FALCON IN 2016, IS UNKNOWN; HOWEVER, DUE TO LOCATION OF MORTALITIES AND THEIR PROXIMITY TO MINE INFRASTRUCTURE, IT IS LIKELY THESE WERE THE RESULT OF COLLISIONS WITH VEHICLES.

REFERENCE(S)

1. 2022 SPOT IMAGE AND 2020 WORLDVIEW IMAGE OBTAINED FROM CLIENT
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT

PROJECT

DIAVIK DIAMOND MINES INC.

TITLE

RECORDED ON-SITE RAPTOR MORTALITIES, 2002-2022

	CONSULTANT	YYYY-MM-DD	2023-04-25
	DESIGNED	NM	
	PREPARED	ANK	
	REVIEWED	DC	
	APPROVED	JV	

PROJECT NO.	PHASE	REV.	FIGURE
22511717	12000	0	28

8.0 WASTE MANAGEMENT

Diavik is committed to taking the necessary steps to collect, store, transport, and dispose of all waste generated by the Mine. These procedures are being completed in a safe, efficient, and environmentally compliant manner. The Waste Management Plan is an integral part of DDMI's Environmental Management System and focuses on practical and positive management of waste.

The objectives of the Waste Management Plan include:

- creating a system for proper disposal of waste
- minimizing potentially adverse impacts on the physical and biological environment
- complying with Federal and NWT legislation

Mitigation practices include food waste incineration, categorical segregation of non-food waste for storage and subsequent removal from site, and on-site disposal and monitoring. In addition to these mitigation practices, DDMI has implemented recycling and renewable energy initiatives.

In addition to waste management, waste rock and the number of employees at site have been identified as indices of Mine activity (Golder 2017) and have been reported annually beginning in 2017. Waste rock deposition includes hauling of waste rock and is a source of fugitive dust, noise, and general activity at the Mine site. Mine activity includes all sources of sensory disturbance (e.g., dust, smells, lights, noise, and presence of people) potentially influencing the distribution of wildlife in areas adjacent to the Mine.

8.1 Waste Inspections

The DDMI Waste Management Plan outlines practices for waste disposal and mitigation actions. A Waste Management Plan was submitted in January 2015 to the Wek'èezhìi Land and Water Board (WLWB) as part of the water license renewal under water license number W2015L2-0001 (WLWB 2015). The most recent version of Waste Management Plan was submitted to the WLWB on 19 October 2022 and was implemented in 2022 (DDMI 2022b). The Asset Management Department at the Mine maintains the various waste collection transfer and disposal points, inventories of bulk wastes, waste management datasheets, and status of protective equipment and spill kits. This assists in evaluating the capacity of waste management facilities, planning for logistics associated with backhauling, and requirements for any modifications to the system.

Waste Management staff identify problem areas and work with contractors and Mine employees to resolve any issues. Numbering and inspecting waste collection bins prior to pick up is an effective method of facilitating communication between Waste Management and Environment Department staff and addressing issues within various departments. Efforts are made to identify improperly disposed waste in the large waste collection bins prior to collection; however, on occasion improperly disposed waste may end up in either the Landfill or the burn pit.

Incineration, segregation, and storage of waste takes place at the waste transfer area (WTA), which was established to provide proper handling and storage of waste on site. The facility is located on the south side of East Island. The WTA is a lined facility surrounded by a gated, three-metre-high chain link fence to control wind transportation of any litter and prevent most wildlife intrusion. Contained within the WTA are two incinerators for food waste, a burn pit for non-toxic/non-food contaminated burnable material, a contaminated soils containment area, a treated sewage containment area, as well as sea cans, sheds, and storage areas for drums, crates, bins, and totes. Two water scrubbed incinerators were installed and operational in October 2012 and are located within the incinerator building. One of the incinerators was replaced in the fall of 2020 with a non-scrubbed incinerator that is large enough to handle all waste. The remaining incinerator is currently used as a back up to the new incinerator. The majority of waste is inventoried and stored at the WTA while awaiting backhaul on the Tibbitt-to-Contwoyto Winter Road.

On-site disposal of non-burnable wastes such as steel (ground support for underground mining), vent tubing, plastics, and glass currently occurs at the inert Landfill located within the Waste Rock Storage Area – North Country Rock Pile. Waste is pushed into a large depression in the landfill. The location of the Landfill within the rock pile and traffic in the area will continue to discourage wildlife access to the Landfill, thereby limiting the availability of infrequently misdirected food and food packaging for animals.

8.1.1 Methods

In 2022, waste inspections at the WTA, Landfill, Underground waste bins, and A21 Area were completed twice per week during the winter and once per week in the summer. These inspections are to confirm that all waste segregation, storage, and disposal procedures set out in the Waste Management Plan are being followed. Inspections undertaken by Environment Department staff consist of walking the area of the WTA, Landfill, A21 Area, and Underground waste bins, where safe to do so, and documenting the type and number of misdirected waste items, as well as wildlife species and sign that were present during the survey. Corrective actions at the WTA and Landfill area include notifying a WTA coordinator and transferring items to the appropriate disposal area. Corrective actions at the A21 Area and Underground waste bins include notifying the area supervisor to arrange for the transfer of items to the appropriate disposal area and additional worker education where required. All misdirected waste items found during inspections in the WTA and Landfill are sorted into the proper disposal area by Waste Management staff. For example, non-burnable material is removed from the incinerator waste stream and transferred to the designated area in the Landfill. Hazardous wastes are stored in the WTA until they can be shipped to licensed facilities off-site.

The percentages of inspections with wildlife per site were compared to the number of inspections completed at each site since inspections first began to determine if a relationship exists between increased inspection effort and wildlife observed.

8.1.2 Results

Development of the Underground mines and the A21 open pit in 2022 yielded 4,920,765 tonnes of mined waste rock and 0 tonnes of overburden till and lake bottom sediment, while a total of 2,158,334 tonnes of ore were processed. The average daily population at the Mine in 2022 was 557 people, and weekly the population ranged from 529 to 591 people (Table 25; Appendix P). During 2022, the WTA and Landfill were surveyed on 64 and 60 occasions, respectively. Both the A21 Area and Underground were surveyed 64 times. All surveys occurred from 8 January to 28 December (Table 38; Appendix Q). A total of 99 misdirected waste items were found during WTA inspections, 777 items during Landfill inspections, 393 items at the A21 Area, and 944 items at the waste segregation area of the Underground (Table 38). At the WTA, Landfill, A21, and Underground, 26.6%, 68.3%, 43.8%, and 54.7% of the inspections had at least one item of misdirected waste, respectively.

In the WTA, the most common misdirected waste item was food packaging (26 items), followed by gloves (23 items), and recyclable drink containers and food (11 items for both types of waste). In the Landfill, the most common misdirected item was gloves (203 items), followed by food packaging (119 items), and oily rags and cigarette butts (100 items for both types of waste). In the A21 Area, the most common misdirected waste item was cigarette butts (1433 items), followed by oily rags (93 items) and gloves (47 items). In the Underground, the most common misdirected waste item was cigarette butts (745 items), followed by gloves (71 items), and cigarette packing (37 items).

Considering the total amount of waste disposed (424,753 kg incinerated, and 833 tonnes landfilled), the amount of misdirected waste is negligible. Improperly disposed items at the WTA and Landfill were reported to Waste Management staff for immediate rectification.

Table 38: Misdirected Waste at the Waste Transfer Area, Landfill, A21 Area, and Underground, 2022

Misdirected Waste Type	Waste Transfer Area (n = 64 surveys)		Landfill (n = 60 surveys)		A21 Area (n = 64 surveys)		Underground (n = 64 Surveys)	
	Total Number Found in All Inspections	Percent of Inspections	Total Number Found in All Inspections	Percent of Inspections	Total Number Found in All Inspections	Percent of Inspections	Total Number Found in All Inspections	Percent of Inspections
Aerosol Cans	0	0.0	15	15.0	30	6.3	5	7.8
Batteries	1	1.6	1	1.7	1	1.6	0	0.0
Cigarette Butts	1	1.6	100	1.7	143	4.7	745	31.3
Cigarette Packaging	4	3.1	1	1.7	1	1.6	37	7.8
Drink Containers Recyclable	11	4.7	45	23.3	12	12.5	21	12.5
Food	11	17.2	5	1.7	0	0.0	1	1.6
Food Packaging	26	9.4	119	18.3	3	1.6	4	4.7
Gloves	23	12.5	203	33.3	47	17.2	71	31.3
Oil Contaminated Waste	1	1.6	67	6.7	12	7.8	4	6.3
Oil Products and Containers	6	6.3	48	15.0	34	7.8	25	6.3
Oily Rags	4	3.1	100	26.7	93	28.1	27	21.9
Other	11	9.4	73	25.0	17	10.9	4	3.1
Total	99	26.6¹	777	68.3¹	393	43.8¹	944	54.7¹

(1) This value indicates the total percentage of inspections with at least one misdirected waste item for that particular sample location.

Wildlife were observed on 17.2% of inspections of the WTA, 1.6% of inspections of the A21 Area, and 3.1% of inspections at the waste segregation area of the Underground. Wildlife were not observed during inspections of the Landfill (Table 39). Wildlife species observed during inspections were common raven and red fox (*Vulpes vulpes*). Wildlife sign was observed on 14.1%, 6.7%, 6.3%, and 7.8% of inspections at the WTA, Landfill, A21 Area, and Underground, respectively. The most common wildlife sign observed were red fox tracks.

No statistically significant relationship between the number of inspections completed per site and the percentage of inspections where wildlife were observed were found for the WTA (Spearman correlation rho = 0.18, P = 0.64), the Landfill (Spearman correlation rho = -0.12, P = 0.76), the A21 Area (Spearman correlation rho = -0.44, P = 0.32), or the Underground (Spearman correlation rho = -0.25, P = 0.59).

Table 39: Wildlife and Wildlife Sign in the Waste Transfer Area, Landfill, A21 Area, and Underground, 2022

Species	Waste Transfer Area (n = 64 surveys)			Landfill (n = 60 surveys)			A21 Area (n = 64 surveys)			Underground (n = 64 Surveys)		
	Number of Inspections with Wildlife Observations	Total Number of Observations	Number of Inspections with Wildlife Sign Observed	Number of Inspections with Wildlife Observations	Total Number of Observations	Number of Inspections with Wildlife Sign Observed	Number of Inspections with Wildlife Observations	Total Number of Observations	Number of Inspections with Wildlife Sign Observed	Number of Inspections with Wildlife Observations	Total Number of Observations	Number of Inspections with Wildlife Sign Observed
Bear spp.	0	0	0	0	0	0	0	0	0	0	0	1
Red fox	3	3	8	0	0	1	1	1	1	0	0	1
Common raven	8	17	0	0	0	0	0	0	0	2	3	0
Unidentified	0	0	1	0	0	3	0	0	3	0	0	3
Total	11	20	9	0	0	4	1	1	4	2	3	5

Since 2014 (when frequency of inspections during summer was reduced to once per week), wildlife observed during waste inspections has remained relatively low and consistent. The highest amount of wildlife was recorded at the WTA in 2014 where 38 red fox, 14 common raven, and 2 unknown gull species were recorded. No wildlife were recorded at the Landfill in 2019 and 2022, the Underground in 2020, and the A21 Area from 2019 to 2021. Overall, 7.3% of inspections since 2014 have included wildlife observations (Figure 29).

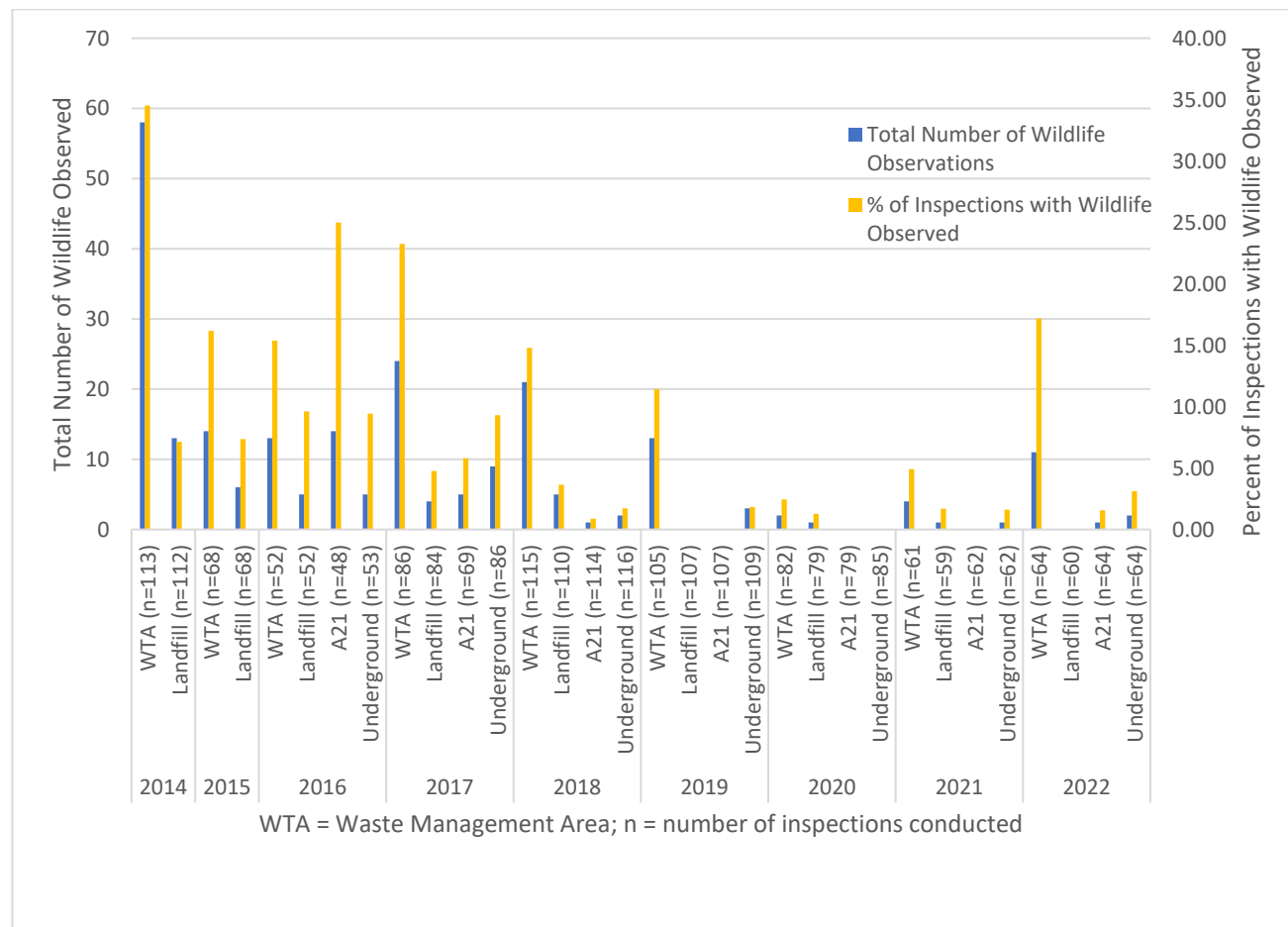


Figure 29: Total Number of Wildlife Observations per Waste Management Area, 2014 to 2022

Wildlife observed since 2014 during waste inspections are summarized in Table 40. The WTA has had an average of 18.7 wildlife observations recorded per year during inspections; 2014 having the highest amount of wildlife recorded with 58 observations recorded. The most frequently observed species at the WTA has been red fox. The Landfill has had an average of 3.9 observations recorded per year during inspections; 2014 having the highest amount of wildlife recorded with 13 observations. The most frequently observed species at the Landfill has been common raven. An average of 3.0 observations have been recorded per year since 2016 when inspections began at the A21 Area; 2016 having the highest amount of wildlife recorded with 14 observations. The most frequently observed species at the A21 Area has been fox species. An average of 3.3 observations have been recorded per year since 2016 when inspections began at the Underground; 2017 having the highest amount of wildlife recorded with nine observations. The most frequently observed species at the Underground has been fox species.

Table 40: Wildlife Reported During Waste Inspections, 2014 to 2022

Year	Location	Number of Surveys in Year	Red Fox	Fox spp.	Grey Wolf	Wolverine	Arctic Hare	Common Raven	Rough-Legged Hawk	Gull spp.	Unidentified	Total
2014	WTA	113	38	0	0	0	0	14	0	2	4	58
	Landfill	112	4	0	1	1	0	4	3	0	0	13
2015	WTA	68	0	6	0	0	0	5	0	0	3	14
	Landfill	68	0	3	0	0	0	3	0	0	0	6
2016	WTA	52	0	5	0	0	0	1	0	0	7	13
	Landfill	52	0	2	0	0	0	2	0	0	1	5
	A21	48	0	11	0	3	0	0	0	0	0	14
	Underground	53	0	3	0	2	0	0	0	0	0	5
2017	WTA	86	0	16	0	2	0	5	0	1	0	24
	Landfill	84	0	2	0	0	0	2	0	0	0	4
	A21	69	0	1	0	1	0	2	0	0	1	5
	Underground	86	0	7	0	0	0	2	0	0	0	9
2018	WTA	115	19	0	0	1	0	1	0	0	0	21
	Landfill	110	2	0	0	0	0	3	0	0	0	5
	A21	114	0	0	0	1	0	0	0	0	0	1
	Underground	116	0	0	0	0	0	2	0	0	0	2
2019	WTA	105	11	0	0	0	0	1	0	1	0	13
	Landfill	107	0	0	0	0	0	0	0	0	0	0
	A21	107	0	0	0	0	0	0	0	0	0	0
	Underground	109	2	0	0	0	1	0	0	0	0	3
2020	WTA	82	2	0	0	0	0	0	0	0	0	2
	Landfill	79	1	0	0	0	0	0	0	0	0	1
	A21	79	0	0	0	0	0	0	0	0	0	0
	Underground	85	0	0	0	0	0	0	0	0	0	0
2021	WTA	61	3	0	0	0	0	1	0	0	0	4
	Landfill	59	0	0	0	0	0	1	0	0	0	1
	A21	62	0	0	0	0	0	0	0	0	0	0
	Underground	62	0	0	0	0	0	1	0	0	0	1
2022	WTA	64	3	0	0	0	0	17	0	0	0	20
	Landfill	60	0	0	0	0	0	0	0	0	0	0
	A21	64	1	0	0	0	0	0	0	0	0	1
	Underground	64	0	0	0	0	0	3	0	0	0	3
Total			86	56	1	11	1	70	3	4	16	248

Note: waste inspections began in 2016 at the A21 and Underground waste bin areas.

Recycling Initiatives

During 2008, DDMI implemented an employee-driven recycling program for plastic bottles and aluminium cans generated on site. Aluminium and plastic containers were collected in 2022 but have yet to be shipped off the Mine site for recycling. This is expected to occur in 2023. To date, the total proceeds since the inception of the employee-driven recycling program has generated \$32,777.50.

Scrap copper was also collected in 2021 and sold for \$289,680 in 2022. These proceeds were donated to the Ragged Riders Snowsport Society, Foster Family Coalition, Bechoko Friendship Centre, Yellowknife Women's Society, Aboriginal Sports Circle, Northern Mosaic Network, and Tulita Land Corp., which supports a youth pre-trades training program.

During 2022, approximately 234,204 litres of waste oil were collected to be used in the waste oil boiler that was commissioned in the second quarter of 2014. Since the boiler was commissioned, 1,983,994 litres of waste oil were burned to create heat at the Mine rather than being shipped off-site.

In addition, a number of waste materials generated on-site are shipped off-site using winter road backhauls. Diavik is committed to maximizing recycling opportunities for wastes generated from Mine operations that cannot be disposed of on site. Items shipped for recycling 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
- absorbents

Diavik will continue to increase recycling opportunities and reduce waste streams generated at the Mine.

8.2 Renewable Energy

The wind farm became operational on 28 September 2012 and it was predicted that it would reduce Mine diesel consumption by 10%, as well as greenhouse-gas emissions by 12,000 tonnes of carbon dioxide (CO₂) equivalents annually. During the eleventh year of operation, the wind farm generated 17,600,000 kilowatt hours (kWh) of power, which represents 8.8% of the total power generated in 2022 and an approximate diesel savings of 4.2 million litres (Figure 30). From 2005 through 2022, the annual diesel fuel consumption at the Mine has ranged from 55,573,00 litres to 82,236,753 litres. In 2022, the total fuel consumption was 79,014,352 litres, which follows 2020 and 2021 as the third highest consumption during this period.

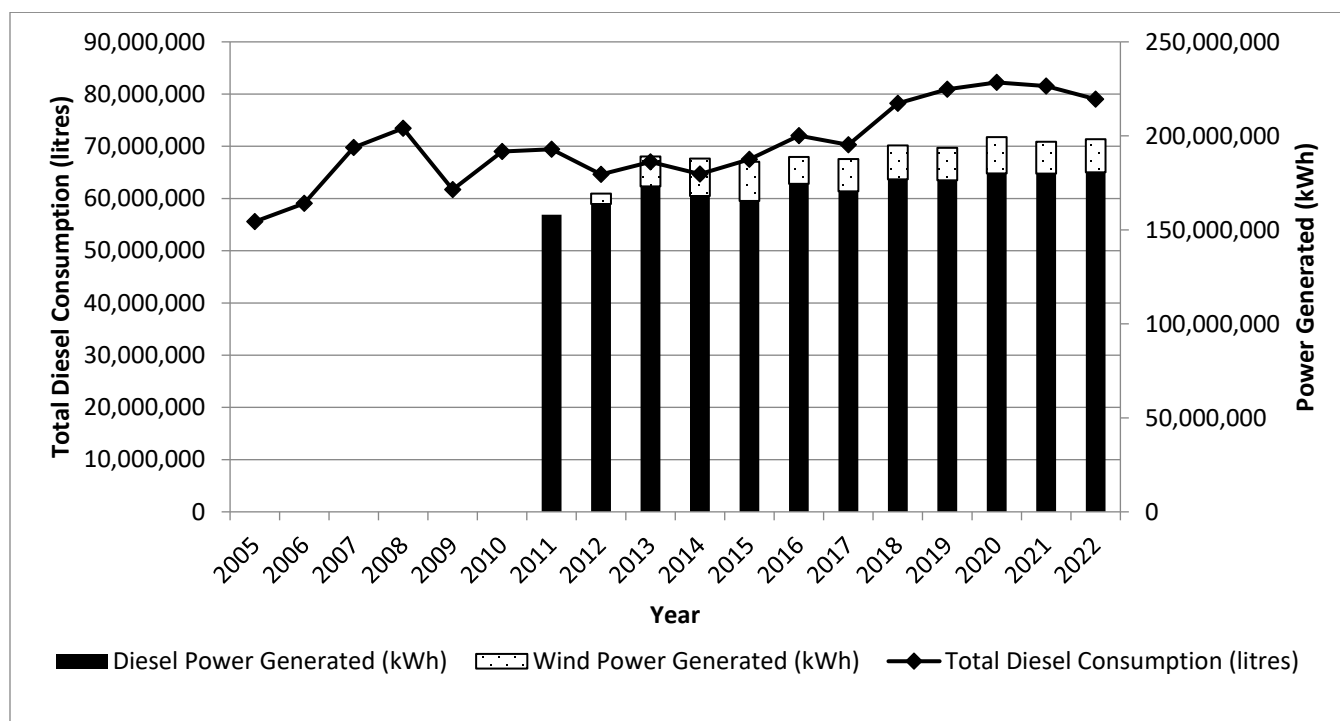


Figure 30: Annual Diavik Power Generation and Diesel Consumption

The peak amount of total power used can be as high as 60% wind power on a given day. The wind farm offset an estimated 11,336 tonnes of CO₂ emissions in 2022 (Table 41). The total CO₂ emissions (equivalents) offset since 2013 by the wind farm is 117,343 tonnes.

Table 41: Total Litres of CO₂ Offset by the Wind Farm (2013-2022)

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Wind Farm Energy Generated (KWh's)	15,823,543	19,747,333	20,842,138	14,297,803	17,192,885	18,001,285	17,326,685	19,292,380	17,011,845	17,600,000
CO ₂ Offset (tonnes)	12,000	14,068	14,403	9,030	10,478	12,063	10,798	12,898	10,269	11,336
Total CO ₂ Offset by Windfarm (tonnes)								117,343		

Adaptive Management and Recommendations

Procedures and mitigation strategies currently in place have been relatively successful at limiting wildlife interactions in the WTA and Landfill. While foxes, ravens and occasionally wolverine appear to be present at the WTA, Landfill, A21 Area and Underground waste bins, these animals are natural scavengers and will continue to visit these areas throughout the Mine's life. Diavik will continue to monitor the WTA and Landfill at the frequency of twice per week in the winter and once per week in the summer, and the A21 Area and Underground once per week during the year. Diavik remains committed to carrying out employee education programs related to waste handling.

9.0 CLOSURE

The reader is referred to the Study Limitations, which precedes the text and forms an integral part of this report.

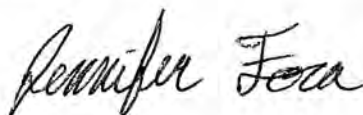
We trust the above meets your present requirements. If you have any questions or requirements, please contact the undersigned.

Signature Page

WSP Canada Inc.



Grace Enns, M.Sc.
Wildlife Biologist



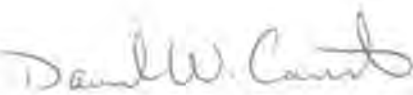
Jenny Foca, M.Sc.
Wildlife Biologist



Neil Moss, R.P.Bio.
Wildlife Biologist



Scott Wilson, M.Sc., R.P.Bio.
Wildlife Biologist



Daniel Coulton, Ph.D., R.P.Bio.
Senior Wildlife Biologist



John Virgl, Ph.D.
Senior Principal Ecologist

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APPENDIX A

**Responses to EMAB Comments
on the 2021 WMMR**

TECHNICAL MEMORANDUM**DATE** 24 August 2022**Reference No.** 21452119-2388-TM-Rev0-5000**DIAVIK WORK PLAN No.** 698 Rev. 0**DIAVIK PO No.** 3104601458**TO** Kofi Boa-Antwi
Diavik Diamond Mines (2012) Inc.**CC** Rainie Sharpe (WSP Golder)**FROM** Dan Coulton and John Virgl**EMAIL** Daniel.Coulton@wsp.com;
John.Virgl@wsp.com**RESPONSES TO EMAB COMMENTS ON DIAVIK 2021 WMMR****1.0 INTRODUCTION**

On 29 June 2022, the Environmental Monitoring Advisory Board (EMAB) provided 33 comments and recommendations from their review of the 2021 Wildlife Management and Monitoring Report (WMMR; WSP Golder 2022) to Diavik Diamond Mines (2012) Inc. (DDMI). The comments provided by EMAB included the review by Management and Solutions in Environmental Science (MSES). Twenty-two of EMAB's comments and recommendations either referred to other 2022 comment identifiers, were not directed to DDMI, or stated that a response was not required. WSP Golder has prepared responses to the 11 remaining EMAB comments in Table 1.

Table 1: Responses to EMAB Comments on the 2021 WMMR

2022 Comment Identifier	Category	Comment	Recommendation	DDMI Response
DDMI-WMP-10	Caribou Movement	DDMI provided a discussion clarifying their responses to DDMI-WMP-10 and GNWT-20-WMP-3, stating that GNWT's comment is related to use of an interaction term and EMAB's comment is related to the use of distance zones. DDMI emphasizes the importance of demonstrating the validity of assumptions about the spatial trend in habitat quality. DDMI suggests that two independent studies (ACDC Ltd. 2021 and Golder 2020) that use different methods but arrive at the same conclusion, while demonstrating that their assumptions are valid (spatial trend of habitat quality is not uniformly distributed) provides stronger evidence than two studies by the same researchers (Boulanger et al. 2012; 2021) using the same methods and without verifying assumptions (assumed uniform spatial trend in habitat quality).	For reasons described below DDMI-WMP-48), we concur with ENR that Golder 2020 is not a conclusive test of ZOIs around the Mine. We note that in the 2021 WMR, DDMI states they will continue ZOI monitoring using alternative methods and data presented by the ZOI Technical Task Group (GNWT-ZOITTG, 2015). It will be helpful to see annual estimates of the ZOI once DDMI begins analyzing the collar data as closure approaches and activity winds down at the site.	ZOI monitoring and analyses are described by Diavik's Tier 3 Wildlife Management and Monitoring Plan (WWMP). DDMI intends to examine annual ZOI patterns following ZOI Technical Task Group guidelines (ZOITTG 2015) based on collared caribou data as part of the 2022 Wildlife Management and Monitoring Report. DDMI will prepare a Tier 2 WWMP that will address monitoring during the closure phase. Annual ZOI estimates from collared caribou data (2009 to 2017) for the Diavik-Ekati mine complex are available in Boulanger et al. (2021). The annual ZOI patterns vary from year-to-year and range from negative (attraction) to positive (avoidance) estimates. In four of nine years a ZOI of avoidance was not detected. The results of Boulanger et al. (2021) indicate that indirect habitat loss is not constant during mine operations as was assumed in the EER (DDMI 1998). The presence of negative ZOIs (attraction) also suggests there are occasional increases in the suitability of habitat adjacent to the mines.
DDMI-WMP-14	Vegetation and Wildlife Habitat	DDMI indicated that they responded to EMAB's comments 17, 18, and 19 on the SW4 Closure Objective during the Wek'èezhii Land and Water Board (WLAWB) review phase of the ICRP version 4.1. Comments 17, 18, & 19 are relevant to Closure Objective SW4: Dust levels do not affect palatability of vegetation to wildlife.	We recommend removing this issue from the WMMR review process and addressing it through the ICRP process.	DDMI agrees that the Diavik Mine Tier 3 WWMP designed for Mine operations cannot address Closure Objective SW4.

DDMI-WMP-14	Vegetation and Wildlife Habitat	The responses provided by DDMI outline a very basic approach to evaluating palatability – “if there is vegetation in an area and caribou are observed using and consuming vegetation then this would mean the vegetation is palatable” (DDMI 2021b). Caribou could be foraging on impacted sites, but not at the same levels as prior to disturbance or at the same level as similar, unimpacted control sites. In order to assess the effectiveness of re-vegetation efforts in creating wildlife habitat, wildlife use of re-vegetated or reclaimed areas must be assessed using a scientifically defensible and repeatable method. A full before-after-control-impact (BACI) is a statistically powerful study design for environmental effects monitoring programs and should be applied, if possible. Formal wildlife species surveys could include approaches such as winter track surveys (relative abundance/density), wildlife cameras (warmer seasons only; abundance and diversity, potentially health; caribou GPS collar location data can complement a camera program), and auditory recording units (warmer seasons only; abundance and diversity). These surveys would target a group of species located in the area at a particular time (e.g., time of day, season, etc.). Data collected through a wildlife use monitoring program for reclaimed sites can also be used to inform future reclamation practices via an adaptive management approach.	Wildlife use of re-vegetated or reclaimed areas must be assessed using a scientifically defensible and repeatable method. All data collected needs to be standardized to ensure comparability between sites and years. Data on dust levels and vegetation abundance/composition should be collected at the same control and impact sites to evaluate factors influencing foraging rates.	DDMI believes EMAB’s proposed approach is not feasible because it has an extremely low likelihood for success. There are no baseline caribou behaviour (i.e., foraging) data located on East Island. Closure of the Mine includes reseeding treatments, which may take a very long time to be similar to ecological conditions on control (reference) areas, which have continued to adapt and evolve during the life of mine and will evolve further after mine closure; vegetation composition, structure, and richness on treatment plots will likely never be equivalent to control areas. The goal of reclamation is to create functional habitat for caribou and other wildlife and not equivalent ecological conditions as ecosites or habitats not affected by the mine. Currently, vegetation monitoring takes place during summer when caribou are no longer regularly present. Vegetation monitoring plots are 4 m². The 2021 WMMR estimated the Mine footprint is 11.55 km². In 2018 the Bathurst caribou herd was estimated to be 8,200 animals (GNWT-ENR 2022) with an autumn range size of 52,191.4 km² (Golder 2020a). Thus, the Mine footprint represents 0.02% of the autumn range and occurs on East Island in Lac de Gras. The Mine site is currently rare in terms of availability to caribou, which coincides with low caribou abundance. When the herd was much larger during baseline, some caribou used East Island as a route during the southern migration. Treatment replication is also not possible as there will be only one reclaimed Mine site. Observed use by caribou (and other wildlife) would support a conclusion that reclaimed areas provide suitable functional habitat. However, lack of use by caribou does not necessarily support no suitability because the chance of observing use during small herd sizes decreases.
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Table 1: Responses to EMAB Comments on the 2021 WMMR

2022 Comment Identifier	Category	Comment	Recommendation	DDMI Response
DDMI-WMP-14	Vegetation and Wildlife Habitat			The presence of other wildlife such as upland birds, foxes, Arctic ground squirrel and grizzly bear would support the objective that the reclaimed Mine site provides functional wildlife habitat.
DDMI-WMP-17	Caribou Distribution	DDMI has already committed to provide range attributes for Bathurst caribou that would provide insight into range fidelity and the correlation of travel routes with seasonal ranges. We agree that this information would reflect cumulative effects from multiple overlapping developments that occur in the caribou range. Both parties are in agreement that future environmental assessments may require energetic analysis. The original migration predictions are based on a least-cost path (friction) analysis. In hindsight, this component of the monitoring program probably should have been set up to evaluate changes in the cost of movement for caribou migrating past the Diavik Mine. Based on the results of the energetic analysis completed for the Jay Project, we could assume that impacts from the Diavik Project would decrease caribou fecundity by <0.3%. Diavik provided additional insight to the Jay analysis that suggests the analysis was quite conservative and that there is likely no measurable energetic effect. We are not familiar with the details of that analysis and cannot comment further on it.	Can DDMI propose an alternative approach to monitoring change in caribou migration patterns that could be specifically linked to Diavik Mine activities? Using collar data, could seasonal migration travel routes be evaluated post-closure to evaluate whether the removal of human activity and infrastructure at the Diavik Mine site results in changes to migration travel routes from those observed during Mine operations? This information could potentially be used to inform future development activities and impact predictions.	DDMI has used Bathurst caribou collar data (1996 to 2018) to assess east-west deflection of caribou movements (migration routes) during the northern and southern migration (Golder 2020a). The conclusion from long-term results is that the Diavik Mine has not had a strong influence on caribou northern or southern migration patterns during construction and operation, which has led to the discontinuation of this monitoring. DDMI has acknowledged that the use of East Island by migrating caribou during baseline has discontinued since Diavik Mine construction and during operation. Closure of Diavik Mine will not remove all human activity from the Lac de Gras region. The adjacent Ekati mine will continue to operate after Diavik mine is closed making it problematic to assign any change or lack of change in caribou migration routes explicitly to Diavik Mine.

Table 1: Responses to EMAB Comments on the 2021 WMMR

2022 Comment Identifier	Category	Comment	Recommendation	DDMI Response
DDMI-WMP-17	Caribou Distribution			Spatial and temporal patterns of caribou distribution should reflect changes in travel routes by migrating caribou at coarse scales but not particular routes. It is possible to assess changes to migration routes at the level of individual collared caribou (e.g., Poole et al. 2021), which is different than population-level patterns and the scale of the EER (DDMI 1998) and effects monitoring (DDMI 2021) by Diavik Mine. An additional consideration for EMAB's proposed analysis would be the timing of the assessment during post-closure. Variation in seasonal range sizes and location over time demonstrate that caribou herd size influences the migration routes of individuals (Virgl et al. 2017; Golder 2020a). The Bathurst caribou herd began declining during baseline years (since mid-1980s [Virgl et al. 2017]) for Diavik Mine, with population cycles estimated to be 40 to 60 years (Zalatan et al. 2006). This type of influence would need to be addressed in order to strengthen inferences for the proposed comparison.

Table 1: Responses to EMAB Comments on the 2021 WMMR

2022 Comment Identifier	Category	Comment	Recommendation	DDMI Response
DDMI-WMP-48	Caribou Movement	DDMI reiterated their view that two independent studies (ACDC Ltd. 2021 and Golder 2020) that use different methods but arrive at the same conclusion, while demonstrating that their assumptions are valid (spatial trend of habitat quality is not uniformly distributed) provides stronger evidence that two studies by the same researchers (Boulanger et al. 2012; 2021) using the same methods and without verifying assumptions (assumed uniform spatial trend in habitat quality). The distribution of preferred habitat quality is an important assumption for the type of analysis DDMI did, which was simply a regression analysis to explain patterns in caribou abundance using different environmental variables. Habitat selection is inferred, not measured directly in such an analysis. Habitat selection is also inferred in the ACDC Ltd report because aerial survey methods do not lend themselves to exact location data on caribou, so it is impossible to identify exactly what habitat a caribou is using at any given time (Boulanger et al. 2021) directly measured habitat selection by comparing used to available habitats at different distances from the mines. In our opinion, Boulanger et al. (2021) do not need to make assumptions about the distribution of preferred habitat because they are directly estimating habitat selection by comparing the conditions at each location used by caribou to the conditions at random locations. In our opinion, Boulanger et al.'s (2021) analysis accounts for the distribution, and avoidance of large water features by caribou, on the landscape in both their base habitat selection model and the ZOI analysis.	Considering all of the information available to us at this point in time, we recognize that a ZOI exists for caribou around the Diavik diamond Mine and recommend all future efforts be focused on developing and implementing mitigation measures to counter this impact to caribou. We re-iterate our recommendation: DDMI, in collaboration with GNWT, should immediately develop monitoring techniques to identify Mine-related sources of sensory disturbance and new methods for monitoring caribou abundance and distribution relative to the Mine whenever they are in the area.	Please refer to the response DDMI-WMP-10 for annual caribou ZOI patterns from the most recent ZOI analyses for the Diavik and Ekati mines (Boulanger et al. 2021a). To date only statistical effects have been demonstrated and that there is yet to be evidence of ecological effects or demographic consequence from mining. Ecological effects analysis was completed by Plante et al. (2020) who found no reduction in caribou survival related to interactions with industrial disturbances by the Leaf River and George River caribou herds. Similarly, Golder (2020b) showed that Lorillard collared caribou interacting with Meadowbank mine road ZOIs reached calving areas and showed similar parturition timing, calving rates and neonate mortality rates as reference caribou despite conclusions of statistical ZOI effects from the same collar data (Boulanger et al. 2020). The studies of Golder (2020) and ACDC (2020) identified available preferred and selected habitats based on results from use-availability (resource selection function [RSF]) analyses of collared caribou (e.g., Johnson et al. 2005; Boulanger et al. 2012). Preferred and selected habitats were then applied to the analysis of aerial survey data. Boulanger et al. (2012, 2021) also identified selected habitats from the same collared caribou data and applied the results of their RSF to the analysis of aerial survey data. The application of selected habitats for analysis of aerial survey data was the same for all studies. All four studies (Boulanger et al. 2012, 2021; ACDC 2020; Golder 2020) used the same aerial survey data so any location error is present in these studies and within the 1.2 km² sampling unit.

DDMI-WMP-48	Caribou Movement	In our opinion, given that DDMI's and ACDC Ltd.'s analyses look only at the aerial survey data and lack direct measures of habitat selection, there is insufficient reason to discount the findings of Boulanger et al. (2021), which has also been through the peer-review process. Given the current state of the Bathurst caribou population, we recommend a precautionary approach to caribou management. DDMI identified the following Mine activity covariates that are monitored and have been evaluated: fugitive dust deposition, number of flights and blasts, waste rock hauled and full-time equivalents. DDMI reported that no significant relationship to wildlife monitoring data was found. DDMI concludes that many lines of evidence show no response or a weak response by caribou to sensory disturbance.	A more direct way to test whether selection of habitat(s) changed with proximity would have been to include an interaction term between distance and habitat variables in the RSF model. By doing so, it would have tested whether the odds of selection changed as a function of distance while controlling for the availability of different habitats (Jaccard 2001). Boulanger et al. (2012, 2021) did not include this type of interaction in their RSF. DDMI agrees that Boulanger et al. (2012, 2021) accounts for the selection of large water features but disagrees that these studies account for a change in selection of large water features relative to different distances to Diavik and Ekati mine. Accounting for the change in selection would require the inclusion of an interaction between distance and habitat variables (e.g., large water features). Failure to include an effect for distance in base habitat models would assume all patches of the same habitat type are selected equally regardless of where they occur even though the context of availability has changed. It would be analogous to saying that heath tundra on an island in Lac de Gras (without a mine) is as likely to be selected as patches on the mainland even though the island patch is surrounded by water, which caribou avoid. Sources of sensory disturbance that are monitored at Diavik Mine include fugitive dust deposition, full-time equivalents, number of flights, number of blasts and waste rock hauled (Golder 2017), which have been included in comprehensive analyses (e.g., Golder 2017, 2020). A new study design/sampling method for monitoring of caribou abundance and distribution is not necessary because caribou collar data are available and can be used to estimate caribou ZOIs (Johnson et al. 2005; Boulanger et al. 2012, 2021a; ZOITG 2015).
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Table 1: Responses to EMAB Comments on the 2021 WMMR

2022 Comment Identifier	Category	Comment	Recommendation	DDMI Response
DDMI-WMP-54	Wolverine	DDMI reiterated the decision to discontinue wolverine hair snagging made at the February 2021 Diamond Mine Wildlife Monitoring Meeting. DDMI suggests that wolverine snow track monitoring is sufficient to understand trends in wolverine abundance because trends in occurrence from the wolverine snow track monitoring program corresponded with trends in abundance for the hair snagging program. They use a reference to a 2007 DDMI report on monitoring methods, which we don't have on file and so could not review. They also included a figure with their responses showing the correspondence between hair snagging and snow track monitoring estimates. No information on how the 'correspondence' was estimated was provided in DDMI's response. It is impossible to confirm predictions about wolverine presence and altered population parameters without the existence of a program such as the hair snagging program.	To have a clearer understanding of potential wolverine population trends, as inferred by snow track occurrence, we recommend producing a figure annually in the WMMR that is similar to the one provided by DDMI in its' response, in order for reviewers to easily note potential population trends by demonstrating the temporal trend in occurrence estimates. We recommend EMAB discuss regional wolverine population trends with ENR and what, if any triggers they have to undertake another round of regional DNA-based population surveys.	Correspondence concluded from Figure 2 (Golder 2021) was qualitatively assessed from similar temporal trends (measured in the same years) between snow track monitoring designs (IQ = Inuit Qaujimagatuqangit, SRS = simple random sampling) and hair-snagging results (DNA = hair snagging). Figure 2 included demarcation of values included in correspondence determination. The requested figure will be included in annual reports. Direct mine-related wolverine mortalities at Diavik continue to be infrequent (WSP Golder 2022), which is a key driver of population demography. Hair snagging is not necessary to determine presence. Snow track counts provide more than presence; the current design (two rounds) provides detection rate and relative abundance. DDMI will provide another copy of the DDMI (2007) to distribute to MSES.
DDMI-WMP-58	Vegetation and Wildlife Habitat	In 2021, the changes in landcover were associated with losses of heath tundra (0.07 km²), heath boulder (0.02 km²), heath bedrock (0.01 km²), and tussock/hummock (0.04 km²) classes in the Ecological Landscape Classification (ELC). We noted a potential typo in Section 3.2 and Table 2, it appears as though the heath boulder class is incorrectly titled the health boulder class in the text and table.	Please revise the text and table as necessary. In addition, please clarify what type of satellite imagery is used in this analysis as it provides an understanding of the data resolution used in the landscape analysis. Otherwise, the methods applied for this part of monitoring are adequate.	Thank you for identifying misspellings of "heath" in the 2021 WMMR. A SPOT satellite Image was used in Landscape Change analysis. The resolution of the imagery is 150 cm.

Table 1: Responses to EMAB Comments on the 2021 WMMR

2022 Comment Identifier	Category	Comment	Recommendation	DDMI Response
DDMI-WMP-60	Caribou Movement	No new data on caribou movement was presented, and no additional analyses for ZOI monitoring were completed, for the 2021 WMMR. DDMI provides a brief synopsis of Golder 2020 and ERM 2021, two analyses of the aerial survey data that were used to suggest there was no ZOI around the mines. They point out that this result contradicts the findings of Boulanger et al. (2012 & 2021). No further discussion is applied. We have noted in previous reviews why we disagree with the conclusions of Golder 2020, and in their review of the 2020 WMR, ENR stated they do not consider Golder 2020 a conclusive test of the ZOI around the mines. DDMI indicates they will continue monitoring the ZOI using methods and data presented by the ZOI Technical Task Group. Based on statements in previous WMRs, we are expecting DDMI to report on their new approach to ZOI analysis in the next Comprehensive Wildlife Monitoring Report in 2023.	Following that, we recommend including annual estimates of the ZOI size in order for EMAB to monitor how it changes through Mine closure and reclamation on shorter time scales rather than waiting for the Comprehensive Wildlife Monitoring Reports every third year.	Please refer to response DDMI-WMP-10. As ZOI monitoring does not inform Diavik Mine operations, ZOI estimates will not be provided in annual reports but follow the schedule identified in the WMMP (DDMI 2021).
DDMI-WMP-65	Caribou Deterrence	If caribou are present in hazardous areas, such as the airport or blast areas, active deterrence (slow herding) is used to move caribou away. In 2021, there was one use of active deterrence when a caribou was observed on the south haul road. Traffic control measures were implemented, Environment Department staff prevented the caribou from returning to the road. Mitigations were successful and the caribou moved away from the haul road.	Active deterrence is not required every year; however, when it is reported, it would be helpful if the results included one statement placing them in historical context (e.g., When was the last time it was used? How frequently has it been deployed over the years?). Otherwise, the methods applied for this part of monitoring are adequate.	Historical context of active deterrence for caribou will be provided in the 2022 WMMR.

Table 1: Responses to EMAB Comments on the 2021 WMMR

2022 Comment Identifier	Category	Comment	Recommendation	DDMI Response
DDMI-WMP-66	Caribou Adaptive Management	The 2021 WMMR includes a section where DDMI outlines adaptive management measures they are introducing or recommendations for the upcoming monitoring year. In response to ENR-WMMP-02 (DDMI 2021, Appendix C, Table 2), DDMI has included additional mitigation measures in the 2021 WMMP that are specific to caribou, including caribou detection, action levels, tiered mitigation, and blasting. DDMI provides a high-level description of some of these mitigation measures. We reviewed the relevant portions of the latest version of the WMMP (i.e., Table 4.1-1, pg. 4-3) and found the additional mitigation details generally useful for understanding how caribou mitigation and monitoring will occur when caribou are in the region. DDMI identified four action levels, defined based on timing (i.e., actions taken throughout the year) or the proximity of caribou to mine infrastructure. We note that for each level DDMI proposes a few monitoring actions. Behavioural scans on observed caribou are a recommended measure throughout the year, and when caribou are sighted on east island or on other mine areas or roads. However, behavioural scans are not included as part of the monitoring when collared caribou are within 5 km of east island.	Please discuss why behavioural scans are not included as part of the monitoring, even in cases when caribou are incidentally observed within 5 km of east island.	Section 4.3.2 of the 2021 WMMR indicates that group behaviour scans were completed on 21 caribou groups that were incidentally detected, ranging from 0 km to 15 km from Diavik Mine. In cases where caribou are incidentally detected beyond visibility from the Mine site (e.g., >2 km), group behaviour scans may be recorded if the staff present are familiar with group scan methods and it does not detract from achieving the objective of the off-site work. Beyond visibility from East Island, DDMI wants to avoid traveling to caribou groups to perform scans and potentially introduce caribou to stressors (e.g., snowmobiles). As noted previously to EMAB, winter represents a time with extreme cold temperatures and wind chill and limited daylight hours that increase human health and safety risks. DDMI will not complete this monitoring when it deems it is not safe to do so.
DDMI-WMP-70	Raptors	Mine-related incidents and raptor mortalities are reported through incidental reports from Mine staff. In 2021, two raptor mortalities were reported: a dead rough-legged hawk near the south entrance to the A21 pit, and a dead short-eared owl on the road between the airport and the north inlet water treatment plant. Due to their proximity to Mine-related roads, it is assumed both deaths results from collisions with vehicles.	The methods applied for raptor monitoring are adequate, no further recommendations. However, we recommend developing a figure showing the number of Mine-related incidents and mortalities by year in each future monitoring report. This will allow for easy interpretation of mortality trends over time and should be easy to update each year.	A figure showing annual Mine-related raptor mortalities will be included in the 2022 WMMR.

Table 1: Responses to EMAB Comments on the 2021 WMMR

2022 Comment Identifier	Category	Comment	Recommendation	DDMI Response
DDMI-WMP-72	Comprehensive Vegetation and Lichen Analysis Report	In general, the vegetation data indicated there were differences in species abundance and community composition over time “likely due to Mine-related effects, such as dust deposition.” (Golder 2022, Appendix N, pg. 21). DDMI recommendations include continued monitoring of dust deposition and vegetation plots; however, it is unclear what is being done to mitigate the impacts of dust deposition on plant communities.	Can DDMI please discuss what, if any mitigation measures are being used to reduce levels of dust deposition? Can DDMI also please discuss if any non-native plant species have been found in any of the monitoring plots?	The Tier 3 WMMP for Diavik identifies several mitigations to reduce fugitive dust deposition. These include use of dust suppressants, low speed limits and a small footprint. Additionally, the use of underground mining techniques has reduced fugitive dust. Non-native plants were not observed at monitoring plots in 2021 and have not been observed previously.

2.0 CLOSURE

We trust that this technical memorandum meets your current requirements. Please contact the undersigned if you have any questions or concerns.

Golder Associates Ltd.



Dan Coulton, Ph.D., RPBio.
Senior Wildlife Biologist



John Virgl
Senior Principal Ecologist

DWC/JV/rd

Disclaimer

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APPENDIX B

**Responses to ENR and EMAB
Comments on 2022 WMMP**

TECHNICAL MEMORANDUM**DATE** 4 October 2022**Reference No.** 21452119-2395-TM-Rev2-13000**DIAVIK WORK PLAN No.** 716 Rev0**DIAVIK PO No.** 3104889168**TO** Kofi Boa-Antwi
Diavik Diamond Mines (2012) Inc.**CC** Rainie Sharpe**FROM** Daniel Coulton and John Virgl**EMAIL** Daniel.Coulton@wsp.com;
John.Virgl@wsp.com**ENR CONDITIONS ON TIER 3 WMMP, V1.2****1.0 INTRODUCTION**

On 15 July 2022, the Government of the Northwest Territories, Department of Environment and Natural Resources (GNWT-ENR) issued a letter of conditional approval of Diavik Diamond Mine's Tier 3 Wildlife Management and Monitoring Plan (WMMP). The conditional approval lists seven conditions (Table 1) that must be included in a revision of the WMMP, which is to be provided to the GNWT-ENR within 90 days of the 15 July 2022 letter. The GNWT-ENR and DDMI met on 26 August 2022 discuss the Tier 3 WMMP approval conditions. The outcomes of this meeting as agreed to by the GNWT-ENR and DDMI related to conditions are reflected in Table 1.

Table 1: ENR Conditions on the Diavik WMMP, V1.2

Condition No.	Comment	Approval Condition	Response
1	EMAB recommended that DDMI utilize multiple sampling methods to estimate the presence and size of ZOI in any given year and that the ZOI Technical Task Group be convened to discuss the necessity for continued aerial surveys. ENR is of the view that, given increased number of collars on barren-ground caribou herds, data from geo-fenced collars will suffice for meeting the monitoring objective “to determine whether ZOI changes in relation to mine activity” and does not require aerial surveys to resume as the primary data collection method for monitoring the ZOI at the site level. ENR partly agrees with DDMI’s assertion that ZOI does not inform mitigation directly, as it does not provide either a timely or sensitive enough metric to directly inform mitigation on an appropriate time scale at the site level. ENR does not believe the slight to moderate improvement in precision from aerial surveys warrant the added disturbance to caribou ENR does, however, believe there is value in understanding spatial-temporal trends in ZOI. This would include the relationship of ZOI to mining activity, for the purposes of informing design and impact assessment of potential future development and tracking cumulative impacts. Given an identified need, ENR may engage the support of the mines for periodic aerial surveys to inform regional ZOI estimates to validate collar-based estimates generated by individual projects. ENR considers contribution to these types of efforts to partly meet the Tier 3 WMMP requirement to contribute towards regional-scale wildlife monitoring and/or cumulative effects research, assessment, or management as stipulated in the WMMP guidelines.	Given the lack of detail provided about the methods that will be used for ZOI analysis, DDMI will submit to ENR a detailed description of their proposed ZOI analysis methods, including which metrics of mine activity levels will be included as covariates in the analyses and how they will be derived, at least six months prior to the submission of the comprehensive WMMP report in 2023. ENR will circulate the description of proposed ZOI analysis methods for a 30-day review period, and DDMI will respond to reviewer comments and indicate how feedback will be incorporated into the comprehensive WMMP.	DDMI proposed that Condition 1 be changed to state that completion of the analysis and reporting will occur within 6 months following the review period and DDMI’s responses. The ZOI analysis would be provided as an Addendum to the 2022 Wildlife Management and Monitoring Report (WMMR), which would be delivered by the 30 April 2023 deadline (as per Condition 7). The WMMR would include a description of the progress on the ZOI analysis.
2	With regards to how the ZOI monitoring requirement is captured in the WMMP, ENR notes few details are provided on the approach to analyses either in terms of ZOI estimation or how mine activity metrics will be incorporated into the analysis. This is of particular concern given that ENR does not consider aerial survey analyses provided in DDMI’s recent annual reports to be actual analyses of ZOI. ENR’s views on these analyses and associated concerns are fully outlined in ENR’s comments on the annual reports. ENR acknowledges that neither the ZOI Technical Task Group nor workshops or meetings to discuss wildlife monitoring conducted by the mines have achieved consensus on appropriate methods for analyses to generate ZOI estimates from collar data. In the absence of consensus, ENR requires DDMI to demonstrate that their proposed methods of analysis will provide a statistical means to estimate and test significance of a ZOI. ENR notes that one approach to achieve this is by using segmented regression as outlined in the peer-reviewed methods contained in Boulanger et al. 2021. DDMI states in Section 5.4.3 – Page 5-10 of their WMMP that “Diavik will also explore individual geo-fenced caribou movement paths in relation to the Mine.” No details were provided about the objectives of these exploratory analyses, the methods that will be used, or how the findings will in turn inform future ZOI analyses. ENR acknowledges receipt of the “Diavik Exploratory Collared Caribou Movement Analysis Technical Memorandum” on 20 June 2022, which was submitted as an addendum to the 2021 Wildlife Report. ENR believes that this type of analysis may provide further insight into the mechanisms influencing ZOI, as well as mitigation measures that may help to reduce ZOI. ENR looks forward to reviewing this addendum and to seeing how these exploratory analyses will be further considered or expanded upon by DDMI in forthcoming ZOI analyses.	DDMI will ensure that Section 5.4.3 of the WMMP clarifies that, although comprehensive analysis and reporting of ZOI will occur in 2023 (which will include data up to the end of 2022), and at the end of closure and in post-closure, in each of these reporting periods annual estimates of ZOI will be reported for all intervening years in which an adequate sample is achieved. Analyses for ZOI will include a covariate(s) reflecting variation in the annual level of mine activity. The year for reporting in post-closure will be identified in the Tier 2 WMMP submitted for the closure/post-closure phase.	The ZOI analysis for the 2022 WMMR will include all applicable collar data up to the end of December 2022. The analysis will include mine activity indices (covariates). The analysis for closure and post-closure would include a covariate(s) for mine activity; further details to be provided in the Tier 2 WMMP for the closure/post-closure phases. Since a new Tier 2 WMMP will be required for the closure/post-closure period, DDMI’s Tier 3 WMMP revision will remove reference to the closure/post-closure monitoring.
3		Diavik will contribute to future GNWT-coordinated efforts to undertake periodic aerial-based ZOI surveys, if deemed necessary.	DDMI will consider future contributions towards regional-scale wildlife monitoring and/or cumulative effects research, assessment, or management. DDMI has contributed to these in the past.
4	Although ENR will be requiring DDMI to provide a revised Tier 2 WMMP in advance of closure to ensure it is consistent with final closure plans, ENR understands that DDMI needs to begin adding processed kimberlite (PK) to the pits prior to infilling and that it may begin this during the operations phase once it addresses relevant measures in the Report of Environmental Assessment (EA1819-01) of DDMI’s plan to deposit PK to pits and underground. Commitment 33 from that environmental assessment states that DDMI commits “to updating the wildlife monitoring program for Diavik to include the Processed Kimberlite to Mine Workings project to validate/confirm predictions about potential for wildlife-project interaction. The updated monitoring program would support site monitoring during operations to determine whether wildlife, including migratory birds, interact with pit(s)/mine working during infilling and prior to stabilization of water quality.” ENR acknowledges DDMI’s addition of Section 4.1.5 Pit Infilling in this version of the WMMP however the approach is not fully developed with links to the appropriate SOPs for quantifying wildlife presence and triggers for deterrence. ENR notes that weekly monitoring of pit walls for nesting birds and deterrence measures to prevent nesting in pit walls and on infrastructure are provided in SOP ENVI-897-0119. While these methods partly address the commitment, it is unclear how they will extend to surveillance and deterrence of wildlife presence in the waters of the pits during PK deposition and infilling. To test the prediction regarding interactions of wildlife with the pits as they are being filled, systematic surveys should regularly be conducted during PK deposition and infilling prior to stabilization. ENR also notes that WMMP section 5.8 - Waterbird states that it will reinstate waterbird surveys for three years during mine closure; however, no details on the methods to be used are provided. ENR recommends that DDMI engage with ECCC regarding waterbird survey methods, waterfowl deterrence best practices, and their suitability for achieving the objective in commitment 33.	DDMI will, 90 days in advance of adding PK to any pit, submit to ENR for approval, and copy to EMAB and ECCC, comprehensive operating procedures for surveying wildlife presence in pit waters during infilling (e.g., timing, frequency, metrics recorded, triggers for deterrence) and deterrence methods specific to wildlife presence in the waters.	DDMI will prepare and provide an updated standard operating procedure (SOP) for review by the GNWT-ENR. SOPs are provided as an Appendix in the WMMP. The GNWT-ENR does not approve SOPs for operating developments.

Table 1: ENR Conditions on the Diavik WMMP, V1.2

Condition No.	Comment	Approval Condition	Response
5	Sensory disturbance to caribou is an impact identified in the WMMP and is of considerable concern to communities. ENR does not believe that 500 m as a blast exclusion zone for caribou in a tundra environment is sufficient. ENR acknowledges that DDMI's choice of a 500 m exclusion zone reflects the general buffer zone recommendation in the Northern Land Use Guidelines for Northwest Territories Seismic Operations, but notes that those guidelines were primarily developed for forested environments and the buffer is not specific to blasting. ENR also notes discussions that occurred in the environmental assessment for Sabina Gold and Silver Corps' Back River Project in Nunavut, where more conservative setback distances (4 km) for blasting were applied for caribou during sensitive time periods. While the Diavik Mine is not located in the calving or post-calving ranges and likely does not warrant the highest level of precaution, ENR believes that until behavioral monitoring can indicate otherwise, something more intermediate is appropriate. Ekati currently uses a setback distance of 1 km.	DDMI will increase the blast exclusion zone for caribou to a minimum of 1 km in Section in 4.1.2.	DDMI has revised the blast exclusion zone threshold to 1 km in the WMMP.
6	ENR acknowledges that DDMI has elected to continue to include caribou activity monitoring to determine if caribou behaviour changes with distance from the mines. However, the WMMP does not appear to consider modifications to this program that would increase the potential to generate data that will address that question. Sample sizes and adequate coverage of distances from the mine have hampered the ability of this program to produce robust results. In its rationale for why DDMI could not pool data to consider variables such as year, gender, and distance to the mine, DDMI indicated that sample sizes from behavioural scan data are unbalanced across monitoring years and distance from the Mine, and therefore inappropriate to pool. They state that statistical analysis will be completed once sufficient data are available at the frequency identified in the WMMP. ENR requires DDMI to revise this section of the WMMP to identify how DDMI will increase the probability of this program obtaining robust results. Options include reducing the frequency of monitoring such that greater more focussed efforts are done every few years, enhancing collaborative efforts with Ekati, or partnering with academia and/or communities. Given that Diavik expects to move into closure in 2025, ENR would expect DDMI to aim for at least two solid years of data should they decide to decrease the frequency of behaviour monitoring in favour of intensifying efforts in given years.	DDMI will collaborate with EMAB and submit a plan to ENR for approval within 120 days of receipt of this Reasons for Decision that will indicate how it will improve the ability of the caribou behavior monitoring program, using both group scans and focal observations, to generate results that will contribute to the monitoring objective "to determine if caribou behaviour changes with distance from the mines."	The 2021 Mine Wildlife Meeting minutes prepared by ENR (GNWT-ENR 2021), identify other approaches can be used to monitor caribou behaviour and suggest the use of geo-fence collars for behaviour analysis. DDMI will revise the WMMP to replace caribou group scan methods with collar behaviour analysis. Collaboration with EMAB on planning group scans is no longer necessary because DDMI is discontinuing group scan behavioural monitoring. DDMI will also use existing group scan data in a "pooled" analysis and compare to the 2011 results as part of the 2022 WMMR. Note that DDMI has never collected focal scan behaviour data.
7	Review of annual and comprehensive WMMP reports will follow the process outlined in the Environmental Agreement with the deadline stipulated below. DDMI shall circulate the annual and comprehensive WMMP reports to all parties to the Environmental Agreement. ENR will post copies of annual and comprehensive reports to ENR's WMMP Resources webpage. ENR will ask that parties submit comments and recommendations on the reports to DDMI and copy ENR. DDMI shall provide responses to comments and recommendations from different parties and indicate if and how they will be incorporated into adaptive management measures or future amendments to the WMMP. ENR will post a compilation of the comments, recommendations, and DDMI's response to them, on the WMMP Resources webpage.	Annual reports will be submitted to ENR by 30 April of each year. The next comprehensive analysis reports will be submitted to ENR by 30 April of 2023 and will include data collected up to 31 December 2022.	DDMI will provide a WMMR to the GNWT-ENR on or before 30 April 2023, recognizing that the ZOI analysis will likely be submitted later as an Addendum (as per Condition 1).

2.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or comments, please contact the undersigned.

Golder Associates Ltd.



Daniel Coulton, PhD, RPBio
Wildlife Biologist



John Virgl, PhD
Ecologist Senior, Principal

DC/JV/rd/hp/ss/ar

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This technical memorandum was prepared solely and exclusively for Rio Tinto Canada Management Inc. and can only be used and relied upon, in its entirety, by Rio Tinto Canada Management Inc. The technical memorandum is being submitted electronically in accordance with Mackenzie Valley Land and Water Board's (MVLWB) preferred submission protocol, in the unsecured ADOBE pdf format stipulated in the submission standards issued by MVLWB. The technical memorandum is provided "as is" without warranty of any kind either expressed or implied. Only the original, signed and stamped technical memorandum is considered true and final. Any reuse, alteration, extraction, edit, or reproduction of this technical memorandum will be at the sole risk and responsibility of the user, without any liability or legal exposure to Golder Associates Ltd., its affiliates, and their respective directors, officers, employees, agents, consultants, and sub contractors.

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APPENDIX C

Caribou Range Attributes

Table 1: Annual Collared Bathurst Caribou Cow Spring Range Attributes

Year	Season	Range Area (km ²)	Range Overlap with Previous Year (km ²)	Range Site Fidelity (%)	Distance of Range from Treeline (km)
2006	Spring	120091	N/A	N/A	198
2007		119830	60994	34	115
2008		231741	119830	52	112
2009		152106	144973	61	37
2010		103626	54320	27	176
2011		172541	63017	30	93
2012		113325	84114	42	137
2013		172701	103517	57	141
2014		60139	60069	35	171
2015		61252	48238	66	169
2016		58870	52674	78	166
2017		119857	56548	46	147
2018		108137	70886	45	183
2019		113734	84504	62	157
2020		62202	61163	53	101
2021		87929	49918	50	184
2022		142223	86497	60	164
2006	Post Calving	54864	N/A	N/A	140
2007		97962	53698	54	156
2008		87012	78724	74	171
2009		55132	54746	63	147
2010		48781	38398	59	180
2011		90398	46286	50	141
2012		56704	51322	54	136
2013		24987	21905	37	145
2014		25070	19147	62	159
2015		22571	18079	61	141
2016		21002	14049	48	138
2017		22603	19348	80	139
2018		37136	20145	51	143
2019		34317	30018	72	156
2020		33587	22776	51	139
2021		38874	28389	64	147
2022		29004	25946	62	147

Table 1: Annual Collared Bathurst Caribou Cow Spring Range Attributes

Year	Season	Range Area (km ²)	Range Overlap with Previous Year (km ²)	Range Site Fidelity (%)	Distance of Range from Treeline (km)
2006	Autumn	51295	N/A	N/A	104
2007		141096	36704	24	26
2008		75328	52328	32	104
2009		24396	23985	32	80
2010		17410	2942	8	114
2011		16024	0	0	44
2012		43202	8484	17	131
2013		21662	9385	17	184
2014		44059	18092	38	167
2015		27937	20753	41	133
2016		11192	10910	39	132
2017		7288	4590	33	157
2018		24442	4139	15	82
2019		10636	7624	28	164
2020		46815	10089	21	136
2021		29843	17911	31	146
2022		33522	17487	38	145
2006	Winter	98951	N/A	N/A	109
2007		238629	95140	39	87
2008		160383	95598	32	48
2009		192096	95940	37	199
2010		36993	24638	12	39
2011		82889	3786	3	79
2012		104752	35311	23	11
2013		40606	31992	28	8
2014		26643	25222	60	13
2015		70166	26107	37	17
2016		78141	32076	28	26
2017		52183	30932	31	154
2018		45843	21559	28	51
2019		25708	21371	43	34
2020		51224	20489	36	45
2021		56803	33742	45	57
2022		30531	25701	42	37

N/A = Not Applicable.

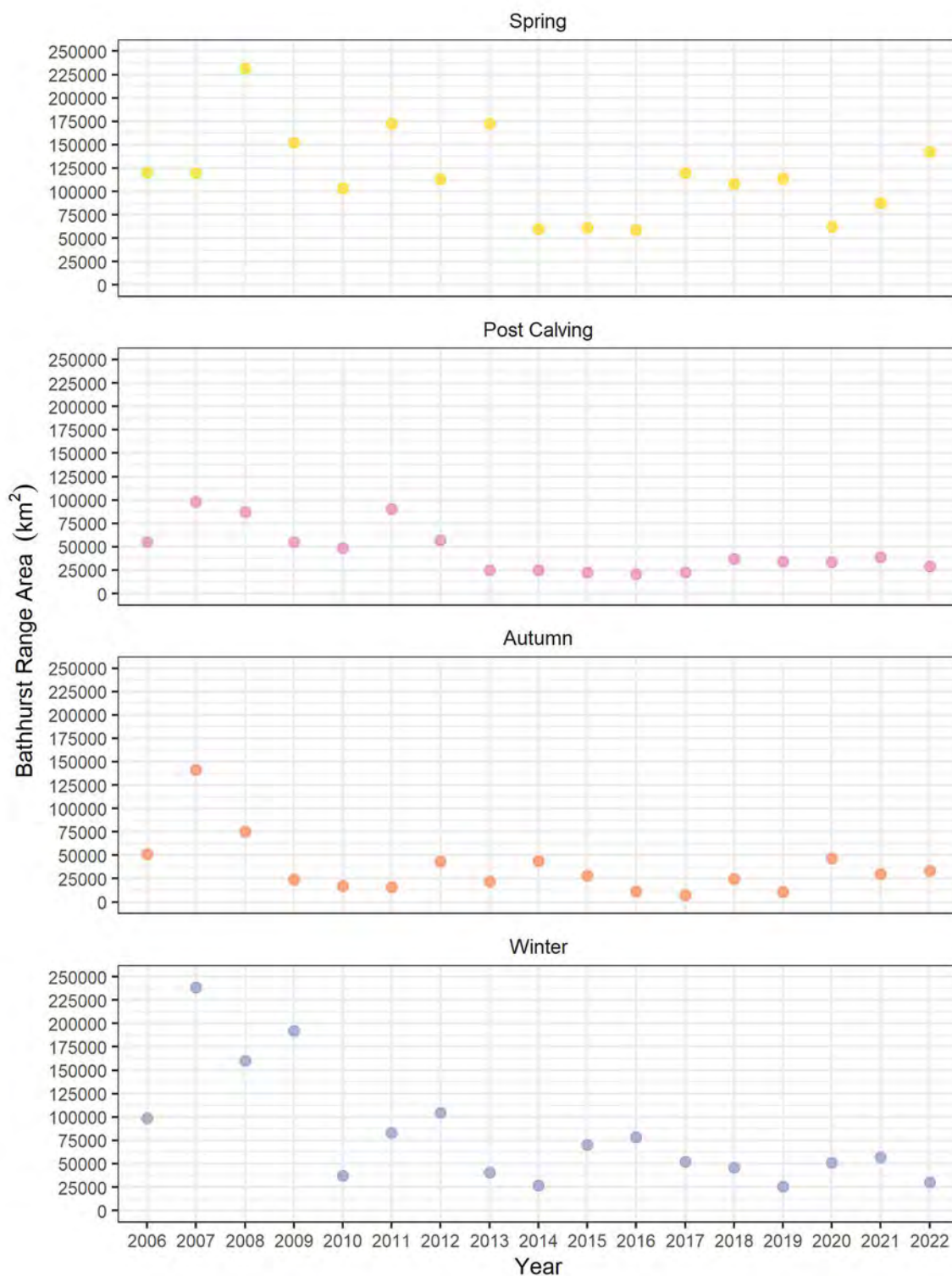


Figure 1: Bathurst Range Area by Year and Season

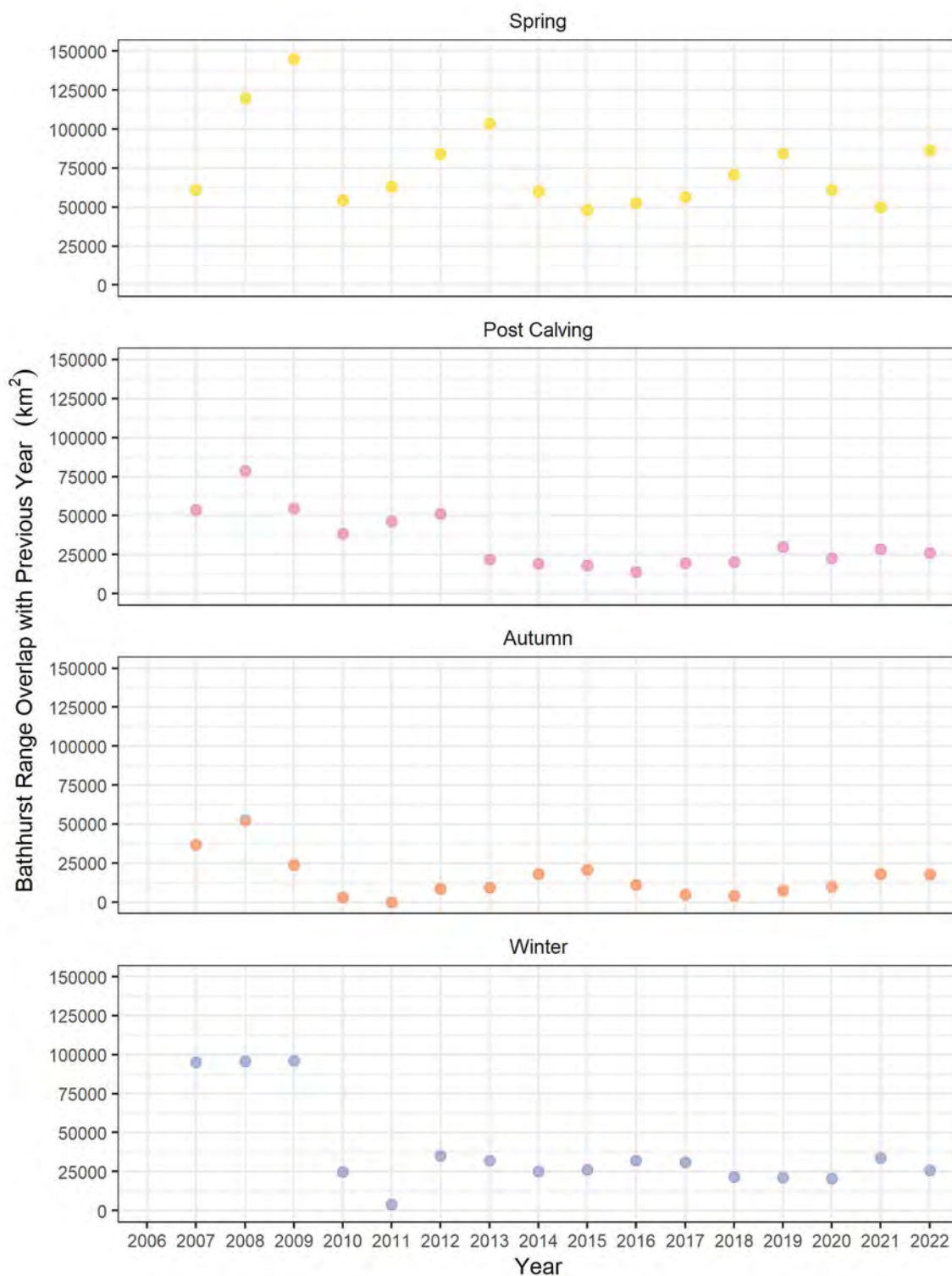


Figure 2: Bathurst Range Area Overlap with Previous Year by Year and Season

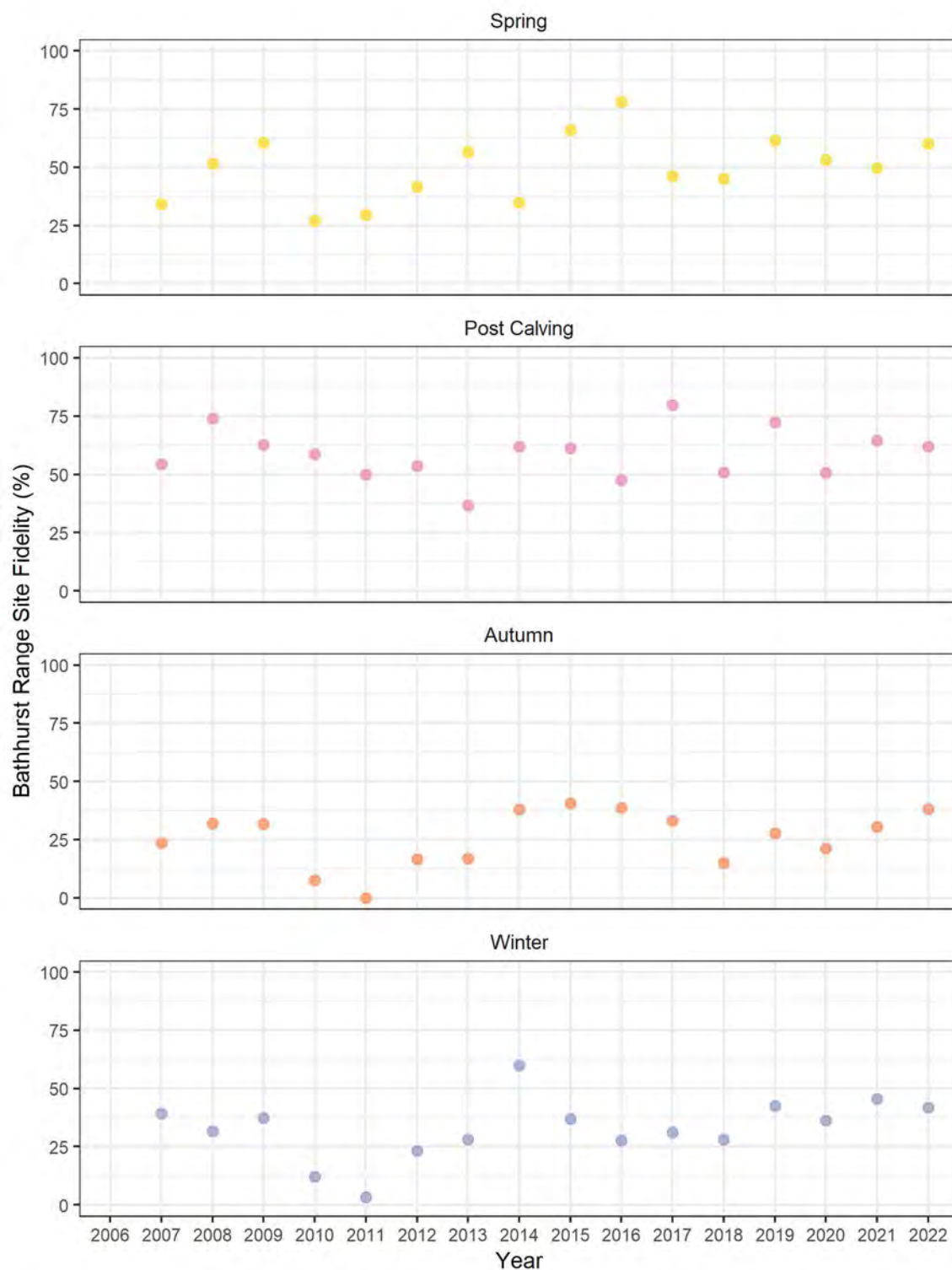


Figure 3: Bathurst Range Site Fidelity by Year and Season

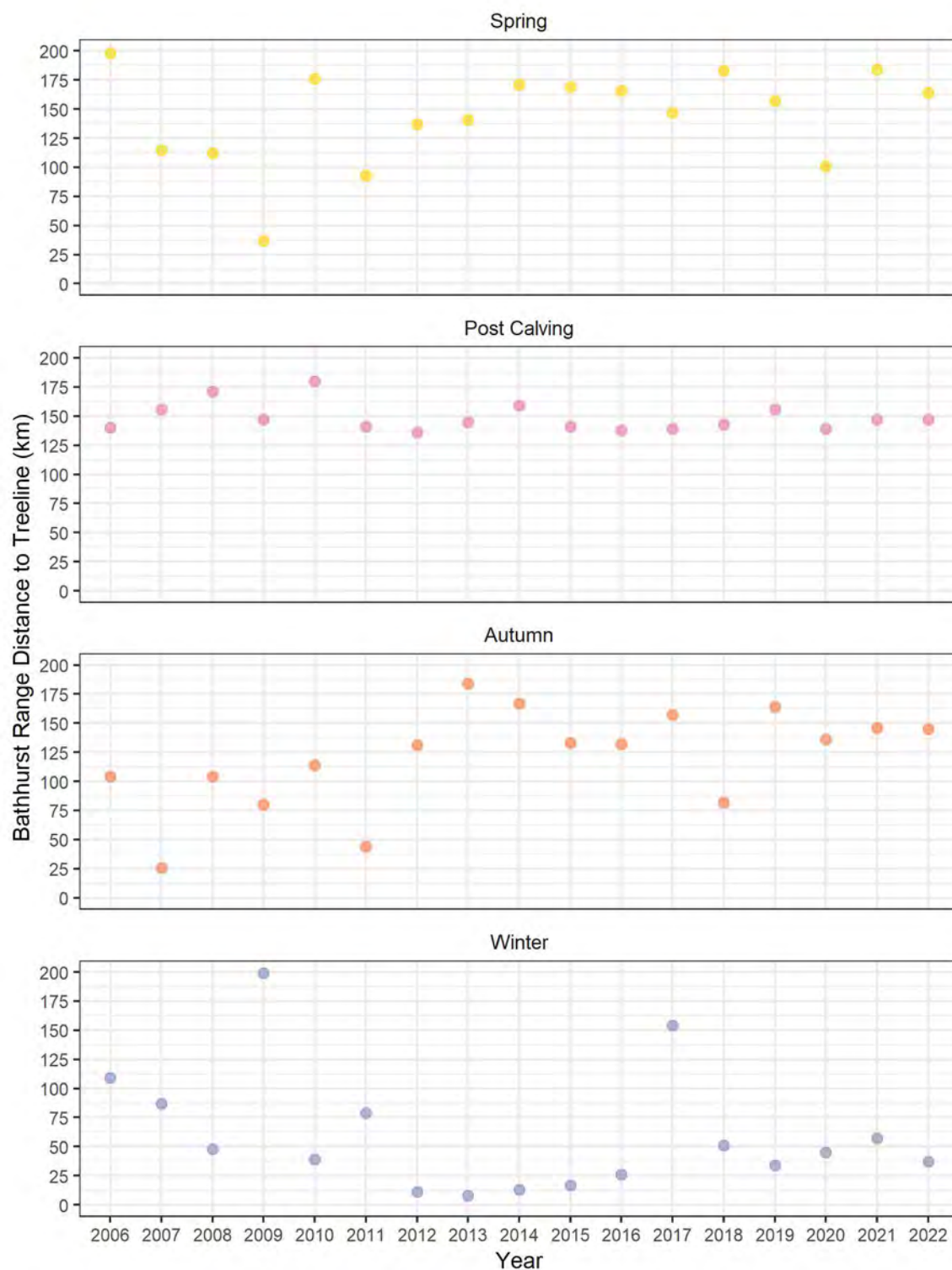


Figure 4: Bathurst Range Distance to Treeline by Year and Season

APPENDIX D

**Candidate Model Set for
Caribou Movement**

Candidate Model Set: Evaluating Speed and Hard Turns

Table 1: Final candidate model set and hypotheses used to evaluate speed and proportion of hard turns.

Model Grouping	Model Name	Model ^(a)	Hypothesis
Null	Null Model	Response variable ~ 1	Covariates improve model fit.
Habitat	Model 1	Response variable ~ Land Cover	This model tests the relationship of different land cover types on the speed or proportion of hard turns exhibited by barren-ground caribou. Barren-ground caribou use an assemblage of habitat types for various functions (Baltensperger and Joly, 2019; Fullman et al. 2017; Prichard et al. 2020). It is a recurring theme in caribou ecology that lichen species and other bryoids are caribou's preferred forage (Baltensperger and Joly, 2019; Schaefer et al. 2016). For instance, caribou are known to feed on low shrubs and herbs despite lower preference, when preferred forage is limited (Baltensperger and Joly, 2019; Fullman et al. 2017; Prichard et al. 2020; Schaefer et al. 2016). Caribou are expected to reduce speed and exhibit higher proportions of hard turns when foraging in areas with bryoids (lichens), low shrubs, and herbs to meet their survival requirements. It is expected that caribou reduce speed and increase hard turns to forage on lichens in areas with conifer, or to access thermal cover, especially during fall and winter when migratory caribou move to treeline (Heard et al. 1992). Other factors could affect caribou movement on the landscape. For instance, it has been long documented that caribou movement may be influenced and slowed by excessive snow cover, hardness, and depth (Duquette et al. 1988). In contrast, it is expected caribou may increase their speed and reduce hard turns when traversing exposed land and rocky areas, particularly in response to their higher visibility and risk of predation. Wetland and mixed deciduous forests are not known to be preferred habitats of migratory caribou and thus caribou are expected to move through these habitats more quickly and reduce hard turns, if the habitat is not avoided altogether. Additionally, during seasons of open water, water/snow/ice is expected to hinder or alter caribou travel, while it may help facilitate travel during seasons where water has frozen over (Leblond et al. 2016). Therefore, caribou are expected to increase speeds and decrease their proportion of hard turns when making straight-line movements on frozen water/snow/ice to reduce predation risk and because little forage is available. Alternatively, when the lakes are not frozen, caribou are expected to reduce speeds and exhibit higher proportion of hard turns, especially near large water bodies, because their straight-line movements may be altered as they are forced to walk along the lake boundaries or adjust their routes.

Table 1: Final candidate model set and hypotheses used to evaluate speed and proportion of hard turns.

Model Grouping	Model Name	Model ^(a)	Hypothesis
Habitat & Mine	Model 2	Response variable ~ Land Cover * Distance from Mine	This model tests the effect of buffered distance from the Diavik and Ekati mine complex on the occurrence of speed or hard turns in relation to the land cover type that a caribou uses along its path. If proximity to the mine complex has an effect on caribou movements, it is expected that caribou will reduce their speed and will make more hard turns closer to the mine complex due to delays caused by mining activity, as hypothesized by Poole et al. (2021). Alternatively, if the mine complex does not influence caribou movement, then there will not be a trend in speed or proportion of hard turns across distances from the mine. Further, it would be expected that caribou speed and proportion of hard turns would vary across distances from the mine landcover types and distances from the mine.
Individual Attributes & Temporal Patterns	Model 3	Response variable ~ Herd + Sex + Biological Year + Path Duration + Speed	Caribou may vary in speeds and proportion of turning angles by sex, herd, and year due to differences in seasonal and/or daily movements. Movements of male and female caribou can vary seasonally, and thus, it is expected that the speeds and proportion of hard turns may vary by sex. For example, females are expected to make longer migrations to calving grounds during spring migration (Bergman et al. 2000), which may result in females exhibiting faster and straighter paths than males during spring migration. Additionally, speed and proportion of hard turns may vary by biological year due to random annual stochasticity and/or factors that vary temporally like snow depth, spring green-up, or other natural factors. This model also tests whether the duration (hours) influences the speed and hard turns of a caribou path. It is expected that caribou will exhibit more hard turns and slower speeds when a caribou path remained in the buffer zone for a long period of time. Lastly, speed was incorporated as an explanatory variable in the candidate model set evaluating hard turns. It is expected that slower speeds result in higher proportions of hard turns, and faster speeds result in less hard turns.
Individual Attributes & Temporal Patterns & Mine	-	Response variable ~ Herd + Sex + Biological Year + Path Duration + Speed + Distance from Mine	This model could not be used due to failure to converge for all season datasets and across response variables. This model built on Model 3 and would have also tested the effect of buffered distance.
Habitat & Mine & Individual Attributes	Model 4	Response variable ~ Land Cover * Distance from Mine + Herd + Sex + Path Duration + Speed	Combined Models 2 and 3, except biological year was removed due to failure to converge.

(a) Response variable refers to either speed (km/hr) or hard turn (Y/N).

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APPENDIX E

**Movement Analysis
Modelling Results**

Model Results: Evaluating Speed

Spring Migration

Table 2. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for spring migration

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl1	0.8	0.0	0.8	0.9
landcover.recl2	0.2	0.0	0.2	0.3
landcover.recl3	-0.2	0.0	-0.2	-0.1
landcover.recl4	0.0	0.0	0.0	0.1
landcover.recl5	0.3	0.1	0.1	0.5
landcover.recl6	-0.4	0.0	-0.5	-0.3
ns(dist.from.mine, df = 3)1	0.4	0.0	0.4	0.5
ns(dist.from.mine, df = 3)2	0.8	0.1	0.7	0.9
ns(dist.from.mine, df = 3)3	-0.1	0.0	-0.1	-0.1
Herd:Beverly	0.0	0.0	0.0	0.0
Sex:Male	0.2	0.0	0.1	0.3
ns(path duration, df = 3)1	-2.4	0.0	-2.5	-2.4
ns(path duration, df = 3)2	-6.6	0.0	-6.7	-6.5
ns(path duration, df = 3)3	-4.3	0.0	-4.4	-4.2
landcover.recl1:ns(dist.from.mine, df = 3)1	0.1	0.0	0.1	0.2
landcover.recl2:ns(dist.from.mine, df = 3)1	-0.2	0.0	-0.2	-0.1
landcover.recl3:ns(dist.from.mine, df = 3)1	0.4	0.0	0.4	0.5
landcover.recl4:ns(dist.from.mine, df = 3)1	0.0	0.0	-0.1	0.1
landcover.recl5:ns(dist.from.mine, df = 3)1	-0.4	0.1	-0.6	-0.2
landcover.recl6:ns(dist.from.mine, df = 3)1	0.1	0.0	0.0	0.2
landcover.recl1:ns(dist.from.mine, df = 3)2	-0.1	0.1	-0.3	0.0
landcover.recl2:ns(dist.from.mine, df = 3)2	-0.1	0.1	-0.2	0.1
landcover.recl3:ns(dist.from.mine, df = 3)2	0.4	0.1	0.3	0.5
landcover.recl4:ns(dist.from.mine, df = 3)2	-0.3	0.1	-0.5	-0.1
landcover.recl5:ns(dist.from.mine, df = 3)2	-0.9	0.3	-1.4	-0.5
landcover.recl6:ns(dist.from.mine, df = 3)2	1.0	0.1	0.8	1.3
landcover.recl1:ns(dist.from.mine, df = 3)3	0.3	0.0	0.3	0.4
landcover.recl2:ns(dist.from.mine, df = 3)3	-0.3	0.0	-0.4	-0.3
landcover.recl3:ns(dist.from.mine, df = 3)3	0.1	0.0	0.0	0.1
landcover.recl4:ns(dist.from.mine, df = 3)3	0.0	0.0	0.0	0.1
landcover.recl5:ns(dist.from.mine, df = 3)3	0.8	0.1	0.7	0.9
landcover.recl6:ns(dist.from.mine, df = 3)3	-0.6	0.0	-0.6	-0.5

(a) landcover.recl refers to the categorical variable 'Land Cover' which consists of seven land covers included in the model: Water/Snow/Ice, Low Shrub/Herb, Bryoids, Exposed Land/Rock, Mixed/Deciduous forest, Conifer forest, Wetland. The land cover class, Water/Snow/Ice, was set as the reference for land cover classes included in the model.

(b) refers to the explanatory variable 'Buffered Distance from Mine Complex' that was fit as a spline with 3 degrees of freedom (df=3).

(c) refers to the explanatory variable 'Path Duration (hours)' that was fit as a spline (df = 3).

(d) refers to the interaction between 'Land Cover' classes and a spline of 'Buffered Distance from the Mine Complex' (df = 3).

Abbreviations: ns = model annotation for spline; df = degrees of freedom; SE = standard error; CI = confidence interval.

Summer**Table 2. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for summer**

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
(Intercept)	0.3	0.0	0.3	0.4
landcover.recl1	0.6	0.0	0.5	0.7
landcover.recl2	0.4	0.0	0.4	0.4
landcover.recl3	0.1	0.0	0.0	0.1
landcover.recl4	0.1	0.0	0.0	0.1
landcover.recl5	-0.3	0.1	-0.4	-0.2
landcover.recl6	-0.4	0.0	-0.5	-0.3
ns(dist.from.mine, df = 5)1	1.0	0.0	0.9	1.0
ns(dist.from.mine, df = 5)2	1.3	0.0	1.2	1.3
ns(dist.from.mine, df = 5)3	0.9	0.0	0.8	0.9
ns(dist.from.mine, df = 5)4	1.3	0.0	1.2	1.4
ns(dist.from.mine, df = 5)5	0.8	0.0	0.8	0.9
herd1	0.0	0.0	0.0	0.1
sex1	0.1	0.0	0.0	0.1
ns(sub.duration.hours, df = 3)1	-2.3	0.0	-2.3	-2.3
ns(sub.duration.hours, df = 3)2	-5.0	0.0	-5.0	-4.9
ns(sub.duration.hours, df = 3)3	-3.5	0.0	-3.6	-3.5
landcover.recl1:ns(dist.from.mine, df = 5)1	0.0	0.0	-0.1	0.1
landcover.recl2:ns(dist.from.mine, df = 5)1	-0.2	0.0	-0.3	-0.2
landcover.recl3:ns(dist.from.mine, df = 5)1	-0.2	0.1	-0.3	-0.1
landcover.recl4:ns(dist.from.mine, df = 5)1	0.3	0.0	0.2	0.4
landcover.recl5:ns(dist.from.mine, df = 5)1	-0.1	0.1	-0.3	0.0
landcover.recl6:ns(dist.from.mine, df = 5)1	0.3	0.0	0.2	0.4
landcover.recl1:ns(dist.from.mine, df = 5)2	-0.3	0.1	-0.4	-0.1
landcover.recl2:ns(dist.from.mine, df = 5)2	-0.6	0.0	-0.7	-0.5
landcover.recl3:ns(dist.from.mine, df = 5)2	0.0	0.1	-0.1	0.1
landcover.recl4:ns(dist.from.mine, df = 5)2	0.1	0.0	0.0	0.2
landcover.recl5:ns(dist.from.mine, df = 5)2	-0.4	0.1	-0.6	-0.2
landcover.recl6:ns(dist.from.mine, df = 5)2	0.8	0.1	0.7	0.9
landcover.recl1:ns(dist.from.mine, df = 5)3	0.0	0.0	-0.1	0.1
landcover.recl2:ns(dist.from.mine, df = 5)3	0.1	0.0	0.0	0.2
landcover.recl3:ns(dist.from.mine, df = 5)3	0.6	0.0	0.5	0.6
landcover.recl4:ns(dist.from.mine, df = 5)3	0.0	0.0	-0.1	0.1
landcover.recl5:ns(dist.from.mine, df = 5)3	-0.2	0.1	-0.4	-0.1
landcover.recl6:ns(dist.from.mine, df = 5)3	-0.1	0.0	-0.1	0.0
landcover.recl1:ns(dist.from.mine, df = 5)4	-0.1	0.1	-0.3	0.1
landcover.recl2:ns(dist.from.mine, df = 5)4	-0.4	0.1	-0.5	-0.3
landcover.recl3:ns(dist.from.mine, df = 5)4	-0.1	0.1	-0.2	0.0
landcover.recl4:ns(dist.from.mine, df = 5)4	0.1	0.1	0.0	0.3
landcover.recl5:ns(dist.from.mine, df = 5)4	0.4	0.1	0.1	0.7
landcover.recl6:ns(dist.from.mine, df = 5)4	1.3	0.1	1.1	1.5
landcover.recl1:ns(dist.from.mine, df = 5)5	-0.1	0.0	-0.2	0.0
landcover.recl2:ns(dist.from.mine, df = 5)5	0.1	0.0	0.0	0.1

Table 2. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for summer

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl3:ns(dist.from.mine, df = 5)5	0.5	0.0	0.5	0.6
landcover.recl4:ns(dist.from.mine, df = 5)5	0.0	0.0	-0.1	0.0
landcover.recl5:ns(dist.from.mine, df = 5)5	-0.3	0.1	-0.4	-0.1
landcover.recl6:ns(dist.from.mine, df = 5)5	0.1	0.0	0.1	0.2

(a) landcover.recl refers to the categorical variable 'Land Cover' which consists of seven land covers included in the model. Land cover classes are identified with a number as follows: 1 = Low Shrub/Herb, 2 = Bryoids, 3 = Exposed Land/Rock, 4 = Mixed/Deciduous forest, 5 = Conifer forest, 6 = Wetland, and Water/Snow/Ice was held as the reference land cover class in the model with which each land cover was compared to.

(b) refers to the explanatory variable, Buffered Distance from Mine Complex, that was fit as a spline (df=5).

(c) refers to the explanatory variable, Path Duration (hours), that was fit as a spline (df = 3).

(d) refers to the interaction between Land Cover classes and a spline of Buffered Distance from the Mine Complex (df = 5). See footnote (a) for identification number of each land cover class.

Abbreviations: "ns" = model annotation for spline; "df" = degrees of freedom; "SE" = standard error; "CI" = confidence interval.

Fall

Table 3. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for fall

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl1	0.9	0.0	0.8	0.9
landcover.recl2	0.4	0.0	0.3	0.4
landcover.recl3	-0.2	0.0	-0.2	-0.2
landcover.recl4	0.2	0.0	0.2	0.3
landcover.recl5	-0.1	0.0	-0.2	0.0
landcover.recl6	-0.5	0.0	-0.5	-0.4
ns(dist.from.mine, df = 3)1	0.5	0.0	0.5	0.6
ns(dist.from.mine, df = 3)2	1.4	0.0	1.3	1.5
ns(dist.from.mine, df = 3)3	0.4	0.0	0.3	0.4
Herd:Beverly	0.0	0.0	0.0	0.0
Sex:Male	0.1	0.0	0.0	0.1
ns(path duration, df = 3)1	-2.0	0.0	-2.1	-2.0
ns(path duration, df = 3)2	-4.8	0.0	-4.9	-4.8
ns(path duration, df = 3)3	-3.1	0.0	-3.2	-3.1
landcover.recl1:ns(dist.from.mine, df = 3)1	-0.2	0.0	-0.3	-0.2
landcover.recl2:ns(dist.from.mine, df = 3)1	-0.2	0.0	-0.3	-0.2
landcover.recl3:ns(dist.from.mine, df = 3)1	0.4	0.0	0.4	0.5
landcover.recl4:ns(dist.from.mine, df = 3)1	0.0	0.0	-0.1	0.1
landcover.recl5:ns(dist.from.mine, df = 3)1	-0.7	0.0	-0.8	-0.6
landcover.recl6:ns(dist.from.mine, df = 3)1	0.1	0.0	0.1	0.2
landcover.recl1:ns(dist.from.mine, df = 3)2	-0.6	0.1	-0.7	-0.5
landcover.recl2:ns(dist.from.mine, df = 3)2	-0.5	0.0	-0.6	-0.4
landcover.recl3:ns(dist.from.mine, df = 3)2	0.3	0.1	0.2	0.4
landcover.recl4:ns(dist.from.mine, df = 3)2	-0.2	0.1	-0.3	0.0
landcover.recl5:ns(dist.from.mine, df = 3)2	0.0	0.1	-0.2	0.3
landcover.recl6:ns(dist.from.mine, df = 3)2	1.3	0.1	1.1	1.4
landcover.recl1:ns(dist.from.mine, df = 3)3	-0.2	0.0	-0.3	-0.2

Table 3. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for fall

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl2:ns(dist.from.mine, df = 3)3	0.0	0.0	-0.1	0.0
landcover.recl3:ns(dist.from.mine, df = 3)3	0.2	0.0	0.2	0.3
landcover.recl4:ns(dist.from.mine, df = 3)3	-0.2	0.0	-0.3	-0.2
landcover.recl5:ns(dist.from.mine, df = 3)3	0.4	0.1	0.3	0.5
landcover.recl6:ns(dist.from.mine, df = 3)3	0.1	0.0	0.1	0.2

(a) landcover.recl refers to the categorical variable 'Land Cover' which consists of seven land covers included in the model: Water/Snow/Ice, Low Shrub/Herb, Bryoids, Exposed Land/Rock, Mixed/Deciduous forest, Conifer forest, Wetland. The land cover class, Water/Snow/Ice, was set as the reference for land cover classes included in the model.

(b) refers to the explanatory variable 'Buffered Distance from Mine Complex' that was fit as a spline with 3 degrees of freedom (df=3).

(c) refers to the explanatory variable 'Path Duration (hours)' that was fit as a spline (df = 3).

(d) refers to the interaction between 'Land Cover' classes and a spline of 'Buffered Distance from the Mine Complex' (df = 3).

Abbreviations: ns = model annotation for spline; df = degrees of freedom; SE = standard error; CI = confidence interval.

Winter

Table 4. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for winter

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl1	0.8	0.0	0.8	0.9
landcover.recl2	0.2	0.0	0.2	0.3
landcover.recl3	-0.2	0.0	-0.2	-0.1
landcover.recl4	0.0	0.0	0.0	0.1
landcover.recl5	0.3	0.1	0.1	0.5
landcover.recl6	-0.4	0.0	-0.5	-0.3
ns(dist.from.mine, df = 3)1	0.4	0.0	0.4	0.5
ns(dist.from.mine, df = 3)2	0.8	0.1	0.7	0.9
ns(dist.from.mine, df = 3)3	-0.1	0.0	-0.1	-0.1
Herd:Beverly	0.0	0.0	0.0	0.0
Sex:Male	0.2	0.0	0.1	0.3
ns(path duration, df = 3)1	-2.4	0.0	-2.5	-2.4
ns(path duration, df = 3)2	-6.6	0.0	-6.7	-6.5
ns(path duration, df = 3)3	-4.3	0.0	-4.4	-4.2
landcover.recl1:ns(dist.from.mine, df = 3)1	0.1	0.0	0.1	0.2
landcover.recl2:ns(dist.from.mine, df = 3)1	-0.2	0.0	-0.2	-0.1
landcover.recl3:ns(dist.from.mine, df = 3)1	0.4	0.0	0.4	0.5
landcover.recl4:ns(dist.from.mine, df = 3)1	0.0	0.0	-0.1	0.1
landcover.recl5:ns(dist.from.mine, df = 3)1	-0.4	0.1	-0.6	-0.2
landcover.recl6:ns(dist.from.mine, df = 3)1	0.1	0.0	0.0	0.2
landcover.recl1:ns(dist.from.mine, df = 3)2	-0.1	0.1	-0.3	0.0
landcover.recl2:ns(dist.from.mine, df = 3)2	-0.1	0.1	-0.2	0.1
landcover.recl3:ns(dist.from.mine, df = 3)2	0.4	0.1	0.3	0.5
landcover.recl4:ns(dist.from.mine, df = 3)2	-0.3	0.1	-0.5	-0.1
landcover.recl5:ns(dist.from.mine, df = 3)2	-0.9	0.3	-1.4	-0.5
landcover.recl6:ns(dist.from.mine, df = 3)2	1.0	0.1	0.8	1.3
landcover.recl1:ns(dist.from.mine, df = 3)3	0.3	0.0	0.3	0.4

Table 4. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for winter

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl2:ns(dist.from.mine, df = 3)3	-0.3	0.0	-0.4	-0.3
landcover.recl3:ns(dist.from.mine, df = 3)3	0.1	0.0	0.0	0.1
landcover.recl4:ns(dist.from.mine, df = 3)3	0.0	0.0	0.0	0.1
landcover.recl5:ns(dist.from.mine, df = 3)3	0.8	0.1	0.7	0.9
landcover.recl6:ns(dist.from.mine, df = 3)3	-0.6	0.0	-0.6	-0.5

(a) landcover.recl refers to the categorical variable 'Land Cover' which consists of seven land covers included in the model: Water/Snow/Ice, Low Shrub/Herb, Bryoids, Exposed Land/Rock, Mixed/Deciduous forest, Conifer forest, Wetland. The land cover class, Water/Snow/Ice, was set as the reference for land cover classes included in the model.

(b) refers to the explanatory variable 'Buffered Distance from Mine Complex' that was fit as a spline with 3 degrees of freedom (df=3).

(c) refers to the explanatory variable 'Path Duration (hours)' that was fit as a spline (df = 3).

(d) refers to the interaction between 'Land Cover' classes and a spline of 'Buffered Distance from the Mine Complex' (df = 3).

Abbreviations: ns = model annotation for spline; df = degrees of freedom; SE = standard error; CI = confidence interval.

Model Results: Evaluating Proportion of Hard Turns

Spring Migration

Table 5. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for spring migration

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl1	0.2	0.1	0.0	0.5
landcover.recl2	-0.1	0.1	-0.4	0.2
landcover.recl3	0.0	0.1	-0.2	0.3
landcover.recl4	0.1	0.1	-0.2	0.4
landcover.recl5	-0.3	0.7	-1.8	1.1
landcover.recl6	0.0	0.2	-0.5	0.4
ns(dist.from.mine, df = 5)1	-0.9	0.2	-1.1	-0.6
ns(dist.from.mine, df = 5)2	-0.3	0.2	-0.6	0.1
ns(dist.from.mine, df = 5)3	-0.6	0.1	-0.8	-0.4
ns(dist.from.mine, df = 5)4	-0.4	0.3	-1.0	0.1
ns(dist.from.mine, df = 5)5	-0.7	0.1	-0.8	-0.5
Herd:Beverly	-0.2	0.1	-0.3	-0.1
Sex:Male	-0.4	0.1	-0.6	-0.3
ns(path duration, df = 2)1	0.6	0.1	0.4	0.8
ns(path duration, df = 2)2	2.6	0.2	2.2	3.0
speed.km	-2.6	0.0	-2.6	-2.5
landcover.recl1:ns(dist.from.mine, df = 5)1	-0.1	0.2	-0.4	0.3
landcover.recl2:ns(dist.from.mine, df = 5)1	0.3	0.2	-0.1	0.6
landcover.recl3:ns(dist.from.mine, df = 5)1	0.2	0.2	-0.2	0.5
landcover.recl4:ns(dist.from.mine, df = 5)1	0.0	0.2	-0.3	0.4
landcover.recl5:ns(dist.from.mine, df = 5)1	-0.6	0.7	-1.9	0.8
landcover.recl6:ns(dist.from.mine, df = 5)1	-0.2	0.3	-0.7	0.4
landcover.recl1:ns(dist.from.mine, df = 5)2	-0.6	0.2	-1.0	-0.1
landcover.recl2:ns(dist.from.mine, df = 5)2	-0.4	0.2	-0.8	0.0
landcover.recl3:ns(dist.from.mine, df = 5)2	-0.2	0.2	-0.6	0.2
landcover.recl4:ns(dist.from.mine, df = 5)2	-0.4	0.2	-0.9	0.1
landcover.recl5:ns(dist.from.mine, df = 5)2	1.3	0.9	-0.4	2.9

Table 5. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for spring migration

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl6:ns(dist.from.mine, df = 5)2	0.3	0.3	-0.4	0.9
landcover.recl1:ns(dist.from.mine, df = 5)3	0.1	0.1	-0.2	0.3
landcover.recl2:ns(dist.from.mine, df = 5)3	0.2	0.1	0.0	0.5
landcover.recl3:ns(dist.from.mine, df = 5)3	0.1	0.1	-0.2	0.3
landcover.recl4:ns(dist.from.mine, df = 5)3	0.3	0.1	0.0	0.5
landcover.recl5:ns(dist.from.mine, df = 5)3	-0.5	0.5	-1.5	0.5
landcover.recl6:ns(dist.from.mine, df = 5)3	0.0	0.2	-0.4	0.4
landcover.recl1:ns(dist.from.mine, df = 5)4	-0.3	0.3	-0.9	0.3
landcover.recl2:ns(dist.from.mine, df = 5)4	0.1	0.3	-0.5	0.7
landcover.recl3:ns(dist.from.mine, df = 5)4	-0.2	0.3	-0.8	0.5
landcover.recl4:ns(dist.from.mine, df = 5)4	0.0	0.3	-0.6	0.6
landcover.recl5:ns(dist.from.mine, df = 5)4	1.0	1.5	-2.0	4.0
landcover.recl6:ns(dist.from.mine, df = 5)4	0.0	0.5	-1.1	1.0
landcover.recl1:ns(dist.from.mine, df = 5)5	0.0	0.1	-0.3	0.2
landcover.recl2:ns(dist.from.mine, df = 5)5	0.2	0.1	0.0	0.4
landcover.recl3:ns(dist.from.mine, df = 5)5	0.1	0.1	-0.1	0.3
landcover.recl4:ns(dist.from.mine, df = 5)5	0.2	0.1	0.0	0.5
landcover.recl5:ns(dist.from.mine, df = 5)5	-0.4	0.4	-1.3	0.4
landcover.recl6:ns(dist.from.mine, df = 5)5	0.3	0.2	-0.1	0.6

(a) landcover.recl refers to the categorical variable 'Land Cover' which consists of seven land covers included in the model. Land cover classes are identified with a number as follows: 1 = Low Shrub/Herb, 2 = Bryoids, 3 = Exposed Land/Rock, 4 = Mixed/Deciduous forest, 5 = Conifer forest, 6 = Wetland, and Water/Snow/Ice was held as the reference land cover class in the model with which each land cover was compared to.

(b) refers to the explanatory variable, Buffered Distance from Mine Complex, that was fit as a spline (df=5).

(c) refers to the explanatory variable, Path Duration (hours), that was fit as a spline (df = 2).

(d) refers to the interaction between Land Cover classes and a spline of Buffered Distance from the Mine Complex (df = 5). See footnote

(a) for identification number of each land cover class.

Abbreviations: "ns" = model annotation for spline; "df" = degrees of freedom; "SE" = standard error; "CI" = confidence interval.

Summer

Table 6. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for summer

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl1	0.2	0.1	0.0	0.5
landcover.recl2	-0.1	0.1	-0.4	0.2
landcover.recl3	0.0	0.1	-0.2	0.3
landcover.recl4	0.1	0.1	-0.2	0.4
landcover.recl5	-0.3	0.7	-1.8	1.1
landcover.recl6	0.0	0.2	-0.5	0.4
ns(dist.from.mine, df = 5)1	-0.9	0.2	-1.1	-0.6
ns(dist.from.mine, df = 5)2	-0.3	0.2	-0.6	0.1
ns(dist.from.mine, df = 5)3	-0.6	0.1	-0.8	-0.4
ns(dist.from.mine, df = 5)4	-0.4	0.3	-1.0	0.1
ns(dist.from.mine, df = 5)5	-0.7	0.1	-0.8	-0.5
Herd:Beverly	-0.2	0.1	-0.3	-0.1
Sex:Male	-0.4	0.1	-0.6	-0.3

Table 6. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for summer

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
ns(path duration, df = 2)1	0.6	0.1	0.4	0.8
ns(path duration, df = 2)2	2.6	0.2	2.2	3.0
speed.km	-2.6	0.0	-2.6	-2.5
landcover.recl1:ns(dist.from.mine, df = 5)1	-0.1	0.2	-0.4	0.3
landcover.recl2:ns(dist.from.mine, df = 5)1	0.3	0.2	-0.1	0.6
landcover.recl3:ns(dist.from.mine, df = 5)1	0.2	0.2	-0.2	0.5
landcover.recl4:ns(dist.from.mine, df = 5)1	0.0	0.2	-0.3	0.4
landcover.recl5:ns(dist.from.mine, df = 5)1	-0.6	0.7	-1.9	0.8
landcover.recl6:ns(dist.from.mine, df = 5)1	-0.2	0.3	-0.7	0.4
landcover.recl1:ns(dist.from.mine, df = 5)2	-0.6	0.2	-1.0	-0.1
landcover.recl2:ns(dist.from.mine, df = 5)2	-0.4	0.2	-0.8	0.0
landcover.recl3:ns(dist.from.mine, df = 5)2	-0.2	0.2	-0.6	0.2
landcover.recl4:ns(dist.from.mine, df = 5)2	-0.4	0.2	-0.9	0.1
landcover.recl5:ns(dist.from.mine, df = 5)2	1.3	0.9	-0.4	2.9
landcover.recl6:ns(dist.from.mine, df = 5)2	0.3	0.3	-0.4	0.9
landcover.recl1:ns(dist.from.mine, df = 5)3	0.1	0.1	-0.2	0.3
landcover.recl2:ns(dist.from.mine, df = 5)3	0.2	0.1	0.0	0.5
landcover.recl3:ns(dist.from.mine, df = 5)3	0.1	0.1	-0.2	0.3
landcover.recl4:ns(dist.from.mine, df = 5)3	0.3	0.1	0.0	0.5
landcover.recl5:ns(dist.from.mine, df = 5)3	-0.5	0.5	-1.5	0.5
landcover.recl6:ns(dist.from.mine, df = 5)3	0.0	0.2	-0.4	0.4
landcover.recl1:ns(dist.from.mine, df = 5)4	-0.3	0.3	-0.9	0.3
landcover.recl2:ns(dist.from.mine, df = 5)4	0.1	0.3	-0.5	0.7
landcover.recl3:ns(dist.from.mine, df = 5)4	-0.2	0.3	-0.8	0.5
landcover.recl4:ns(dist.from.mine, df = 5)4	0.0	0.3	-0.6	0.6
landcover.recl5:ns(dist.from.mine, df = 5)4	1.0	1.5	-2.0	4.0
landcover.recl6:ns(dist.from.mine, df = 5)4	0.0	0.5	-1.1	1.0
landcover.recl1:ns(dist.from.mine, df = 5)5	0.0	0.1	-0.3	0.2
landcover.recl2:ns(dist.from.mine, df = 5)5	0.2	0.1	0.0	0.4
landcover.recl3:ns(dist.from.mine, df = 5)5	0.1	0.1	-0.1	0.3
landcover.recl4:ns(dist.from.mine, df = 5)5	0.2	0.1	0.0	0.5
landcover.recl5:ns(dist.from.mine, df = 5)5	-0.4	0.4	-1.3	0.4
landcover.recl6:ns(dist.from.mine, df = 5)5	0.3	0.2	-0.1	0.6

(a) landcover.recl refers to the categorical variable 'Land Cover' which consists of seven land covers included in the model. Land cover classes are identified with a number as follows: 1 = Low Shrub/Herb, 2 = Bryoids, 3 = Exposed Land/Rock, 4 = Mixed/Deciduous forest, 5 = Conifer forest, 6 = Wetland, and Water/Snow/Ice was held as the reference land cover class in the model with which each land cover was compared to.

(b) refers to the explanatory variable, Buffered Distance from Mine Complex, that was fit as a spline (df=5).

(c) refers to the explanatory variable, Path Duration (hours), that was fit as a spline (df = 2).

(d) refers to the interaction between Land Cover classes and a spline of Buffered Distance from the Mine Complex (df = 5). See footnote (a) for identification number of each land cover class.

Abbreviations: "ns" = model annotation for spline; "df" = degrees of freedom; "SE" = standard error; "CI" = confidence interval.

Fall**Table 7. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for fall**

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl1	0.0	0.1	-0.2	0.1
landcover.recl2	0.0	0.1	-0.1	0.1
landcover.recl3	0.0	0.1	-0.1	0.1
landcover.recl4	0.0	0.1	-0.1	0.1
landcover.recl5	-0.2	0.2	-0.7	0.2
landcover.recl6	0.2	0.1	0.0	0.4
ns(dist.from.mine, df = 6)1	-0.2	0.1	-0.3	0.0
ns(dist.from.mine, df = 6)2	-0.2	0.1	-0.4	-0.1
ns(dist.from.mine, df = 6)3	-0.5	0.1	-0.6	-0.4
ns(dist.from.mine, df = 6)4	-0.4	0.1	-0.5	-0.3
ns(dist.from.mine, df = 6)5	-0.4	0.1	-0.6	-0.1
ns(dist.from.mine, df = 6)6	-0.3	0.1	-0.4	-0.2
Herd:Beverly	0.0	0.0	0.0	0.0
Sex:Male	-0.1	0.0	-0.2	0.0
ns(path duration, df = 2)1	0.0	0.0	-0.1	0.1
ns(path duration, df = 2)2	1.7	0.1	1.6	1.9
speed.km	-1.4	0.0	-1.4	-1.3
landcover.recl1:ns(dist.from.mine, df = 6)1	-0.4	0.1	-0.6	-0.2
landcover.recl2:ns(dist.from.mine, df = 6)1	0.0	0.1	-0.1	0.2
landcover.recl3:ns(dist.from.mine, df = 6)1	0.1	0.1	0.0	0.3
landcover.recl4:ns(dist.from.mine, df = 6)1	0.0	0.1	-0.2	0.2
landcover.recl5:ns(dist.from.mine, df = 6)1	0.3	0.2	-0.2	0.7
landcover.recl6:ns(dist.from.mine, df = 6)1	-0.2	0.1	-0.4	0.0
landcover.recl1:ns(dist.from.mine, df = 6)2	-0.1	0.1	-0.4	0.1
landcover.recl2:ns(dist.from.mine, df = 6)2	-0.3	0.1	-0.5	-0.1
landcover.recl3:ns(dist.from.mine, df = 6)2	-0.4	0.1	-0.6	-0.1
landcover.recl4:ns(dist.from.mine, df = 6)2	0.1	0.1	-0.1	0.3
landcover.recl5:ns(dist.from.mine, df = 6)2	0.4	0.3	-0.1	1.0
landcover.recl6:ns(dist.from.mine, df = 6)2	-0.1	0.1	-0.3	0.2
landcover.recl1:ns(dist.from.mine, df = 6)3	-0.2	0.1	-0.5	0.0
landcover.recl2:ns(dist.from.mine, df = 6)3	-0.2	0.1	-0.3	0.0
landcover.recl3:ns(dist.from.mine, df = 6)3	-0.3	0.1	-0.5	-0.2
landcover.recl4:ns(dist.from.mine, df = 6)3	0.2	0.1	0.0	0.3
landcover.recl5:ns(dist.from.mine, df = 6)3	0.7	0.3	0.2	1.2
landcover.recl6:ns(dist.from.mine, df = 6)3	0.0	0.1	-0.3	0.2
landcover.recl1:ns(dist.from.mine, df = 6)4	-0.2	0.1	-0.4	0.0
landcover.recl2:ns(dist.from.mine, df = 6)4	-0.1	0.1	-0.3	0.0
landcover.recl3:ns(dist.from.mine, df = 6)4	-0.2	0.1	-0.4	-0.1
landcover.recl4:ns(dist.from.mine, df = 6)4	0.0	0.1	-0.2	0.2
landcover.recl5:ns(dist.from.mine, df = 6)4	0.4	0.2	0.0	0.8
landcover.recl6:ns(dist.from.mine, df = 6)4	0.3	0.1	0.1	0.5
landcover.recl1:ns(dist.from.mine, df = 6)5	-0.1	0.2	-0.5	0.2
landcover.recl2:ns(dist.from.mine, df = 6)5	-0.1	0.1	-0.4	0.1
landcover.recl3:ns(dist.from.mine, df = 6)5	-0.1	0.1	-0.3	0.2

Table 7. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for fall

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl4:ns(dist.from.mine, df = 6)5	-0.2	0.2	-0.5	0.1
landcover.recl5:ns(dist.from.mine, df = 6)5	0.4	0.5	-0.6	1.4
landcover.recl6:ns(dist.from.mine, df = 6)5	-0.2	0.2	-0.6	0.3
landcover.recl1:ns(dist.from.mine, df = 6)6	-0.4	0.1	-0.6	-0.3
landcover.recl2:ns(dist.from.mine, df = 6)6	0.1	0.1	0.0	0.3
landcover.recl3:ns(dist.from.mine, df = 6)6	0.0	0.1	-0.1	0.2
landcover.recl4:ns(dist.from.mine, df = 6)6	0.1	0.1	-0.1	0.3
landcover.recl5:ns(dist.from.mine, df = 6)6	-0.4	0.2	-0.8	0.0
landcover.recl6:ns(dist.from.mine, df = 6)6	-0.1	0.1	-0.3	0.1

(a) landcover.recl refers to the categorical variable 'Land Cover' which consists of seven land covers included in the model. Land cover classes are identified with a number as follows: 1 = Low Shrub/Herb, 2 = Bryoids, 3 = Exposed Land/Rock, 4 = Mixed/Deciduous forest, 5 = Conifer forest, 6 = Wetland, and Water/Snow/Ice was held as the reference land cover class in the model with which each land cover was compared to.

(b) refers to the explanatory variable, Buffered Distance from Mine Complex, that was fit as a spline (df=6).

(c) refers to the explanatory variable, Path Duration (hours), that was fit as a spline (df = 2).

(d) refers to the interaction between Land Cover classes and a spline of Buffered Distance from the Mine Complex (df = 6). See footnote (a) for identification number of each land cover class.

Abbreviations: "ns" = model annotation for spline; "df" = degrees of freedom; "SE" = standard error; "CI" = confidence interval.

Winter

Table 8. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for winter

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl1	0.1	0.1	0.0	0.3
landcover.recl2	0.0	0.1	-0.2	0.2
landcover.recl3	0.0	0.1	-0.1	0.2
landcover.recl4	0.1	0.1	-0.1	0.2
landcover.recl5	-0.2	0.4	-1.0	0.5
landcover.recl6	-0.1	0.1	-0.4	0.1
ns(dist.from.mine, df = 6)1	-0.2	0.1	-0.4	0.0
ns(dist.from.mine, df = 6)2	-0.2	0.1	-0.4	0.0
ns(dist.from.mine, df = 6)3	-0.2	0.1	-0.4	0.0
ns(dist.from.mine, df = 6)4	-0.2	0.1	-0.3	-0.1
ns(dist.from.mine, df = 6)5	0.0	0.2	-0.3	0.4
ns(dist.from.mine, df = 6)6	0.0	0.0	-0.1	0.1
Herd:Beverly	-0.1	0.0	-0.1	0.0
Sex:Male	-0.1	0.0	-0.2	-0.1
ns(path duration, df = 2)1	0.1	0.1	0.0	0.2
ns(path duration, df = 2)2	1.6	0.1	1.4	1.8
speed.km	-1.4	0.0	-1.4	-1.4
landcover.recl1:ns(dist.from.mine, df = 6)1	-0.1	0.1	-0.3	0.1
landcover.recl2:ns(dist.from.mine, df = 6)1	0.0	0.1	-0.2	0.2
landcover.recl3:ns(dist.from.mine, df = 6)1	0.2	0.1	0.0	0.4
landcover.recl4:ns(dist.from.mine, df = 6)1	0.1	0.1	-0.2	0.3
landcover.recl5:ns(dist.from.mine, df = 6)1	0.0	0.4	-0.7	0.7
landcover.recl6:ns(dist.from.mine, df = 6)1	0.0	0.2	-0.3	0.3

Table 8. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for winter

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
landcover.recl1:ns(dist.from.mine, df = 6)2	-0.2	0.1	-0.4	0.1
landcover.recl2:ns(dist.from.mine, df = 6)2	-0.1	0.1	-0.4	0.1
landcover.recl3:ns(dist.from.mine, df = 6)2	-0.2	0.1	-0.4	0.1
landcover.recl4:ns(dist.from.mine, df = 6)2	-0.1	0.2	-0.4	0.2
landcover.recl5:ns(dist.from.mine, df = 6)2	0.6	0.5	-0.4	1.5
landcover.recl6:ns(dist.from.mine, df = 6)2	0.1	0.2	-0.3	0.4
landcover.recl1:ns(dist.from.mine, df = 6)3	-0.1	0.1	-0.3	0.1
landcover.recl2:ns(dist.from.mine, df = 6)3	0.0	0.1	-0.2	0.2
landcover.recl3:ns(dist.from.mine, df = 6)3	-0.1	0.1	-0.3	0.1
landcover.recl4:ns(dist.from.mine, df = 6)3	0.0	0.1	-0.3	0.2
landcover.recl5:ns(dist.from.mine, df = 6)3	0.0	0.4	-0.8	0.8
landcover.recl6:ns(dist.from.mine, df = 6)3	0.2	0.2	-0.1	0.5
landcover.recl1:ns(dist.from.mine, df = 6)4	-0.3	0.1	-0.4	-0.1
landcover.recl2:ns(dist.from.mine, df = 6)4	-0.1	0.1	-0.2	0.1
landcover.recl3:ns(dist.from.mine, df = 6)4	0.0	0.1	-0.2	0.1
landcover.recl4:ns(dist.from.mine, df = 6)4	-0.1	0.1	-0.3	0.1
landcover.recl5:ns(dist.from.mine, df = 6)4	0.2	0.3	-0.4	0.8
landcover.recl6:ns(dist.from.mine, df = 6)4	0.1	0.1	-0.2	0.3
landcover.recl1:ns(dist.from.mine, df = 6)5	-0.1	0.2	-0.5	0.2
landcover.recl2:ns(dist.from.mine, df = 6)5	-0.1	0.2	-0.5	0.3
landcover.recl3:ns(dist.from.mine, df = 6)5	0.0	0.2	-0.4	0.4
landcover.recl4:ns(dist.from.mine, df = 6)5	-0.3	0.2	-0.7	0.2
landcover.recl5:ns(dist.from.mine, df = 6)5	0.2	0.9	-1.5	1.9
landcover.recl6:ns(dist.from.mine, df = 6)5	0.2	0.3	-0.4	0.8
landcover.recl1:ns(dist.from.mine, df = 6)6	-0.2	0.1	-0.3	-0.1
landcover.recl2:ns(dist.from.mine, df = 6)6	0.0	0.1	-0.1	0.1
landcover.recl3:ns(dist.from.mine, df = 6)6	-0.1	0.1	-0.3	0.0
landcover.recl4:ns(dist.from.mine, df = 6)6	0.0	0.1	-0.2	0.1
landcover.recl5:ns(dist.from.mine, df = 6)6	0.0	0.2	-0.3	0.4
landcover.recl6:ns(dist.from.mine, df = 6)6	0.4	0.1	0.2	0.5

(a) landcover.recl refers to the categorical variable 'Land Cover' which consists of seven land covers included in the model. Land cover classes are identified with a number as follows: 1 = Low Shrub/Herb, 2 = Bryoids, 3 = Exposed Land/Rock, 4 = Mixed/Deciduous forest, 5 = Conifer forest, 6 = Wetland, and Water/Snow/Ice was held as the reference land cover class in the model with which each land cover was compared to.

(b) refers to the explanatory variable, Buffered Distance from Mine Complex, that was fit as a spline (df=6).

(c) refers to the explanatory variable, Path Duration (hours), that was fit as a spline (df = 2).

(d) refers to the interaction between Land Cover classes and a spline of Buffered Distance from the Mine Complex (df = 6). See footnote (a) for identification number of each land cover class.

Abbreviations: "ns" = model annotation for spline; "df" = degrees of freedom; "SE" = standard error; "CI" = confidence interval.

APPENDIX F

**Caribou Behavioural
Observations Summary, 2022**

Date	Time	Distance to Mine Component (km)	UTM Easting	UTM Northing	Group Size	Sample Composition
2022-03-29	13:43	20.23	556809	7159121	14	Males / Females / Calves
2022-03-05	14:03	1.34	533155	7147530	21	Males / Females / Calves
2022-04-03	14:37	16.49	540795	7169601	2	Females / Calves
2022-04-06	13:48	16.92	545328	7136162	400	Males / Females / Calves
2022-04-06	15:10	11.69	543243	7141451	130	Males / Females / Calves
2022-03-24	12:56	0.32	532751	7154716	4	Females
2022-04-08	9:51	1.70	5131141	7155294	14	Males / Females
2022-04-08	14:45	4.85	527825	7155303	16	Females / Calves
2022-04-14	9:33	5.84	543247	7154034	8	Males / Females / Calves
2022-04-13	9:07	1.34	531081	7153464	27	Females / Calves
2022-04-21	9:12	0.35	534887	7154476	10	Males / Females
2022-04-29	13:30	0.34	536090	7153796	14	Males / Females
2022-03-29	13:45	20.23	556809	7159121	6	Males / Females
2022-06-03	8:45	0.00	533743	7153448	1	Males
2022-06-05	11:44	0.00	532024	7152056	1	Males
2022-06-06	9:08	0.00	533743	7153448	1	Males
2022-06-06	16:40	0.00	534802	7153204	1	Males
2022-06-07	11:50	0.00	534884	7152982	1	Males
2022-06-08	9:43	0.06	533647	7153844	1	Unspecified
2022-06-08	13:55	0.11	532186	7151435	1	Females
2022-06-11	14:33	0.02	535595	7153109	1	Males
2022-06-16	8:45	0.00	534884	7152982	2	Males / Females
2022-06-17	11:40	0.00	534884	7152982	2	Males / Females
2022-06-19	16:05	0.00	532697	7152346	4	Males / Females
2022-06-23	9:00	0.00	534411	7151920	1	Males
2022-07-05	6:45	0.00	533505	7154268	1	Males
2022-07-08	11:51	0.00	533953	7150538	1	Males
2022-07-01	10:40	0.00	532255	7151635	1	Females
2022-07-10	15:11	0.00	532875	7153480	2	Females / Calves
2022-07-18	7:50	0.00	533576	7154260	3	Males / Females
2022-07-18	14:12	0.00	533130	7150132	1	Males
2022-07-26	16:15	0.00	534425	7153241	2	Males
2022-07-28	13:30	0.00	535746	7152157	1	Unspecified
2022-07-29	14:40	0.04	535512	7153200	2	Males
2022-08-01	11:32	0.02	534608	7150595	1	Males
2022-08-04	14:24	0.00	534004	7150582	1	Males
2022-08-07	8:15	0.02	533638	7153884	1	Males
2022-08-10	8:34	0.00	533124	7150081	2	Males

APPENDIX G

Behaviour Analysis Model Results

Model Results: Proportion of Time Spent Feeding

Table 1. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for proportion of time spent feeding for non-nursery groups

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
DistMine ^(b) 1	0.40	0.13	0.15	0.66
DistMine ^(b) 2	-0.21	0.10	-0.40	-0.01
DistMine ^(b) 3	-0.12	0.11	-0.33	0.10
Temperature ^(b) 1	0.17	0.07	0.02	0.31
Temperature ^(b) 2	-0.59	0.25	-1.07	-0.11
Temperature ^(b) 3	-0.27	0.08	-0.43	-0.12

(a) DistMine = distance to mine footprints (m; scaled), Temperature = mean weekly temperature (°C; scaled).

(b) Covariate was included as a spline with three degrees of freedom (df=3).

Abbreviations: SE = standard error; CI = confidence interval.

Table 2. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for proportion of time spent feeding for nursery groups

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
DistMine	0.02	0.02	-0.01	0.06
Temperature ^(b) 1	0.26	0.07	0.12	0.40
Temperature ^(b) 2	-0.08	0.25	-0.56	0.40
Temperature ^(b) 3	-0.16	0.10	-0.36	0.04

(a) DistMine = distance to mine footprints (m; scaled), Temperature = mean weekly temperature (°C; scaled).

(b) Covariate was included as a spline with three degrees of freedom (df=3).

Abbreviations: SE = standard error; CI = confidence interval.

Model Results: Proportion of Time Spent Feeding/Resting

Table 3. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for proportion of time spent feeding/resting for non-nursery groups

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
DistMine ^(b) 1	0.20	0.12	-0.03	0.44
DistMine ^(b) 2	-0.33	0.09	-0.51	-0.15
DistMine ^(b) 3	0.11	0.10	-0.08	0.30
Insect Activity	-0.11	0.02	-0.14	-0.07

(a) DistMine = distance to mine footprints (m; scaled), Insect Activity = mean weekly insect activity index.

(b) Covariate was included as a spline with three degrees of freedom (df=3).

Abbreviations: SE = standard error; CI = confidence interval.

Table 4. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for proportion of time spent feeding/resting for nursery groups

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
Insect Activity	-0.06	0.02	-0.11	-0.01
Precipitation	0.00	0.02	-0.03	0.04
Temperature	-0.02	0.02	-0.06	0.02
Wind ^(b) 1	0.21	0.08	0.05	0.36
Wind ^(b) 2	-0.54	0.17	-0.88	-0.20
Wind ^(b) 3	-0.10	0.09	-0.27	0.07

(a) Insect Activity = mean weekly insect activity index, Precipitation = sum of weekly precipitation (mm; scaled), Temperature = mean weekly temperature (°C; scaled), Wind = mean weekly wind speed (m/s; scaled).

(b) Covariate was included as a spline with three degrees of freedom (df=3).

Abbreviations: SE = standard error; CI = confidence interval.

Model Results: Proportion of Time Spent Alert/Moving

Table 5. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for proportion of time spent alert/moving for non-nursery groups

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
DistMine ^(b) 1	-0.17	0.11	-0.38	0.05
DistMine ^(b) 2	0.33	0.08	0.17	0.49
DistMine ^(b) 3	-0.12	0.09	-0.30	0.05
Insect Activity	0.04	0.02	0.01	0.07

(a) DistMine = distance to mine footprints (m; scaled), Insect Activity = mean weekly insect activity index.

(b) Covariate was included as a spline with three degrees of freedom (df=3).

Abbreviations: SE = standard error; CI = confidence interval.

Table 6. Beta estimates, standard error and 95% confidence intervals of explanatory variables in the top model for proportion of time spent alert/moving for nursery groups

Covariate ^(a)	Beta Estimate	SE	Lower 95% CI	Upper 95% CI
Precipitation	-0.02	0.02	-0.05	0.02
Temperature	0.03	0.02	0.00	0.07
Wind ^(b) 1	-0.20	0.07	-0.35	-0.06
Wind ^(b) 2	0.45	0.15	0.16	0.75
Wind ^(b) 3	0.08	0.08	-0.08	0.24

(a) Precipitation = sum of weekly precipitation (mm; scaled), Temperature = mean weekly temperature (°C; scaled), Wind = mean weekly wind speed (m/s; scaled).

(b) Covariate was included as a spline with three degrees of freedom (df=3).

Abbreviations: SE = standard error; CI = confidence interval.

APPENDIX H

**Wildlife Mortality Incident
Reports, 2022**

Wildlife Report - 2021

2022-04-27 - Caribou Leg @ Dump 7

Complete

Score	100%	Flagged items	0	Actions	0
-------	------	---------------	---	---------	---

Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location)	2022-04-27 - Caribou Leg @ Dump 7
Document No.	WildlifeReport000170

Completed On

29 Apr 2022

Wildlife Report

Type of Wildlife Report

General sighting / Other

Report Type

Sighting

Severed caribou leg found near dump 7

General Wildlife Sighting

Animal Type

Caribou

Description of Individual / Activity (eg. number of individuals, colour, age, size, etc.)

Single severed caribou lower leg segment found on top of snow bank adjacent to Dump 7.

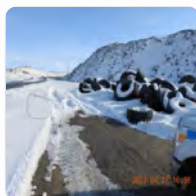
Photo (If Possible)

Photo 1

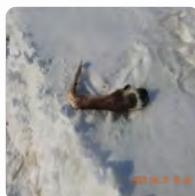


Photo 2



Photo 3



Photo 4

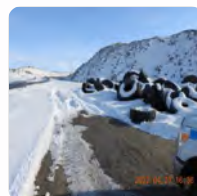


Photo 5

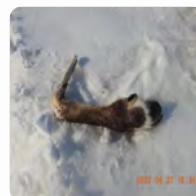


Photo 6

Enter Initial Time of Wildlife Sighting

27 Apr 2022 15:00 MDT

Department/Individual Who Reported Wildlife:

Specimen was first seen and reported by Fountain Tire, who contacted Truck Shop Supervisor and message was relayed to Environment team shortly after.

Environment On Scene**Environment at Call-out Location**

27 Apr 2022 17:00 MDT

Chronological Events

~ 15:00 - Fountain Tire employees were dumping old tires at Dump #7, a designated tire disposal area just off the 154 haul road. At that time they noticed a severed caribou leg resting on top of the snow adjacent to the dump area. Sighting was discussed with truck shop, who then relayed the message to Environment.

~ 17:00 - Environment arrived on site and quickly spotted the severed leg. Photos were taken of the specimen and the area and the leg was bagged and brought to waste transfer for incineration. No sign of wildlife or wildlife tracks in area that would explain the leg segment being deposited in that area.

Movement Map (Import NotePlus Site Map)**Environment Off Scene****End of Environment Call-out**

27 Apr 2022 18:00 MDT

Final Location of Wildlife

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Justin Macek

29 Apr 2022 15:06 MDT



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

Wildlife Report - 2021

Duck Mortality - 2022-09-04 Airport Apron

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Duck Mortality - 2022-09-04 Airport Apron	
Document No.				WildlifeReport000226	
				04.09.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	04.09.2022 08:10 MDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

Airport Control Tower

Environment at Call-out Location	04.09.2022 08:51 MDT
---	----------------------

Location

Airport apron

Animal Type	Other
--------------------	-------

Description of Animal/Scene

Duck lying on east side of apron. Breast ripped out and blood stain on ground, appears to have been killed by raptor.

Photo of Scene

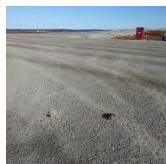


Photo 1



Photo 2

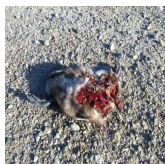


Photo 3

Estimated Time of Death	Hours
--------------------------------	-------

End of Environment Call-out	04.09.2022 09:01 MDT
------------------------------------	----------------------

Final Location of Carcass

Stored in freezer until GNWT-ENR confirmation, then may be incinerated or shipped to GNWT-ENR for analysis

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Nicole Goodman
04.09.2022 11:45 MDT

Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Duck Predation - 2022-09-15 Truck shop
Megadome

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Duck Predation - 2022-09-15 Truck shop Megadome	
Document No.				WildlifeReport000228	
				15.09.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	15.09.2022 07:00 MDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

Site vehicles

Environment at Call-out Location	15.09.2022 07:10 MDT
---	----------------------

Location

In middle of road between truck shop parking lot and megadome storage tent.

Animal Type	Other
--------------------	-------

Description of Animal/Scene

One duck assumed dead from PEFA or RLHA attack lying on the road with a Rough Legged Hawk standing on the partially eaten carcass. 2 Peregrine Falcons on the road nearby squawking at the RLHA. Vehicles passing by around the carcass.

Photo of Scene



Photo 1



Photo 2

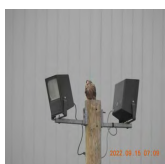


Photo 3



Photo 4



Photo 5

Estimated Time of Death	Hours
--------------------------------	-------

End of Environment Call-out	15.09.2022 07:20 MDT
------------------------------------	----------------------

Final Location of Carcass

Moved Carcass off the road to the tundra side of the pipe berm near pond 10. Close enough for the raptors to return to the carcass.

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5

Wildlife Report - 2021

Ducks-2022-08-25

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Ducks-2022-08-25	
Document No.				WildlifeReport000224	
				26.08.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	25.08.2022 07:00 MDT
Department/Individual Who Reported Mortality:	
Supervisor of the backfill department.	
Environment at Call-out Location	25.08.2022 07:00 MDT
Location	
Back fill Plant	
Animal Type	Other
Description of Animal/Scene	
Ducks, three dead ducks, looks like necks were broken, dent marks on walkway of building.	
Photo of Scene	
 Photo 1	 Photo 2
 Photo 3	 Photo 4
Estimated Time of Death	Hours
End of Environment Call-out	25.08.2022 07:30 MDT
Final Location of Carcass	
Environment Freezer	
Closure & Sign-off	
Wildlife Report Complete	On
Signature	

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Wildlife Report - 2021

Complete

Score	100%	Failed items	0	Actions	0
-------	------	--------------	---	---------	---

Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location)

Document No.

WildlifeReport000167

Completed On

11 Mar 2022

Audit	100%
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Wildlife Report

Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report

10 Mar 2022 13:30 MST

Department/Individual Who Reported Mortality:

Environment

Environment On Scene

Environment at Call-out Location

10 Mar 2022 14:00 MST

Location

Waste transfer area near land farm

Animal Type

Fox

Description of Animal/Scene

Environment and waste transfer staff had earlier reported a fox with significant injuries in the waste transfer area. The injured fox was euthanized on the advice of and following procedures directed by the Government of the Northwest Territories, Department of Environment and Natural Resources (GNWT-ENR).

Photo of Scene



Photo 1



Photo 2



Photo 3



Photo 4

Estimated Time of Death

Hours

Environment Off Scene

End of Environment Call-out

10 Mar 2022 14:30 MST

Final Location of Carcass

Carcass was packaged and brought to Environment freezer for interim storage before being shipped off site to ENR.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Brett Potter

11 Mar 2022 08:55 MST

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Hare - 2022-08-09 - Powerhouse 2

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Hare - 2022-08-09 - Powerhouse 2	
Document No.				WildlifeReport000221	
				09.08.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	09.08.2022 07:00 MDT
Department/Individual Who Reported Mortality:	Powerhouse 2 personnel
Environment at Call-out Location	09.08.2022 10:30 MDT
Location	Near back entrance of the Powerhouse 2 building.
Animal Type	Other
Description of Animal/Scene	Single deceased hare located beside the back entrance of the Powerhouse 2 building. Carcass appears to been scavenged upon.

Photo of Scene



Photo 1



Photo 2

Estimated Time of Death	Hours
End of Environment Call-out	09.08.2022 11:30 MDT
Final Location of Carcass	Waste Transfer Facility

Closure & Sign-off

100%

Wildlife Report Complete	On
Signature	Anton Jitnikovitch

Anton Jitnikovitch

09.08.2022 14:32 MDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Hare - 2022-10-10 - Road near Waste Transfer

Complete

Score	100%	Flagged items	0	Actions	0
-------	------	---------------	---	---------	---

Audit Title (Animal - yyyy-mm-dd - Location)	Hare - 2022-10-10 - Road near Waste Transfer
Document No.	WildlifeReport000238
	10.10.2022

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	10.10.2022 06:30 PDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

A21 Pit Supervisor

Environment at Call-out Location	10.10.2022 05:45 PDT
---	----------------------

Location

Middle of the road near Waste Transfer - on the way to the PKC Muster

Animal Type	Other
--------------------	-------

Description of Animal/Scene

Dead hare, some fur patches scattered throughout the area. Fresh carcass - body was still warm.

Photo of Scene



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5

Estimated Time of Death	Hours
--------------------------------	-------

End of Environment Call-out	10.10.2022 06:00 PDT
------------------------------------	----------------------

Final Location of Carcass

Freezer in the Environment Sulfur Lab

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Anton Jitnikovitch

Anton Jitnikovitch
10.10.2022 07:17 PDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5

Wildlife Report - 2021

Hare - 2022-10-30 - Near Powerhouse Entrance

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Hare - 2022-10-30 - Near Powerhouse Entrance	
Document No.				WildlifeReport000241	
				30.10.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	30.10.2022 05:40 PDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

Site Services

Environment at Call-out Location	30.10.2022 06:00 PDT
---	----------------------

Location

Entrance to Powerhouse

Animal Type	Other
--------------------	-------

Description of Animal/Scene

Deceased hare in the middle of the road.

Photo of Scene



Photo 1

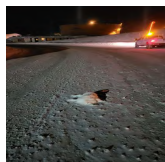


Photo 2



Photo 3

Estimated Time of Death	Hours
End of Environment Call-out	30.10.2022 06:15 PDT
Final Location of Carcass	Freezer in Environment Sulfur Lab

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Anton Jitnikovitch

Anton Jitnikovitch
30.10.2022 16:55 PDT

Appendix



Photo 1

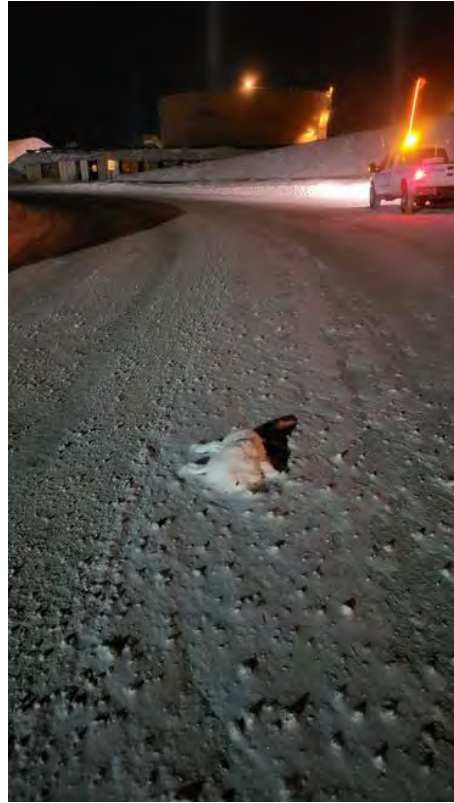


Photo 2



Photo 3

Wildlife Report - 2021

Ptarmigan 2022-10-19 - Till Pile

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Ptarmigan 2022-10-19 - Till Pile	
Document No.				WildlifeReport000239	
				20.10.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	19.10.2022 10:30 PDT
Department/Individual Who Reported Mortality:	
Surface Ops	
Environment at Call-out Location	19.10.2022 11:00 PDT
Location	
Till Pile	
Animal Type	Other
Description of Animal/Scene	
Remains of ptarmigan at scene found by personnel. Evidence suggests animal/raptor kill.	
Photo of Scene	
	
Photo 1	
Estimated Time of Death	
End of Environment Call-out	19.10.2022 11:00 PDT
Final Location of Carcass	
Environment lab freezer	

Closure & Sign-off

100%

Wildlife Report Complete	On
Signature	

Dylan Price
20.10.2022 08:08 PDT

Appendix



Photo 1

Wildlife Report - 2021

Ptarmigan - 2022-11-17 - A21 Zone 3

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Ptarmigan - 2022-11-17 - A21 Zone 3	
Document No.				WildlifeReport000242	
				18.11.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	17.11.2022 09:00 PST			
Department/Individual Who Reported Mortality:				
Surface Geotechnical				
Environment at Call-out Location	17.11.2022 13:00 PST			
Location				
A21 Zone 3, TEAM DRILLING laydown				
Animal Type	Other			
Description of Animal/Scene				
Ptarmigan carcass on ground on north side of A21 pit in Zone 3 laydown. Raven in area scavenging when initially sighted. Head and most flesh removed from carcass, more than likely post-mortem. Cause of death unknown.				
Photo of Scene				
 Photo 1	 Photo 2	 Photo 3	 Photo 4	 Photo 5
Estimated Time of Death	Days			
End of Environment Call-out	17.11.2022 13:30 PST			
Final Location of Carcass				
Environment sulfur lab freezer				
Closure & Sign-off	100%			
Wildlife Report Complete	On			
Signature				

Justin Macek
18.11.2022 08:25 PST

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5

Wildlife Report - 2021

Ptarmigan - 2022-12-27 - Airport Road

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Ptarmigan - 2022-12-27 - Airport Road	
Document No.				WildlifeReport000243	
				27.12.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	27.12.2022 09:30 PST				
Department/Individual Who Reported Mortality:					
Site Services					
Environment at Call-out Location	27.12.2022 10:05 PST				
Location					
Airport Road					
Animal Type	Other				
Description of Animal/Scene					
Ptarmigan was found in the center of the median on Airport Road. Ptarmigan was frozen to the ground and appeared to have be run over - unclear if it was run over before or after death.					
Photo of Scene					
					
Photo 1	Photo 2	Photo 3	Photo 4	Photo 5	Photo 6

Estimated Time of Death	Hours
End of Environment Call-out	27.12.2022 10:30 PST
Final Location of Carcass	
Environment Sulfur Lab freezer	

Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Anton Jitnikovitch	

Anton Jitnikovitch

27.12.2022 10:57 PST

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

Wildlife Report - 2021

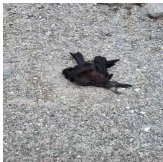
Raven - 2022-07-16 - A154 Dike

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)			Raven - 2022-07-16 - A154 Dike		
Document No.			WildlifeReport000209		
			16.07.2022		

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	16.07.2022 10:30 MDT		
Department/Individual Who Reported Mortality:			
Geotechnical Staff Member			
Environment at Call-out Location	16.07.2022 13:15 MDT		
Location			
Eastern A154 Dike			
Animal Type	Other		
Raven			
Description of Animal/Scene			
Lifeless raven found along the eastern portion of the A154 Dike. Raven body was mainly intact with a wound/some damage on its left body/wing. Carcass was relatively fresh - some maggots/carcass feeders present and appeared to just recently begin feeding on the underside of the wound.			
Photo of Scene			
			
Photo 1	Photo 2	Photo 3	Photo 4

Estimated Time of Death	Hours
End of Environment Call-out	16.07.2022 13:20 MDT
Final Location of Carcass	
Environment Sulfur Lab Freezer	
Closure & Sign-off	100%
Wildlife Report Complete	On

Signature

A handwritten signature in black ink, reading "Anton Jitnikovitch". The script is cursive and fluid, with the first name "Anton" and last name "Jitnikovitch" clearly distinguishable.

Anton Jitnikovitch
16.07.2022 16:16 MDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Rough Legged Hawk 2022-08-29 A21 Dike

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Rough Legged Hawk 2022-08-29 A21 Dike	
Document No.				WildlifeReport000225	
				30.08.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	29.08.2022 15:21 MDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

Surface Mining

Environment at Call-out Location	30.08.2022 15:42 MDT
---	----------------------

Location

A21 Dike

Animal Type	Other
--------------------	-------

Description of Animal/Scene

Rough Legged Hawk heavily scavenged lying on the roadway atop the A21 dike. Near former Rough Legged Hawk nest on the south ramp of A21. Unknown cause of death.

Photo of Scene



Photo 1

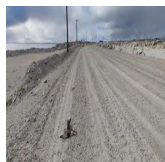


Photo 2

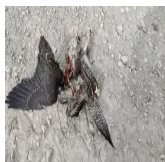


Photo 3

Estimated Time of Death	Hours
--------------------------------	-------

End of Environment Call-out	30.08.2022 15:50 MDT
------------------------------------	----------------------

Final Location of Carcass

Stored in freezer until GNWT - ENR confirmation, then may be incinerated or shipped to GNWT - ENR for analysis.

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Gord Cumming
30.08.2022 16:08 MDT

Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Hawk-2022-09-04

Complete

Score	100%	Flagged items	0	Actions	0
-------	------	---------------	---	---------	---

Audit Title (Animal - yyyy-mm-dd - Location)

Hawk-2022-09-04

Document No.

WildlifeReport000227

04.09.2022

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	04.09.2022 11:00 MDT
Department/Individual Who Reported Mortality:	Clinton, Geotech
Environment at Call-out Location	04.09.2022 11:15 MDT
Location	East end of A21 dike
Animal Type	Other

Description of Animal/Scene

Hawk called in in the middle of the road on the A21 dike. Found with a hole in its chest, which the reporter indicated had been caused by a scavenging seagull, but otherwise intact. Cause of death unknown.

Photo of Scene

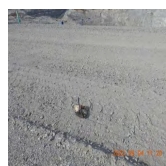


Photo 1



Photo 2



Photo 3



Photo 4

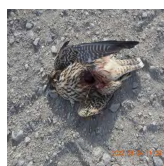


Photo 5



Photo 6

Estimated Time of Death	Hours
End of Environment Call-out	04.09.2022 11:30 MDT
Final Location of Carcass	Stored in environment freezer until GNWT-ENR confirmation, then may be incinerated or shipped to GNWT-ENR for analysis
Closure & Sign-off	100%
Wildlife Report Complete	On

Signature

Brennan Debassige
04.09.2022 12:06 MDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

APPENDIX I

Site Wildlife Photos, 2022



Figure 1: Barren-ground caribou (*Rangifer tarandus groenlandicus*). 29 July 2022.



Figure 2: Moose (*Alces alces*). 12 August 2022.



Figure 3: Grizzly bear (*Ursus arctos*) sow and cubs. 6 June 2022.



Figure 4: Grizzly bear. 18 June 2022



Figure 5: Grizzly bear sow and cub. 23 July 2022.



Figure 6: Red fox (*Vulpes vulpes*). 8 June 2022.



Figure 7: Arctic hare (*Lepus arcticus*). 30 June 2022.



Figure 8: Nesting peregrine falcon (*Falco peregrinus*). 4 June 2022.

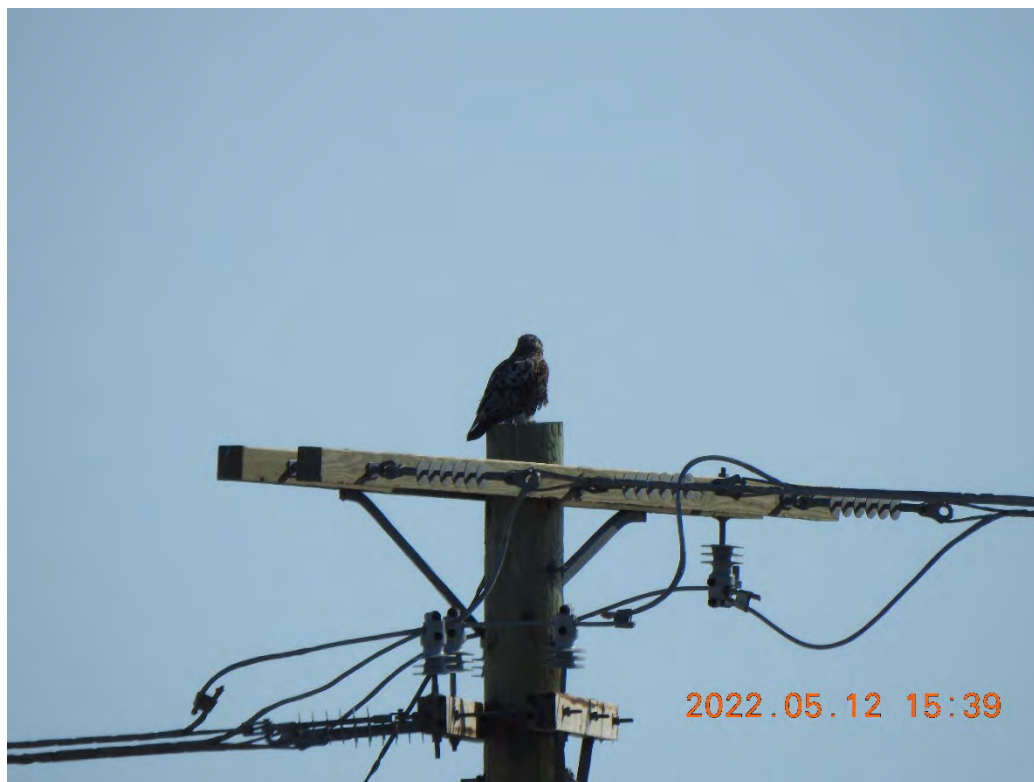


Figure 9: Rough-legged hawk (*Buteo lagopus*). 12 May 2022.



Figure 10: Eggs of American robin (*Turdus migratorius*). 10 June 2022.



Figure 11: Common ravens (*Corvus corax*) 9 June 2022.



Figure 12: Greater white-fronted geese (*Anser albifrons*). 12 May 2022.



Figure 13: Red-necked phalarope (*Phalaropus lobatus*). 12 June 2022.



Figure 14: Willow ptarmigan (*Lagopus lagopus*). 3 May 2022.

APPENDIX J

**Caribou Incidental
Observations Summary, 2022**

Date	Number of Caribou	Description
2022-03-05	31	Group of 31 caribou heading NE on Lac de Gras, south of RTX drill site near A21.
2022-04-17	1	East of PKC near Pond 3
2022-04-27	1	Caribou leg
2022-06-03	1	North Inlet near the pipe outlets
2022-06-05	1	-
2022-06-06	1	-
2022-06-07	1	Grasslands between North Inlet and Airport.
2022-06-08	1	North Inlet
2022-06-08	1	Pond 7
2022-06-13	1	ROM Hill to E21 Sump
2022-06-16	2	Airport Road near North Inlet Water Treatment Plant
2022-06-17	2	Airport Road near North Inlet Water Treatment Plant
2022-06-23	1	Shallow bay area near Rose garden
2022-06-25	1	South haul road and up ROM hill to tundra near Pond 12
2022-06-27	2	Grazing beside Airport Road
2022-07-02	1	Single Caribou on Airport road
2022-07-03	1	Single Caribou on North Haul Road
2022-07-05	1	Single Caribou on Airport Runway
2022-07-05	1	Single Caribou on Airport road
2022-07-06	1	Single Caribou crossing North Haul road towards batch plant
2022-07-08	1	(1) Storage Tank Farm to Communication Shack (2) Road adjacent to BB Dormitories towards vegetation patch near Pond 10
2022-07-14	1	North Inlet Water Treatment Plant
2022-07-15	1	Vegetation Patch adjacent to the North Inlet Water Treatment Plant
2022-07-18	3	Airport landing strip, and vegetation patch
2022-07-29	2	Tundra north of airport road, North Inlet
2022-07-31	1	Shallow bay area near Rose garden
2022-08-05	1	A21 muster, South Tank Farm, kitchen loading area
2022-08-05	1	Tundra south of airport road
2022-08-21	2	A21 Dike and Lakeshore Blvd.
2022-08-24	2	A21 Lakeshore Boulevard
2022-08-24	2	Near Emulsion Plant and Magazine Storage
2022-10-19	1	West cell access road, PKC

APPENDIX K

**Grizzly Bear Incidental
Observations Summary, 2022**

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-05-03	1	Unknown, spotted by pilot from air	Grizzly (unknown sex) spotted 3.5 miles south of camp by RTX helicopter	No
2022-05-09	1	Dark Grizzly, unknown ID,	Spotted on ice heading towards A21 muster. Turned around and returned West along coastline	No
2022-05-18	3	Sow and two very young cubs, possibly mother of resident bear	Seen near A21 muster moving toward SCRP	Yes
2022-05-18	3	Sow and two very young cubs, possibly mother of resident bear	Seen on south haul road heading toward backfill plant	Yes
2022-05-20	1	Single grizzly, unknown sex. RTX took photos from a distance, looks quite dark brown	Spotted moving towards Diavik on ice from A154 dike	No
2022-05-22	3	Sow and two very young cubs, possibly mother of resident bear	Seen on the south haul road near the truck shop	Yes
2022-05-23	3	Sow and two very young cubs, possibly mother of resident bear	Seen on the south haul road before climbing rock pile to north haul road	Yes
2022-05-25	3	Sow and two very young cubs, possibly mother of resident bear	Seen at base of NCRP beside airport road before climbing the rock pile	No
2022-05-26	3	Sow and two very young cubs, possibly mother of resident bear	Seen moving between the landfill and shallow bays, large amount of unsegregated waste (and oil spill) found in landfill	No
2022-05-31	1	Dark brown, unknown sex	Tundra directly south of North Inlet. Directly in between airport area and water treatment plant	No
2022-06-01	1	Dark brown, unknown sex	Bottom of A418 pit	Yes
2022-06-03	1	Single youth from previous two years. Last year was first year on its own. Same bear that was relocated with its mother	South Tank Farm to North Inlet	Yes
2022-06-04	3	Sow and two very young cubs, possibly mother of resident bear	A21	No
2022-06-05	3	Sow and two very young cubs, possibly mother of resident bear	A21	No

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-06-08	3	Sow and two very young cubs, possibly mother of resident bear	Backfill loadout and S Haul Road	Yes
2022-06-09	3	Sow and two very young cubs, possibly mother of resident bear	Backfill to Shallow Bay (past Underground Portal work area)	Yes
2022-06-10	1	Adolescent Grizzly (primarily blonde with darker brown near its behind)	Crusher ROM to ERT	Yes
2022-06-10	3	Sow and two very young cubs	A418 Dike	Yes
2022-06-11	3	Sow and two very young cubs	SCAP Yard	Yes
2022-06-11	1	Adolescent Grizzly (primarily blonde with darker brown near its behind)	Crusher ROM to NCRP	Yes
2022-06-13	3	Sow and two very young cubs	Till Pile to North Inlet	Yes
2022-06-13	1	Adolescent Grizzly <i>named Dipstick</i> (primarily blonde with darker brown near its behind)	D1 laydown, geology core shack	Yes
2022-06-14	3	Sow and two very young cubs	Geology Shack within D1 Laydown	Yes
2022-06-15	3	Sow and two very young cubs	South Haul Road to SCAP to UG Portal Laydown area, to Pond 13, to Shallow Bay area	Yes
2022-06-15	1	Single Grizzly - blonde with darker patches around the legs and arms	Intersection of Backfill Plant and South Haul Road	No
2022-06-15	1	Single Grizzly - very blonde with darker patches around the legs and arms	Geology Shack to ERT Training Grounds vegetation patch	Yes
2022-06-16	1	Single Grizzly - very blonde with darker patches around the legs and arms. Dark brown fur, surrounded by blonde fur, on the underside of the front arms.	Geology Shack to ERT Training Grounds vegetation patch	Yes
2022-06-16	1	Sow and two very young cubs	Vegetation Patch beside Pond 5	No

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-06-16	1	Single Grizzly - very blonde with darker patches around the legs and arms. Dark brown fur, surrounded by blonde fur, on the underside of the front arms.	D1 Laydown to Fresh Air Raise	Yes
2022-06-16	3	Sow and two very young cubs	Metcon Laydown	No
2022-06-17	3	Sow and two very young cubs	Refueling Bay beside Metcon Laydown	No
2022-06-17	1	Single large Grizzly, blonde color with small white patch in between eyes	(1) and (2) Geology Shack to A154 Dike area	Yes
2022-06-18	1	Single large Grizzly, blonde color with small white patch in between eyes	(1) Backfill to Shallow Bay, (2) Backfill to ERT Training Grounds Veg. Patch	Yes
2022-06-20	3	Sow and two very young cubs	Storage Tank Farm to Pond 11	Yes
2022-06-22	3	Sow and two cubs	Spotted on A21 haul road walking toward pit shop, moved to AN road	No
2022-06-27	1	Unknown	Spotted on approach road heading toward the runway, later spotted on Ice north of 154	No
2022-07-10	2	Same sow as before but only one cub	Near start of A418 dyke SE of north mine dry area	No
2022-07-15	2	Sow and one very young cub	(1) ERT Training Grounds (2) Backfill Plant to Shallow Bay (3) Backfill Plant to Shallow Bay	Yes
2022-07-19	2	Sow and one very young cub	Sow and cub reported breaking into a bin of oily rags at the south tank farm	No
2022-07-22	2	Sow and young cub	Sow and cub hanging around PKC barge road	No
2022-07-23	4	Sow and three young cubs. Seem to be new to island. 2 brown cubs and 1 quite blonde.	Vegetation patch behind ERT training area	No
2022-07-25	2	Sow and 1 cub, formerly the sow with 2 cubs.	South Tank Farm to Tundra by Lakeshore Boulevard	Yes
2022-07-26	1	Single male	A21 muster station	No
2022-07-26	4	sow and 3 cubs	Batch plant to till pile, finally resting in veg patch behind ERT training area	No
2022-07-26	2	sow and 1 cub	South Tank Farm	No

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-07-27	4	Sow and 3 cubs in waste bin at batch plant.	Batch plant to North/South haul road intersection	Yes
2022-07-27	2	Sow and 1 cub	Tundra near North Winter Road Approach	No
2022-07-28	2	Sow and 1 cub	off site over the pipe on west side of PKC.	No
2022-07-29	4	Sow and 3 cubs	Airport road by the airport	No
2022-07-29	2	sow and 1 cub	A21 dike south entrance	No
2022-07-30	4	Sow and 3 cubs	Batch plant to north winter road approach/SWRA	Yes
2022-07-31	4	Sow and 3 cubs	Main Accommodations to shallow bays	No
2022-07-31	2	Sow and 1 cub	Shallow bay area near Rose garden	No
2022-08-01	4	sow and 3 cubs	C Portal to A154 infield	No
2022-08-02	4	Sow and 3 cubs	Airport entrance heading West	No
2022-08-02	1	Single Male - blonde, adult	near A21 muster station	No
2022-08-03	2	Sow and single cub	Pond 10, shallow bays	Yes
2022-08-04	2	Sow and single cub	North/South haul road intersection, backfill loadout	Yes
2022-08-07	2	Sow and single cub	South haul road, heading south towards backfill, into shallow bays	No
2022-08-21	2	Sow and single cub - cub has a white patch of fur on its front right shoulder.	Hockey Rink to B-Dorm to Shallow Bay to Vegetation Patch south of Backfill Plant	Yes
2022-09-10	1	Single grizzly	Single grizzly in D1 laydown near top of 418	No
2022-09-15	2	Brown Sow and single yearling cub	Till Pile to 154 Infield to North Inlet	Yes
2022-09-19	2	Brown Sow and single yearling cub	Metcon to Lakeshore boulevard	Yes
2022-09-22	2	Sow and single cub	North side of till pile near NIWTP	No
2022-09-20	2	Sow and single cub	South of South Tank Farm	No
2022-09-22	2	Sow and single cub	Landfill to PKC	No
2022-09-24	2	Sow and single cub	Waste transfer to SCRP	No
2022-09-25	2	Sow and single cub	Tundra between mag storage and SCRP	No
2022-09-26	2	Sow and single cub	PKC muster to AN road and mag storage	No
2022-09-26	2	Sow and single cub	PKC muster to area west of test piles	Yes
2022-09-27	2	Sow and single cub	Tundra between mag storage and SCRP	No

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-09-28	2	Sow and single cub	Tundra west of A21 pit shop, heading north to PKC	Yes
2022-09-29	2	Sow and single cub	Near the California Trailer	No
2022-10-01	2	Sow and single cub	SCRP Hanging Tree	No
2022-10-21	1	Single, large (male?) grizzly, very dark brown/almost black	Airport, core shack, North Approach	No

APPENDIX L

**Wildlife Deterrent Action
Incident Reports, 2022**

Wildlife Report - 2021

2022-04-27 - Caribou Leg @ Dump 7

Complete

Score	100%	Flagged items	0	Actions	0
-------	------	---------------	---	---------	---

Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location)	2022-04-27 - Caribou Leg @ Dump 7
Document No.	WildlifeReport000170

Completed On

29 Apr 2022

Wildlife Report

Type of Wildlife Report

General sighting / Other

Report Type

Sighting

Severed caribou leg found near dump 7

General Wildlife Sighting

Animal Type

Caribou

Description of Individual / Activity (eg. number of individuals, colour, age, size, etc.)

Single severed caribou lower leg segment found on top of snow bank adjacent to Dump 7.

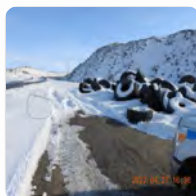
Photo (If Possible)

Photo 1

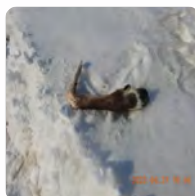


Photo 2



Photo 3



Photo 4

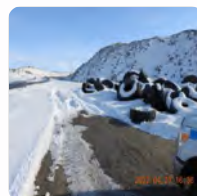


Photo 5

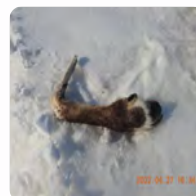


Photo 6

Enter Initial Time of Wildlife Sighting

27 Apr 2022 15:00 MDT

Department/Individual Who Reported Wildlife:

Specimen was first seen and reported by Fountain Tire, who contacted Truck Shop Supervisor and message was relayed to Environment team shortly after.

Environment On Scene**Environment at Call-out Location**

27 Apr 2022 17:00 MDT

Chronological Events

~ 15:00 - Fountain Tire employees were dumping old tires at Dump #7, a designated tire disposal area just off the 154 haul road. At that time they noticed a severed caribou leg resting on top of the snow adjacent to the dump area. Sighting was discussed with truck shop, who then relayed the message to Environment.

~ 17:00 - Environment arrived on site and quickly spotted the severed leg. Photos were taken of the specimen and the area and the leg was bagged and brought to waste transfer for incineration. No sign of wildlife or wildlife tracks in area that would explain the leg segment being deposited in that area.

Movement Map (Import NotePlus Site Map)**Environment Off Scene****End of Environment Call-out**

27 Apr 2022 18:00 MDT

Final Location of Wildlife

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Justin Macek

29 Apr 2022 15:06 MDT



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

Wildlife Report - 2021

Duck Mortality - 2022-09-04 Airport Apron

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Duck Mortality - 2022-09-04 Airport Apron	
Document No.				WildlifeReport000226	
				04.09.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	04.09.2022 08:10 MDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

Airport Control Tower

Environment at Call-out Location	04.09.2022 08:51 MDT
---	----------------------

Location

Airport apron

Animal Type	Other
--------------------	-------

Description of Animal/Scene

Duck lying on east side of apron. Breast ripped out and blood stain on ground, appears to have been killed by raptor.

Photo of Scene

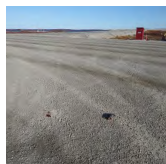


Photo 1



Photo 2

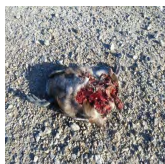


Photo 3

Estimated Time of Death	Hours
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End of Environment Call-out	04.09.2022 09:01 MDT
------------------------------------	----------------------

Final Location of Carcass

Stored in freezer until GNWT-ENR confirmation, then may be incinerated or shipped to GNWT-ENR for analysis

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Nicole Goodman
04.09.2022 11:45 MDT

Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Duck Predation - 2022-09-15 Truck shop
Megadome

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Duck Predation - 2022-09-15 Truck shop Megadome	
Document No.				WildlifeReport000228	
				15.09.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	15.09.2022 07:00 MDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

Site vehicles

Environment at Call-out Location	15.09.2022 07:10 MDT
---	----------------------

Location

In middle of road between truck shop parking lot and megadome storage tent.

Animal Type	Other
--------------------	-------

Description of Animal/Scene

One duck assumed dead from PEFA or RLHA attack lying on the road with a Rough Legged Hawk standing on the partially eaten carcass. 2 Peregrine Falcons on the road nearby squawking at the RLHA. Vehicles passing by around the carcass.

Photo of Scene



Photo 1



Photo 2

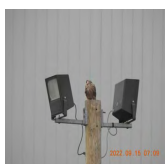


Photo 3



Photo 4



Photo 5

Estimated Time of Death	Hours
--------------------------------	-------

End of Environment Call-out	15.09.2022 07:20 MDT
------------------------------------	----------------------

Final Location of Carcass

Moved Carcass off the road to the tundra side of the pipe berm near pond 10. Close enough for the raptors to return to the carcass.

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5

Wildlife Report - 2021

Ducks-2022-08-25

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Ducks-2022-08-25	
Document No.				WildlifeReport000224	
				26.08.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	25.08.2022 07:00 MDT
Department/Individual Who Reported Mortality:	
Supervisor of the backfill department.	
Environment at Call-out Location	25.08.2022 07:00 MDT
Location	
Back fill Plant	
Animal Type	Other
Description of Animal/Scene	
Ducks, three dead ducks, looks like necks were broken, dent marks on walkway of building.	
Photo of Scene	
 Photo 1	 Photo 2
 Photo 3	 Photo 4
Estimated Time of Death	Hours
End of Environment Call-out	25.08.2022 07:30 MDT
Final Location of Carcass	
Environment Freezer	
Closure & Sign-off	
Wildlife Report Complete	On
Signature	

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Wildlife Report - 2021

Complete

Score	100%	Failed items	0	Actions	0
-------	------	--------------	---	---------	---

Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location)

Document No.

WildlifeReport000167

Completed On

11 Mar 2022

Audit	100%
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Wildlife Report

Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report

10 Mar 2022 13:30 MST

Department/Individual Who Reported Mortality:

Environment

Environment On Scene

Environment at Call-out Location

10 Mar 2022 14:00 MST

Location

Waste transfer area near land farm

Animal Type

Fox

Description of Animal/Scene

Environment and waste transfer staff had earlier reported a fox with significant injuries in the waste transfer area. The injured fox was euthanized on the advice of and following procedures directed by the Government of the Northwest Territories, Department of Environment and Natural Resources (GNWT-ENR).

Photo of Scene



Photo 1



Photo 2



Photo 3



Photo 4

Estimated Time of Death

Hours

Environment Off Scene

End of Environment Call-out

10 Mar 2022 14:30 MST

Final Location of Carcass

Carcass was packaged and brought to Environment freezer for interim storage before being shipped off site to ENR.

Closure & Sign-off

100%

Wildlife Report Complete

On

Private & Confidential

2/4

Signature

Brett Potter

11 Mar 2022 08:55 MST

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Hare - 2022-08-09 - Powerhouse 2

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Hare - 2022-08-09 - Powerhouse 2	
Document No.				WildlifeReport000221	
				09.08.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	09.08.2022 07:00 MDT
Department/Individual Who Reported Mortality:	Powerhouse 2 personnel
Environment at Call-out Location	09.08.2022 10:30 MDT
Location	Near back entrance of the Powerhouse 2 building.
Animal Type	Other
Description of Animal/Scene	Single deceased hare located beside the back entrance of the Powerhouse 2 building. Carcass appears to been scavenged upon.

Photo of Scene



Photo 1



Photo 2

Estimated Time of Death	Hours
End of Environment Call-out	09.08.2022 11:30 MDT
Final Location of Carcass	Waste Transfer Facility

Closure & Sign-off

100%

Wildlife Report Complete	On
Signature	Anton Jitnikovitch

Anton Jitnikovitch

09.08.2022 14:32 MDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Hare - 2022-10-10 - Road near Waste Transfer

Complete

Score	100%	Flagged items	0	Actions	0
-------	------	---------------	---	---------	---

Audit Title (Animal - yyyy-mm-dd - Location)	Hare - 2022-10-10 - Road near Waste Transfer
Document No.	WildlifeReport000238
	10.10.2022

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	10.10.2022 06:30 PDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

A21 Pit Supervisor

Environment at Call-out Location	10.10.2022 05:45 PDT
---	----------------------

Location

Middle of the road near Waste Transfer - on the way to the PKC Muster

Animal Type	Other
--------------------	-------

Description of Animal/Scene

Dead hare, some fur patches scattered throughout the area. Fresh carcass - body was still warm.

Photo of Scene



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5

Estimated Time of Death	Hours
--------------------------------	-------

End of Environment Call-out	10.10.2022 06:00 PDT
------------------------------------	----------------------

Final Location of Carcass

Freezer in the Environment Sulfur Lab

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Anton Jitnikovitch

Anton Jitnikovitch
10.10.2022 07:17 PDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5

Wildlife Report - 2021

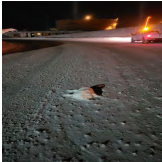
Hare - 2022-10-30 - Near Powerhouse Entrance

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Hare - 2022-10-30 - Near Powerhouse Entrance	
Document No.				WildlifeReport000241	
				30.10.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	30.10.2022 05:40 PDT
Department/Individual Who Reported Mortality:	
Site Services	
Environment at Call-out Location	30.10.2022 06:00 PDT
Location	
Entrance to Powerhouse	
Animal Type	Other
Description of Animal/Scene	
Deceased hare in the middle of the road.	
Photo of Scene	
	
Photo 1	Photo 2
	
Photo 3	
Estimated Time of Death	Hours
End of Environment Call-out	30.10.2022 06:15 PDT
Final Location of Carcass	
Freezer in Environment Sulfur Lab	
Closure & Sign-off	
100%	
Wildlife Report Complete	On
Signature	

Anton Jitnikovitch

Anton Jitnikovitch
30.10.2022 16:55 PDT

Appendix



Photo 1

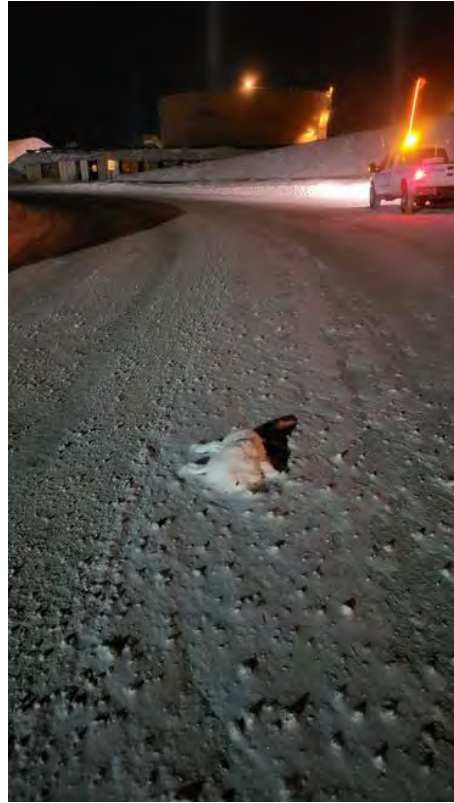


Photo 2



Photo 3

Wildlife Report - 2021

Ptarmigan 2022-10-19 - Till Pile

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)			Ptarmigan 2022-10-19 - Till Pile		
Document No.			WildlifeReport000239		
			20.10.2022		

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	19.10.2022 10:30 PDT
Department/Individual Who Reported Mortality:	
Surface Ops	
Environment at Call-out Location	19.10.2022 11:00 PDT
Location	
Till Pile	
Animal Type	Other
Description of Animal/Scene	
Remains of ptarmigan at scene found by personnel. Evidence suggests animal/raptor kill.	
Photo of Scene	
	
Photo 1	
Estimated Time of Death	
End of Environment Call-out	19.10.2022 11:00 PDT
Final Location of Carcass	
Environment lab freezer	

Closure & Sign-off

100%

Wildlife Report Complete	On
Signature	

Dylan Price
20.10.2022 08:08 PDT

Appendix



Photo 1

Wildlife Report - 2021

Ptarmigan - 2022-11-17 - A21 Zone 3

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Ptarmigan - 2022-11-17 - A21 Zone 3	
Document No.				WildlifeReport000242	
				18.11.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	17.11.2022 09:00 PST
Department/Individual Who Reported Mortality:	Surface Geotechnical
Environment at Call-out Location	17.11.2022 13:00 PST
Location	A21 Zone 3, TEAM DRILLING laydown
Animal Type	Other

Description of Animal/Scene

Ptarmigan carcass on ground on north side of A21 pit in Zone 3 laydown. Raven in area scavenging when initially sighted. Head and most flesh removed from carcass, more than likely post-mortem. Cause of death unknown.

Photo of Scene



Photo 1



Photo 2

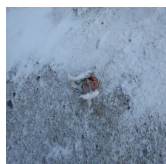


Photo 3



Photo 4



Photo 5

Estimated Time of Death	Days
End of Environment Call-out	17.11.2022 13:30 PST
Final Location of Carcass	Environment sulfur lab freezer

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Justin Macek
18.11.2022 08:25 PST

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5

Wildlife Report - 2021

Ptarmigan - 2022-12-27 - Airport Road

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Ptarmigan - 2022-12-27 - Airport Road	
Document No.				WildlifeReport000243	
				27.12.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	27.12.2022 09:30 PST
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Department/Individual Who Reported Mortality:

Site Services

Environment at Call-out Location	27.12.2022 10:05 PST
---	----------------------

Location

Airport Road

Animal Type	Other
--------------------	-------

Description of Animal/Scene

Ptarmigan was found in the center of the median on Airport Road. Ptarmigan was frozen to the ground and appeared to have be run over - unclear if it was run over before or after death.

Photo of Scene



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

Estimated Time of Death	Hours
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End of Environment Call-out	27.12.2022 10:30 PST
------------------------------------	----------------------

Final Location of Carcass

Environment Sulfur Lab freezer

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Anton Jitnikovitch

Anton Jitnikovitch

27.12.2022 10:57 PST

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

Wildlife Report - 2021

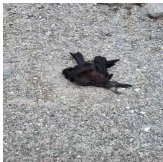
Raven - 2022-07-16 - A154 Dike

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)			Raven - 2022-07-16 - A154 Dike		
Document No.			WildlifeReport000209		
			16.07.2022		

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	16.07.2022 10:30 MDT		
Department/Individual Who Reported Mortality:			
Geotechnical Staff Member			
Environment at Call-out Location	16.07.2022 13:15 MDT		
Location			
Eastern A154 Dike			
Animal Type	Other		
Raven			
Description of Animal/Scene			
Lifeless raven found along the eastern portion of the A154 Dike. Raven body was mainly intact with a wound/some damage on its left body/wing. Carcass was relatively fresh - some maggots/carcass feeders present and appeared to just recently begin feeding on the underside of the wound.			
Photo of Scene			
			
Photo 1	Photo 2	Photo 3	Photo 4

Estimated Time of Death	Hours
End of Environment Call-out	16.07.2022 13:20 MDT
Final Location of Carcass	
Environment Sulfur Lab Freezer	
Closure & Sign-off	100%
Wildlife Report Complete	On

Signature

A handwritten signature in black ink that reads "Anton Jitnikovitch". The script is cursive and fluid.

Anton Jitnikovitch
16.07.2022 16:16 MDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Rough Legged Hawk 2022-08-29 A21 Dike

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Rough Legged Hawk 2022-08-29 A21 Dike	
Document No.				WildlifeReport000225	
				30.08.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	29.08.2022 15:21 MDT
-------------------------------------	----------------------

Department/Individual Who Reported Mortality:

Surface Mining

Environment at Call-out Location	30.08.2022 15:42 MDT
---	----------------------

Location

A21 Dike

Animal Type	Other
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Description of Animal/Scene

Rough Legged Hawk heavily scavenged lying on the roadway atop the A21 dike. Near former Rough Legged Hawk nest on the south ramp of A21. Unknown cause of death.

Photo of Scene



Photo 1

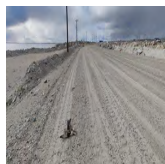


Photo 2

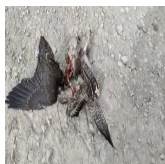


Photo 3

Estimated Time of Death	Hours
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End of Environment Call-out	30.08.2022 15:50 MDT
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Final Location of Carcass

Stored in freezer until GNWT - ENR confirmation, then may be incinerated or shipped to GNWT - ENR for analysis.

Closure & Sign-off

100%

Wildlife Report Complete	On
---------------------------------	----

Signature

Gord Cumming
30.08.2022 16:08 MDT

Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Hawk-2022-09-04

Complete

Score	100%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Hawk-2022-09-04	
Document No.				WildlifeReport000227	
				04.09.2022	

Audit	100%
Type of Wildlife Report	General sighting / Other
Report Type	Mortality

Wildlife Mortality

Enter Initial Time of Report	04.09.2022 11:00 MDT
Department/Individual Who Reported Mortality:	Clinton, Geotech
Environment at Call-out Location	04.09.2022 11:15 MDT
Location	East end of A21 dike
Animal Type	Other

Description of Animal/Scene

Hawk called in in the middle of the road on the A21 dike. Found with a hole in its chest, which the reporter indicated had been caused by a scavenging seagull, but otherwise intact. Cause of death unknown.

Photo of Scene

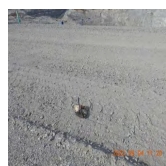


Photo 1



Photo 2



Photo 3



Photo 4

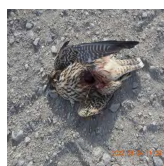


Photo 5



Photo 6

Estimated Time of Death	Hours
End of Environment Call-out	04.09.2022 11:30 MDT
Final Location of Carcass	Stored in environment freezer until GNWT-ENR confirmation, then may be incinerated or shipped to GNWT-ENR for analysis
Closure & Sign-off	100%
Wildlife Report Complete	On

Signature

Brennan Debassige
04.09.2022 12:06 MDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

APPENDIX I

Site Wildlife Photos, 2022



Figure 1: Barren-ground caribou (*Rangifer tarandus groenlandicus*). 29 July 2022.



Figure 2: Moose (*Alces alces*). 12 August 2022.



Figure 3: Grizzly bear (*Ursus arctos*) sow and cubs. 6 June 2022.



Figure 4: Grizzly bear. 18 June 2022



Figure 5: Grizzly bear sow and cub. 23 July 2022.



Figure 6: Red fox (*Vulpes vulpes*). 8 June 2022.



Figure 7: Arctic hare (*Lepus arcticus*). 30 June 2022.



Figure 8: Nesting peregrine falcon (*Falco peregrinus*). 4 June 2022.

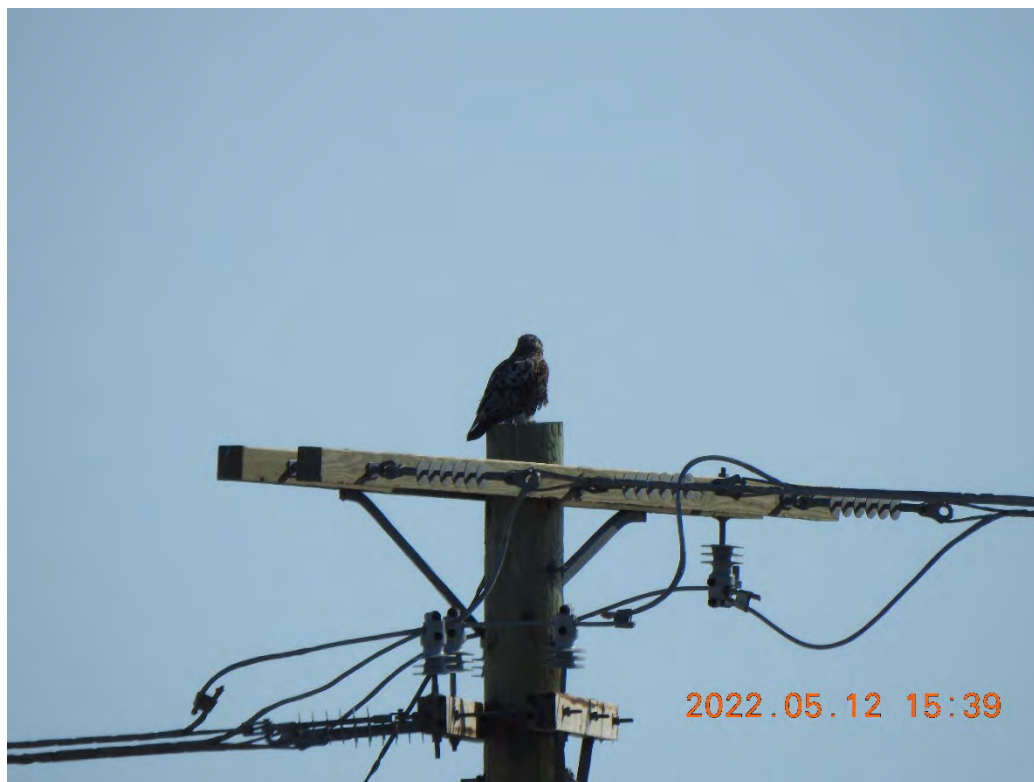


Figure 9: Rough-legged hawk (*Buteo lagopus*). 12 May 2022.



Figure 10: Eggs of American robin (*Turdus migratorius*). 10 June 2022.



Figure 11: Common ravens (*Corvus corax*) 9 June 2022.



Figure 12: Greater white-fronted geese (*Anser albifrons*). 12 May 2022.



Figure 13: Red-necked phalarope (*Phalaropus lobatus*). 12 June 2022.



Figure 14: Willow ptarmigan (*Lagopus lagopus*). 3 May 2022.

APPENDIX J

**Caribou Incidental
Observations Summary, 2022**

Date	Number of Caribou	Description
2022-03-05	31	Group of 31 caribou heading NE on Lac de Gras, south of RTX drill site near A21.
2022-04-17	1	East of PKC near Pond 3
2022-04-27	1	Caribou leg
2022-06-03	1	North Inlet near the pipe outlets
2022-06-05	1	-
2022-06-06	1	-
2022-06-07	1	Grasslands between North Inlet and Airport.
2022-06-08	1	North Inlet
2022-06-08	1	Pond 7
2022-06-13	1	ROM Hill to E21 Sump
2022-06-16	2	Airport Road near North Inlet Water Treatment Plant
2022-06-17	2	Airport Road near North Inlet Water Treatment Plant
2022-06-23	1	Shallow bay area near Rose garden
2022-06-25	1	South haul road and up ROM hill to tundra near Pond 12
2022-06-27	2	Grazing beside Airport Road
2022-07-02	1	Single Caribou on Airport road
2022-07-03	1	Single Caribou on North Haul Road
2022-07-05	1	Single Caribou on Airport Runway
2022-07-05	1	Single Caribou on Airport road
2022-07-06	1	Single Caribou crossing North Haul road towards batch plant
2022-07-08	1	(1) Storage Tank Farm to Communication Shack (2) Road adjacent to BB Dormitories towards vegetation patch near Pond 10
2022-07-14	1	North Inlet Water Treatment Plant
2022-07-15	1	Vegetation Patch adjacent to the North Inlet Water Treatment Plant
2022-07-18	3	Airport landing strip, and vegetation patch
2022-07-29	2	Tundra north of airport road, North Inlet
2022-07-31	1	Shallow bay area near Rose garden
2022-08-05	1	A21 muster, South Tank Farm, kitchen loading area
2022-08-05	1	Tundra south of airport road
2022-08-21	2	A21 Dike and Lakeshore Blvd.
2022-08-24	2	A21 Lakeshore Boulevard
2022-08-24	2	Near Emulsion Plant and Magazine Storage
2022-10-19	1	West cell access road, PKC

APPENDIX K

**Grizzly Bear Incidental
Observations Summary, 2022**

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-05-03	1	Unknown, spotted by pilot from air	Grizzly (unknown sex) spotted 3.5 miles south of camp by RTX helicopter	No
2022-05-09	1	Dark Grizzly, unknown ID,	Spotted on ice heading towards A21 muster. Turned around and returned West along coastline	No
2022-05-18	3	Sow and two very young cubs, possibly mother of resident bear	Seen near A21 muster moving toward SCRP	Yes
2022-05-18	3	Sow and two very young cubs, possibly mother of resident bear	Seen on south haul road heading toward backfill plant	Yes
2022-05-20	1	Single grizzly, unknown sex. RTX took photos from a distance, looks quite dark brown	Spotted moving towards Diavik on ice from A154 dike	No
2022-05-22	3	Sow and two very young cubs, possibly mother of resident bear	Seen on the south haul road near the truck shop	Yes
2022-05-23	3	Sow and two very young cubs, possibly mother of resident bear	Seen on the south haul road before climbing rock pile to north haul road	Yes
2022-05-25	3	Sow and two very young cubs, possibly mother of resident bear	Seen at base of NCRP beside airport road before climbing the rock pile	No
2022-05-26	3	Sow and two very young cubs, possibly mother of resident bear	Seen moving between the landfill and shallow bays, large amount of unsegregated waste (and oil spill) found in landfill	No
2022-05-31	1	Dark brown, unknown sex	Tundra directly south of North Inlet. Directly in between airport area and water treatment plant	No
2022-06-01	1	Dark brown, unknown sex	Bottom of A418 pit	Yes
2022-06-03	1	Single youth from previous two years. Last year was first year on its own. Same bear that was relocated with its mother	South Tank Farm to North Inlet	Yes
2022-06-04	3	Sow and two very young cubs, possibly mother of resident bear	A21	No
2022-06-05	3	Sow and two very young cubs, possibly mother of resident bear	A21	No

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-06-08	3	Sow and two very young cubs, possibly mother of resident bear	Backfill loadout and S Haul Road	Yes
2022-06-09	3	Sow and two very young cubs, possibly mother of resident bear	Backfill to Shallow Bay (past Underground Portal work area)	Yes
2022-06-10	1	Adolescent Grizzly (primarily blonde with darker brown near its behind)	Crusher ROM to ERT	Yes
2022-06-10	3	Sow and two very young cubs	A418 Dike	Yes
2022-06-11	3	Sow and two very young cubs	SCAP Yard	Yes
2022-06-11	1	Adolescent Grizzly (primarily blonde with darker brown near its behind)	Crusher ROM to NCRP	Yes
2022-06-13	3	Sow and two very young cubs	Till Pile to North Inlet	Yes
2022-06-13	1	Adolescent Grizzly <i>named Dipstick</i> (primarily blonde with darker brown near its behind)	D1 laydown, geology core shack	Yes
2022-06-14	3	Sow and two very young cubs	Geology Shack within D1 Laydown	Yes
2022-06-15	3	Sow and two very young cubs	South Haul Road to SCAP to UG Portal Laydown area, to Pond 13, to Shallow Bay area	Yes
2022-06-15	1	Single Grizzly - blonde with darker patches around the legs and arms	Intersection of Backfill Plant and South Haul Road	No
2022-06-15	1	Single Grizzly - very blonde with darker patches around the legs and arms	Geology Shack to ERT Training Grounds vegetation patch	Yes
2022-06-16	1	Single Grizzly - very blonde with darker patches around the legs and arms. Dark brown fur, surrounded by blonde fur, on the underside of the front arms.	Geology Shack to ERT Training Grounds vegetation patch	Yes
2022-06-16	1	Sow and two very young cubs	Vegetation Patch beside Pond 5	No

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-06-16	1	Single Grizzly - very blonde with darker patches around the legs and arms. Dark brown fur, surrounded by blonde fur, on the underside of the front arms.	D1 Laydown to Fresh Air Raise	Yes
2022-06-16	3	Sow and two very young cubs	Metcon Laydown	No
2022-06-17	3	Sow and two very young cubs	Refueling Bay beside Metcon Laydown	No
2022-06-17	1	Single large Grizzly, blonde color with small white patch in between eyes	(1) and (2) Geology Shack to A154 Dike area	Yes
2022-06-18	1	Single large Grizzly, blonde color with small white patch in between eyes	(1) Backfill to Shallow Bay, (2) Backfill to ERT Training Grounds Veg. Patch	Yes
2022-06-20	3	Sow and two very young cubs	Storage Tank Farm to Pond 11	Yes
2022-06-22	3	Sow and two cubs	Spotted on A21 haul road walking toward pit shop, moved to AN road	No
2022-06-27	1	Unknown	Spotted on approach road heading toward the runway, later spotted on Ice north of 154	No
2022-07-10	2	Same sow as before but only one cub	Near start of A418 dyke SE of north mine dry area	No
2022-07-15	2	Sow and one very young cub	(1) ERT Training Grounds (2) Backfill Plant to Shallow Bay (3) Backfill Plant to Shallow Bay	Yes
2022-07-19	2	Sow and one very young cub	Sow and cub reported breaking into a bin of oily rags at the south tank farm	No
2022-07-22	2	Sow and young cub	Sow and cub hanging around PKC barge road	No
2022-07-23	4	Sow and three young cubs. Seem to be new to island. 2 brown cubs and 1 quite blonde.	Vegetation patch behind ERT training area	No
2022-07-25	2	Sow and 1 cub, formerly the sow with 2 cubs.	South Tank Farm to Tundra by Lakeshore Boulevard	Yes
2022-07-26	1	Single male	A21 muster station	No
2022-07-26	4	sow and 3 cubs	Batch plant to till pile, finally resting in veg patch behind ERT training area	No
2022-07-26	2	sow and 1 cub	South Tank Farm	No

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-07-27	4	Sow and 3 cubs in waste bin at batch plant.	Batch plant to North/South haul road intersection	Yes
2022-07-27	2	Sow and 1 cub	Tundra near North Winter Road Approach	No
2022-07-28	2	Sow and 1 cub	off site over the pipe on west side of PKC.	No
2022-07-29	4	Sow and 3 cubs	Airport road by the airport	No
2022-07-29	2	sow and 1 cub	A21 dike south entrance	No
2022-07-30	4	Sow and 3 cubs	Batch plant to north winter road approach/SWRA	Yes
2022-07-31	4	Sow and 3 cubs	Main Accommodations to shallow bays	No
2022-07-31	2	Sow and 1 cub	Shallow bay area near Rose garden	No
2022-08-01	4	sow and 3 cubs	C Portal to A154 infield	No
2022-08-02	4	Sow and 3 cubs	Airport entrance heading West	No
2022-08-02	1	Single Male - blonde, adult	near A21 muster station	No
2022-08-03	2	Sow and single cub	Pond 10, shallow bays	Yes
2022-08-04	2	Sow and single cub	North/South haul road intersection, backfill loadout	Yes
2022-08-07	2	Sow and single cub	South haul road, heading south towards backfill, into shallow bays	No
2022-08-21	2	Sow and single cub - cub has a white patch of fur on its front right shoulder.	Hockey Rink to B-Dorm to Shallow Bay to Vegetation Patch south of Backfill Plant	Yes
2022-09-10	1	Single grizzly	Single grizzly in D1 laydown near top of 418	No
2022-09-15	2	Brown Sow and single yearling cub	Till Pile to 154 Infield to North Inlet	Yes
2022-09-19	2	Brown Sow and single yearling cub	Metcon to Lakeshore boulevard	Yes
2022-09-22	2	Sow and single cub	North side of till pile near NIWTP	No
2022-09-20	2	Sow and single cub	South of South Tank Farm	No
2022-09-22	2	Sow and single cub	Landfill to PKC	No
2022-09-24	2	Sow and single cub	Waste transfer to SCRP	No
2022-09-25	2	Sow and single cub	Tundra between mag storage and SCRP	No
2022-09-26	2	Sow and single cub	PKC muster to AN road and mag storage	No
2022-09-26	2	Sow and single cub	PKC muster to area west of test piles	Yes
2022-09-27	2	Sow and single cub	Tundra between mag storage and SCRP	No

Date	Number of Animals	Characteristics of Animals	Location	Deterrents Used?
2022-09-28	2	Sow and single cub	Tundra west of A21 pit shop, heading north to PKC	Yes
2022-09-29	2	Sow and single cub	Near the California Trailer	No
2022-10-01	2	Sow and single cub	SCRIP Hanging Tree	No
2022-10-21	1	Single, large (male?) grizzly, very dark brown/almost black	Airport, core shack, North Approach	No

APPENDIX L

**Wildlife Deterrent Action
Incident Reports, 2022**

Wildlife Report - 2021

Grizzly - 2022-05-18 - SCRP

Complete

Score	0.5%	Flagged items	0	Actions	0
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Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location) Grizzly - 2022-05-18 - SCRP

Document No. WildlifeReport000172

Completed On

19 May 2022

Wildlife Report

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.25%

Enter Initial Time of Wildlife Sighting

18 May 2022 09:30 MDT

Department/Individual Who Reported Wildlife:

Surface Mining

Environment On Scene

Environment at Call-out Location

18 May 2022 09:45 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and two new cubs

Photo (If Possible):

Chronological Events

0930 - Environment received a report of a sow grizzly and two cubs near the A21 muster station

0945 - Environment on scene, found sow and cubs on A21 haul road walking up to SCRCP. Environment followed bears at a distance

1000 - Used TRUCK to move bears to the west and off the SCRCP, bears respond but move slowly. Environment continued to follow at a distance

1020 - Bears remain at the western toe of the SCRCP, Environment leaves scene

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

0.25%

Truck

1

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger	0
	From 0 to 40
C/F Pen Whistle	0
	From 0 to 40
12GA Explosive	0
	From 0 to 40
12GA B.B. Marker	0
	From 0 to 40
12GA Rubber Bullet	0
	From 0 to 40
12GA Slug	0
	From 0 to 40
Helicopter	0
	From 0 to 40
Other	0
	From 0 to 40
Specify	
Environment Off Scene	
End of Environment Call-out	18 May 2022 10:20 MDT
Final Location of Wildlife	
West toe of SCRP	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Brett Potter	
19 May 2022 08:25 MDT	

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-05-18 - South Haul Road

Complete

Score	0.75%	Flagged items	0	Actions	0
-------	-------	---------------	---	---------	---

Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location) Grizzly - 2022-05-18 - South Haul Road

Document No. WildlifeReport000173

Completed On

19 May 2022

Wildlife Report

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.5%

Enter Initial Time of Wildlife Sighting

18 May 2022 19:25 MDT

Department/Individual Who Reported Wildlife:

Unknown

Environment On Scene

Environment at Call-out Location

18 May 2022 19:40 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and two cubs, same as previous report



Photo 1

Photo (If Possible):



Photo 2

Chronological Events

19:25 - Environment received a report of a grizzly and two cubs on the south haul road near the truck shop

19:40 - Environment on scene, found sow and two cubs on tundra near the old vegetation plots. Bears began moving slowly in the direction of main camp

19:55 - Environment repositioned and CYCLED SHOTGUN ACTION, sow ran in the opposite direction for a short distance

20:10 - Sow and cubs returned to previous location, Environment used BANGER to move bears northeast and away from main camp and south haul road. Bears did not respond, Environment continued to monitor

20:40 - Environment left scene

Movement Map (Import NotePlus Site Map)

Deterrent Count

0.5%

Truck	0
	From 0 to 40
Air Horn	0
	From 0 to 40
C/F Bear Banger	1
	From 0 to 40
C/F Pen Whistle	0
	From 0 to 40
12GA Explosive	0
	From 0 to 40
12GA B.B. Marker	0
	From 0 to 40
12GA Rubber Bullet	0
	From 0 to 40
12GA Slug	0
	From 0 to 40
Helicopter	0
	From 0 to 40
Other	1
	From 0 to 40
Specify	Cycle shotgun action
Environment Off Scene	
End of Environment Call-out	18 May 2022 20:40 MDT
Final Location of Wildlife	
Tundra southeast of south haul road	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Brett Potter	
19 May 2022 14:53 MDT	



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly - 2022-05-22 - South Haul Road

Complete

Score	1.25%	Flagged items	0	Actions	0
-------	-------	---------------	---	---------	---

Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location) Grizzly - 2022-05-22 - South Haul Road

Document No. WildlifeReport000174

Completed On

23 May 2022

Wildlife Report

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1%

Enter Initial Time of Wildlife Sighting

22 May 2022 07:30 MDT

Department/Individual Who Reported Wildlife:

Surface dispatch

Environment On Scene

Environment at Call-out Location

22 May 2022 07:40 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and two new cubs. Same group as in previous reports.

Photo (If Possible):



Photo 1

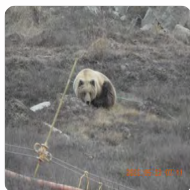


Photo 2

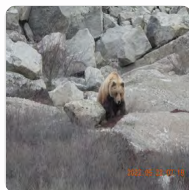


Photo 3

Chronological Events

07:30 - Environment received a report of a grizzly bear on the south haul road near the truck shop

07:45 - Cycled SHOTGUN ACTION to move bears northeast away from the truck shop. Sow briefly moved away but all bears remained in the area.

08:00 - Used BANGER to move bears northeast away from the truck shop. Bears did not respond.

08:13 - REVVED ENGINE and SHOUTED to move bears northeast away from the truck shop. Bears began to move very slowly to the northeast. Environment followed bears at a distance.

09:00 Environment left scene.

Movement Map (Import NotePlus Site Map)

Deterrent Count

1%

Truck

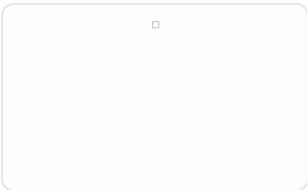
0

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger	1
	From 0 to 40
C/F Pen Whistle	0
	From 0 to 40
12GA Explosive	0
	From 0 to 40
12GA B.B. Marker	0
	From 0 to 40
12GA Rubber Bullet	0
	From 0 to 40
12GA Slug	0
	From 0 to 40
Helicopter	0
	From 0 to 40
Other	3
	From 0 to 40
Specify	Shotgun action, revved engine, shouting
Environment Off Scene	
End of Environment Call-out	22 May 2022 09:00 MDT
Final Location of Wildlife	
Tundra southeast of south haul road	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
	Anton Jitnikovitch 23 May 2022 08:12 MDT

Appendix



Photo 1



Photo 2

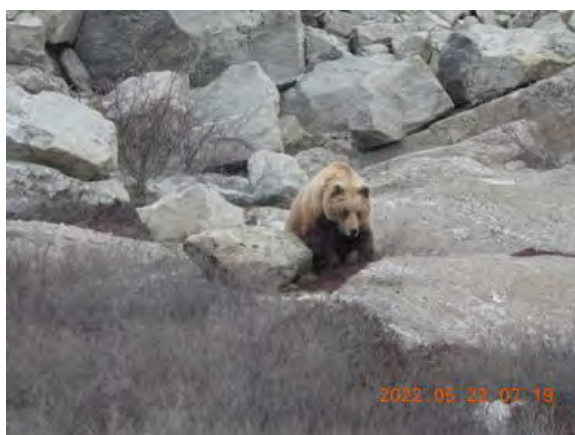


Photo 3

Wildlife Report - 2021

Grizzly - 2022-05-23 - North Haul Road

Complete

Score	0.75%	Flagged items	0	Actions	0
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Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location) Grizzly - 2022-05-23 - North Haul Road

Document No. WildlifeReport000175

Completed On

24 May 2022

Wildlife Report

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.5%

Enter Initial Time of Wildlife Sighting

23 May 2022 14:00 MDT

Department/Individual Who Reported Wildlife:

Unknown

Environment On Scene

Environment at Call-out Location

23 May 2022 14:20 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and two cubs

Photo (If Possible):



Photo 1

Chronological Events

14:00 - Environment received a report of a sow and two cubs on the south haul road near Pond 5

14:20 - Environment on scene, found bears at the base of the rock pile NE of south haul road. Environment continued to monitor bears

14:25 - Bears slowly climbed the rock pile, heading toward the north haul road

14:35 - Environment moved to the north haul road and encountered the bears at the edge of the rock pile

14:40 - Used TRUCK to move bears back down the rock pile toward the shallow bays

14:42 - Used BANGER to move bears back down the rock pile toward the shallow bays. Could not observe bears' response due to the berm on the north haul road. Environment continued to monitor the area/

15:00 - Environment left scene

Movement Map (Import NotePlus Site Map)

Deterrent Count

0.5%

Truck

1

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger	1
	From 0 to 40
C/F Pen Whistle	0
	From 0 to 40
12GA Explosive	0
	From 0 to 40
12GA B.B. Marker	0
	From 0 to 40
12GA Rubber Bullet	0
	From 0 to 40
12GA Slug	0
	From 0 to 40
Helicopter	0
	From 0 to 40
Other	0
	From 0 to 40
Specify	
Environment Off Scene	
End of Environment Call-out	23 May 2022 15:00 MDT
Final Location of Wildlife	
Unknown	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Brett Potter	
24 May 2022 07:46 MDT	

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-06-01 A418 Pit

Complete

Score	2.24%	Flagged items	0	Actions	0
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Audit Title (Animal - yyyy-mm-dd - Location)

Grizzly - 2022-06-01 A418 Pit

Document No.

WildlifeReport000176

02.06.2022

Audit

2.24%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

2%

Enter Initial Time of Wildlife Sighting

01.06.2022 16:00 PDT

Department/Individual Who Reported Wildlife:

Surface Mining

Environment at Call-out Location

01.06.2022 16:15 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Single grizzly, dark brown in colour. Likely 3-4 years of age, average size.

Photo (If Possible):

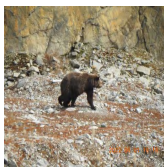


Photo 1



Photo 2

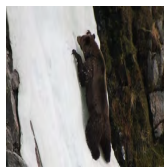


Photo 3

Chronological Events

17:00- Call received from surface mining that a single grizzly was near the top of the 418 pit ramp.

17:05- Another call from surface mining alerted Environment (ENV) team that the bear had begun descending into the 418 pit.

17:15- ENV team arrives at bottom of 418 pit and get visual confirmation of bear. Initially located opposite the pit refuelling bay on an old, unused pit bench. Area is inaccessible to light vehicles. Bear was attempting to find a route to exit the bottom portion of the pit and attempted to climb between pit bench levels unsuccessfully.

17:25- ENV attempted to get the bear to move to a safer area near A Portal and the pit refuelling bay. One ENV team member stayed one level above the bench where the bear to maintain visual contact with it while another ENV member moved to get position to deter the bear back to safety at the bottom of the pit ramp. ENV member got in position and used a BANGER. Bear did not respond, so a total of 4 BANGERS were deployed in hopes of pushing the bear counter-clockwise. Did not work.

17:38- ENV used TRUCK to get on the other side of the animal and to attempt to direct the bear to head back up the pit ramp. Bear instead began travelling in opposite direction and went further down the pit, into a similar area it was first sighted.

17:57- ENV decided best course of action was to back off, to both get a better vantage point to monitor bear as well as get out of the bears sight, in hopes that the bear would eventually come back up out of bottom of pit.

18:16- From further up pit ramp, ENV was able to watch the bear make its way back to base of ramp. A Grader was on its way down to the bottom of the pit as bear approached. ENV contacted

the grader operator and requested the equipment be shut down. Bear passed the grader and headed up ramp, at which point grader operator was asked to start the equipment again and move back up the pit ramp to direct the bear up and out of the pit area.

18:22- Bear passed by ENV team further up pit ramp. ENV pickup truck was started and ENV team began slowly driving up ramp behind bear, maintaining safe distance but ensuring bear was continuing to move up ramp towards pit exit. Bear eventually goes over berm at top of pit ramp and continued moving east towards 418 dike and Lac de Gras.

18:50- Bear exited mine area via lake ice in southeast direction. ENV team leaves scene.

Movement Map (Import NotePlus Site Map)



Photo 4

Deterrent Count

2%

Truck

4

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

4

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

0

From 0 to 40

Specify

End of Environment Call-out

01.06.2022 17:50 PDT

Final Location of Wildlife

Lac de Gras, on ice heading in southeast direction toward island. Approx 750 m SE of 418 pit.

Closure & Sign-off

100%

Wildlife Report Complete	On
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Signature

Justin Macek
02.06.2022 10:08 PDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Grizzly - 2022-06-03 - Metcon to North Inlet

Complete

Score	6.98%	Flagged items	0	Actions	0
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Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location)

Grizzly - 2022-06-03 - Metcon to
North Inlet

Document No.

WildlifeReport000177

Completed On

4 Jun 2022

Wildlife Report

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

6.75%

Enter Initial Time of Wildlife Sighting

3 Jun 2022 20:22 MDT

Department/Individual Who Reported Wildlife:

Surface Mining Dispatch

Environment On Scene

Environment at Call-out Location

3 Jun 2022 20:40 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

3-4 year old youth, blonde face with dark patches along side and rear. Definitely a cub from the previous 2 years. Comfortable with site and haul traffic, resistant to deterrents

Photo (If Possible):



Photo 1



Photo 2

Chronological Events

08:22 Security notified environment that Surface Dispatch called in a single grizzly at the South Tank Farm (STF).

08:40 Environment responder (ENV) arrived on scene and discovered Grizzly in METCON Laydown attempting to head East. ENV honked the horn and blocked the bear with the vehicle and the bear turned around to head NW.

08:47 Bear called in descending ROM hill. ENV mobilized to the area. Bear was spotted by ENV as it descended to the base of the ROM hill. ENV attempted to block with the Truck, bear went over the berm and around vehicle into pond 5 near the Truck Shop.

08:52 ENV fired 2x Pen Bangers to try and move bear away from Truck Shop vicinity, bear moved a short distance but stayed in the pond foraging.

09:13 Bear started moving towards South Haul Road (SHR), ENV stood on berm near vehicle and yelled to discourage bear away from road.

09:15 Bear returned to grazing in pond, ENV Yelled, waved arms, then fired 1 Pen Banger and bear moved short distance away from road.

09:20 ENV Yelled, then fired 1 Pen Banger and bear moved back onto ROM hill.

09:22 Bear climbs berm toward SHR, ENV attempts to block with truck but bear crosses road towards Shallow Bays. Cycling the action on the shotgun got the bear moving quickly away from the road further into the shallow bays.

09:55
Bear crossed SHR into Pond 1 beside the Backfill Plant. ENV contacts backfill and notifies area workers of intent to persuade bear north towards the North Inlet tundra. ENV used 1x 12gauge banger, fired one Medium Range Rubber bullet from 40 meters which impacted near the bear. Bear then climbed berm north towards the Backfill laydown. ENV followed bear in light vehicle at a distance.

Bear headed north along backfill water pipes and attempted to head east several times. ENV followed along the SHR in the truck and deterred the bear back to the pipes by exiting the vehicle and yelling 4 times. Bear responds to personnel on the ground, but is not deterred by vehicle or haul truck presence.

ENV used shotgun action cycling to persuade bear back to pipes once near the end of the Backfill Loadout Yard. The Bear responded to action cycling and climbed the loadout yard access berm then crossed to a depression beside the road.

10:19 ENV Cycled action again and bear climbed North Haul Road berm, then crossed the road leaving the Backfill yard. ENV notified haul truck drivers that the bear was crossing the active haul road.

10:20 ENV cycled the action and yelled once each to keep bear moving along water pipes around the Till Dump.

10:28 Exited vehicle to cycle action and Yell to stop bear from crossing towards 154 pit.

10:31 ENV cycled the action once and yelled at Bear on North side of Till pile to ensure it crossed road towards North Inlet.

Bear was then in good location, Environment left scene.

Movement Map (Import NotePlus Site Map)

 [2022 Site Layout Labels.pdf](#)

Deterrent Count	6.75%
Truck	3 From 0 to 40
Air Horn	0 From 0 to 40
C/F Bear Banger	4 From 0 to 40
C/F Pen Whistle	0 From 0 to 40

12GA Explosive	0
	From 0 to 40
12GA B.B. Marker	0
	From 0 to 40
12GA Rubber Bullet	1
	From 0 to 40
12GA Slug	0
	From 0 to 40
Helicopter	0
	From 0 to 40
Other	19
	From 0 to 40
Specify	Horn (1), Yelling (10), Clapping/waving hands (2), cycling shotgun action(6)
Environment Off Scene	
End of Environment Call-out	3 Jun 2022 22:30 MDT
Final Location of Wildlife	
North Inlet	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Gord Cumming	
5 Jun 2022 17:41 MDT	

Appendix



Photo 1



Photo 2

 [2022 Site Layout Labels.pdf](#)

Wildlife Report - 2021

Grizzly - 2022-06-07 - A154 to FAR outskirts

Complete

Score	1%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-07 - A154 to FAR outskirts	
Document No.				WildlifeReport000180	
				07.06.2022	

Audit

1%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.75%

Enter Initial Time of Wildlife Sighting

07.06.2022 10:00 MDT

Department/Individual Who Reported Wildlife:

Surface Mining Dispatch

Environment at Call-out Location

07.06.2022 10:25 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and cubs from previous weeks

Photo (If Possible):



Photo 1



Photo 2

Chronological Events

10:00 Surface mining dispatch spotted a Bear and two cubs in the bottom of the A154 pit.

10:25 Environment Responder (ENV) arrived on scene in a light truck and made visual contact with the bear and two cubs at the ramp near the top of the A154 pit. At this point, bear and two cubs were seen walking towards the direction leading out of the A154 pit. ENV allowed bears to pass, giving them a wide berth then turned to follow them up the ramp at a distance.

10:30 Bear and two cubs walked to an upper ledge just outside of the A154 pit.

10:35 Bear and two cubs grazing on berries, vegetation, etc., just outside of the A154 pit.

10:45 Mother bear walked ~20 metres and drank water out of a puddle then returned to the upper ledge location just outside of the A154 pit back to the two cubs.

10:55 Bear and two cubs walked towards the direction of the A154 Dike (directly East from the Fresh Air Raise)

10:56 Bear and two cubs continued walking slowly towards the same direction and were in a good location (minimal potential for interaction with people/machines)

10:57 ENV left the scene.

Movement Map (Import NotePlus Site Map)



Deterrent Count

0.75%

Truck**3**

From 0 to 40

Air Horn**0**

From 0 to 40

C/F Bear Banger**0**

From 0 to 40

C/F Pen Whistle**0**

From 0 to 40

12GA Explosive**0**

From 0 to 40

12GA B.B. Marker**0**

From 0 to 40

12GA Rubber Bullet**0**

From 0 to 40

12GA Slug**0**

From 0 to 40

Helicopter**0**

From 0 to 40

Other**0**

From 0 to 40

Specify**End of Environment Call-out**

07.06.2022 10:57 MDT

Final Location of Wildlife

Directly East from the Fresh Air Raise, headed towards the A154 Dike.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

07.06.2022 15:17 MDT



Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Grizzly - 2022-06-08 - Backfill Loadout

Complete

Score	2%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-08 - Backfill Loadout	
Document No.				WildlifeReport000181	
				09.06.2022	

Audit

2%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1.75%

Enter Initial Time of Wildlife Sighting

08.06.2022 19:00 MDT

Department/Individual Who Reported Wildlife:

Backfill

Environment at Call-out Location

08.06.2022 20:11 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Same Sow and 2 young Cubs of the Year (COY) that has been on site.

Photo (If Possible):



Photo 1

Chronological Events

19:00 Environment on-call technician (ENV) received report of Sow and 2 cubs beside backfill loadout yard and south haul road.

19:11 ENV on scene, bears were sleeping on black water pipes between the south haul road and backfill loadout yard.

19:13 Approached slowly in vehicle to avoid stressing the animals, got to within 20m in vehicle and sow picked up her head. ENV honked once to try and get them up with the intention of moving them to the North Inlet away from workers and traffic. Sow did not get up. Attempted to talk to the bear out the window, with little response from the sow. Opening the door and repeating the phrase while standing on the running board got the sow up and slowly walking north along the pipes with the cubs.

19:18 Sow turned from pipes to head towards South Haul Road, ENV opened vehicle door and stood on running boards to ask her to turn around. She turned back to pipes and continued north. 19:30 Sow and cubs paused at vegetated area beside North Haul Road for several mins. ENV waited until traffic in the area had cleared, then notified haul traffic that the bears would be crossing haul road shortly. Then ENV cycled the shotgun action from the top of berm looking towards bears from 40m away. Sow was reluctant, but yelling and cycling persuaded her to climb the berm and cross the North Haul Road with her cubs.

19:43 Bears climbed the North Country Till Pile (NCTP) on the east end. ENV fired 1 pen banger to stop the bears from turning back.

19:54 Bears climbed down the north side of NCTP.

20:01 Sow grizzly crossed airport road to North Inlet tundra. ENV left the area.

Movement Map (Import NotePlus Site Map)

[2022-06-08 Sow and COYS Backfill.pdf](#)

Deterrent Count

1.75%

Truck

1

From 0 to 40

Air Horn

1

From 0 to 40

C/F Bear Banger

1

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

4

From 0 to 40

Specify

Yelling (3), Cycling action of
shotgun (1)

End of Environment Call-out

08.06.2022 20:01 MDT

Final Location of Wildlife

Tundra in North Inlet

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

GC
09.06.2022 08:25 MDT

Appendix



Photo 1

[2022-06-08 Sow and COYS Backfill.pdf](#)

Wildlife Report - 2021

Grizzly - 2022-06-10 - Backfill to ERT

Complete

Score	1.25%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-10 - Backfill to ERT	
Document No.				WildlifeReport000183	
				10.06.2022	

Audit

1.25%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1%

Enter Initial Time of Wildlife Sighting

10.06.2022 10:00 PDT

Department/Individual Who Reported Wildlife:

Crusher ROM Yard Operator

Environment at Call-out Location

10.06.2022 10:00 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

- Adolescent Grizzly (primarily blonde with darker brown near its behind)

Photo (If Possible):

Chronological Events

11:00 - Environment (ENV) received call from Crusher ROM Yard Operator about a Grizzly bear being spotted in the area.

11:05 ENV personnel were working nearby and were quick to arrive on the scene and make visual contact with the Grizzly. Grizzly bear was walking on top of the rock berm near the entrance of the Crusher Loadout Yard.

11:10 ENV personnel got out of the LIGHT VEHICLE approximately 40 metres away from the Grizzly and CLAPPED and SHOUTED in order to guide the bear to move from the Crusher Loadout Yard towards the Till Dump.

11:12 Grizzly started running North in the direction of the Till Dump.

11:15 ENV followed the Grizzly behind with a LIGHT VEHICLE (Truck).

11:18 Grizzly cut across the Till Dump and then the Airport Road until it reached the south side of the ERT Training Grounds.

11:20 Grizzly jumped on top of a pipeline near the ERT Training Grounds and ran approximately 100 metres on top of it until reaching a grassy meadow slightly East of the ERT Training Grounds and started grazing.

11:30 ENV noted the bear continued to graze in the grassy meadow slightly East of the ERT Training Grounds.

11:31 ENV left the scene.

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

1%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

2

From 0 to 40

Specify

CLAPPED, SHOUTED

End of Environment Call-out

10.06.2022 10:31 PDT

Final Location of Wildlife

ERT Training Grounds

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
10.06.2022 17:29 PDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-06-11 - Crusher ROM to NCRP

Complete

Score	2.24%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-11 - Crusher ROM to NCRP	
Document No.				WildlifeReport000186	
				12.06.2022	

Audit

2.24%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

2%

Enter Initial Time of Wildlife Sighting

11.06.2022 14:00 MDT

Department/Individual Who Reported Wildlife:

Crusher ROM Yard Operator

Environment at Call-out Location

12.06.2022 14:00 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

- Adolescent Grizzly (primarily blonde with darker brown near its behind) with two (2) cubs (blonde face, brown bodies).

Photo (If Possible):

Chronological Events

14:00 Environment (ENV) received call from Crusher ROM Yard Operator about a Grizzly bear with two (2) cubs being spotted in the area.

14:15 ENV personnel drove onto the North Haul Road with a LIGHT VEHICLE (LV) heading towards the Crusher ROM Yard and made visual contact with the Grizzly and two (2) cubs. Grizzly and two (2) cubs were running towards the North Country Rock Pile (NCRP) and ENV followed behind ~30 metres away in a LV.

14:20 Grizzly and two (2) cubs climbed on top of the most eastern edge of the NCRP and began napping.

14:25 Grizzly was periodically putting their snout high up and sniffing the air.

14:31 Grizzly and two (2) cubs were settled into a nap at the same spot - the most eastern edge of the NCRP.

14:41 Grizzly and two (2) cubs continue to lay down and nap on the eastern edge of the NCRP.

14:45 Another ENV personnel arrived and noted the NCRP was not a suitable napping/resting location for the Grizzly and two (2) cubs due to heavy vehicle haul traffic and workers outside of vehicle s being present nearby. As such, ENV prepared to release three (3) BEAR BANGERS in an attempt for the bears to relocate.

14:48 ENV personnel SHOUTED, CLAPPED and released three (3) BEAR BANGERS in the Grizzly and two (2) cubs general direction on top of the NCRP. The Grizzly and two (2) cubs reacted to the deterrents and moved west into the NCRP.

14:53 ENV personnel split up - the original ENV respondent drove the LV along the Airport Road in search of the Grizzly and two (2) cubs, while the ENV respondent that arrived at 14:45 transitioned to respond to an alternative bear call.

15:02 ENV drove westbound on Airport Road and did not spot the Grizzly and two (2) cubs.

15:06 ENV turned the LV around and drove eastbound on Airport Road and spotted the Grizzly and two (2) cubs approximately 400 metres west of the North Inlet.

15:10 ENV observed the Grizzly and two (2) cubs grazing.

15:17 ENV observed the Grizzly lay down on it's back and nurse the two (2) cubs (feed, hug, pat, rub).

15:18 Grizzly and two (2) cubs were laying down together and did not move from their original location approximately 400 metres west of the North Inlet along the Airport Road.
15:19 ENV left the scene.

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

2%

Truck

2
From 0 to 40

Air Horn

0
From 0 to 40

C/F Bear Banger

3
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

3
From 0 to 40

Specify

SHOUT, CLAP

End of Environment Call-out

11.06.2022 13:19 MDT

Final Location of Wildlife

~400 metres west of the North Inlet along the base of the NCRP, adjacent to the Airport Road

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
12.06.2022 07:57 MDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-06-11 - SCAP Yard

Complete

Score	2%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)			Grizzly - 2022-06-11 - SCAP Yard		
Document No.			WildlifeReport000187		
			12.06.2022		

Audit	2%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1.75%
Enter Initial Time of Wildlife Sighting	11.06.2022 11:00 MDT
Department/Individual Who Reported Wildlife:	
SCAP Yard Operator	
Environment at Call-out Location	11.06.2022 11:15 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
- Adolescent Grizzly (mix of blonde and brown)	
Photo (If Possible):	
Chronological Events	
11:00 ENV (Environment) received an initial call of a single Grizzly in the SCAP yard. 11:15 ENV arrived with a LIGHT VEHICLE (LV) and moved towards the Grizzly in the SCAP yard. Grizzly noticed the LV approaching and walked to a grassland meadow between the SCAP Yard and the South Haul Road (SHR). 11:35 ENV got out of the LV and began CLAPPING and YELLING in an attempt to guide the bear towards the Shallow Bay area. Grizzly glanced at ENV and continued on grazing - minimal response overall. 11:38 Grizzly was grazing and making its way towards the SHR. 11:40 ENV drove to the other side of the meadow along the SHR in an attempt to stop the Grizzly from approaching the SHR. Grizzly continued its approach. 11:42 ENV exited the LV, SHOUTED and CLAPPED in an attempt to guide the bear away from approaching ENV personnel and the SHR. Grizzly did not respond and continued its approach. 11:43 ENV deployed one (1) BANGER in the Grizzly bears' general direction (Grizzly reacted to the BANGER noise by moving ~5 yards in the opposite direction and then proceeded to walk towards the road located south of Pond 13). 11:45 Grizzly walked ~15 metres along the road located south of Pond 13 and headed towards the SHR. ENV drove the LV towards the bear while holding down the LV HORN. Grizzly ran back into the grassy meadow between the SHR and the SPAC Yard. 11:50 ENV positioned themselves in an area with clear and complete visibility of the grassy meadow in order to establish continuous visibility on the Grizzly. 12:00 Grizzly stopped grazing and began to lay down. 12:10 ENV observed the Grizzly using Binoculars. Grizzly was laying down (resting). 12:20 ENV repositioned themselves in order to have an alternative angle on the Grizzly. ENV noted the Grizzly was napping in the corner of the grassy meadow at the base of the rock berm near SCAP. ENV left the scene.	
Movement Map (Import NotePlus Site Map)	



Photo 1

Deterrent Count	1.75%
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Truck	3 From 0 to 40
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Air Horn	0 From 0 to 40
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C/F Bear Banger	1 From 0 to 40
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C/F Pen Whistle	0 From 0 to 40
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12GA Explosive	0 From 0 to 40
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12GA B.B. Marker	0 From 0 to 40
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12GA Rubber Bullet	0 From 0 to 40
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12GA Slug	0 From 0 to 40
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Helicopter	0 From 0 to 40
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Other	3 From 0 to 40
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Specify	SHOUT, CLAP
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End of Environment Call-out	11.06.2022 12:20 MDT
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Final Location of Wildlife

Grassy meadow between South Haul Road and SPAC Yard.

Closure & Sign-off	100%
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Wildlife Report Complete	On
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Signature

Anton Jitnikovitch

Anton Jitnikovitch
12.06.2022 08:53 MDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-06-13 D1 Core Shack

Complete

Score	2%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-13 D1 Core Shack	
Document No.				WildlifeReport000189	
				13.06.2022	

Audit	2%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1.75%
Enter Initial Time of Wildlife Sighting	13.06.2022 09:45 MDT
Department/Individual Who Reported Wildlife:	
Geology	
Environment at Call-out Location	13.06.2022 11:05 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
3 year old cub from resident female's previous litter. Same one that has been on site recently	
Photo (If Possible):	
Chronological Events	
9:45am Single grizzly bear called in at Geology Core Shack near vegetated area. Environment (ENV) mobilized to the area. 10:00am Sow and cubs called in at Till Pile, ENV redirected to Sow and Cubs. 11:00 ENV arrives at scene of single grizzly call. 11:02 ENV scans area from high point, no sign of grizzly amid stacks of core. ENV cycled shotgun action twice and bear popped its head up nearby. ENV yelled to get its attention, then cycled action again. Bear moved a short distance along pipe then stopped and looked back at wildlife monitor. ENV fired 1 12G rubber bullet which missed within 1ft. The bear ran a short distance to base of berm, then began climbing berm to A154 haul road, away from active work area. 11:12 Environment monitor drove around and found bear on tundra north of A154 haul road. ENV looked over edge of berm and said "hello" and the bear ran a short distance further from the road. 1:24 ENV repositioned, got vantage point above bear, waited to see if bear would leave area. It was lingering near the haul road, ENV fired 2x 12 Gauge bangers and bear moved along pipes toward North Inlet. Bear was now heading away from active work areas and in a good direction, ENV updated wildlife advisory sitewide and left the area.	
Movement Map (Import NotePlus Site Map)	
Deterrent Count	1.75%
Truck	0 From 0 to 40
Air Horn	0 From 0 to 40
C/F Bear Banger	0

	From 0 to 40
C/F Pen Whistle	0 From 0 to 40
12GA Explosive	2 From 0 to 40
12GA B.B. Marker	0 From 0 to 40
12GA Rubber Bullet	1 From 0 to 40
12GA Slug	0 From 0 to 40
Helicopter	0 From 0 to 40
Other	4 From 0 to 40
Specify	Cycled Action (3), Yelled (1)
End of Environment Call-out	13.06.2022 11:30 MDT
Final Location of Wildlife	
Moving towards North Inlet from ERT training grounds.	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
GC 13.06.2022 16:23 MDT	

Wildlife Report - 2021

Grizzly - 2022-06-14 - Geology Shack

Complete

Score	1.5%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-14 - Geology Shack	
Document No.				WildlifeReport000191	
				15.06.2022	

Audit	1.5%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1.25%
Enter Initial Time of Wildlife Sighting	14.06.2022 23:45 MDT
Department/Individual Who Reported Wildlife:	
Security Dispatch on behalf of Open Pit Operator	
Environment at Call-out Location	15.06.2022 00:05 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
- Adolescent Grizzly (primarily blonde with darker brown near its behind) with two (2) cubs (blonde face, brown bodies).	
Photo (If Possible):	
Chronological Events	
23:45 Security notified Environment (ENV) that a Pit Operator observed a Grizzly bear at the A418 Chicane and it appeared to be crossing the berm towards Zone 1. 00:05 ENV arrived at the A418 Chicane in a LIGHT VEHICLE (LV) and scanned the immediate area - no bear was observed. 00:15 ENV scanned around the A418 dike. 00:45 ENV scanned the UG Portal, UG Mine Dry, Batch Plant, SCAP Fab Shop, Zone 1, SHR, the A154 dike and re-scanned the A418 Dike. 00:50 Pit Operator notified ENV that a Sow and two (2) cubs were spotted at the D1 Laydown. 00:55 ENV arrived and began to scan the D1 Laydown. No bear was observed. 01:00 ENV scanned the Geology Shack within the D1 Laydown and observed two (2) cubs. Moments later, a Grizzly Sow walked past the ENV LV towards the cubs. Two (2) other LV's with multiple persons inside them were at the Geology shack area and were watching the bears. 01:05 Grizzly and cubs climbed onto the berm to the north of the Geology Shack area, but stopped and began to lay down on the rock-berm. 01:07 ENV stepped out of the LV and CLAPPED and YELLED at the bears. The bears moved north, past the berm, onto the A154 Pit Haul Road - no haul traffic or LV traffic was present on the A154 Pit Haul Road during this time. 01:10 ENV circled around to the A154 Pit Haul Road, the N3 Laydown, and the ERT Training Grounds and performed a visual scan. No bears were observed. 01:45 ENV performed a scan of the D1 Laydown, the Fresh Air Raise, Pond 13, Batch Plant, UG Mine Dry, UG Portal, Zone 1, SCAP Warehouse, SCAP Fab Shop, the A418 Chicane and A418 Dike and did not locate any bears. 01:50 ENV made an ANNOUNCEMENT, informed the last known location of the bear, and then left the scene.	
Movement Map (Import NotePlus Site Map)	



Photo 1

Deterrent Count

1.25%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

3

From 0 to 40

Specify

SHOUTED, CLAPPED

End of Environment Call-out

15.06.2022 01:50 MDT

Final Location of Wildlife

A154 Pit Haul Road

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
15.06.2022 17:54 MDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-06-15 - Geology Shack to ERT
Training Grounds Vegetation Patch

Complete

Score	1.5%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-15 - Geology Shack to ERT Training Grounds Vegetation Patch	
Document No.				WildlifeReport000194	
				16.06.2022	

Audit	1.5%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1.25%
Enter Initial Time of Wildlife Sighting	15.06.2022 14:00 MDT
Department/Individual Who Reported Wildlife:	
Rio Tinto Exploration (RTX)	
Environment at Call-out Location	15.06.2022 14:25 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Single Grizzly, blonde, with darker patches of brown along the arms and legs.	
Photo (If Possible):	
Chronological Events	
14:00 Environment (ENV) was notified by Rio Tinto Exploration (RTX) personnel that a single Grizzly was walking around the Geology Shack within the D1 Laydown. RTX noted that several workers were present and were working outside of their vehicle in the D1 Laydown. 14:25 ENV arrived on-site in a LIGHT VEHICLE (LV) and spoke with RTX personnel - RTX pointed out the location of the Grizzly; approximately 125 metres west of the Geology Shack. 14:27 ENV observed the Grizzly grazing between the geology core box stacks. 14:28 ENV exited the LV and SHOUTED and CLAPPED in order to encourage the Grizzly to move north towards the vegetation area near the ERT Training Grounds. There was no response. 14:30 Due to the presence of multiple workers nearby, ENV released a BEAR BANGER in the general direction of the bear. The bear reacted and moved north. 14:33 ENV drove towards the ERT Training Grounds and noted the Grizzly grazing in the nearby vegetation patch. 14:34 ENV made a site-wide ANNOUNCEMENT and then left the scene.	
Movement Map (Import NotePlus Site Map)	
	
Photo 1	
Deterrent Count	1.25%
Truck	1 From 0 to 40

Air Horn

0
From 0 to 40

C/F Bear Banger

1
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

3
From 0 to 40

Specify

SHOUTED, CLAPPED

End of Environment Call-out

15.06.2022 14:34 MDT

Final Location of Wildlife

Vegetation patch east of the ERT Training Grounds.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
16.06.2022 11:09 MDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-06-16 - D1 Laydown to Fresh Air Raise

Complete

Score	0.5%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-16 - D1 Laydown to Fresh Air Raise	
Document No.				WildlifeReport000197	
				16.06.2022	

Audit

0.5%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.25%

Enter Initial Time of Wildlife Sighting

16.06.2022 12:55 PDT

Department/Individual Who Reported Wildlife:

Rio Tinto Exploration (RTX)

Environment at Call-out Location

16.06.2022 13:15 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Single Grizzly, blonde, with very dark patch of brown fur on the underside of front arms.

Photo (If Possible):

Chronological Events

13:55 Rio Tinto Exploration (RTX) notifies Environment (ENV) about a single Grizzly beside the Geology Shack.

14:15 ENV arrived in a LIGHT VEHICLE (LV) and scanned the D1 Laydown and Geology Shack area. RTX personnel came up to ENV and notified them the Grizzly is beside the two large red storage tanks. Using the LV, ENV drove up to the red storage tanks in the D1 Laydown and spotted the Grizzly. The Grizzly reacted and ran towards the pond between the D1 Laydown and the Fresh Air Raise (FAR).

14:30 ENV scanned the FAR, D1 Laydown, and Geology Shack area and did not locate the Grizzly. ENV spoke with the workers in the D1 Laydown and notified them to be aware and diligent while working in the area and to notify ENV if any wildlife is spotted.

14:36 ENV continued to scan the FAR, D1 Laydown, and Geology Shack area.

14:39 ENV scanned the vegetation patch east of the ERT Training Grounds. No bear was located.

14:40 ENV left the scene.

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

0.25%

Truck

1
From 0 to 40

Air Horn

0
From 0 to 40

C/F Bear Banger

0
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

0
From 0 to 40

Specify

End of Environment Call-out

16.06.2022 13:39 PDT

Final Location of Wildlife

Fresh Air Raise area

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature



Anton Jitnikovitch
16.06.2022 14:16 PDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-06-16 - Geology Shack to ERT
Training Grounds Veg. Patch

Complete

Score	1.25%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-16 - Geology Shack to ERT Training Grounds Veg. Patch	
Document No.				WildlifeReport000195	
				16.06.2022	

Audit

1.25%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1%

Enter Initial Time of Wildlife Sighting

16.06.2022 09:09 MDT

Department/Individual Who Reported Wildlife:

Rio Tinto Exploration (RTX)

Environment at Call-out Location

16.06.2022 09:17 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Single Grizzly, blonde, with darker patches of brown along the arms and legs.

Photo (If Possible):

Chronological Events

09:09 Rio Tinto Exploration (RTX) notified Environment (ENV) that a single Grizzly was wandering around the Geology Shack area within the D1 Laydown..

09:17 ENV arrived on-scene in a LIGHT VEHICLE (LV) and spoke with RTX personnel. RTX pointed to wards the location of the Grizzly.

09:18 ENV observed the single Grizzly grazing between the geology core stacks.

09:20 ENV SHOUTED and CLAPPED in order to encourage the bear to climb the berm and move north towards the ERT Training Grounds. Grizzly had no reaction.

09:24 ENV drove the LV closer towards the Grizzly in a slow and calm approach (<10km/h). As the LV approached the Grizzly (30 metres distance), it began to climb over the berm beside the Geology Shack.

09:27 ENV drove back onto the South Haul Road, then drove onto the A154 Haul Road, and then turned towards a laydown area where the vegetation patch east of the ERT Training Grounds was in clear sight.

09:30 ENV spotted the Grizzly grazing in the vegetation patch east of the ERT Training Grounds.

09:40 Grizzly continued to graze in the vegetation patch east of the ERT Training Grounds. ENV left the scene.

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

1%

Truck	1	From 0 to 40
Air Horn	0	From 0 to 40
C/F Bear Banger	0	From 0 to 40
C/F Pen Whistle	0	From 0 to 40
12GA Explosive	0	From 0 to 40
12GA B.B. Marker	0	From 0 to 40
12GA Rubber Bullet	0	From 0 to 40
12GA Slug	0	From 0 to 40
Helicopter	0	From 0 to 40
Other	3	From 0 to 40
Specify	SHOUTED, CLAPPED	
End of Environment Call-out	16.06.2022 09:40 MDT	
Final Location of Wildlife	Vegetation patch east of the ERT Training Grounds	
Closure & Sign-off	100%	
Wildlife Report Complete	On	
Signature	 Anton Jitnikovitch 16.06.2022 12:10 MDT	

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-06-17- Geology Shack to A154 Dike

Complete

Score	3.99%	Flagged items	0	Actions	0
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Audit Title (Animal - yyyy-mm-dd - Location)

Grizzly - 2022-06-17- Geology
Shack to A154 Dike

Document No.

WildlifeReport000199

19.06.2022

Audit

3.99%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

3.75%

Enter Initial Time of Wildlife Sighting

17.06.2022 11:20 MDT

Department/Individual Who Reported Wildlife:

Rio Tinto Exploration (RTX)

Environment at Call-out Location

18.06.2022 11:35 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Single large Grizzly, blonde color with white patch in between eyes.

Photo (If Possible):



Photo 1



Photo 2

Chronological Events

11:20 Rio Tinto Exploration (RTX) notified Environment (ENV) of a single Grizzly hanging around the Geology Shack.

11:30 ENV arrived on-scene in a LIGHT VEHICLE (LV) and spotted the Grizzly beside the grey sea-can in the Geology Shack area. ENV

11:35 ENV CLAPPED and SHOUTED at the Grizzly - Grizzly responded by running up the berm towards the A148 Haul Road.

11:40 ENV circled around from the Geology Shack to the A148 Haul Road and spotted the Grizzly walking down the Haul Road. As ENV approached the Grizzly with the LV, the Grizzly moved into the inner part of the A154 Dike and stopped moving. ENV was unable to reach the Grizzly location due to inaccessible terrain for the LV. ENV SHOUTED and CLAPPED but the Grizzly did not have a reaction.

11:42 ENV released a BEAR BANGER and the Grizzly began to run further into the A148 Dike - no workers were observed in the vicinity.

11:45 ENV observed the Grizzly walking further into the A154 Dike area.

11:50 ENV continued to observe the Grizzly walking further into the A154 Dike area, into a vegetation patch area. ENV left the scene.

14:30 RTX reported a single Grizzly at the Geology Shack.

14:32 ENV arrived on-scene in a LV and CLAPPED and SHOUTED at the Grizzly - Grizzly had no reaction and did not respond.

14:35 Released two (2) BEAR BANGERS, Grizzly had an immediate reaction and ran up the berm towards

ards the A154 Haul Road.
14:40 ENV circled around from the Geology Shack area to the A154 Haul Road and observed the Grizzly at the A154 Muster area. ENV CHARGED at the Grizzly with the LV and the Grizzly ran over the berm towards the A154 Dike area.
14:42 ENV SHOUTED and CLAPPED as the bear walked further into the A154 Dike.
14:45 ENV made a site-wide ANNOUNCEMENT and continued to observe the Grizzly as it walked further into the A154 Dike.
14:47 Grizzly walked out of observable range and ENV left the scene.

Movement Map (Import NotePlus Site Map)

Deterrent Count 3.75%

Truck 4
From 0 to 40

Air Horn 0
From 0 to 40

C/F Bear Banger 3
From 0 to 40

C/F Pen Whistle 0
From 0 to 40

12GA Explosive 0
From 0 to 40

12GA B.B. Marker 0
From 0 to 40

12GA Rubber Bullet 0
From 0 to 40

12GA Slug 0
From 0 to 40

Helicopter 0
From 0 to 40

Other 8
From 0 to 40

Specify SHOUT, CLAP

End of Environment Call-out 19.06.2022 14:47 MDT

Final Location of Wildlife

A154 Dike Area

Closure & Sign-off 100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
19.06.2022 12:11 MDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly - 2022-06-18 - Backfill to Veg. Patch East of ERT Training Grounds

Complete

Score	2.99%	Flagged items	0	Actions	0
-------	-------	---------------	---	---------	---

Audit Title (Animal - yyyy-mm-dd - Location)

Grizzly - 2022-06-18 - Backfill to Veg. Patch East of ERT Training Grounds

Document No.

WildlifeReport000198

19.06.2022

Audit

2.99%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

2.75%

Enter Initial Time of Wildlife Sighting

19.06.2022 10:00 MDT

Department/Individual Who Reported Wildlife:

Backfill Loadout Area Operator

Environment at Call-out Location

18.06.2022 10:10 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Single large Grizzly, blonde color with white patch in between eyes.

Photo (If Possible):



Photo 1

Chronological Events

10:00 Backfill Plant Operator notified Environment (ENV) of a single Grizzly.
10:10 ENV arrived on-scene in a LIGHT VEHICLE (LV) and searched for the Grizzly.
10:20 ENV located bear in a ditch between the Backfill Plant and the South Haul Road (SHR).
10:25 ENV CLAPPED and SHOUTED at the Grizzly - Grizzly had no reaction and did not respond.
10:30 ENV CYCLED ACTION of a firearm and continued to SHOUT and YELL. Grizzly had an immediate response and ran towards the Backfill Plant Cement Yard and then turned to run towards the SHR.
10:35 ENV continued to guide the Grizzly from the SHR towards the Shallow Bay.
10:40 Grizzly entered the Shallow Bay and began grazing.
10:50 Grizzly continued to graze in the Shallow Bay area. ENV left the scene.

13:30 ENV was notified of a Grizzly walking along the pipe in the Backfill Plant area.
13:40 ENV arrived on-scene in a LV and observed the bear walking along the pipe in the Backfill Plant area.
13:41 ENV CLAPPED and SHOUTED at the Grizzly - Grizzly had no reaction and did not respond.
13:45 ENV repositioned the LV in a way that would encourage the Grizzly to move away from the Backfill Plant (to head north towards the ERT Training Grounds from the Backfill Plant) - ENV CHARGED at the Grizzly with the LV and HONKED the horn simultaneously.
13:46 Grizzly responded immediately and began to run North to Till Pile.
13:55 ENV observed the Grizzly walking from the Till Pile to the vegetation patch east of the ERT Training Grounds.

14:00 Grizzly began to graze in the vegetation patch east of the ERT Training Grounds.
14:10 ENV observed the Grizzly continue to graze in the vegetation patch east of the ERT Training Grounds. ENV made an ANNOUNCEMENT and left the scene.

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count

2.75%

Truck

4
From 0 to 40

Air Horn

0
From 0 to 40

C/F Bear Banger

0
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

7
From 0 to 40

Specify

CLAPPED, SHOUTED, CHARGED

End of Environment Call-out

19.06.2022 14:10 MDT

Final Location of Wildlife

Vegetation patch east of the ERT Training Grounds.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
19.06.2022 11:23 MDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly - 2022-06-20 - Storage Tank Farm to Pond 11

Complete

Score	3.24%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-06-20 - Storage Tank Farm to Pond 11	
Document No.				WildlifeReport000200	
				20.06.2022	

Audit

3.24%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

3%

Enter Initial Time of Wildlife Sighting

20.06.2022 09:00 PDT

Department/Individual Who Reported Wildlife:

Fuel Truck Operator

Environment at Call-out Location

20.06.2022 09:08 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and two (2) very young cubs

Photo (If Possible):



Photo 1

Chronological Events

10:00 Fuel Truck Operator and others on the Diavik HSE Radio channel notify Environment (ENV) of a Sow and two (2) cubs walking along the road at the refueling bay/storage tank farm.

10:08 ENV arrives at the Storage Tank Farm in a LIGHT VEHICLE (LV) and spots the Grizzly and two (2) cubs.

10:10 ENV SHOUTS and CLAPS - to which the Grizzly and cubs have no reaction.

10:12 ENV SHOUTS and CLAPS and CYCLES ACTION of firearm - to which the Grizzly and cubs have a minimal reaction (slowly stand up and start moving and then pausing).

10:15 ENV SHOUTS, CLAPS, CYCLES ACTION of firearm, and releases a BEAR BANGER - to which the Grizzly immediately begins to run towards the Trucker Ice Road laydown area.

10:17 ENV follows the Grizzly and cubs and drives the LV towards them at a low rate of speed (10-17km/h) while using the LV HORN. Grizzly and cubs begin to run towards the vegetation patch area beside Pond 11, within the Ring Road.

10:18 Grizzly and cubs enter the vegetation patch area beside Pond 11, within the Ring Road.

10:19 ENV makes a Diavik site-wide ANNOUNCEMENT about the location of the Grizzly and cubs and then continues to observe the Grizzlies as they graze.

10:29 Grizzly and cubs continue to graze in the area. ENV leaves the scene.

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count

3%

Truck

3

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

1

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

8

From 0 to 40

Specify

SHOUT, CLAP, CYCLE ACTION

End of Environment Call-out

20.06.2022 09:29 PDT

Final Location of Wildlife

Pond 11 vegetation patch

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
04.12.2022 15:57 PST

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

2022-06-22

Complete

Score	2.49%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				2022-06-22	
Document No.				WildlifeReport000203	
				22.06.2022	

Audit	2.49%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	2.25%
Enter Initial Time of Wildlife Sighting	22.06.2022 14:10 MDT
Department/Individual Who Reported Wildlife:	Surface Mining
Environment at Call-out Location	22.06.2022 14:30 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	Sow and two cubs (brown)
Photo (If Possible):	
Chronological Events	
14:10 Environment (ENV) called to South Dike A21 responding to a report of a sow and two cubs 14:30 arrived on scene, found bears on grassy area near A21 dike 14:40 ENV used TRUCK HORN to push the bears South. The bears began moving in the intended direction but soon stopped 14:45 ENV used two BEAR BANGERS to get the sow to move South, bears began moving south, bears did not respond 15:00 ENV used TRUCK HORN and two BEAR BANGERS to move sow and two cubs South, bears do not respond 15:20 ENV used TRUCK HORN to move bears south, bears begin slowly moving south 15:31 ENV used two BEAR BANGERS to move bears south, bears slowly left the area. ENV continued to monitor bears. 16:00 ENV left scene	
Movement Map (Import NotePlus Site Map)	
Deterrent Count	2.25%
Truck	0 From 0 to 40
Air Horn	3 From 0 to 40
C/F Bear Banger	6 From 0 to 40
C/F Pen Whistle	0

	From 0 to 40
12GA Explosive	0 From 0 to 40
12GA B.B. Marker	0 From 0 to 40
12GA Rubber Bullet	0 From 0 to 40
12GA Slug	0 From 0 to 40
Helicopter	0 From 0 to 40
Other	0 From 0 to 40
Specify	
End of Environment Call-out	22.06.2022 16:00 MDT
Final Location of Wildlife	
Tundra east of A21 Zone 2	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Jarod Tuckey 24.06.2022 17:19 MDT	

Wildlife Report - 2021

Grizzly - 2022-07-15 - C Dorm

Complete

Score	1%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)			Grizzly - 2022-07-15 - C Dorm		
Document No.			WildlifeReport000208		
			16.07.2022		

Audit	1%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	0.75%
Enter Initial Time of Wildlife Sighting	15.07.2022 17:55 PDT
Department/Individual Who Reported Wildlife:	Security
Environment at Call-out Location	15.07.2022 18:10 PDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	Sow and single cub
Photo (If Possible):	
Chronological Events	
18:55 Environment received a report of a sow grizzly and single cub walking past the main camp kitchen toward C dorm 19:10 Environment on scene, found bears grazing on tundra between main camp and the comms shack. Used TRUCK to move bears to the southeast. Bears did not respond. 19:16 Used C/F BEAR BANGER to move bears to the southeast. Sow moved away a short distance but immediately returned and continued grazing. 19:20 Environment followed bears slowly to the south 19:45 Used TRUCK to move bears into Pond 11, bears move slowly into the pond. Environment continued to monitor bears. 20:05 Environment left scene	
Movement Map (Import NotePlus Site Map)	
	
Photo 1	
Deterrent Count	
0.75%	
Truck	2 From 0 to 40
Air Horn	0 From 0 to 40

C/F Bear Banger

1
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

0
From 0 to 40

Specify

End of Environment Call-out

15.07.2022 19:05 PDT

Final Location of Wildlife

Pond 11

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Brett Potter
16.07.2022 07:10 PDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-07-15 - ERT Training Grounds to Shallow Bay

Complete

Score	2.74%	Flagged items	0	Actions	0
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Audit Title (Animal - yyyy-mm-dd - Location)

Grizzly - 2022-07-15 - ERT Training Grounds to Shallow Bay

Document No.

WildlifeReport000206

15.07.2022

Audit	2.74%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	2.5%
Enter Initial Time of Wildlife Sighting	15.07.2022 05:50 MDT
Department/Individual Who Reported Wildlife:	
Pit Dispatcher	
Environment at Call-out Location	15.07.2022 06:10 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Grizzly (primarily blonde with darker brown near its behind) with one (1) cub (blonde face, brown body).	
Photo (If Possible):	
Chronological Events	
#1. 05:50 ENV was notified by security of a bear at the North Mine Dry Parking Lot. 06:10 ENV arrived at the North Mine Dry Parking Lot in a LIGHT VEHICLE (LV) and did not observe a bear. 06:30 ENV scanned the surrounding areas. 06:50 ENV scanned the ERT Training Grounds and located a Grizzly and one (1) cub in the vegetation patch adjacent to the ERT Training Grounds. 07:05 ENV observed the Grizzly and cub grazing within the vegetation patch. 07:10 Grizzly and cub attempted to leave the ERT Training Grounds towards the North Till Pile. ENV used the LV to dissuade the Grizzly and cub from leaving the vegetation patch. 07:25 Grizzly and cub continued grazing within the vegetation patch beside the ERT Training Grounds. ENV left the scene. --- #2. 07:40 ENV was notified that a Grizzly and one (1) cub were seen heading towards the Backfill Plant from the North Till Pile. 07:45 ENV arrive at the Backfill Plant in a LV and searched for the Grizzly and cub. No bears were spotted. 08:05 ENV located the Grizzly and cub crossing the South Haul Road heading towards Pond 11. 08:07 ENV observed the Grizzly and cub crossing the road from Pond 11 towards the Shallow Bay. 08:10 Grizzly and cub were seen grazing in the Shallow Bay. 08:15 Grizzly and cub walked further into the Shallow Bay. ENV left the scene. --- #3. 08:40 Bear spotted in pond near Backfill Plant by Backfill operator. 08:45 ENV arrived on-scene in a LV and observed the Grizzly and cub in the vegetation patch adjacent to the Backfill Plant. 08:50 ENV SHOUTED and CLAPPED, bear had no response.	

08:51 ENV SHOUTED, CLAPPED, and CYCLED ACTION of firearm. Grizzly and cub had an immediate reaction and ran across the South Haul Road into the Shallow Bay.
 08:57 Grizzly and cub continued to move further into the Shallow Bay.
 09:02 Grizzly and cub laid down to rest near the Vegetation Plot within the Shallow Bay.
 09:14 Grizzly and cub resting near the Vegetation Plot within the Shallow Bay. ENV left the scene.
 09:50 ENV returned to the scene and observed the Grizzly and cub still resting near the Vegetation Plot within the Shallow Bay. ENV left the scene.

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

2.5%

Truck

3
From 0 to 40

Air Horn

0
From 0 to 40

C/F Bear Banger

2
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

5
From 0 to 40

Specify

SHOUT, CLAP, CYCLE ACTION

End of Environment Call-out

15.07.2022 09:50 MDT

Final Location of Wildlife

Near the Vegetation Plot within the Shallow Bay.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature



Anton Jitnikovitch
16.07.2022 07:44 MDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-07-15 - Vegetation Patch adjacent to North Inlet Water Treatment Plant

Complete

Score	1.75%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-07-15 - Vegetation Patch adjacent to North Inlet Water Treatment Plant	
Document No.				WildlifeReport000207	
				16.07.2022	

Audit	1.75%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1.5%
Enter Initial Time of Wildlife Sighting	15.07.2022 09:20 MDT
Department/Individual Who Reported Wildlife:	
ENV personnel	
Environment at Call-out Location	15.07.2022 16:05 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Single large Grizzly, blonde color with small white patch in between eyes	
Photo (If Possible):	
Chronological Events	
16:05 ENV personnel observed a single Grizzly near the Water Treatment Plant. 16:15 Another ENV member arrived with deterrents and observed the single Grizzly resting in the vegetation patch east of the Water Treatment Plant. 16:25 Grizzly continued to rest in the vegetation patch east of the North Inlet Water Treatment Plant. 16:34 Grizzly began to walk towards ENV personnel. 16:35 ENV CLAPPED and SHOUTED - Grizzly had no reaction. 16:37 ENV CLAPPED, SHOUTED, and released two (2) BEAR BANGERS. The Grizzly ran towards the vegetation patch behind the Water Treatment Plant. 16:40 Grizzly continued walking west further into the vegetation patch adjacent to the Airport Road. 16:45 ENV left the scene.	
Movement Map (Import NotePlus Site Map)	
	
Photo 1	
Deterrent Count	1.5%
Truck	0 From 0 to 40

Air Horn	0
	From 0 to 40
C/F Bear Banger	2
	From 0 to 40
C/F Pen Whistle	0
	From 0 to 40
12GA Explosive	0
	From 0 to 40
12GA B.B. Marker	0
	From 0 to 40
12GA Rubber Bullet	0
	From 0 to 40
12GA Slug	0
	From 0 to 40
Helicopter	0
	From 0 to 40
Other	4
	From 0 to 40
Specify	CLAP, SHOUT
End of Environment Call-out	16.07.2022 16:45 MDT
Final Location of Wildlife	
Vegetation patch adjacent, and to north of, Airport Road.	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
	Anton Jitnikovitch 16.07.2022 08:16 MDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-07-17 - Pond 13

Complete

Score	1.75%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-07-17 - Pond 13	
Document No.				WildlifeReport000210	
				17.07.2022	

Audit	1.75%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1.5%
Enter Initial Time of Wildlife Sighting	17.07.2022 08:30 MDT
Department/Individual Who Reported Wildlife:	
Geotechnical Personnel	
Environment at Call-out Location	17.07.2022 08:50 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Single large adult male grizzly. Blondish fur, large snout.	
Photo (If Possible):	
Chronological Events	
08:30 Environment (ENV) was notified of a single grizzly walking on the South Haul Road towards the Shallow Bay. 08:50 ENV arrived on-scene in a LIGHT VEHICLE (LV) and observed a single large grizzly grazing in the Shallow Bay. 08:55 Grizzly crossed the road towards the vegetation patch in the Pond 13 area. 09:00 ENV CLAPPED and SHOUTED - grizzly had no reaction 09:05 ENV CLAPPED, SHOUTED, and CYCLED ACTION of firearm. Bear moved further into the vegetation patch in the Pond 13 area and began to rest. 09:10 Grizzly resting in the vegetation patch in the Pond 13 area. 09:30 Grizzly resting in the vegetation patch in the Pond 13 area. ENV left the scene.	
Movement Map (Import NotePlus Site Map)	
 Photo 1	
Deterrent Count	1.5%
Truck	1 From 0 to 40
Air Horn	0 From 0 to 40

C/F Bear Banger

0
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

5
From 0 to 40

Specify

SHOUT, CLAP, CYCLE ACTION

End of Environment Call-out

17.07.2022 09:30 MDT

Final Location of Wildlife

Pond 13.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature



Anton Jitnikovitch
17.07.2022 10:54 MDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-07-23 - Backfill

Complete

Score	1.25%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-07-23 - Backfill	
Document No.				WildlifeReport000211	
				24.07.2022	

Audit	1.25%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1%
Enter Initial Time of Wildlife Sighting	23.07.2022 13:00 MDT
Department/Individual Who Reported Wildlife:	
Backfill lead hand	
Environment at Call-out Location	23.07.2022 13:15 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Large blonde sow and three young cubs	
Photo (If Possible):	
Chronological Events	
13:00 Environment received a report of a sow and three cubs in the crusher loadout. 13:15 Environment on scene, did not find bears in the crusher loadout. Continued to search the area. 13:22 Environment found sow and three cubs in a vegetation patch between two pipe benches near the backfill plant, moving slowly toward the truck shop. 13: 30 Environment used TRUCK to move bears to the northeast. Bears stop but do not change direction. 13:35 Environment used BEAR Banger to move bears to the northeast. Bears do not respond. 13:40 Environment used TRUCK to move bears to the northeast. Bears begin to move slowly. 13:45 Environment followed bears northeast along the pipe bench to the north haul road. 14:20 Bears cross north haul road, Environment used TRUCK to move bears to the east edge of the till pile. Bears move quickly to a vegetation patch at the base of the till pile. Environment continued to follow bears. 14:30 Bears move to tundra patch on the north side of the till pile and out of view. Environment continued to monitor area. 14:45 Environment left scene.	
Movement Map (Import NotePlus Site Map)	
Deterrent Count	1%
Truck	3 From 0 to 40
Air Horn	0 From 0 to 40

C/F Bear Banger	1 From 0 to 40
C/F Pen Whistle	0 From 0 to 40
12GA Explosive	0 From 0 to 40
12GA B.B. Marker	0 From 0 to 40
12GA Rubber Bullet	0 From 0 to 40
12GA Slug	0 From 0 to 40
Helicopter	0 From 0 to 40
Other	0 From 0 to 40
Specify	
End of Environment Call-out	23.07.2022 14:45 MDT
Final Location of Wildlife	
Tundra near till pile	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Brett Potter 24.07.2022 09:11 MDT	

Wildlife Report - 2021

Grizzly - 2022-07-25 - STF

Complete

Score	0.5%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-07-25 - STF	
Document No.				WildlifeReport000212	
				26.07.2022	

Audit	0.5%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	0.25%
Enter Initial Time of Wildlife Sighting	25.07.2022 22:30 MDT
Department/Individual Who Reported Wildlife:	
Site Services	
Environment at Call-out Location	25.07.2022 22:30 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Sow Grizzly and single cub that have been present on site frequently	
Photo (If Possible):	
Chronological Events	
20:20 Sow and cub were called in to security at the South Tank Farm. 20:30 Environment bear monitor arrived on scene, began scouting surrounding areas for the bears. 21:01 Environment monitor discovered the sow grizzly and cub on the tundra near the lakeshore, south of the South Tank Farm. The monitor shouted to encourage the bears to move away from the area and further out onto the tundra. 21:30 bears appear to be heading in a good direction, Environment leaves area.	
Movement Map (Import NotePlus Site Map)	
Deterrent Count	0.25%
Truck	0 From 0 to 40
Air Horn	0 From 0 to 40
C/F Bear Banger	0 From 0 to 40
C/F Pen Whistle	0 From 0 to 40
12GA Explosive	0 From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

1
From 0 to 40

Shouting (1)

Specify

End of Environment Call-out

25.07.2022 23:30 MDT

Final Location of Wildlife

Tundra south of South Tank Farm

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

GC
26.07.2022 15:52 MDT

Wildlife Report - 2021

Grizzly - 2022-07-27 Batch Plant

Complete

Score	2%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)			Grizzly - 2022-07-27 Batch Plant		
Document No.			WildlifeReport000214		
			27.07.2022		

Audit

2%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1.75%

Enter Initial Time of Wildlife Sighting

27.07.2022 06:35 MDT

Department/Individual Who Reported Wildlife:

Batch Plant Operator

Environment at Call-out Location

27.07.2022 06:45 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow with three young cubs. Sow and one cub are quite blonde, other two cubs are brown

Photo (If Possible):



Photo 1



Photo 2



Photo 3

Chronological Events

6:35 - Environment receives call from Batch Plant Operator that a grizzly sow and three cubs are in the Batch Plant yard, near the non-burn bin in front of the plant. Environment team (ENV) mobilizes.

6:45 - ENV arrives on scene and finds the sow inside of the non-burn waste bin, while the three cubs are on the ground outside of it. Sow is digging around inside of the bin and cubs are walking around it attempting to climb the bin to join the sow.

6:55 - ENV parks approximately 10 meters from bin and uses HORN on truck multiple times to get the sow out of the bin. Sow does not react to the HORN and remains in bin, while cubs are curious by ENV presence but not deterred from ground adjacent to bin.

7:00 - ENV team then CYCLES ACTION on SHOTGUN, sow climbs up and over the side of the bin. Sow and cubs then head east through batch plant yard towards aggregate stockpiles.

7:10 - Bears climb over the east berm separating the batch plant and A418 pit equipment laydown. ENV monitors the bears as they graze in field before they continue southeast towards boulder field and A418 dike.

7:20 - ENV loses sight of bears after they climb over another berm, heading in a SE direction. ENV cannot locate the bears. ENV notifies area personnel of last known location and returns to batch plant to investigate possible attractants in bin. ENV found small amount of food-contact waste including paper plates and utensils that likely acted as an attractant. Area supervisor was notified and bin was to be emptied shortly after, and operating crew was immediately reminded of proper waste segregation.

8:05 - ENV receives another call from batch plant operator, the bears are back in the yard and moving towards the same non-burn bin. Site Services have not had a chance to empty bin since first encounter.

8:15 - ENV arrives on scene, sow is once again inside of the bin with the cubs on the ground nearby. ENV attempts to use truck HORN again, but the bear does not react.

8:20 - ENV CYCLES ACTION on SHOTGUN, deterring the sow from the bin and again heading in a SE direction across the batch plant yard. ENV reiterates with Site Services that the non-burn bin in question must be emptied promptly to limit the wildlife attractants in the area.

8:25 - ENV loses sight of sow and cubs again in boulder field. Remain in area for a period of time in case the bears returned but they did not.

14:00 - ENV receives another call, cubs have been spotted on the berm adjacent to winter road approach with the sow moving up the road towards the North Mine Dry and Batch plant. ENV arrives on site to the cubs still on the berm, and are notified that the sow is back at the batch plant.

14:10 - Sow is once again interested in the non-burn bin, which has since been emptied since the morning interaction. ENV continues to monitor sow in batch plant yard as she begins to move towards the plant itself and climbing the barriers around the ramp. ENV used truck HORN to deter her from the area, hoping to get her moving back towards her cubs and away from mine infrastructure.

14:20 - Sow was reluctant to leave the area but eventually began moving SE towards winter road approach and her cubs. ENV controlled traffic in the area as the sow crossed multiple haul roads toward North Approach and shallow bay area. Sow rejoins cubs and heads down haul road towards A418.

14:45 - After turning N back towards batch plant area, ENV loses site of the bears again but eventually finds them again in the batch plant yard. Sow headed back towards the non-burn bin once again.

14:50 - The bin is now empty, however the sow once again decides to jump into the bin. ENV used HORN to deter her with little reaction at first, but eventually she climbed back up and headed N towards SCAP warehouse and Pit refueling area near North Haul road.

15:10 - Sow and cubs continue heading NW through SCAP warehouse yard towards the South and North Haul road intersection. ENV controls traffic via radio as the bears cross the busy haul road. Sow and cubs climb a berm adjacent to South Haul road and climb down into valley on west side of road.

15:30 - Bears are monitored for further movement. ENV leaves scene as bears are grazing in area away from mine activity.

Movement Map (Import NotePlus Site Map)



Photo 4

Deterrent Count

1.75%

Truck

5
From 0 to 40

Air Horn

0
From 0 to 40

C/F Bear Banger

0
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

2
From 0 to 40

Specify

Action on shotgun

End of Environment Call-out

27.07.2022 15:30 MDT

Final Location of Wildlife

Valley NW corner of North/South Haul road intersection.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Justin Macek
28.07.2022 18:26 MDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Grizzly - 2022-07-29 - Batch Plant

Complete

Score	1%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-07-29 - Batch Plant	
Document No.				WildlifeReport000215	
				31.07.2022	

Audit

1%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.75%

Enter Initial Time of Wildlife Sighting

29.07.2022 19:40 MDT

Department/Individual Who Reported Wildlife:

Batch Plant Operator

Environment at Call-out Location

29.07.2022 19:55 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and three young cubs, sow and one cub blonde, two brown cubs.

Photo (If Possible):



Photo 1

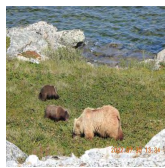


Photo 2



Photo 3

Chronological Events

19:40 - Environment team (ENV) receives a call from the Backfill/Batch Plant operations team that the sow and 3 cubs have entered into the yard from the east and are moving slowly towards the plant. ENV leaves main camp to retrieve deterrents and heads towards the scene.

19:50 - While on route to scene, ENV receives another call from the Batch Plant, this time explaining that the bears are congregating around the non-burn waste bin and cement bag storage area. Batch Plant supervisor is on scene until ENV arrives.

19:55 - ENV arrives on scene to the bears leaving the non-burn waste area and heading southwest towards the yard exit. ENV continues monitoring their movement.

20:00 - Bears continue southwest directly across the road and climb the berm into the North Mine Dry/Underground area. ENV alerts all personnel via radio that the bears are in the work area. There were many personnel outside the dry prior to the start of their shift. ENV uses TRUCK and HORN to deter the bears but they turn directly towards the dry. Personnel in the area see the interaction occurring and seek shelter in the building and vehicles nearby. ENV continues using TRUCK and HORN to deter the bears and guide them towards the east side of the yard and away from vulnerable people.

20:10 - Bears hop over eastern berm, down into a UG material laydown to the east, before continuing across the underground haul road and out into the shallow bays. ENV monitors the animals for approximately 20 minutes as they head further into the bay and away from mine infrastructure. ENV leaves the scene.

Movement Map (Import NotePlus Site Map)



Photo 4

Deterrent Count

0.75%

Truck

3

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

0

From 0 to 40

Specify

End of Environment Call-out

29.07.2022 20:30 MDT

Final Location of Wildlife

Shallow bays, near the North Winter Road approach.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Justin Macek
31.07.2022 07:56 MDT

Appendix



Photo 1



Photo 2



Photo 3



Photo 4

Wildlife Report - 2021

Grizzly - 2022-07-30 - Main Camp

Complete

Score	1.5%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-07-30 - Main Camp	
Document No.				WildlifeReport000216	
				31.07.2022	

Audit	1.5%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1.25%
Enter Initial Time of Wildlife Sighting	30.07.2022 13:25 MDT
Department/Individual Who Reported Wildlife:	
Site Services	
Environment at Call-out Location	30.07.2022 01:30 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Sow Grizzly with 3 cubs	
Photo (If Possible):	
	
Photo 1	
Chronological Events	
13:25 Site services reported a sow grizzly with 3 cubs by the lake across from the Site Services Lineup and the Truck Shop. Environment bear monitor (ENV) made an announcement, then mobilized to the area. 13:32 ENV arrived on scene. Bears continued heading east along the lakeshore. ENV kept the truck between the bears and Main Accommodations and monitored their progress. 13:45 Bears then out of sight beyond the Communications Building, ENV left the area. 16:05 Bears are reported near South Camp dormitories, ENV mobilizes. 16:09 ENV receives updates that bears are approaching Main Camp loading dock. 16:10 ENV on scene, sow grizzly and cubs are actively investigating the closed doors of the loading dock which is near the MAC kitchen. ENV pushes bears away from loading dock with Truck and horn. The bears ran south the way they had come. ENV followed in the truck and ensured they continued to pond 11 near the Steel Yard. 16:12 ENV entered steel yard, waited until sow was away from cubs, then fired one mid range rubber bullet at backside of sow. She reacted by running to the edge of pond 11 and looking back. ENV fired 2 12Gauge explosives in the air to keep the bears moving out of pond 11 and away from camp. 16:14 ENV repositions to find bears near South Winter Road Approach. ENV followed the bears in the truck until they made their way to the tundra near A21 Lakeshore Boulevard. 17:30 Bears in good area by Lakeshore Boulevard. ENV off scene.	

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count

1.25%

Truck

1
From 0 to 40

Air Horn

1
From 0 to 40

C/F Bear Banger

0
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

2
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

1
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

0
From 0 to 40

Specify

End of Environment Call-out

30.07.2022 17:30 MDT

Final Location of Wildlife

On tundra by Lakeshore Boulevard A21 light vehicle road

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

GC
31.07.2022 11:23 MDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly - 2022-08-21 - Hockey Rink to Backfill Veg. Patch

Complete

Score	3.99%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-08-21 - Hockey Rink to Backfill Veg. Patch	
Document No.				WildlifeReport000223	
				21.08.2022	

Audit

3.99%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

3.75%

Enter Initial Time of Wildlife Sighting

21.08.2022 06:30 MDT

Department/Individual Who Reported Wildlife:

Operations Personnel

Environment at Call-out Location

21.08.2022 06:35 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Grizzly Sow and Cub. Cub has a white fur patch on his right shoulder.

Photo (If Possible):



Photo 1

Chronological Events

#1

6:30 Environment (ENV) notified of a sow and cub at the vegetation patch beside the Storage Tank Farm.

6:35 ENV arrived on-scene in a LIGHT VEHICLE (LV).

6:40 ENV CLAPPED and SHOUTED - Sow did not react.

6:45 ENV released two (2) BEAR BANGERS - Sow did not react.

6:48 ENV CYCLED ACTION of firearm - Sow had a minimal reaction.

6:51 Sow and cub walked further into the vegetation patch.

6:53 ENV returned to the LV and repositioned on the other side of the vegetation patch. Sow and cub were spotted grazing at the vegetation patch beside the lake.

7:00 Sow and cub continued to graze at the vegetation patch beside the lake. ENV left the scene.

#2

9:15 ENV was notified of a Sow and cub beside the Hockey Rink at Main Camp.

9:20 ENV arrived on-scene in a LV and spotted the Sow and cub on the west side of B-dorm.

9:22 ENV CLAPPED and SHOUTED - Sow had no reaction.

9:25 ENV CYCLED ACTION of firearm - Sow and cub began to move towards the South Haul Road.

9:26 ENV returned to the LV and guided the Sow and cub towards the Shallow Bay area.

9:45 Sow and cub swam across the Shallow Bay and entered the vegetation patch south of the Backfill Plant.

9:50 ENV SHOUTED, CLAPPED, and CYCLED ACTION of firearm - Sow had no reaction.

9:55 ENV discharged a RUBBER BULLET at the Sow's rear. Sow had a minimal reaction and continued to graze.

10:05 Sow and cub walked further into the vegetation patch south of the Backfill Plant.

10:10 ENV left the scene.

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count

3.75%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

3

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

1

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

9

From 0 to 40

Specify

CLAP (3), SHOUT (3), CYCLE
ACTION (3)

End of Environment Call-out

21.08.2022 10:10 MDT

Final Location of Wildlife

Vegetation patch south of Backfill Plant

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
22.08.2022 07:51 MDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly - 2022-09-15 Till Pile

Complete

Score	3.49%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-09-15 Till Pile	
Document No.				WildlifeReport000229	
				16.09.2022	

Audit

3.49%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

3.25%

Enter Initial Time of Wildlife Sighting

15.09.2022 15:10 PDT

Department/Individual Who Reported Wildlife:

Surface Mining Drill and Blast

Environment at Call-out Location

15.09.2022 15:20 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow with single cub

Photo (If Possible):

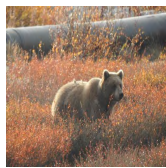


Photo 1



Photo 2

Chronological Events

1610 Surface mining drill and blast reported a bear crossing the airport road heading south towards the north country till pile (NCTP). A blast was scheduled for 17:30 that same day.

16:20 Environment arrived on scene at the north side of the till pile where they found the sow and cub grazing in a small depression between the airport road and NCTP slope. Due to the imminent blast, Environment decided to deter the bears away from the blast exclusion zone.

16:22 Environment yelled and clapped at the bears from approximately 30m away with no effect.

16:24 Fired 2 pen bangers. The bears continued grazing.

16:26 Environment fired 2 12 gauge bear bangers and the bears begin to move out of ditch and back onto the road. Bears continued east hopping back over ditch towards NCTP.

16:32 Environment repositioned to south side of NCTP along the north haul road. The bears headed south directly towards ditch near Environment. When the bears were in the ditch below, environment used yelling, and cycling the action to attempt to move bears back towards the north inlet. Bears began moving east across the airport road towards the tundra near the ERT training grounds. Environment fired 1 12 gauge bear banger to try and persuade them north. Bears continue East.

1640 Environment repositioned to a road cutout off of the 154 pit haul road, where they could be above the tundra that the bears were on. Environment fired 2 12 gauge bear bangers to try and get the bears moving. Bears moved a short distance then returned to grazing. Bears were outside the zone of the till pile blast.

1735: Blast went off and all clear was given several minutes later.

17:55 Environment returned to location and found Sow and Cub in the same location. Environment

yelled and clapped to get them moving north again (they had finished grazing in the area). Bears moved slowly towards 154 fish habitat, then crossed the dike heading towards the north inlet. Environment monitored the animals until they were north of the dike at 18:10.

Movement Map (Import NotePlus Site Map)



Photo 3

Deterrent Count

3.25%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

2

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

5

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

4

From 0 to 40

Specify

Clapping, Yelling, cycling action

End of Environment Call-out

15.09.2022 17:30 PDT

Final Location of Wildlife

Tundra near North Inlet Water Treatment Plant

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Gord Cumming
16.09.2022 10:59 PDT

Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Grizzly - 2022-09-19 - Metcon

Complete

Score	1%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)			Grizzly - 2022-09-19 - Metcon		
Document No.			WildlifeReport000230		
			19.09.2022		

Audit	1%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	0.75%
Enter Initial Time of Wildlife Sighting	19.09.2022 11:40 PDT
Department/Individual Who Reported Wildlife:	Site Services
Environment at Call-out Location	19.09.2022 11:50 PDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	Sow and single cub
Photo (If Possible):	
Chronological Events	
12:40 Environment received a report of a sow grizzly and single cub in the metcon laydown 12:50 Environment on scene, found bears in the metcon laydown. Used TRUCK HORN to move bears west toward the AN road. Bears begin to move south 12:55 Environment followed bears across the A21 haul road and south to a tundra patch between the A21 pit shop and Lakeshore Boulevard 1300 Used TRUCK and TRUCK HORN to move bears out of tundra patch. Bears responded and moved across Lakeshore Boulevard to the tundra. Environment continued to monitor bears 1320 Bears moved further into the tundra and out of sight. Environment left the scene.	
Movement Map (Import NotePlus Site Map)	
	
Photo 1	
Deterrent Count	
Truck	1 From 0 to 40
Air Horn	0 From 0 to 40
C/F Bear Banger	0

	From 0 to 40
C/F Pen Whistle	0 From 0 to 40
12GA Explosive	0 From 0 to 40
12GA B.B. Marker	0 From 0 to 40
12GA Rubber Bullet	0 From 0 to 40
12GA Slug	0 From 0 to 40
Helicopter	0 From 0 to 40
Other	2 From 0 to 40
Specify	Truck horn
End of Environment Call-out	19.09.2022 12:20 PDT
Final Location of Wildlife	
Tunrda east of Lakeshore Boulevard	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Brett Potter 19.09.2022 12:40 PDT	

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-09-26

Complete

Score	1.5%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly - 2022-09-26	
Document No.				WildlifeReport000236	
				27.09.2022	

Audit

1.5%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1.25%

Enter Initial Time of Wildlife Sighting

26.09.2022 15:30 PDT

Department/Individual Who Reported Wildlife:

PKC / Surface Mining

Environment at Call-out Location

26.09.2022 15:45 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and single yearling cub. Habituated to island.

Photo (If Possible):

Chronological Events

4:30 - Environment (ENV) receives call from PKC/Surface Mining personnel that a sow and cub have been spotted on the PKC-South access road near the PKC muster
4:40 - ENV receives another call that the bears have cleared the berm on the west side of the access road and have climbed down into the adjacent valley
4:45 - ENV arrives on scene to bears slowly grazing in valley and monitors their movements as they head southwest
5:00 - Bears continue southwest towards waste transfer. ENV uses TRUCK and BANGER to deter away from the sensitive waste area, hoping to entice the bear to continue southwest towards AN road and open tundra. Banger has very brief effect on the bears behaviour
5:10-5:25 - Bears continue in direction of waste transfer area. ENV uses three more BANGERS (total of 4) with only mild reaction from the bears
5:30 - Bears climb onto rock face to southwest of valley and begin grazing. Sow begins digging quite aggressively into a patch of soil and moss, seemingly chasing some small animal burrowing underneath
5:45 - Bears continue grazing on elevated soil patch west of waste transfer
6:00 - ENV leaves scene

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

1.25%

Truck	1	From 0 to 40
Air Horn	0	From 0 to 40
C/F Bear Banger	4	From 0 to 40
C/F Pen Whistle	0	From 0 to 40
12GA Explosive	0	From 0 to 40
12GA B.B. Marker	0	From 0 to 40
12GA Rubber Bullet	0	From 0 to 40
12GA Slug	0	From 0 to 40
Helicopter	0	From 0 to 40
Other	0	From 0 to 40
Specify		
End of Environment Call-out	26.09.2022 17:00 PDT	
Final Location of Wildlife	Rocky area west of waste transfer	
Closure & Sign-off	100%	
Wildlife Report Complete	On	
Signature	Justin Macek 27.09.2022 17:08 PDT	

Appendix



Photo 1

Wildlife Report - 2021

Grizzly - 2022-09-26 - PKC to A.N. Road

Complete

Score	1.25%	Flagged items	0	Actions	0
-------	-------	---------------	---	---------	---

Audit Title (Animal - yyyy-mm-dd - Location)	Grizzly - 2022-09-26 - PKC to A. N. Road
Document No.	WildlifeReport000235
	26.09.2022

Audit

1.25%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1%

Enter Initial Time of Wildlife Sighting

26.09.2022 07:30 PDT

Department/Individual Who Reported Wildlife:

Surface Operations/Workers at PKC Muster

Environment at Call-out Location

26.09.2022 07:45 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

1 Sow Grizzly (resident bear) - Healthy, shiny winter coat growing. Winter coat is darker than her shaggy, blonde, summer fur.

1 Grizzly Cub (born this year) - Gaining substantial weight, is a slightly blonder color than sow.

Photo (If Possible):

Chronological Events

8:30 am - First call of sow and cub walking along south haul road from PKC muster toward waste transfer.

8:45 am - Environment team arrives on scene, drives around PKC muster, around outside of waste transfer, around back side of test piles looking for bears.

9:00 am - Environment spots bears around back side of test piles near California trailer. Using the truck (no horn), Environment pushes sow and cub to tundra between test piles and A.N. road.

9:15 am - Environment fires first 12-gauge banger using the shotgun. Bears move away from noise of the exploding shell, slowly.

9:20 am - Environment fires second 12-gauge banger using the shotgun. Bears continue to move away from sound of exploding shell and cross over south haul road onto A.N. road.

9:30 am - Environment follows sow and cub down A.N. road and uses truck to push them onto the tundra between the SCRP and magazine storage. Environment continues to observe bears on tundra to ensure they do not return to south haul road.

9:50 am - Environment makes site-wide wildlife announcement and leaves sow and cub grazing on the tundra between the SCRP and magazine storage.

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

1%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

2

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

0

From 0 to 40

Specify

End of Environment Call-out

26.09.2022 08:50 PDT

Final Location of Wildlife

On tundra between South Country Rock Pile (SCRCP) and magazine storage

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Jordan M. Carper
26.09.2022 10:30 PDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly and cub 2022-07-31 ROM Hill to Shallow Bay

Complete

Score	1.5%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly and cub 2022-07-31 ROM Hill to Shallow Bay	
Document No.				WildlifeReport000218	
				01.08.2022	

Audit	1.5%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	1.25%
Enter Initial Time of Wildlife Sighting	31.07.2022 15:00 PDT
Department/Individual Who Reported Wildlife:	
Backfill	
Environment at Call-out Location	31.07.2022 18:57 PDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Grizzly sow with single cub that has been on site since this spring	
Photo (If Possible):	
Chronological Events	
16:00 Environment (ENV) received call from PKC personnel that sow and single cub were spotted at the bottom of the test piles area. 16:20 ENV arrived on site but was unable to obtain visual confirmation of bears. 16:40 ENV received another call, this time from Surface Mining. Sow and cub spotted at the intersection of the North Haul road and ROM hill road. 16:50 ENV arrived on site but only saw the cub, which had run across the PKC muster area and back down into the valley under the test piles. 17:10 ENV continued to search the area for the sow but was unable to locate her. At this point the cub climbed back up from the valley it was in and crossed towards the ROM hill. ENV got visual confirmation that the cub was back with the sow. 17:45 Sow and cub began heading northeast alongside south haul road towards the backfill plant. 18:00 Sow and cub cross the haul road into the shallow bays where they graze for about 10 minutes prior to ENV leaving the scene. 19:57 ENV found sow and single cub on tundra beside backfill/south haul road intersection. 19:59 ENV tried to persuade bears north across haul road in the direction of the North Inlet. Fired one 12G explosive in the air, bears did not move towards haul road as intended. ENV fired one rubber bullet at backside of sow, did not contact the animal. 20:04 ENV relocated to vegetation plots access road to block bears and send them north. Fired 2 12Gauge explosives in the air and bears did not respond. Fired another 12G explosive closer to the animals and they moved a short distance away from ENV range. ENV left the scene. 21:02 ENV returns, sow and cub are making their way south further into shallow bays. ENV tries to persuade bears to go North instead to get them to the North Inlet. Shallow bays are surrounded by active work areas. ENV takes the veg plot road to get south of the Bears. ENV exits vehicle and cycles shotgun action. ENV repositions south of bears on veg plot road and attempt a second action cycling, same response from sow and cub. Nothing ENV can do. 21:25 ENV off scene.	

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count 1.25%

Truck 0
From 0 to 40

Air Horn 0
From 0 to 40

C/F Bear Banger 0
From 0 to 40

C/F Pen Whistle 0
From 0 to 40

12GA Explosive 4
From 0 to 40

12GA B.B. Marker 0
From 0 to 40

12GA Rubber Bullet 1
From 0 to 40

12GA Slug 0
From 0 to 40

Helicopter 0
From 0 to 40

Other 0
From 0 to 40

Specify Cycling Action (2)

End of Environment Call-out 31.07.2022 20:30 PDT

Final Location of Wildlife

Shallow Bays across from MAC

Closure & Sign-off 100%

Wildlife Report Complete On

Signature

Appendix



Photo 1

Wildlife Report - 2021

Grizzly and Cubs - 2022-06-11 - A418 Dike

Complete

Score	1.75%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly and Cubs - 2022-06-11 - A418 Dike	
Document No.				WildlifeReport000184	
				11.06.2022	

Audit

1.75%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1.5%

Enter Initial Time of Wildlife Sighting

10.06.2022 12:30 PDT

Department/Individual Who Reported Wildlife:

A418 Surface Mine Operator

Environment at Call-out Location

11.06.2022 12:30 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow (mix of brown and blonde) and two young cubs (blonde head, brown body).

Photo (If Possible):

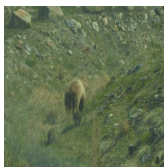


Photo 1



Photo 2

Chronological Events

1:30 Environment (ENV) personnel arrived to the A418 dike to take photos in a Light Vehicle (LV).

1:31 ENV exited the LV and walked upon a small berm overlooking the A418 pit. Upon reaching near the top of the berm, ENV spotted a Grizzly with two (2) Cubs directly below the berm, approximately 5-metres distance. ENV and the Grizzly made eye contact and the Grizzly began moving towards ENV personnel.

1:32 ENV immediately returned to the LV while SHOUTING "Get Back".

1:33 ENV exited the vehicle, removed the vehicle chocks, and drove to an area where viewing the other side of the berm was possible.

1:36 ENV noticed the Grizzly and two (2) cubs grazing in the area. No other workers were present in the immediate area.

1:37 ENV made an announcement and left the scene.

3:45 An A418 Surface Mine Operator radioed ENV on the EHS Channel to state that a single Grizzly cub was spotted at the top of the A418 Ramp.

4:20 ENV arrived at the A418 area and drove to a high-ground location on the SW portion of the A418 dike.

4:30 ENV scanned the A418 pit, pit walls, dike, berms, and surroundings using binoculars.

4:32 Four (4) Surface Operator Technicians (comprising of three (3) green helmets and one (1) blue helmet) drove up to ENV in a LV and questioned what ENV was doing. ENV explained they were scanning for wildlife since a Grizzly bear cub was reported in the area recently.

4:33 Surface Operator Technicians noted they were unaware of any wildlife in the area and then

proceeded to the A418 pit lookout. Upon reaching near the A418 lookout, Surface Operator Technicians parked their LV and walked ~10 metres to the A418 lookout location.

4:35 ENV drove their LV near the A418 lookout and noted fresh Grizzly scat in the immediate area. ENV performed a visual scan of the surroundings and noted a Grizzly with two (2) cubs in a ditch ~30 metres away.

4:38 ENV immediately informed the four (4) Surface Operator Technicians to return to a means of safety (LV) due to a Grizzly and two (2) cubs being spotted in the immediate area.

4:40 Surface Operator Technicians return to LV and leave the scene.

4:41 ENV notes that no other Diavik personnel are working in the area and ENV leaves the scene.

Movement Map (Import NotePlus Site Map)



Photo 3

Deterrent Count	1.5%
Truck	2 From 0 to 40
Air Horn	0 From 0 to 40
C/F Bear Banger	0 From 0 to 40
C/F Pen Whistle	0 From 0 to 40
12GA Explosive	0 From 0 to 40
12GA B.B. Marker	0 From 0 to 40
12GA Rubber Bullet	0 From 0 to 40
12GA Slug	0 From 0 to 40
Helicopter	0 From 0 to 40
Other	4 From 0 to 40
Specify	SHOUT (4)
End of Environment Call-out	10.06.2022 15:42 PDT

Final Location of Wildlife

Southwest portion of A418 Dike

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature



Anton Jitnikovitch
11.06.2022 07:14 PDT

Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Grizzly and Two Cubs - 2022-06-15 - SHR to Shallow Bay

Complete

Score	2.24%	Flagged items	0	Actions	0
-------	-------	---------------	---	---------	---

Audit Title (Animal - yyyy-mm-dd - Location)

Grizzly and Two Cubs -
2022-06-15 - SHR to Shallow
Bay

Document No.

WildlifeReport000192

15.06.2022

Audit	2.24%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	2%
Enter Initial Time of Wildlife Sighting	15.06.2022 07:55 MDT
Department/Individual Who Reported Wildlife:	
Backfill Plant Operator	
Environment at Call-out Location	15.06.2022 08:10 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	
Grizzly (primarily blonde with darker brown near its behind) with two (2) cubs (blonde face, brown bodies).	
Photo (If Possible):	
Chronological Events	
07:55 Environment (ENV) was notified that a Grizzly and two (2) cubs were spotted at the intersection of the North Haul Road and the South Haul Road (SHR). 08:10 ENV arrived on-scene in a LIGHT VEHICLE (LV) and began to scan the immediate area. 08:15 ENV scanned the Backfill Plant, Zone 1, SCAP Warehouse, SCAP Fab Shop and Pond 13. 08:25 ENV was travelling towards the ERT Training Grounds when a Grizzly and two (2) cubs were spotted on the SHR near the SCAP Warehouse and were heading south. ENV drove the LV towards them and HONKED the LV Horn. The bears reacted and ran into the SCAP Yard. 8:27 ENV notified the SCAP supervisor that a bear and two (2) cubs was in their work area and to take all necessary precautions. SCAP supervisor acknowledged and requested ENV to provide an update when the bear left their work area. 08:30 ENV guided the bear and cubs towards the vegetation patch beside Pond 13 using the LV. 08:35 ENV notified the SCAP supervisor that the bears were clear of their immediate work area, but were nearby and to remain cautious and maintain diligent scans of their work area. ENV also made a site-wide ANNOUNCEMENT. 8:40 ENV maintain visual contact on the Grizzly and two (2) cubs at the Pond 13 vegetation patch. 8:53 ENV continued to maintain visual contact with the bears at the Pond 13 vegetation patch. 9:04 Bears began to slowly walk towards the SHR. ENV repositioned their LV in front of the bears walking route in order to discourage them from walking towards/on the SHR. 9:10 Bears stopped walking towards the SHR and began to graze at the Pond 13 vegetation patch. 9:15 Bears began to walk along another route towards the SHR. 9:20 ENV stepped outside of the LV and SHOUTED and CLAPPED. The bears did not react. 9:23 ENV CYCLED the SHOTGUN ACTION. The bears reacted and ran South from Pond 13 into the Shallow Bay area and then started grazing. 9:30 ENV observed the bears move further into the Shallow Bay area and then ENV left the scene.	
Movement Map (Import NotePlus Site Map)	



Photo 1

Deterrent Count

2%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

6

From 0 to 40

Specify

SHOUTED, CLAPPED, CYCLED
SHOTGUN ACTION

End of Environment Call-out

15.06.2022 09:30 MDT

Final Location of Wildlife

Shallow Bay Area near the Underground Portal

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
16.06.2022 07:41 MDT

Appendix



Photo 1

Wildlife Report - 2021

Grizzly Bear - 2022-09-21- Rose Garden-Backfill

Complete

Score	1.75%	Flagged items	0	Actions	0
-------	-------	---------------	---	---------	---

Audit Title (Animal - yyyy-mm-dd - Location)	Grizzly Bear - 2022-09-21- Rose Garden-Backfill
Document No.	WildlifeReport000231
	21.09.2022

Audit

1.75%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1.5%

Enter Initial Time of Wildlife Sighting

21.09.2022 09:30 PDT

Department/Individual Who Reported Wildlife:

Backfill

Environment at Call-out Location

21.09.2022 09:30 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

1 large sow (resident bear) and 1 cub from this years litter.

Photo (If Possible):

Chronological Events

10:30 Environment (ENV) received a report of a sow with one cub heading across the South Haul road towards the Rose Garden vegetation plots.

10:40 ENV arrives at site and finds the bears at SE end of the vegetation plots heading towards the Truck Shop.

10:45 ENV yells at bears with no response.

10:50 ENV fires a C/F bear banger on the truck shop side of the bears. The cub is alarmed and the sow is alert but not alarmed. Bears move slowly NW.

11:15 ENV monitors bears until they are out of sight to the W of the Rose Garden vegetation plots.

11:16 ENV leaves scene

15:30 The same bears were called in between Backfill and Pond 1. Environment (ENV) mobilized to area.

15:47 ENV arrives at scene of Sow and single cub call out.

15:48 ENV attempts to push bears (in pickup) South out of the Backfill yard. Bears head West/ further into the area.

15:51 ENV drive back around to the West of the bears and pushes them East while sounding the horn. Bears move to ditch alongside South Haul road and start feeding.

15:52 ENV walks up berm and yells at bears. They run East across road.

15:55 ENV pushes bears East down the Shallow Bay Vegetation Plots road until they are settled a good distance from site infrastructure.

15:56 ENV leave the scene.

Movement Map (Import NotePlus Site Map)



Photo 1

Photo 2

Deterrent Count

1.5%

Truck

3

From 0 to 40

Used Truck and Horn

Air Horn

0

From 0 to 40

C/F Bear Banger

1

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

2

From 0 to 40

Specify

YELL

End of Environment Call-out

21.09.2022 15:00 PDT

Final Location of Wildlife

Shallow Bay Vegetation Plot road.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Patrick McIlroy
21.09.2022 17:15 PDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly-2022-09-28

Complete

Score	1.25%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly-2022-09-28	
Document No.				WildlifeReport000237	
				29.09.2022	

Audit

1.25%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1%

Enter Initial Time of Wildlife Sighting

28.09.2022 14:00 PDT

Department/Individual Who Reported Wildlife:

Environment

Environment at Call-out Location

28.09.2022 14:00 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and single cub. Native to island.

Photo (If Possible):



Photo 1



Photo 2



Photo 3



Photo 4

Chronological Events

15:00 - While in the field, Environment (ENV) spotted a sow and cub on the tundra to the west of the A21 pitshop. ENV announced the sighting site-wide and began monitoring the bears.

15:10 - Sow began moving north with cub following close behind. Bears crossed the AN road towards Pond 12 and waste transfer area.

15:25 - ENV continues monitoring bears as they graze in area to southwest of waste transfer. ENV team attempts to deter the bears to open tundra to south using truck HORN with little response from bears, begin moving north again.

15:45 - Bears continue north along west boundary of waste transfer into valley to west of test piles. ENV loses visual on bears at this point but re-confirms location further north. ENV uses two (2) BANGERS to deter bears to south once again. Very brief response from bears as they continue north towards PKC.

16:00 - Sow and cub reach the north boundary of the valley and begin climbing the rock wall towards the PKC. ENV heads back towards the road and enters the south PKC to continue tracking the bears. Bears were found digging in patch of FPK near barge road.

16:10 - ENV used one BANGER to deter bears from area. Sow and cub react and begin moving over FPK towards open tundra to west.

16:20 - ENV continues to monitor from safe distance as bears walk along base of berm, eventually climbing over towards west PKC access road

16:30 - Bears reach road and climb over berm towards AN road and open tundra. ENV alerts area owners the bears are clear and leaves scene.

Movement Map (Import NotePlus Site Map)



Photo 5

Deterrent Count	1%
Truck	1 From 0 to 40
Air Horn	0 From 0 to 40
C/F Bear Banger	3 From 0 to 40
C/F Pen Whistle	0 From 0 to 40
12GA Explosive	0 From 0 to 40
12GA B.B. Marker	0 From 0 to 40
12GA Rubber Bullet	0 From 0 to 40
12GA Slug	0 From 0 to 40
Helicopter	0 From 0 to 40
Other	0 From 0 to 40
Specify	
End of Environment Call-out	28.09.2022 15:30 PDT
Final Location of Wildlife	
Tundra near AN road, west of PKC	
Closure & Sign-off	100%
Wildlife Report Complete	On

Signature

Justin Macek
29.09.2022 11:10 PDT

Appendix



Photo 1



Photo 2



Photo 3

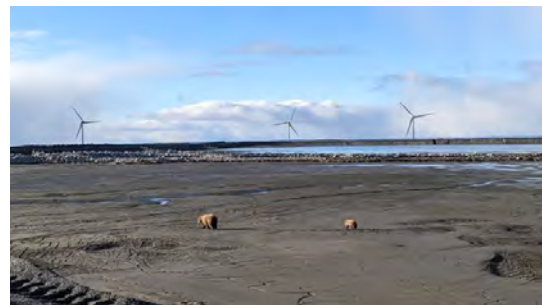


Photo 4



Photo 5

Wildlife Report - 2021

Grizzly Sow and 1 Cub - 2022-08-03

Complete

Score	1.5%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly Sow and 1 Cub - 2022-08-03	
Document No.				WildlifeReport000220	
				05.08.2022	

Audit

1.5%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1.25%

Enter Initial Time of Wildlife Sighting

03.08.2022 16:00 MDT

Department/Individual Who Reported Wildlife:

Site Services

Environment at Call-out Location

03.08.2022 16:05 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and single cub native to island

Photo (If Possible):

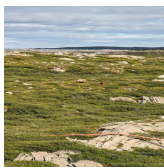


Photo 1

Chronological Events

1600 - Environment (ENV) received a report from site services that a sow grizzly and single cub were spotted near Pond 10, across from the truck shop.

1605 - ENV arrived on scene and found the sow and cub near the berm on the north side of the road in front of the truck shop.

1607 - ENV used truck HORN and SHOUTED to encourage the sow to begin moving northwest toward the shallow bays. Sow did not react. ENV used HORN again and the sow began to move away from the road and back towards the bay.

1610 - Sow and cub walked down the Pond 10 access road and then turned towards the shallow bays, walking down the berm from the road to the tundra below. ENV continued to monitor the bears as they headed northwest in the shallow bays parallel to the road.

1638 - Sow continued parallel to the road for approximately 400m before turning toward road. ENV CYCLED SHOTGUN ACTION which quickly deterred the sow from the road and mine infrastructure, back into the bay. Cub followed sow closely.

1653 - Sow and cub continued to move parallel with the haul road, now in a NE direction. Sow once again turned toward the road and began to attempt to climb the berm. ENV CYCLED SHOTGUN ACTION, sow and cub moved east towards water. ENV continued monitoring bears for a short time before leaving the scene.

1835 - ENV received a call from Backfill Operations that the bears had been spotted again near the light vehicle entrance to the Backfill plant.

1844 - ENV arrived on scene to find the sow and cub in vegetation patch at the south east corner of the backfill yard. ENV CYCLED SHOTGUN ACTION again, bears moved east across the haul road and

back onto tundra. Bears continued walking and grazing deeper into shallow bays while ENV monitored for a short time before leaving the scene.

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count

1.25%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

3

From 0 to 40

Specify

Cycled action on shotgun

End of Environment Call-out

03.08.2022 19:10 MDT

Final Location of Wildlife

North portion of shallow bays area, heading towards vegetation plot access road.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Justin Macek
05.08.2022 17:39 MDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly sow and 3 cubs 2022-07-31 Main Camp

Complete

Score	3.24%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly sow and 3 cubs 2022-07-31 Main Camp	
Document No.				WildlifeReport000217	
				01.08.2022	

Audit

3.24%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

3%

Enter Initial Time of Wildlife Sighting

31.07.2022 19:20 MDT

Department/Individual Who Reported Wildlife:

Duane - Site Services

Environment at Call-out Location

31.07.2022 19:30 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow with 3 cubs, same one that has frequented site

Photo (If Possible):



Photo 1

Chronological Events

17:00 Sow grizzly with 3 cubs spotted by Environment Technicians in Pond 11 near South Camp. Environment Techs did not have deterrents while performing operational tasks, used horn multiple times over the course of 30 mins to move the bears East towards tundra.

17:30 Bears out of sight East of communications building. Environment techs leave area.

19:20 Sow and grizzlies reported in front of Main Accommodations Complex (MAC) cafeteria. Environment (ENV) mobilizes to the location.

19:29 ENV on scene. Bears are in heath tundra in front of MAC cafeteria grazing on berries 100m from cafeteria patio. ENV positions truck between bears and MAC, honks horn and shouts, no response from bears.

19:31 Fired 2 Pen launched bangers. Bears moved away from Cafeteria area and across road towards the lake. ENV followed and monitored them as they headed west along lakeshore.

19:55 Bears were heading North into shallow bays, ENV left to check on second sow grizzly in shallow bays.

20:20 ENV returned to Sow and 3 cubs, Could not regain visual on bears. ENV attempted to locate bears for several minutes and left area at 20:55. End of callout.

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count

3%

Truck

10
From 0 to 40

Air Horn

1
From 0 to 40

C/F Bear Banger

0
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

1
From 0 to 40

Specify

Shouting (1),

End of Environment Call-out

31.07.2022 20:20 MDT

Final Location of Wildlife

Shallow Bays

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

GC
01.08.2022 09:37 MDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly sow and 3 cubs - 2022-08-01 C Portal-A154

Complete

Score	0.75%	Flagged items	0	Actions	0
-------	-------	---------------	---	---------	---

Audit Title (Animal - yyyy-mm-dd - Location)			Grizzly sow and 3 cubs - 2022-08-01 C Portal-A154		
Document No.			WildlifeReport000219		
			01.08.2022		

Audit

0.75%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.5%

Enter Initial Time of Wildlife Sighting

01.08.2022 11:20 PDT

Department/Individual Who Reported Wildlife:

Underground

Environment at Call-out Location

01.08.2022 11:35 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow and 3 cubs, same ones that have been regularly present on site.

Photo (If Possible):

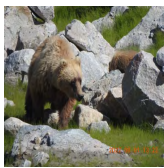


Photo 1

Chronological Events

12:20 Sow and cubs reported crossing backfill CRF road towards underground C portal. Environment (ENV) mobilizes.

12:35 Environment on scene, begins scouting surrounding areas for bears.

13:10 Bears spotted crossing south haul road towards the Backfill Loadout Yard. ENV moves to the area and gets visual on the cubs along the black water pipes.

13:15 Followed bears towards North Haul Road, then cycled shotgun action and shouted once to stop bears from turning around and returning to shallow bays. The bears moved North and crossed the North Haul Road towards the North Country Till Pile.

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count

0.5%

Truck	0
	From 0 to 40
Air Horn	0
	From 0 to 40
C/F Bear Banger	0
	From 0 to 40
C/F Pen Whistle	0
	From 0 to 40
12GA Explosive	0
	From 0 to 40
12GA B.B. Marker	0
	From 0 to 40
12GA Rubber Bullet	0
	From 0 to 40
12GA Slug	0
	From 0 to 40
Helicopter	0
	From 0 to 40
Other	2
	From 0 to 40
Specify	Yelling, cycling shotgun action
End of Environment Call-out	01.08.2022 12:30 PDT
Final Location of Wildlife	
North Inlet	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Grizzly Sow and Cubs - 2022-06-04 - A21

Complete

Score	4.24%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly Sow and Cubs - 2022-06-04 - A21	
Document No.				WildlifeReport000178	
				05.06.2022	

Audit

4.24%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

4%

Enter Initial Time of Wildlife Sighting

04.06.2022 12:40 PDT

Department/Individual Who Reported Wildlife:

Surface Mining

Environment at Call-out Location

04.06.2022 12:50 PDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Sow (mix of brown and blonde) and two young cubs (brown).

Photo (If Possible):



Photo 1

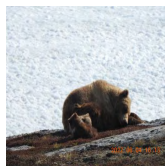


Photo 2

Chronological Events

13:40 - Environment (ENV) received call from Surface Mining personnel that a sow and two cubs have been spotted by the A21 muster station.

13:50 - ENV arrives on location. Bears not observed.

14:00 - Bears located by Surface Ops on the fish habitat, near the Mudex pile and North ramp access. ENV gets into position by a nearby geotechnical shack, overlooking the area. Bears were grazing the vegetated area.

14:16 - It was decided by ENV that the safest recourse for the bears was to get them to move north towards and over the dike and onto the ice directly north of A21. ENV used BANGERS to push the bears north. The bears began slowly moving in the intended direction, until the sow changed course. More BANGERS were used to get the sow to move north again but they were ineffective once the bears were out of range. In total ENV used 6 bangers.

14:44 - The bears were out of range of pen launched bangers at this point, so 3 12G BANGERS were fired to continue pushing them north towards the dike. The deterrents were effective and bears were walking towards the intended area.

15:00 - One ENV truck repositioned at this time and headed towards the infield area, below the dike near the intended exit route for the bears. Via radio communication, ENV team members were able to coordinate and continue to push the bears towards the dike by clapping from on top of the berms above the bears.

15:15 - All three bears reached the dike and crossed over it, onto the ice below. They began heading due north across the bay towards the tundra due south of site.

15:26 - Bears crossed the ice and took a rest on one of the peninsulas across from A21.

15:40 - All 3 bears were resting/sleeping on the tundra, ENV continued monitoring from the A21 dike.

16:20 - Sow woke up and the 3 bears slowly made their way north across the tundra and then onto the ice to the east, towards site.

16:50 - ENV relocated at this time to near the cold storage building as the bears made landfall. Considering the proximity to main camp at this time, ENV attempted to deter the bears from coming in their current direction of travel. ENV used 3 BANGERS and and cycled the action on the shotgun and successfully pushed them east along the shore. Bears eventually came to rest on tundra directly west of south winter road approach.

17:43 - To ensure the bears moved away from actively inhabited areas of site, ENV used two 12 G BANGERS. They were effective and the bears began heading south on the ice away from main camp.

18:25 - Continuing south, bears reached A21 again and crossed over the dike.

18:57 - Bears continued along the infield of the pit, clockwise around A21 and ended up on the south side near the lookout seacan. Surface Ops personnel were alerted to the bears presence and ENV continued monitoring them from the dike as they grazed and rested.

20:05 - All 3 bears had been stationary for some time and had begun falling asleep. ENV left the scene.

Movement Map (Import NotePlus Site Map)



Photo 3

Deterrent Count

4%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

9

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

5

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

0
From 0 to 40

Specify

End of Environment Call-out

04.06.2022 19:05 PDT

Final Location of Wildlife

Infield, south side of A21.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Justin Macek
05.06.2022 18:17 PDT

Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Grizzly Sow and Two Cubs - 2022-06-16 - Pond 5

Complete

Score	0.75%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Grizzly Sow and Two Cubs - 2022-06-16 - Pond 5	
Document No.				WildlifeReport000196	
				16.06.2022	

Audit	0.75%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	0.5%
Enter Initial Time of Wildlife Sighting	16.06.2022 11:32 MDT
Department/Individual Who Reported Wildlife:	Operations Staff Member
Environment at Call-out Location	16.06.2022 11:51 MDT
Animal Type	Grizzly Bear
Description (eg. number of individuals, colour, age, size, etc.):	Sow and two very young cubs
Photo (If Possible):	
Chronological Events	
11:32 An Operations staff member notified Environment (ENV) that a Sow and two (2) cubs were walking near Pond 5 towards the South Haul Road in the direction of the Batch Plant. 11:39 ENV arrived on-scene in a LIGHT VEHICLE (LV) and obtained a visual on the Sow and and two (2) cubs. The bears did not have any reaction to ENV arriving on-scene. The bears were grazing in the vegetation patch beside Pond 5, approximately 75 metres from the South Haul Road. 11:45 Bears continued to graze in the vegetation patch beside Pond 5. 11: 51 Bears did not move much and continued to graze in the vegetation patch beside Pond 5. ENV left the scene.	
Movement Map (Import NotePlus Site Map)	
 Photo 1	
Deterrent Count	
Truck	2 From 0 to 40
Air Horn	0 From 0 to 40
C/F Bear Banger	0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

0

From 0 to 40

Specify

End of Environment Call-out

16.06.2022 11:51 MDT

Final Location of Wildlife

Vegetation patch beside Pond 5

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch

16.06.2022 12:22 MDT

Appendix



Photo 1

Wildlife Report - 2021

Sow and Cubs - 2022-06-13 Till Pile

Complete

Score	2.24%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Sow and Cubs - 2022-06-13 Till Pile	
Document No.				WildlifeReport000188	
				13.06.2022	

Audit

2.24%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

2%

Enter Initial Time of Wildlife Sighting

13.06.2022 10:00 MDT

Department/Individual Who Reported Wildlife:

Site Services

Environment at Call-out Location

13.06.2022 10:10 MDT

Animal Type

Grizzly Bear

Description (eg. number of individuals, colour, age, size, etc.):

Same sow and COYs as previously. Sow has white tag in left ear.

Photo (If Possible):



Photo 1

Chronological Events

09:45 Single bear called in at Geology core shack/D1 laydown area. Environment (ENV) mobilizes and begins heading to location.

10:00 Sow and cubs reported on north side of Till Pile near workers on the ground. ENV deems Sow and Cubs high priority, begins moving to their location.

10:13 ENV arrives on scene on top of Till Pile, gains visual on sow and cubs foraging at base of till pile. Maintenance team was working on equipment on top of till pile.

10:14 ENV yells, claps hands to try and get bears back across the road to the North inlet.

10:20 Bear repositions, but does not cross road. ENV fires 2 pen bangers. Bears barely move at all, make no effort to cross road. No traffic was in the area.

10:26 ENV repositions, cycled the action on the shotgun twice, then fired one 12G Bear Banger. Bears then crossed Airport Road north towards north inlet.

10:30 ENV moves from Till Pile to Airport Road. Cubs are too small to cross the black water pipes at the location they crossed. ENV repositions vehicle to give cubs exit towards an area they can cross the pipes easily. Several times the cubs tried to bed down between the pipes and the road, ENV approached slowly in the vehicle, stayed quiet and allowed the vehicle presence to get the cubs up and moving East towards a pipe crossing point. ENV would then back off and let the animals continue forward until they tried to bed down again. Had to do this three times to get bears to start moving steadily East. Sow returned to the cubs several times and huffed to call them to follow as she headed East towards crossing point.

10:42 Cubs find a spot to climb over and under the 3 sets of pipes, reach the north inlet safely. ENV leaves the area to respond to initial bear call.

Movement Map (Import NotePlus Site Map)

Deterrent Count

2%

Truck

3

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

2

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

1

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

2

From 0 to 40

Specify

Yelling (1), Clapping (1)

End of Environment Call-out

13.06.2022 10:45 MDT

Final Location of Wildlife

In North inlet, north of water pipes

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

GC

13.06.2022 12:12 MDT

Appendix



Photo 1

Wildlife Report - 2021

Caribou - 2022-06-13 - ROM Hill to E21 Sump

Complete

Score	1%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Caribou - 2022-06-13 - ROM Hill to E21 Sump	
Document No.				WildlifeReport000190	
				14.06.2022	

Audit

1%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.75%

Enter Initial Time of Wildlife Sighting

13.06.2022 19:45 PDT

Department/Individual Who Reported Wildlife:

Surface Mining Pit Dispatcher

Environment at Call-out Location

14.06.2022 20:00 PDT

Animal Type

Caribou

Description (eg. number of individuals, colour, age, size, etc.):

Single caribou, large antlers, dark brown fur with lighter grey fur around the stomach and legs.

Photo (If Possible):

Chronological Events

8:45 Surface Mining Pit Dispatcher notifies Environment (ENV) about a single Caribou spotted by an operator at ROM Hill.

9:00 ENV personnel arrived to the Pond 5 location overlooking ROM Hill and the adjacent tundra patch in a LIGHT VEHICLE (LV). ENV personnel scanned the area and did not observe a caribou.

9:15 ENV observed the Caribou walking up ROM Hill. ENV very slowly (<5 km/h) followed the Caribou up ROM Hill and also notified the pit supervisor to keep Heavy Traffic Vehicles alert, maintain diligent scans while driving, to keep a large distance, and give the caribou right-of-way.

9:30 Caribou walked from ROM Hill, on the Road to PKC, and stopped at the south side of Pond 12 to graze. No heavy or light vehicles were present on the Road to PKC or any other road during this time.

9:40 Caribou moved south from Pond 12 towards the tundra patch directly adjacent to the A21 Portal - on the west side. ENV followed the caribou from a distance with the LV, travelling very slowly (<5 km/h).

9:45 Caribou walked along the bypass road adjacent to the A21 Portal towards the A21 Haul Road grazing along the way. ENV observed the caribou from the A21 Portal area and repositioned from the A21 Portal to the southern side of the bypass road between Pond 12 and the A21 Haul road to discourage the caribou from walking on/towards the A21 Haul Road.

9:50 Caribou grazed the tundra vegetation and moved slowly towards the E21 Sump.

10:14 Caribou continued grazing the tundra vegetation near the E21 Sump.

10:15 ENV left the scene.

Movement Map (Import NotePlus Site Map)



Deterrent Count

0.75%

Truck**3**
From 0 to 40**Air Horn****0**
From 0 to 40**C/F Bear Banger****0**
From 0 to 40**C/F Pen Whistle****0**
From 0 to 40**12GA Explosive****0**
From 0 to 40**12GA B.B. Marker****0**
From 0 to 40**12GA Rubber Bullet****0**
From 0 to 40**12GA Slug****0**
From 0 to 40**Helicopter****0**
From 0 to 40**Other****0**
From 0 to 40**Specify****End of Environment Call-out**

13.06.2022 21:15 PDT

Final Location of Wildlife

Tundra vegetation patch adjacent to the E21 Sump.

Closure & Sign-off

100%

Wildlife Report Complete

On

SignatureAnton Jitnikovitch
14.06.2022 13:58 PDT

Appendix



Photo 1

Wildlife Report - 2021

Caribou - 2022-07-09 - Storage Tank Farms

Complete

Score	0.75%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Caribou - 2022-07-09 - Storage Tank Farms	
Document No.				WildlifeReport000204	
				09.07.2022	

Audit	0.75%
Type of Wildlife Report	Deterrent Reporting
Deterrent Report	0.5%
Enter Initial Time of Wildlife Sighting	08.07.2022 11:28 MDT
Department/Individual Who Reported Wildlife:	
Haul Truck Operator	
Environment at Call-out Location	08.07.2022 11:35 MDT
Animal Type	Caribou
Description (eg. number of individuals, colour, age, size, etc.):	
One (1) male with two (2) antler racks - one (1) large velvety antler rack which oriented linearly towards its upper back, and one (1) significantly smaller pair of antlers which protruded nearer to the front of its head.	
Photo (If Possible):	
Chronological Events	
11:28 Several Haul Truck Operators notified Environment (ENV) about a Caribou walking along the A21 Haul Road, heading towards the Storage Tank Farm area. 11:35 ENV arrived on-scene in a LIGHT VEHICLE (LV) and began to search for the Caribou. 11:37 ENV spotted the Caribou near the road in the Storage Tank Farm area. 11:38 ENV positioned the LV behind the Caribou in order to be able to guide it to walk towards the northern vegetation patch (away from it's current high-traffic area). 11:40 Caribou began to slowly walk north towards the Ice Road Trucker Laydown and ENV shut down traffic in the area and slowly (3-5 km/h) drove the LV approximately 20-30 meters behind the Caribou. The Caribou did not show signs of agitation or discomfort and maintained a calm, slow pace. 11:45 Caribou walked past the Ice Road Trucker Laydown and continued towards the Communication Shack area. ENV continued to follow. 11:50 Caribou arrived at the Communication Shack and began grazing in the vegetation patch in the area. ENV performed a Caribou Activity Scan from the LV at a ~35 meter distance for approximately 15-minutes; during which time, the Caribou continued to graze. 12:04 ENV left the Scene. --- 18:00 ENV were in a LV and spotted the same Caribou from earlier walking in the middle of the road near the BB Dormitory. 18:01 ENV notified all personnel on Channel 5 to maintain awareness, and slow down when in the area, give Caribou the right of way. 18:05 Caribou walked east from the road near the BB Dorms towards the vegetation patch near the Shallow Bay adjacent to Pond 10. 18:05 ENV continued to observe the Caribou and performed a Caribou Activity Scan. 18:15 ENV left the scene.	
Movement Map (Import NotePlus Site Map)	



Photo 1

Deterrent Count

0.5%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

0

From 0 to 40

Specify

End of Environment Call-out

08.07.2022 18:00 MDT

Final Location of Wildlife

Vegetation patch between Shallow Bay and Communication Shack.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Anton Jitnikovitch

Anton Jitnikovitch
09.07.2022 07:44 MDT

Appendix



Photo 1

Wildlife Report - 2021

Moose - 2022-08-13 - A154 Pit

Complete

Score	0.75%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Moose - 2022-08-13 - A154 Pit	
Document No.				WildlifeReport000222	
				14.08.2022	

Audit

0.75%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.5%

Enter Initial Time of Wildlife Sighting

13.08.2022 08:15 PDT

Department/Individual Who Reported Wildlife:

Pit Operator

Environment at Call-out Location

14.08.2022 08:20 PDT

Animal Type

Other

Description (eg. number of individuals, colour, age, size, etc.):

Two moose, one with antlers/rack and another without - likely to be a bull and cow. Moderately sized, not large, and with a distinctly black fur/coat on the hind legs.

Photo (If Possible):

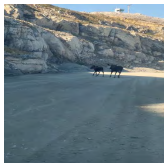


Photo 1

Chronological Events

09:15 Pit Operator notified Environment (ENV) of two (2) moose walking on the A154 pit ramp.

09:20 ENV arrived on-scene in a LIGHT VEHICLE (LV).

09:21 ENV drove the LV at a slow rate of speed (<5 km/h) in order to guide the two (2) moose up the pit ramp.

09:30 ENV guided the moose up the ramp towards the Geology Shack area.

09:32 Moose began grazing at the Geology Shack area.

09:35 Moose began to walk again and ENV drove the LV at a slow rate of speed (<5 km/h) in order to guide the two (2) moose towards the vegetation patch adjacent to the ERT Training Grounds.

09:45 ENV finished guiding the moose to the vegetation patch adjacent to the ERT Training Grounds and observed the moose from afar (~200 metres).

09:55 ENV left the scene.

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count

0.5%

Truck

2
From 0 to 40

Air Horn

0
From 0 to 40

C/F Bear Banger

0
From 0 to 40

C/F Pen Whistle

0
From 0 to 40

12GA Explosive

0
From 0 to 40

12GA B.B. Marker

0
From 0 to 40

12GA Rubber Bullet

0
From 0 to 40

12GA Slug

0
From 0 to 40

Helicopter

0
From 0 to 40

Other

0
From 0 to 40

Specify

End of Environment Call-out

13.08.2022 08:55 PDT

Final Location of Wildlife

Vegetation patch adjacent to ERT Training Grounds.

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature



Anton Jitnikovitch
14.08.2022 14:12 PDT

Appendix



Photo 1



Photo 2

Wildlife Report - 2021

Wolf 2022-03-05 Lakeshore Boulevard

Complete

Score	2.24%	Failed items	0	Actions	0
-------	-------	--------------	---	---------	---

Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location) Wolf 2022-03-05 Lakeshore Boulevard

Document No. WildlifeReport000165

Completed On

5 Mar 2022

Wildlife Report

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

2%

Enter Initial Time of Wildlife Sighting

5 Mar 2022 11:45 MST

Department/Individual Who Reported Wildlife:

Mobile Maintenance

Environment On Scene

Environment at Call-out Location

5 Mar 2022 12:10 MST

Animal Type

Wolf

Description (eg. number of individuals, colour, age, size, etc.):

Adult white wolf

Photo (If Possible):



Photo 1

Chronological Events

11:45 Wolf called in at Lakeshore Boulevard heading toward the South Tank Farm (STF). Environment mobilized.

12:00 Wolf called in at STF near fuel loading personnel, heading North through STF containment area.

12:05 Environment on scene at STF. Environment entered STF on the North side, spotted wolf in containment basin attempting to head North. Environment herded wolf with truck West towards Metcon laydown.

12:13 Wolf crosses berm into Seacan Alley. Wolf returns to heavy vehicle refueling access road and Environment attempts to block it with the truck and push it west towards Pond 12. Wolf crosses the road into Metcon, then crosses A21 Haul Road towards Waste Transfer Area (WTA).

12:35 Environment tracked the wolf to Processed Kimberlite Containment Facility (PKCF) waste water dump site, where it was spotted this morning.

12:40 Environment herded the wolf away from the dump site with the vehicle. The wolf walked a short distance away, Environment then used two bear bangers and yelling to get the animal moving away from the area. The wolf crossed to another PKCF spur road to the west then attempted to return south behind the berm. Environment followed, fired two more bear bangers, and the wolf crossed the PKCF towards the spillway. It was last spotted heading towards pond 3 from the PKCF.

13:30 Environment watched the wolf cross the PKCF, verified it had left the area, then ended the wildlife call.

Movement Map (Import NotePlus Site Map)



Photo 2

Deterrent Count 2%

Truck **3**
From 0 to 40

Air Horn **0**
From 0 to 40

C/F Bear Banger **4**
From 0 to 40

C/F Pen Whistle **0**
From 0 to 40

12GA Explosive **0**
From 0 to 40

12GA B.B. Marker **0**
From 0 to 40

12GA Rubber Bullet **0**
From 0 to 40

12GA Slug **0**
From 0 to 40

Helicopter **0**
From 0 to 40

Other **1**
From 0 to 40

Specify Yelling

Environment Off Scene

End of Environment Call-out 5 Mar 2022 13:30 MST

Final Location of Wildlife

Heading towards Pond 3

Closure & Sign-off 100%

Wildlife Report Complete On

Signature

GC
5 Mar 2022 18:21 MST



Photo 1



Photo 2

Wildlife Report - 2021

Wolf - 2022-03-05 - PKCF South

Complete

Score	4.74%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)			Wolf - 2022-03-05 - PKCF South		
Document No.			WildlifeReport000164		
			05.03.2022		

Audit

4.74%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

4.5%

Enter Initial Time of Wildlife Sighting

05.03.2022 07:30 PST

Department/Individual Who Reported Wildlife:

Duane Lutz - Site Services

Environment at Call-out Location

05.03.2022 07:50 PST

Animal Type

Wolf

Description (eg. number of individuals, colour, age, size, etc.):

Single wolf, adult

Photo (If Possible):



Photo 1



Photo 2

Chronological Events

08:32 Duane with Site Services calls Environment to report a single wolf near the waste water dump at the South Processed Kimberlite Containment Facility (PKCF). Environment mobilizes to the area.

08:55 Environment arrives on scene. Vacuum Truck was in the process of dumping its tank into the designated dump location on the South side of the PKCF. The single wolf was sleeping nearby.

09:10 Environment waited for vac truck to leave, then woke up wolf with yelling and bear bangers. Over the course of 5 mins, Environment fired 7 bear bangers to encourage the wolf to move away from the area. During this time, the wolf approached Environment wildlife monitor twice, and was encouraged away with bangers and yelling. Wolf went into the waste water dump, and Environment fired bangers to push it away. When away from the dump, Environment encouraged it to continue by speaking to it.

09:20 Once away from the waste water dump, the wolf continued south without prompting. The wolf descended the South PKCF, crossed the Magazine storage pad and continued on past the Emulsion Plant.

09:42 Wolf last spotted heading south from the Emulsion Plant.

Environment off Scene

12:00 Wolf spotted crossing A21 haul road onto Lakeshore Boulevard. Environment mobilized

Movement Map (Import NotePlus Site Map)



Photo 3

Deterrent Count

4.5%

Truck

0

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

11

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

7

From 0 to 40

Specify

Yelling (2x), Blocked with Truck
(5x)

End of Environment Call-out

31.08.2001 23:00 PDT

Final Location of Wildlife

Heading towards pond 3 from PKCF

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

GC
05.03.2022 10:43 PST

Appendix



Photo 1



Photo 2



Photo 3

Wildlife Report - 2021

Wolf - 2022-03-08 - PKC

Complete

Score	1.25%	Failed items	0	Actions	0
-------	-------	--------------	---	---------	---

Wildlife Report

Audit Title (Animal - yyyy-mm-dd - Location)	Wolf - 2022-03-08 - PKC
Document No.	WildlifeReport000166

Completed On

8 Mar 2022

Wildlife Report

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

1%

Enter Initial Time of Wildlife Sighting

8 Mar 2022 13:12 MST

Department/Individual Who Reported Wildlife:

PKC

Environment On Scene

Environment at Call-out Location

8 Mar 2022 13:40 MST

Animal Type

Wolf

Description (eg. number of individuals, colour, age, size, etc.):

Single adult

Photo (If Possible):

Chronological Events

1312 Environment received a report of a single wolf near the waste water dump on the PKCF
1330 Environment on scene, found the wolf to the west of the old barge road
1335 Used BANGER to move the wolf away from the area, wolf did not respond
1340 Repositioned, used second BANGER to move the wolf away, wolf did not respond
1410 Followed wolf northeast along pipe bench
1420 Used TRUCK to move wolf south toward the PKC-SCRIP haul road, then followed wolf onto AN road
1430 Followed wolf along AN road toward the wind farm
1445 Used RUBBER BUCKSHOT to move wolf west away from site
1450 End call

Movement Map (Import NotePlus Site Map)



Photo 1

Deterrent Count

1%

Truck

1

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger	2
	From 0 to 40
C/F Pen Whistle	0
	From 0 to 40
12GA Explosive	0
	From 0 to 40
12GA B.B. Marker	0
	From 0 to 40
12GA Rubber Bullet	0
	From 0 to 40
12GA Slug	0
	From 0 to 40
Helicopter	0
	From 0 to 40
Other	1
	From 0 to 40
Specify	Rubber buckshot
Environment Off Scene	
End of Environment Call-out	8 Mar 2022 14:50 MST
Final Location of Wildlife	
Tundra near Environment met station	
Closure & Sign-off	100%
Wildlife Report Complete	On
Signature	
Brett Potter	
8 Mar 2022 16:42 MST	

Appendix



Photo 1

Wildlife Report - 2021

Wolverine - 2022-01-12 - Trucker Ice Road to A21 pit

Complete

Score	0.75%	Flagged items	0	Actions	0
Audit Title (Animal - yyyy-mm-dd - Location)				Wolverine - 2022-01-12 - Trucker Ice Road to A21 pit	
Document No.				WildlifeReport000163	
				12.01.2022	

Audit

0.75%

Type of Wildlife Report

Deterrent Reporting

Deterrent Report

0.5%

Enter Initial Time of Wildlife Sighting

12.01.2022 13:22 PST

Department/Individual Who Reported Wildlife:

Site Services

Environment at Call-out Location

12.01.2022 13:30 PST

Animal Type

Wolverine

Description (eg. number of individuals, colour, age, size, etc.):

One single wolverine

Photo (If Possible):



Photo 1



Photo 2

Chronological Events

14:22 - Call received from site services of a single wolverine near the South Winter Road

14:30 - Environment personnel (Enviro) arrived on scene, located wolverine on ice, slowly headed towards A21 work area.

14:37 - Visual contact was lost as wolverine was continuing in direction of A21 pit. Pit supervisor was made aware of wolverine presence in the area.

14:57 - Enviro repositioned to A21 Dike after losing visual contact. Was able to spot the wolverine on the ice in the bay near A21 causeway. Sitewide announcement was made at this time

15:10 - After monitoring from safe distance, the wolverine climbed the rocks between the A21 Causeway bay and the Dike road. At this point, enviro team member attempted to use the truck and truck horn to deter the animal from advancing closer to pit area. However, instead of running back onto ice where it had come from, the animal turned the other direction and ran up the dike road, towards the zone 3 laydown area. Visual contact lost at this time, A21 supervisor was made aware the animal was advancing closer to the work area

15:17 - A surface haul truck driving called in a sighting on the top of the A21 ramp. Enviro team member headed to that area and into the pit, but was unable to see where the animal had gone. Pit supervisor then called in that the animal was on camera on the first bench of the A21 pit, elevated high above the haul road and ramp.

Movement Map (Import NotePlus Site Map)



Photo 3

Deterrent Count

0.5%

Truck

2

From 0 to 40

Air Horn

0

From 0 to 40

C/F Bear Banger

0

From 0 to 40

C/F Pen Whistle

0

From 0 to 40

12GA Explosive

0

From 0 to 40

12GA B.B. Marker

0

From 0 to 40

12GA Rubber Bullet

0

From 0 to 40

12GA Slug

0

From 0 to 40

Helicopter

0

From 0 to 40

Other

0

From 0 to 40

Specify

End of Environment Call-out

12.01.2022 17:00 PST

Final Location of Wildlife

On the ice, south west of mine site

Closure & Sign-off

100%

Wildlife Report Complete

On

Signature

Justin Macek
12.01.2022 16:13 PST

Appendix



Photo 1



Photo 2



Photo 3

APPENDIX M

**Wolverine Snow Track
Survey Results, 2022**

Table 1: Wolverine Snow Track Survey Results 2022

Date	Transect	UTM Zone 12 W		Days Since		Observation Type	Number of Individuals	Age of Track Since Weather Event	Comments
		Easting	Northing	Last Snow	Last Wind				
29 March	WT22	550773	7151427	6	5	Tracks	1	Before	Small wolverine.
29 March	WT22	551872	7152421	6	5	Tracks	1	Before	Large wolverine.
2 April	WT30	546636	7146662	1.5	9	Tracks	1	After	One adult heading Southwest.
2 April	WT09	539029	7148914	1.5	9	Tracks	1	After	One adult northbound in deep snow.
6 April	WT38	543243	7141580	4.5	1	Tracks	1	After	Heading west. Saw during caribou scan, forgot to take photo.
8 April	WT17	522895	7159614	6	3.5	Tracks	1	After	Adult wolverine small-average size heading east/southeast.
8 April	WT01	526158	7164083	6	3.5	Tracks	1	After	One wolverine, small, short stride. Heading south. Same one.
8 April	WT32	528416	7160141	6	3.5	Tracks	1	After	One wolverine heading east.
8 April	WT32	528633	7157761	6	3.5	Tracks	1	After	Likely same wolverine as previous. Heading southeast.
8 April	WT26	528559	7151300	6	3.5	Tracks	1	After	Wolverine heading northeast towards Diavik, likely the same animal all day.
8 April	WT36	527713	7147806	6	3.5	Tracks	1	After	Same wolverine heading northwest along island chains.
13 April	WT28	535392	7130767	11	1	Tracks	1	Before	Very old tracks. Covered everywhere except 6 prints. Crossed transect again shortly.
13 April	WT28	537362	7136884	11	1	Tracks	1	Before	Old large tracks heading south.
13 April	WT20	537780	7137459	11	1	Tracks	1	Before	Very old tracks heading west, possibly same animal as last photo.
13 April	WT20	535903	7137262	11	1	Tracks	1	Before	Very old tracks heading east.
13 April	WT27	531140	7139745	11	1	Tracks	1	Before	Single wolverine heading north, difficult to identify.
13 April	WT27	53020	7139445	11	1	Animals	1	N/A	Running east into willows.

APPENDIX N

**Wolverine Incidental
Observation Summary, 2022**

Date	Number of Animals	Characteristics of Animals	Location
2022-01-12	1	Single wolverine	Near cold storage white sprung tent
2022-05-04	2	Only confirmed one wolverine, no sign of the reported second one	Spotted at raw water intake building. Seen again at watering treaty heading North.
2022-05-10	1	Single, smaller wolverine	Spotted moving NE along south haul road towards backfill plant/UG portal intersection
2022-05-13	1	Single wolverine	A21 muster parking lot then moved south onto tundra
2022-06-14	1	Single wolverine	Tundra between RTX helipad and runway
2022-08-06	1	Single wolverine	Reported wolverine spotted by haul truck on east dam road of SPKC
2022-12-16	1	Single wolverine	Near cold storage white sprung tent

APPENDIX O

**Pit Wall – Mine Infrastructure
Raptor Survey Results, 2022**

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-05-10	A21 North Wall	L	N/A	0	No	No	No	
2022-05-10	A21 East Wall	L	N/A	0	No	No	No	
2022-05-10	A21 South Wall	L	N/A	0	No	No	No	
2022-05-10	A21 South Ramp	L	N/A	0	No	No	No	
2022-05-10	South Tank Farm	L	common raven	1	Yes	No	No	SE Tanker
2022-05-10	A21 Portal	L	N/A	0	No	No	No	
2022-05-11	A21 North Wall	L	N/A	0	No	No	No	
2022-05-11	A21 East Wall	L	N/A	0	No	No	No	
2022-05-11	A21 South Wall	L	N/A	0	No	No	No	
2022-05-11	A21 South Ramp	L	N/A	0	No	No	No	
2022-05-11	South Tank Farm	L	common raven	1	Yes	No	No	Tank #104
2022-05-11	A21 Portal	L	N/A	0	No	No	No	
2022-05-12	A21 North Wall	L	rough-legged hawk	1	No	No	No	Flying near crest of A21 dike
2022-05-12	A21 East Wall	L	N/A	0	No	No	No	
2022-05-12	A21 South Wall	L	N/A	0	No	No	No	
2022-05-12	A21 South Ramp	L	rough-legged hawk	1	No	No	No	Hanging out on telephone pole, observing
2022-05-12	South Tank Farm	L	common raven	0	Yes	No	No	SE Tanker
2022-05-12	A21 Portal	L	rough-legged hawk	1	No	No	No	Flying behind A21 Portal area
2022-05-13	A21 North Wall	L	rough-legged hawk	1	No	No	No	Flying near crest of A21 dike
2022-05-13	A21 East Wall	L	rough-legged hawk	0	No	No	No	Flying near crest of A21 dike
2022-05-13	A21 South Wall	L	rough-legged hawk	0	No	No	No	Flying near crest of A21 dike
2022-05-13	A21 South Ramp	L	N/A	1	No	No	No	
2022-05-14	A21 North Wall	L	N/A	0	No	No	No	
2022-05-14	A21 East Wall	L	N/A	0	No	No	No	
2022-05-14	A21 South Wall	L	N/A	0	No	No	No	
2022-05-14	A21 South Ramp	L	rough-legged hawk	2	No	Yes	No	Two hawks flying around, they made contact with each other in the middle of the A21 pit area and then went their own separate ways. One hawk went back to the nest, other hawk flew off. Hawk that went back to its nest was also playing/gliding in the wind.
2022-05-14	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-14	A21 Portal	-	N/A	0	No	No	No	
2022-05-15	A21 North Wall	L	peregrine falcon	1	No	No	No	
2022-05-15	A21 East Wall	-	N/A	0	No	No	No	Did not travel to East wall on May 15
2022-05-15	A21 South Wall	L	rough-legged hawk	1	No	No	No	
2022-05-15	A21 South Ramp	L	rough-legged hawk	1	No	Yes	No	Could potentially be adding to the nest
2022-05-15	South Tank Farm	D	N/A	0	Yes	No	No	No change in nest
2022-05-15	A154 Lookout #1	L	N/A	0	No	No	No	Did not see birds at this lookout, but did see 2 raptors from lookout #2
2022-05-15	A154 Lookout #2	L	rough-legged hawk / peregrine falcon	2	No	No	No	RLHA flying and landing on pit walls off and on for awhile. PEFA swooping around East end of pit. RLHA having a mild territorial battle with a raven. RLHA swooped at us and landed on pit ledge roughly 20ft away.
2022-05-15	A418 Lookout #1	L	N/A	0	No	No	No	No bird sightings of any kind
2022-05-15	A418 Lookout #2	L	N/A	0	No	No	No	No bird sightings of any kind
2022-05-16	A21 North Wall	L	rough-legged hawk	1	No	No	No	Flew westward over SW edge of pit into southern circ out of site (near where known nest is located).

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-05-16	A21 East Wall	L	rough-legged hawk	1	No	No	No	Flew over north side of A21 dike and continued out of site to the north. Unclear whether the same bird as sighted on SW edge.
2022-05-16	A21 South Wall	L	rough-legged hawk	1	No	No	No	Playing in wind on North side of pit. Flew to SW end of pit and perched on a telephone pole for long period.
2022-05-16	A21 South Ramp	L	N/A	0	No	No	No	
2022-05-16	South Tank Farm	D	N/A	0	No	Yes	No	
2022-05-16	A21 Portal	L	N/A	0	No	No	No	
2022-05-17	A21 North Wall	L	N/A	0	No	No	No	
2022-05-17	A21 East Wall	L	N/A	0	No	No	No	
2022-05-17	A21 South Wall	L	N/A	0	No	No	No	
2022-05-17	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-05-17	South Tank Farm	D	N/A	0	Yes	No	No	
2022-05-17	A21 Portal	-	N/A	0	No	No	No	
2022-05-19	A21 North Wall	L	rough-legged hawk	1	No	No	No	One hawk perched on the power pole on the road on the north side, near the entrance, of the A21 dike
2022-05-19	A21 East Wall	L	rough-legged hawk	1	No	No	No	One hawk perched on the power pole on the road on the north side, near the entrance, of the A21 dike (same hawk as above and same location)
2022-05-19	A21 South Wall	L	N/A	0	No	No	No	
2022-05-19	A21 South Ramp	-	N/A	0	No	Yes	No	
2022-05-19	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-19	A21 Portal	L	N/A	0	No	No	No	
2022-05-20	A21 North Wall	L	N/A	0	No	No	No	
2022-05-20	A21 East Wall	L	N/A	0	No	No	No	
2022-05-20	A21 South Wall	L	rough-legged hawk	1	No	No	No	RLHA perched on a power pole on the far side of the A21 South Wall, RLHA facing towards the pit enjoying the view. RLHA unperched and flew away towards the lake as we approached in the truck to exit the A21 dike towards the RTX staging grounds/muster station
2022-05-20	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-05-20	South Tank Farm	-	N/A	0	No	No	No	
2022-05-20	A21 Portal	D	N/A	0	No	No	No	
2022-05-21	A21 North Wall	L	N/A	0	No	No	No	
2022-05-21	A21 East Wall	L	N/A	0	No	No	No	
2022-05-21	A21 South Wall	L	N/A	0	No	No	No	
2022-05-21	A21 South Ramp	L	N/A	0	No	Yes	No	No hawk spotted. Nest still visible
2022-05-21	South Tank Farm	L	N/A	0	Yes	No	No	No birds in area.
2022-05-21	A21 Portal	L	N/A	0	No	No	No	Nest spotted (SE Tanker), no birds spotted
2022-05-21	A21 North Wall	L	N/A	0	No	No	No	
2022-05-21	A21 East Wall	L	N/A	0	No	No	No	
2022-05-21	A21 South Wall	L	N/A	0	No	No	No	
2022-05-21	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-05-21	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-21	A21 Portal	L	N/A	0	No	No	No	
2022-05-22	A21 North Wall	L	N/A	0	No	No	No	
2022-05-22	A21 East Wall	L	N/A	0	No	No	No	
2022-05-22	A21 South Wall	L	N/A	0	No	No	No	

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-05-22	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-05-22	South Tank Farm	L	N/A	0	No	No	No	
2022-05-22	A21 Portal	L	N/A	0	No	No	No	
2022-05-23	A21 North Wall	L	N/A	0	No	No	No	
2022-05-23	A21 East Wall	L	N/A	0	No	No	No	
2022-05-23	A21 South Wall	L	N/A	2	No	No	No	Hawk flying towards nest
2022-05-23	A21 South Ramp	L	N/A	2	No	Yes	No	Lots of shrieks likly two RLHA
2022-05-23	South Tank Farm	L	N/A	0	Yes	No	No	No bird but active nest
2022-05-23	A21 Portal	L	N/A	0	No	No	No	
2022-05-24	A21 North Wall	L	N/A	0	No	No	No	
2022-05-24	A21 East Wall	L	N/A	0	No	No	No	
2022-05-24	A21 South Wall	L	rough-legged hawk	3	No	No	No	3 RLHA flying over south side of pit, heading east over lake
2022-05-24	A21 South Ramp	L	N/A	0	No	Yes	No	Nest is present but no raptor activity
2022-05-24	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-24	A21 Portal	L	N/A	0	No	No	No	
2022-05-25	A21 North Wall	L	N/A	0	No	No	No	
2022-05-25	A21 East Wall	L	N/A	0	No	No	No	
2022-05-25	A21 South Wall	L	unknown	2	No	No	No	Potentially peregrine falcon. 2 individuals were seen flying in area and both perched at different times on a rocky outcrop that they seem to have enjoy perching on. Continue to monitor from south side of pit
2022-05-25	A21 South Ramp	L	N/A	0	No	Yes	No	Nest is present but no raptor activity
2022-05-25	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-25	A21 Portal	L	N/A	0	No	No	No	
2022-05-26	A21 North Wall	L	N/A	0	No	No	No	
2022-05-26	A21 East Wall	L	N/A	0	No	No	No	
2022-05-26	A21 South Wall	L	N/A	0	No	No	No	
2022-05-26	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-05-26	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-26	A21 Portal	L	N/A	0	No	No	No	
2022-05-27	A21 North Wall	L	N/A	0	No	No	No	No activity today
2022-05-27	A21 East Wall	L	N/A	0	No	No	No	
2022-05-27	A21 South Wall	L	N/A	0	No	No	No	
2022-05-27	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-05-27	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-27	A21 Portal	L	N/A	0	No	No	No	
2022-05-28	A21 North Wall	L	N/A	0	No	No	No	Not activity today
2022-05-28	A21 East Wall	L	N/A	0	No	No	No	
2022-05-28	A21 South Wall	L	N/A	0	No	No	No	
2022-05-28	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-05-28	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-28	A21 Portal	L	N/A	0	No	No	No	
2022-05-29	A21 North Wall	L	N/A	0	No	No	No	
2022-05-29	A21 East Wall	L	N/A	0	No	No	No	

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-05-29	A21 South Wall	L	N/A	0	No	No	No	
2022-05-29	A21 South Ramp	L	rough-legged hawk	3	No	Yes	No	
2022-05-29	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-29	A21 Portal	L	N/A	0	No	No	No	
2022-05-30	A21 North Wall	L	N/A	0	No	No	No	
2022-05-30	A21 East Wall	L	N/A	0	No	No	No	
2022-05-30	A21 South Wall	L	N/A	0	No	No	No	
2022-05-30	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-05-30	South Tank Farm	L	N/A	0	Yes	No	No	
2022-05-30	A21 Portal	L	N/A	0	No	No	No	
2022-05-31	A21 North Wall	L	N/A	0	No	No	No	
2022-05-31	A21 East Wall	L	N/A	0	No	No	No	
2022-05-31	A21 South Wall	L	N/A	0	No	No	No	
2022-05-31	A21 South Ramp	L	N/A	0	No	Yes	No	Nest does not seem occupied
2022-05-31	South Tank Farm	L	N/A	0	No	Yes	No	
2022-05-31	A21 Portal	L	N/A	0	No	No	No	
2022-06-01	A21 North Wall	L	N/A	0	No	No	No	
2022-06-01	A21 East Wall	L	N/A	0	No	No	No	
2022-06-01	A21 South Wall	L	N/A	0	No	No	No	
2022-06-01	A21 South Ramp	L	N/A	0	No	Yes	No	Nest does not seem occupied
2022-06-01	South Tank Farm	L	common raven	2	No	Yes	No	
2022-06-01	A21 Portal	L	N/A	0	No	No	No	
2022-06-02	A21 North Wall	L	N/A	0	No	No	No	
2022-06-02	A21 East Wall	L	N/A	0	No	No	No	
2022-06-02	A21 South Wall	L	N/A	0	No	No	No	
2022-06-02	A21 South Ramp	L	N/A	0	No	Yes	No	Nest present, no raptor activity
2022-06-02	South Tank Farm	L	N/A	0	No	Yes	No	Nest present, no birds in area
2022-06-02	A21 Portal	L	N/A	0	No	No	No	
2022-06-03	A21 North Wall	L	N/A	0	No	No	No	
2022-06-03	A21 East Wall	L	N/A	0	No	No	No	
2022-06-03	A21 South Wall	L	N/A	0	No	No	No	
2022-06-03	A21 South Ramp	L	N/A	0	No	Yes	No	Nest present, no raptor activity
2022-06-03	South Tank Farm	L	common raven	0	No	Yes	No	Nest present, no birds in area
2022-06-03	Site Services Lineup	L	peregrine falcon	1	Yes	No	No	Same nest used in previous years
2022-06-04	A21 North Wall	L	N/A	0	No	No	No	
2022-06-04	A21 East Wall	L	N/A	2	No	No	No	PEFA circled high above pit for a while, eventually swooping down into pit and targeting another smaller PEFA. Drove other away over lake and perched on telephone pole near N dike access
2022-06-04	A21 South Wall	L	N/A	0	No	No	No	
2022-06-04	A21 South Ramp	L	N/A	0	No	Yes	No	Nest present, no raptor activity
2022-06-05	A21 North Wall	L	N/A	0	No	No	No	
2022-06-05	A21 East Wall	L	N/A	0	No	No	No	
2022-06-05	A21 South Wall	L	N/A	0	No	No	No	

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-06-05	A21 South Ramp	L	N/A	0	No	Yes	No	Nest present, no raptor activity
2022-06-05	South Tank Farm	L	N/A	0	No	Yes	No	Nest present, no birds in area
2022-06-06	A21 North Wall	L	N/A	0	No	No	No	
2022-06-06	A21 East Wall	L	N/A	0	No	No	No	
2022-06-06	A21 South Wall	L	peregrine falcon	1	No	No	No	Single PEFA flying over S ramp, perched on dike power pole, flew south over ice perching on small island S of A21
2022-06-06	A21 South Ramp	L	N/A	0	No	Yes	No	Nest present, no raptor activity
2022-06-08	A21 North Wall	L	N/A	0	No	No	No	
2022-06-08	A21 East Wall	L	N/A	0	No	No	No	
2022-06-08	A21 South Wall	L	N/A	0	No	No	No	
2022-06-08	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-06-08	South Tank Farm	D	common raven	5	Yes	No	4	Nest on SE tank currently has 4 birds of medium size living in it with a full--grown adult bringing the medium--sized ones food (this was directly observed). The medium--sized ones are chicks, apparently.
2022-06-08	A21 Portal	L	American robin	2	No	Yes	No	Many nests have been built in the crevices of the support beams of the portal. We first noticed this last month, today robins were spotted flying out of the portal upon approach. Photos captured.
2022-06-10	South Tank Farm	L	common raven	5	Yes	No	4	Nest on SE tank currently has 4 birds of medium size living in it with a full--grown adult bringing the medium--sized ones food.
2022-06-10	A21 North Wall	L	N/A	0	No	No	No	
2022-06-10	A21 East Wall	L	N/A	0	No	No	No	
2022-06-10	A21 South Wall	L	N/A	0	No	No	No	
2022-06-10	A21 South Ramp	L	N/A	0	No	Yes	No	Nest was visible, however, no RLHA was noted in the area
2022-06-10	South Tank Farm	D	common raven	4	Yes	No	1	Four (4) Ravens spotted. 2 Raven's (appear to be adults) sitting on/beside nest. One (1) adult Raven flew in the nest and appeared to drop off food, then left. One (1) Raven appeared to be an adolescent inside the nest.
2022-06-10	A21 Portal	L	American robin	1	No	Yes	No	Robin flying in the area, potential nest located inside the A21 Portal
2022-06-10	A154 Lookout #1	L	American robin	1	No	No	No	Robin spotted flying around the pit
2022-06-10	A154 Lookout #2	L	N/A	0	No	No	No	
2022-06-10	A418 Lookout #1	L	N/A	0	No	No	No	No bird sightings of any kind
2022-06-10	A418 Lookout #2	L	N/A	0	No	No	No	No bird sightings of any kind
2022-06-11	A21 North Wall	L	N/A	0	No	No	No	
2022-06-11	A21 East Wall	L	N/A	0	No	No	No	
2022-06-11	A21 South Wall	L	N/A	0	No	No	No	
2022-06-11	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-06-11	South Tank Farm	D	common raven	5	Yes	No	3	Two (2) appear to be adults due to the dark--black colored wings. Three (3) appear to be younger due to the lighter--black colored wings.
2022-06-11	A21 Portal	L	American robin	0	Yes	No	No	Multiple nests spotted just within the entrance of the A21 Portal.
2022-06-11	NIWTP stairs	-	American robin	1	Yes	No	4	Nest with 4 eggs reported by NIWTP operator. Operators will avoid using those stairs until eggs are hatched and nest no longer occupied
2022-06-12	A21 North Wall	L	N/A	0	No	No	No	
2022-06-12	A21 East Wall	L	N/A	0	No	No	No	
2022-06-12	A21 South Wall	L	N/A	0	No	No	No	
2022-06-12	A21 South Ramp	L	N/A	0	No	Yes	No	

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-06-12	South Tank Farm	D	common raven	5	Yes	No	3	Four (4) ravens sitting inside/near the nest. Fifth raven flew into the nest a few minutes after the arrival of ENV.
2022-06-12	A21 Portal	L	American robin	0	Yes	No	No	Multiple nests within the entrance of the A21 Portal.
2022-06-13	A21 North Wall	L	N/A	0	No	No	No	
2022-06-13	A21 East Wall	L	N/A	0	No	No	No	
2022-06-13	A21 South Wall	L	N/A	0	No	No	No	
2022-06-13	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-06-13	South Tank Farm	D	common raven	5	Yes	No	3	Five (5) ravens sitting inside/near the nest
2022-06-13	A21 Portal	L	American robin	2	Yes	No	No	Pair of robins observed flying from the A21 Portal
2022-06-14	A21 North Wall	L	N/A	0	No	No	No	
2022-06-14	A21 East Wall	L	N/A	0	No	No	No	
2022-06-14	A21 South Wall	L	N/A	0	No	No	No	
2022-06-14	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-06-14	South Tank Farm	D	common raven	5	Yes	No	3	Five (5) ravens sitting inside/near the nest
2022-06-14	A21 Portal	L	American robin	1	Yes	No	No	Robin observed flying within the A21 Portal
2022-06-15	A21 North Wall	L	unknown	2	No	No	No	Can hear several unknown birds (likely robins) tweeting/chirping, but did not observe any
2022-06-15	A21 East Wall	L	N/A	0	No	No	No	
2022-06-15	A21 South Wall	L	N/A	0	No	No	No	
2022-06-15	A21 South Ramp	L	N/A	0	No	Yes	No	No raptors in nest
2022-06-15	South Tank Farm	D	common raven	5	Yes	No	3	Four (4) ravens perched in the nest, one (1) flew away as I arrived to the viewing location
2022-06-15	A21 Portal	L	American robin	1	Yes	No	No	Single robin flew from outside of the A21 Portal
2022-06-16	A21 North Wall	L	N/A	0	No	No	No	
2022-06-16	A21 East Wall	L	N/A	0	No	No	No	
2022-06-16	A21 South Wall	L	N/A	0	No	No	No	
2022-06-16	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-06-16	South Tank Farm	D	common raven	2	Yes	No	No	
2022-06-16	A21 Portal	L	N/A	0	Yes	No	No	
2022-06-17	A21 North Wall	L	N/A	0	No	No	No	
2022-06-17	A21 East Wall	L	N/A	0	No	No	No	
2022-06-17	A21 South Wall	L	N/A	0	No	No	No	
2022-06-17	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-06-17	South Tank Farm	D	common raven	2	Yes	No	No	Two (2) sitting on stairs above nest. One (1) sitting on light post attached to tanker stairs beside nest Two (2) laying in nest
2022-06-17	A21 Portal	L	N/A	0	Yes	No	No	
2022-06-18	A21 North Wall	L	N/A	0	No	No	No	
2022-06-18	A21 East Wall	L	N/A	0	No	No	No	
2022-06-18	A21 South Wall	L	peregrine falcon	1	No	Yes	No	Peregrine flew into southern side of pit from a power pole on the south side of the dike. Did not see bird leave pit, but did not see in nest.
2022-06-18	A21 South Ramp	L	N/A	0	No	Yes	No	
2022-06-18	South Tank Farm	D	common raven	3	Yes	No	No	3 ravens were hopping around/sitting in nest
2022-06-18	A21 Portal	L	N/A	0	Yes	No	3	
2022-06-19	A21 North Wall	L	N/A	0	No	No	No	

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-06-19	A21 East Wall	L	N/A	0	No	No	No	
2022-06-19	A21 South Wall	L	N/A	0	No	No	No	
2022-06-19	A21 South Ramp	L	N/A	0	No	No	No	Have not seen RLHA or other Raptor enter the nest in this area for some time now so adjusted to Not Active Nest or Potential Nesting
2022-06-19	South Tank Farm	D	common raven	2	Yes	No	No	One (1) perched on top of the tanker surface/roof. One (1) sitting in nest.
2022-06-19	A21 Portal	L	N/A	0	No	No	No	
2022-06-21	A21 North Wall	L	N/A	0	No	No	No	
2022-06-21	A21 East Wall	L	N/A	0	No	No	No	
2022-06-21	A21 South Wall	L	N/A	0	No	No	No	
2022-06-21	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-21	South Tank Farm	D	common raven	2	Yes	No	No	One (1) perched on top of the tanker surface/roof. One (1) sitting in nest.
2022-06-21	A21 Portal	L	N/A	0	No	Yes	No	Robin spotted near portal with several nests inside the portal entrance
2022-06-23	A21 North Wall	L	rough-legged hawk	1	No	No	No	RLH perched on power pole flew away when truck approached
2022-06-23	A21 East Wall	L	N/A	0	No	No	No	
2022-06-23	A21 South Wall	L	N/A	0	No	No	No	
2022-06-23	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-23	South Tank Farm	D	N/A	0	No	No	No	
2022-06-23	A21 Portal	L	N/A	0	No	Yes	No	
2022-06-24	A21 North Wall	L	N/A	0	No	No	No	
2022-06-24	A21 East Wall	L	N/A	0	No	No	No	
2022-06-24	A21 South Wall	L	rough-legged hawk	1	No	No	No	RLH flying above lookout, flew north when truck approached
2022-06-24	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-24	South Tank Farm	D	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-24	A21 Portal	L	N/A	0	No	Yes	No	
2022-06-25	A21 North Wall	L	N/A	0	No	No	No	
2022-06-25	A21 East Wall	L	N/A	0	No	No	No	
2022-06-25	A21 South Wall	L	N/A	0	No	No	No	
2022-06-25	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-25	South Tank Farm	D	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-25	A21 Portal	L	N/A	0	No	No	No	
2022-06-26	A21 North Wall	L	N/A	0	No	No	No	
2022-06-26	A21 East Wall	L	N/A	0	No	No	No	
2022-06-26	A21 South Wall	L	N/A	0	No	No	No	
2022-06-26	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-26	South Tank Farm	D	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-26	A21 Portal	L	N/A	0	No	No	No	
2022-06-27	A21 North Wall	L	N/A	0	No	No	No	
2022-06-27	A21 East Wall	L	N/A	0	No	No	No	
2022-06-27	A21 South Wall	L	N/A	0	No	No	No	
2022-06-27	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-06-27	South Tank Farm	D	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-27	A21 Portal	L	N/A	0	No	No	No	
2022-06-28	A21 North Wall	L	N/A	0	No	No	No	
2022-06-28	A21 East Wall	L	N/A	0	No	No	No	
2022-06-28	A21 South Wall	L	N/A	0	No	No	No	
2022-06-28	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-28	South Tank Farm	D	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-28	A21 Portal	L	N/A	0	No	No	No	
2022-06-29	A21 North Wall	L	N/A	0	No	No	No	
2022-06-29	A21 East Wall	L	N/A	0	No	No	No	
2022-06-29	A21 South Wall	L	N/A	0	No	No	No	
2022-06-29	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-29	South Tank Farm	D	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-29	A21 Portal	L	N/A	0	No	No	No	(seen two raptors at the North water inlet)
2022-06-29	A21 North Wall	L	N/A	0	No	No	No	
2022-06-29	A21 East Wall	L	N/A	0	No	No	No	
2022-06-29	A21 South Wall	L	N/A	0	No	No	No	
2022-06-29	A21 South Ramp	L	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-29	South Tank Farm	D	N/A	0	No	No	No	Same Nest; no new bird activity
2022-06-29	A21 Portal	L	N/A	0	No	No	No	
2022-07-03	A21 North Wall	L	N/A	0	No	No	No	
2022-07-03	A21 East Wall	L	N/A	0	No	No	No	
2022-07-03	A21 South Wall	L	N/A	0	No	No	No	
2022-07-03	A21 South Ramp	L	N/A	0	No	No	No	Same nest; no new bird activity
2022-07-03	South Tank Farm	D	N/A	0	No	No	No	Same nest; no new bird activity
2022-07-03	A154 Lookout #1	L	N/A	0	No	No	No	
2022-07-03	A154 Lookout #2	L	N/A	0	No	No	No	
2022-07-03	A418 Lookout #1	L	N/A	0	No	No	No	
2022-07-03	A418 Lookout #2	L	N/A	0	No	No	No	
2022-07-03	Site Services Lineup	D	peregrine falcon	1	Yes	No	No	
2022-07-04	NIWTP stairs	-	American robin	1	No	No	Unknown	NIWTP operator reported that robins were fledged and flying around and nest no longer occupied. Unable to confirm how many robins fledged.
2022-07-10	A21 North Wall	L	N/A	0	No	No	No	
2022-07-10	A21 East Wall	L	N/A	0	No	No	No	
2022-07-10	A21 South Wall	L	N/A	0	No	No	No	
2022-07-10	A21 South Ramp	L	N/A	0	No	No	No	
2022-07-10	South Tank Farm	D	N/A	0	No	No	No	
2022-07-10	A154 Lookout #1	L	N/A	0	No	No	No	
2022-07-10	A154 Lookout #2	L	unknown	1	No	No	No	unidentified raptor (but likely, RLH) soaring above A154 dike on North side of pit
2022-07-10	A418 Lookout #1	L	N/A	0	No	No	No	
2022-07-10	A418 Lookout #2	L	N/A	0	No	No	No	
2022-07-10	Process Plant	D	N/A	0	No	No	No	

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-07-10	Powerhouse 1	D	N/A	0	No	No	No	
2022-07-10	Powerhouse 2	D	N/A	0	No	No	No	
2022-07-10	Boiler House	D	N/A	0	No	No	No	
2022-07-10	Site Services Lineup	D	peregrine falcon	1	Yes	No	No	
2022-07-10	Backfill Plant	D	N/A	0	No	No	No	
2022-07-17	A154 Lookout #1	L	N/A	0	No	No	No	Lack of activity could be due to rain
2022-07-17	A154 Lookout #2	L	N/A	0	No	No	No	
2022-07-17	A418 Lookout #1	L	N/A	0	No	No	No	
2022-07-17	A418 Lookout #2	L	N/A	0	No	No	No	
2022-07-17	Process Plant	D	N/A	0	No	No	No	
2022-07-17	Powerhouse	D	N/A	0	No	No	No	
2022-07-17	Boiler House	D	N/A	0	No	No	No	
2022-07-17	Site Services Lineup	D	N/A	0	No	No	No	
2022-07-17	Backfill Plant	D	N/A	0	No	No	No	
2022-07-17	South Tank Farm	D	N/A	0	No	No	No	
2022-07-24	A154 Lookout #1	L	N/A	0	No	No	No	Photos taken of the falcons
2022-07-24	A154 Lookout #2	L	N/A	0	No	No	No	
2022-07-24	A418 Lookout #1	L	N/A	0	No	No	No	
2022-07-24	A418 Lookout #2	L	N/A	0	No	No	No	
2022-07-24	Process Plant	D	N/A	0	No	No	No	
2022-07-24	Powerhouse	D	N/A	0	No	No	No	
2022-07-24	Boiler House	D	N/A	0	No	No	No	
2022-07-24	Site Services Lineup	D	peregrine falcon	4	Yes	No	2	
2022-07-24	Backfill Plant	D	N/A	0	No	No	No	
2022-07-24	South Tank Farm	D	N/A	0	No	No	No	
2022-07-31	A154 Lookout #1	D	N/A	0	No	No	No	
2022-07-31	A154 Lookout #2	D	peregrine falcon	2	No	No	No	
2022-07-31	A418 Lookout #1	D	N/A	0	No	No	No	
2022-07-31	A418 Lookout #2	D	N/A	0	No	No	No	
2022-07-31	Process Plant	D	N/A	0	No	No	No	
2022-07-31	Powerhouse	D	N/A	0	No	No	No	
2022-07-31	Boiler House	D	N/A	0	No	No	No	
2022-07-31	Site Services Lineup	D	peregrine falcon	1	Yes	No	1	1 chick in nest, just relaxing. Adults not spotted in area.
2022-07-31	Backfill Plant	D	N/A	0	No	No	No	
2022-07-31	South Tank Farm	D	N/A	0	No	No	No	
2022-08-06	Site Services Lineup	D	peregrine falcon	2	Yes	No	unknown	checked nest due to wolverine sighting in the area same day, peregrine was dive bombing wolverine.
2022-08-07	A154 Lookout #1	D	N/A	0	No	No	No	
2022-08-07	A154 Lookout #2	D	N/A	0	No	No	No	
2022-08-07	A418 Lookout #1	D	peregrine falcon	1	No	No	No	circling back and forth (east to west) over south rim of A418
2022-08-07	A418 Lookout #2	D	N/A	0	No	No	No	
2022-08-07	Process Plant	D	N/A	0	No	No	No	
2022-08-07	Powerhouse	D	N/A	0	No	No	No	

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-08-07	Boiler House	D	N/A	0	No	No	No	
2022-08-07	Site Services Lineup	D	peregrine falcon	4	Yes	No	2	2 adults were flying around nest (1 landed in nest for a short spell) and 2 fledglings were perched in nest
2022-08-07	Backfill Plant	D	N/A	0	No	No	No	
2022-08-07	South Tank Farm	D	N/A	0	No	No	No	
2022-08-14	A154 Lookout #1	D	N/A	0	No	No	No	
2022-08-14	A154 Lookout #2	D	N/A	0	No	No	No	
2022-08-14	A418 Lookout #1	D	N/A	1	No	No	No	
2022-08-14	A418 Lookout #2	D	N/A	0	No	No	No	
2022-08-14	Process Plant	D	N/A	0	No	No	No	
2022-08-14	Powerhouse	D	N/A	0	No	No	No	
2022-08-14	Boiler House	D	N/A	0	No	No	No	
2022-08-14	Site Services Lineup	D	peregrine falcon	4	Yes	No	2	1 fledgeling seen in nest and other seen perched on rocks above nest
2022-08-14	Backfill Plant	D	N/A	0	No	No	No	
2022-08-14	South Tank Farm	D	N/A	0	No	No	No	
2022-08-20	A154 Lookout #1	D	N/A	0	No	No	No	
2022-08-20	A154 Lookout #2	D	N/A	0	No	No	No	
2022-08-20	A418 Lookout #1	D	N/A	0	No	No	No	
2022-08-20	A418 Lookout #2	D	N/A	0	No	No	No	
2022-08-20	Process Plant	D	N/A	0	No	No	No	
2022-08-20	Powerhouse	D	N/A	0	No	No	No	
2022-08-20	Boiler House	D	N/A	0	No	No	No	
2022-08-20	Site Services Lineup	D	N/A	0	No	No	No	did not see any birds in/around the nest this week
2022-08-20	Backfill Plant	D	N/A	0	No	No	No	
2022-08-20	South Tank Farm	D	N/A	0	No	No	No	
2022-08-28	A154 Lookout #1	D	N/A	0	No	No	No	
2022-08-28	A154 Lookout #2	D	N/A	0	No	No	No	
2022-08-28	A418 Lookout #1	D	N/A	0	No	No	No	
2022-08-28	A418 Lookout #2	D	N/A	0	No	No	No	
2022-08-28	Process Plant	D	N/A	0	No	No	No	Seen PEFA perched day before but none during the survey
2022-08-28	Powerhouse	D	N/A	0	No	No	No	
2022-08-28	Boiler House	D	N/A	0	No	No	No	
2022-08-28	Site Services Lineup	D	N/A	0	No	No	No	
2022-08-28	Backfill Plant	D	N/A	0	No	No	No	
2022-08-28	South Tank Farm	D	N/A	0	No	No	No	
2022-09-04	A154 Lookout #1	L	N/A	0	No	No	No	
2022-09-04	A154 Lookout #2	L	N/A	0	No	No	No	
2022-09-04	A418 Lookout #1	L	rough-legged hawk	2	No	No	No	
2022-09-04	A418 Lookout #2	L	N/A	0	No	No	No	
2022-09-05	Process Plant	L	peregrine falcon	2	No	No	No	
2022-09-05	Powerhouse	L	N/A	0	No	No	No	
2022-09-05	Boiler House	L	N/A	0	No	No	No	
2022-09-05	Site Services Lineup	L	N/A	0	No	No	No	No birds seen this week

Date	Area	Method Used (D/L)	Bird Species	Number of Observed	Confirm Active Nest (Y/N)	Potential Nesting (Y/N)	Young / Fledglings (Y#/N/U)	Comments
2022-09-05	Backfill Plant	L	N/A	0	No	No	No	
2022-09-05	South Tank Farm	L	N/A	0	No	No	No	
2022-09-19	A154 Lookout #1	D	N/A	0	No	No	No	
2022-09-19	A154 Lookout #2	D	N/A	0	No	No	No	Seen three raptors at A21 at two flying, and one perched on a power pole
2022-09-19	A418 Lookout #1	D	N/A	0	No	No	No	
2022-09-19	A418 Lookout #2	D	N/A	0	No	No	No	
2022-09-19	Process Plant	D	N/A	0	No	No	No	
2022-09-19	Powerhouse	D	N/A	0	No	No	No	
2022-09-19	Boiler House	D	N/A	0	No	No	No	
2022-09-19	Site Services Lineup	D	N/A	0	No	No	No	
2022-09-19	Backfill Plant	D	N/A	0	No	No	No	
2022-09-19	South Tank Farm	D	N/A	0	No	No	No	

APPENDIX P

Camp Population, 2022

Month	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
January	-	-	-	389	429	443	534	593	866	692	495	603	627	542	489	510	542	565	578	562	583	550	529
February	-	-	-	424	408	512	671	682	973	702	545	661	647	574	524	557	573	615	627	579	617	571	577
March	63	402	576	413	453	585	748	729	1010	712	552	672	617	559	508	556	572	635	620	580	578	584	591
April	-	-	-	318	570	678	743	755	1001	679	548	648	595	553	495	543	580	684	590	570	546	567	570
May	-	-	-	333	470	682	871	854	1021	645	610	634	618	561	509	552	642	718	614	594	616	581	582
June	189	523	751	326	392	746	821	873	1,028	600	612	641	611	552	500	561	694	698	587	606	606	574	564
July	-	-	-	443	396	736	819	857	600	378	589	588	607	524	465	554	701	692	574	583	606	545	540
August	-	-	-	425	399	745	768	868	990	335	623	607	625	524	442	562	703	651	562	584	597	546	532
September	211	681	879	432	408	755	708	943	993	526	639	648	608	547	466	586	704	670	561	609	585	563	545
October	-	-	-	457	390	726	714	950	1,042	524	620	646	577	546	481	564	664	649	563	589	565	550	557
November	-	-	-	379	425	670	704	984	1,043	536	608	648	579	515	498	550	627	618	562	604	569	566	567
December	287	881	766	-	386	611	524	696	1,030	453	510	546	464	452	460	498	490	518	518	545	551	505	533
Maximum	211	681	879	433	408	755	821	943	1,028	600	639	672	647	574	500	562	703	698	587	609	606	584	591

APPENDIX Q

Waste Inspections Summary, 2022

Date	Location	Attractants				Wildlife				Wildlife Sign			
		Attractants Present?	Items	Number of Items Present	Comments	Wildlife Present?	Species	# of Individuals Observed	Wildlife Comments	Wildlife Sign Observed?	Wildlife Sign Observed Species	Wildlife Sign Type	Wildlife Sign Observed Comments
2022-01-08	Landfill	No	-	0		No	-	-	-	Yes	unspecified	unspecified	-
2022-01-14	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-01-26	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-02-02	Landfill	Yes	Other	5	Many cardboard boxes - should go to burn bins	No	-	-	-	No	-	-	-
2022-02-09	Landfill	No	-	0		No	-	-	-	Yes	unspecified	unspecified	-
2022-02-17	Landfill	Yes	Batteries	1		No	-	-	-	No	-	-	-
2022-02-23	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-03-02	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-03-10	Landfill	Yes	Oily Rags	1		No	-	-	-	No	-	-	-
2022-03-17	Landfill	Yes	Other	5	Lots of cardboard and miscellaneous wood in landfill, should be in burn bins	No	-	-	-	No	-	-	-
2022-03-25	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-03-30	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-04-06	Landfill	Yes	Food Packaging	3		No	-	-	-	No	-	-	-
2022-04-13	Landfill	Yes	Drink Containers Recyclable, Gloves, Oily Rags	6		No	-	-	-	No	-	-	-
2022-04-20	Landfill	Yes	Other	6	pallets	No	-	-	-	No	-	-	-
2022-04-28	Landfill	Yes	Gloves, Other	14	pallets	No	-	-	-	Yes	unspecified	unspecified	-
2022-05-11	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-05-19	Landfill	Yes	Aerosol Cans, Gloves, Oily Rags	9		No	-	-	-	No	-	-	-
2022-05-25	Landfill	Yes	Drink Containers Recyclable, Food, Food Packaging, Gloves, Oil Contaminated Waste, Oil Products and Containers, Oily Rags	260		No	-	-	-	No	-	-	-
2022-06-01	Landfill	Yes	Gloves, Oil Contaminated Waste, Oil Products and Containers	80		No	-	-	-	No	-	-	-
2022-06-08	Landfill	Yes	Drink Containers Recyclable	2		No	-	-	-	No	-	-	-

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2022-06-15	Landfill	Yes	Drink Containers Recyclable, Gloves, Oily Rags	9		No	-	-	-	No	-	-	-
2022-06-22	Landfill	Yes	Oily Rags, Other	25	pallets (5) and boxes (15)	No	-	-	-	No	-	-	-
2022-06-29	Landfill	Yes	Other	2	Oily tarp. Lots of unused concrete	No	-	-	-	No	-	-	-
2022-07-06	Landfill	Yes	Oily Rags, Other	7	Full stack of burn items (cardboard) and more scattered throughout	No	-	-	-	No	-	-	-
2022-07-20	Landfill	Yes	Gloves	10		No	-	-	-	No	-	-	-
2022-07-27	Landfill	Yes	Drink Containers Recyclable, Gloves, Oily Rags	3		No	-	-	-	No	-	-	-
2022-08-03	Landfill	Yes	Other	5	Wood pallets, lots of cardboard boxes	No	-	-	-	No	-	-	-
2022-08-10	Landfill	Yes	Aerosol Cans, Drink Containers Recyclable, Food Packaging, Gloves, Oily Rags	30		No	-	-	-	No	-	-	-
2022-08-17	Landfill	Yes	Aerosol Cans, Cigarette Packaging, Gloves, Oily Rags	34		No	-	-	-	No	-	-	-
2022-08-24	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-08-31	Landfill	Yes	Aerosol Cans, Food Packaging, Gloves, Oily Rags	21		No	-	-	-	No	-	-	-
2022-09-08	Landfill	Yes	Cigarette Butts, Drink Containers Recyclable, Gloves, Oil Contaminated Waste, Oily Rags	119	full bucket	No	-	-	-	No	-	-	-
2022-09-21	Landfill	Yes	Drink Containers Recyclable, Food Packaging, Gloves, Other	9	Clothing	No	-	-	-	No	-	-	-
2022-09-28	Landfill	Yes	Aerosol Cans, Drink Containers Recyclable, Gloves, Oil Products and Containers, Oily Rags	21	Full open/exposed bucket of sludge	No	-	-	-	No	-	-	-

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2022-10-02	Landfill	Yes	Aerosol Cans, Drink Containers Recyclable, Food Packaging, Gloves, Oily Rags	12		No	-	-	-	No	-	-	-
2022-10-09	Landfill	Yes	Drink Containers Recyclable, Food Packaging, Gloves, Oil Products and Containers, Oily Rags	9	Bucket of sludge	No	-	-	-	No	-	-	-
2022-10-12	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-10-16	Landfill	Yes	Food Packaging, Gloves, Oil Products and Containers	15		No	-	-	-	No	-	-	-
2022-10-20	Landfill	Yes	Oil Products and Containers, Other	3	cleaning product container	No	-	-	-	No	-	-	-
2022-10-23	Landfill	Yes	Food Packaging, Oil Contaminated Waste, Oil Products and Containers	3		No	-	-	-	No	-	-	-
2022-10-26	Landfill	Yes	Oil Products and Containers	1	grease container	No	-	-	-	No	-	-	-
2022-10-30	Landfill	Yes	Drink Containers Recyclable, Food Packaging, Gloves, Other	10	bucket with some frozen paint/grease inside	No	-	-	-	No	-	-	-
2022-11-03	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-11-07	Landfill	Yes	Other	1	Cardboard and other burnable materials	No	-	-	-	No	-	-	-
2022-11-10	Landfill	Yes	Other	6	cardboard boxes and pallets	No	-	-	-	No	-	-	-
2022-11-14	Landfill	Yes	Aerosol Cans	2	Very small amount of burnables - cardboard box and pallet.	No	-	-	-	Yes	red fox	tracks	-
2022-11-16	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-11-20	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-11-23	Landfill	Yes	Aerosol Cans, Drink Containers Recyclable, Food Packaging, Gloves	6		No	-	-	-	No	-	-	-
2022-11-27	Landfill	No	-	0		No	-	-	-	No	-	-	-

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2022-11-30	Landfill	Yes	Oil Products and Containers	1	grease container	No	-	-	-	No	-	-	-
2022-12-04	Landfill	Yes	Drink Containers Recyclable	1		No	-	-	-	No	-	-	-
2022-12-07	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-12-11	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-12-14	Landfill	Yes	Aerosol Cans, Other	3	Hydraulic hoses	No	-	-	-	No	-	-	-
2022-12-18	Landfill	Yes	Other	3	Cardboard boxes, air filters, and pallets	No	-	-	-	No	-	-	-
2022-12-21	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-12-25	Landfill	Yes	Gloves, Oily Rags	14		No	-	-	-	No	-	-	-
2022-12-28	Landfill	No	-	0		No	-	-	-	No	-	-	-
2022-01-08	Underground	No	-	0		No	-	-	-	Yes	unspecified	unspecified	-
2022-01-14	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-01-20	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-01-26	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-02-02	Underground	Yes	Aerosol Cans, Food Packaging, Gloves, Oily Rags	4		No	-	-	-	No	-	-	-
2022-02-09	Underground	No	-	0		No	-	-	-	Yes	unspecified	unspecified	-
2022-02-17	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-03-02	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-03-10	Underground	Yes	Aerosol Cans, Cigarette Packaging, Food Packaging, Gloves, Oily Rags	44		No	-	-	-	No	-	-	-
2022-03-17	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-03-25	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-03-30	Underground	No	-	0		No	-	-	-	Yes	red fox	unspecified	-
2022-04-06	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-04-13	Underground	Yes	Cigarette Butts, Drink Containers Recyclable, Oily Rags, Other	6	Coffee cups in burnable bin	No	-	-	-	No	-	-	-
2022-04-20	Underground	Yes	Gloves, Oily Rags	8		No	-	-	-	No	-	-	-
2022-04-28	Underground	Yes	Drink Containers Recyclable	3		No	-	-	-	Yes	unspecified	unspecified	-

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2022-05-06	Underground	Yes	Drink Containers Recyclable, Gloves, Oily Rags	5		No	-	-	-	No	-	-	-
2022-05-11	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-05-19	Underground	Yes	Oily Rags	2		No	-	-	-	No	-	-	-
2022-05-25	Underground	Yes	Cigarette Butts, Oil Products and Containers	60		No	-	-	-	No	-	-	-
2022-06-01	Underground	Yes	Aerosol Cans, Cigarette Butts	101		No	-	-	-	No	-	-	-
2022-06-08	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-06-15	Underground	Yes	Cigarette Butts, Drink Containers Recyclable, Oily Rags	53		No	-	-	-	No	-	-	-
2022-06-22	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-06-29	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-07-06	Underground	Yes	Cigarette Butts, Gloves	22		No	-	-	-	No	-	-	-
2022-07-13	Underground	Yes	Cigarette Butts	35		No	-	-	-	No	-	-	-
2022-07-20	Underground	Yes	Cigarette Butts	51		No	-	-	-	No	-	-	-
2022-07-27	Underground	Yes	Cigarette Butts	50		No	-	-	-	Yes	bear spp.	scat	-
2022-08-03	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-08-10	Underground	Yes	Cigarette Butts, Oily Rags	42		No	-	-	-	No	-	-	-
2022-08-17	Underground	Yes	Cigarette Butts, Gloves	37		No	-	-	-	No	-	-	-
2022-08-24	Underground	Yes	Food Packaging	2		Yes	common raven	1	-	No	-	-	-
2022-08-31	Underground	Yes	Cigarette Butts	31		No	-	-	-	No	-	-	-
2022-09-08	Underground	Yes	Cigarette Butts, Drink Containers Recyclable, Gloves, Oily Rags	90		No	-	-	-	No	-	-	-
2022-09-14	Underground	Yes	Cigarette Butts, Gloves, Oily Rags	53		No	-	-	-	No	-	-	-
2022-09-21	Underground	Yes	Gloves, Oil Contaminated Waste, Oily Rags	5	Large bag with clothes in it potentially oily rags	No	-	-	-	No	-	-	-
2022-09-28	Underground	No	-	0		No	-	-	-	No	-	-	-

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2022-10-02	Underground	Yes	Aerosol Cans, Gloves, Oily Rags	7		No	-	-	-	No	-	-	-
2022-10-05	Underground	Yes	Cigarette Packaging, Gloves	3		No	-	-	-	No	-	-	-
2022-10-09	Underground	Yes	Aerosol Cans, Cigarette Butts, Cigarette Packaging, Gloves, Oil Contaminated Waste, Oil Products and Containers, Oily Rags	60	Non burn bin smells of grease/oil	No	-	-	-	No	-	-	-
2022-10-12	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-10-16	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-10-20	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-10-23	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-10-26	Underground	Yes	Cigarette Butts, Cigarette Packaging, Oil Contaminated Waste	31		No	-	-	-	No	-	-	-
2022-10-30	Underground	Yes	Drink Containers Recyclable, Gloves, Oil Contaminated Waste, Oil Products and Containers	6	Everything is oil/grease contaminated in non burn. Burn item in non burn.	No	-	-	-	No	-	-	-
2022-11-03	Underground	Yes	Gloves	2		No	-	-	-	No	-	-	-
2022-11-07	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-11-10	Underground	Yes	Drink Containers Recyclable, Gloves	16		No	-	-	-	No	-	-	-
2022-11-14	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-11-16	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-11-20	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-11-23	Underground	Yes	Cigarette Butts, Oil Products and Containers	47		No	-	-	-	No	-	-	-
2022-11-27	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-11-30	Underground	Yes	Cigarette Butts, Cigarette Packaging, Gloves, Other	27	Pair of Work boots	No	-	-	-	No	-	-	-
2022-12-04	Underground	Yes	Cigarette Butts, Food	4		No	-	-	-	No	-	-	-

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2022-12-07	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-12-11	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-12-14	Underground	No	-	0		No	-	-	-	No	-	-	-
2022-12-18	Underground	Yes	Gloves, Oily Rags	2		Yes	common raven	2	-	No	-	-	-
2022-12-21	Underground	Yes	Gloves	3		No	-	-	-	No	-	-	-
2022-12-25	Underground	Yes	Cigarette Butts, Drink Containers Recyclable, Gloves	17		No	-	-	-	No	-	-	-
2022-12-28	Underground	Yes	Cigarette Butts, Gloves	15		No	-	-	-	No	-	-	-
2022-01-08	Waste Transfer Area	No	-	0		Yes	common raven	2	-	No	-	-	-
2022-01-14	Waste Transfer Area	Yes	Food, Food Packaging	10		Yes	common raven, red fox	3	2 ravens, 1 fox	No	-	-	-
2022-01-20	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-01-26	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-02-02	Waste Transfer Area	No	-	0		No	-	-	-	Yes	red fox	tracks	-
2022-02-09	Waste Transfer Area	No	-	0		Yes	common raven	2	near burn pit	No	-	-	-
2022-02-17	Waste Transfer Area	No	-	0		No	-	-	-	Yes	red fox	tracks	-
2022-03-02	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-03-10	Waste Transfer Area	No	-	0		Yes	red fox	1	injured fox near burn pit	No	-	-	-
2022-03-17	Waste Transfer Area	No	-	0		No	-	-	-	Yes	red fox	tracks	along fenced area and near burn pit
2022-03-25	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-03-30	Waste Transfer Area	No	-	0		No	-	-	-	Yes	red fox	tracks	near burn pit
2022-04-06	Waste Transfer Area	No	-	0		No	-	-	-	Yes	red fox	tracks	-
2022-04-13	Waste Transfer Area	No	-	0		No	-	-	-	Yes	red fox	tracks	in non-burnables bin

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2022-04-20	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-04-28	Waste Transfer Area	No	-	0		No	-	-	-	Yes	unspecified	unspecified	-
2022-05-06	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-05-11	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-05-19	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-05-25	Waste Transfer Area	Yes	Drink Containers Recyclable, Food, Food Packaging, Other	18	Food wrapping and containers	No	-	-	-	No	-	-	-
2022-06-01	Waste Transfer Area	Yes	Gloves	10		No	-	-	-	No	-	-	-
2022-06-08	Waste Transfer Area	Yes	Drink Containers Recyclable, Gloves, Oily Rags, Other	6	face masks	No	-	-	-	No	-	-	-
2022-06-15	Waste Transfer Area	Yes	Cigarette Packaging	1		No	-	-	-	No	-	-	-
2022-06-22	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-06-29	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-07-06	Waste Transfer Area	Yes	Food Packaging, Gloves, Other	4	Burn items (cardboard) in non-burn bin	No	-	-	-	No	-	-	-
2022-07-13	Waste Transfer Area	Yes	Other	2	Burn items in non burn bin (cardboard)	No	-	-	-	No	-	-	-
2022-07-20	Waste Transfer Area	Yes	Oil Products and Containers	2		No	-	-	-	No	-	-	-
2022-07-27	Waste Transfer Area	Yes	Food Packaging, Oil Products and Containers	12		Yes	common raven	5	in burn pit	No	-	-	-
2022-08-03	Waste Transfer Area	Yes	Oil Contaminated Waste	1	Engine oil packaging	Yes	common raven	1	in burn pit	No	-	-	-
2022-08-10	Waste Transfer Area	Yes	Batteries, Cigarette Packaging, Drink Containers Recyclable, Food Packaging, Gloves	12		No	-	-	-	No	-	-	-

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2022-08-17	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-08-24	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-08-31	Waste Transfer Area	Yes	Gloves, Oily Rags	4		No	-	-	-	No	-	-	-
2022-09-08	Waste Transfer Area	Yes	Cigarette Butts, Oil Products and Containers	2		No	-	-	-	No	-	-	-
2022-09-14	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-09-21	Waste Transfer Area	Yes	Gloves, Other	2	Suspicious looking drum	No	-	-	-	No	-	-	-
2022-09-28	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-02	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-05	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-09	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-12	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-16	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-20	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-23	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-26	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-10-30	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-11-03	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-11-06	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-11-10	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-

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2022-11-14	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-11-16	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-11-20	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-11-23	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-11-27	Waste Transfer Area	Yes	Gloves, Oil Products and Containers, Other	8	boots	No	-	-	-	No	-	-	-
2022-11-30	Waste Transfer Area	Yes	Gloves	1		No	-	-	-	No	-	-	-
2022-12-04	Waste Transfer Area	No	-	0		Yes	common raven	2	-	No	-	-	-
2022-12-07	Waste Transfer Area	No	-	0		Yes	common raven	2	-	Yes	red fox	tracks	-
2022-12-11	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-12-14	Waste Transfer Area	Yes	Food Packaging	4		Yes	common raven, red fox	2	-	No	-	-	-
2022-12-18	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-12-21	Waste Transfer Area	No	-	0		No	-	-	-	Yes	red fox	tracks	-
2022-12-25	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-12-28	Waste Transfer Area	No	-	0		No	-	-	-	No	-	-	-
2022-01-08	A21	No	-	0		No	-	-	-	Yes	unspecified	unspecified	-
2022-01-14	A21	No	-	0		No	-	-	-	No	-	-	-
2022-01-20	A21	No	-	0		No	-	-	-	No	-	-	-
2022-01-26	A21	No	-	0		No	-	-	-	No	-	-	-
2022-02-02	A21	Yes	Oily Rags	1		No	-	-	-	No	-	-	-
2022-02-09	A21	No	-	0		No	-	-	-	Yes	unspecified	unspecified	-
2022-02-17	A21	No	-	0		No	-	-	-	No	-	-	-
2022-02-23	A21	No	-	0		Yes	red fox	1	-	Yes	red fox	tracks	-

Date	Location	Attractants				Wildlife				Wildlife Sign			
		Attractants Present?	Items	Number of Items Present	Comments	Wildlife Present?	Species	# of Individuals Observed	Wildlife Comments	Wildlife Sign Observed?	Wildlife Sign Observed Species	Wildlife Sign Type	Wildlife Sign Observed Comments
2022-03-02	A21	Yes	Oil Products and Containers	1		No	-	-	-	No	-	-	-
2022-03-17	A21	No	-	0		No	-	-	-	No	-	-	-
2022-03-25	A21	No	-	0		No	-	-	-	No	-	-	-
2022-03-30	A21	No	-	0		No	-	-	-	No	-	-	-
2022-04-06	A21	No	-	0		No	-	-	-	No	-	-	-
2022-04-13	A21	No	-	0		No	-	-	-	No	-	-	-
2022-04-20	A21	Yes	Aerosol Cans, Oily Rags	2		No	-	-	-	No	-	-	-
2022-04-28	A21	No	-	0		No	-	-	-	Yes	unspecified	unspecified	-
2022-05-06	A21	Yes	Drink Containers Recyclable, Gloves, Oil Contaminated Waste, Oily Rags	6		No	-	-	-	No	-	-	-
2022-05-11	A21	Yes	Drink Containers Recyclable, Gloves	4		No	-	-	-	No	-	-	-
2022-05-19	A21	No	-	0		No	-	-	-	No	-	-	-
2022-05-25	A21	Yes	Aerosol Cans	20		No	-	-	-	No	-	-	-
2022-06-01	A21	Yes	Aerosol Cans	8		No	-	-	-	No	-	-	-
2022-06-08	A21	Yes	Drink Containers Recyclable, Gloves	4		No	-	-	-	No	-	-	-
2022-06-15	A21	Yes	Cigarette Butts	51		No	-	-	-	No	-	-	-
2022-06-22	A21	Yes	Oily Rags	20		No	-	-	-	No	-	-	-
2022-06-29	A21	Yes	Drink Containers Recyclable, Oily Rags, Other	8	Oily wrags at pitshop bin	No	-	-	-	No	-	-	-
2022-07-06	A21	Yes	Batteries, Cigarette Butts, Oil Products and Containers	92		No	-	-	-	No	-	-	-
2022-07-13	A21	Yes	Drink Containers Recyclable, Gloves, Oily Rags	4		No	-	-	-	No	-	-	-
2022-07-20	A21	No	-	0		No	-	-	-	No	-	-	-
2022-07-27	A21	No	-	0		No	-	-	-	No	-	-	-
2022-08-03	A21	No	-	0		No	-	-	-	No	-	-	-
2022-08-10	A21	No	-	0		No	-	-	-	No	-	-	-
2022-08-17	A21	No	-	0		No	-	-	-	No	-	-	-
2022-08-24	A21	No	-	0		No	-	-	-	No	-	-	-

Date	Location	Attractants				Wildlife				Wildlife Sign			
		Attractants Present?	Items	Number of Items Present	Comments	Wildlife Present?	Species	# of Individuals Observed	Wildlife Comments	Wildlife Sign Observed?	Wildlife Sign Observed Species	Wildlife Sign Type	Wildlife Sign Observed Comments
2022-08-31	A21	No	-	0		No	-	-	-	No	-	-	-
2022-09-08	A21	No	-	0		No	-	-	-	No	-	-	-
2022-09-14	A21	Yes	Other	5	Large pile of unsegregated and oil contaminated waste in non burn bin	No	-	-	-	No	-	-	-
2022-09-21	A21	Yes	Oil Contaminated Waste, Oil Products and Containers, Oily Rags, Other	9	Cardboard boxes in non-burn bin. No label on outside of burn bin.	No	-	-	-	No	-	-	-
2022-09-28	A21	Yes	Drink Containers Recyclable, Gloves, Oily Rags	4		No	-	-	-	No	-	-	-
2022-10-02	A21	Yes	Aerosol Cans, Cigarette Butts, Cigarette Packaging, Drink Containers Recyclable, Food Packaging, Gloves, Oily Rags	66		No	-	-	-	No	-	-	-
2022-10-05	A21	Yes	Oily Rags	1		No	-	-	-	No	-	-	-
2022-10-09	A21	Yes	Oily Rags	1		No	-	-	-	No	-	-	-
2022-10-12	A21	No	-	0		No	-	-	-	No	-	-	-
2022-10-16	A21	No	-	0		No	-	-	-	No	-	-	-
2022-10-20	A21	Yes	Drink Containers Recyclable, Gloves, Oily Rags	12		No	-	-	-	No	-	-	-
2022-10-23	A21	No	-	0		No	-	-	-	No	-	-	-
2022-10-26	A21	Yes	Oily Rags, Other	6	Buckets with some oil inside	No	-	-	-	No	-	-	-
2022-10-30	A21	No	-	0		No	-	-	-	No	-	-	-
2022-11-03	A21	Yes	Oil Contaminated Waste, Oil Products and Containers, Oily Rags, Other	6	Non burn in burn bin and vice versa	No	-	-	-	No	-	-	-
2022-11-06	A21	No	-	0		No	-	-	-	No	-	-	-
2022-11-10	A21	No	-	0		No	-	-	-	No	-	-	-
2022-11-14	A21	No	-	0		No	-	-	-	No	-	-	-
2022-11-16	A21	No	-	0		No	-	-	-	No	-	-	-
2022-11-20	A21	No	-	0		No	-	-	-	No	-	-	-

Date	Location	Attractants				Wildlife				Wildlife Sign			
		Attractants Present?	Items	Number of Items Present	Comments	Wildlife Present?	Species	# of Individuals Observed	Wildlife Comments	Wildlife Sign Observed?	Wildlife Sign Observed Species	Wildlife Sign Type	Wildlife Sign Observed Comments
2022-11-23	A21	No	-	0		No	-	-	-	No	-	-	-
2022-11-27	A21	No	-	0		No	-	-	-	No	-	-	-
2022-11-30	A21	No	-	0		No	-	-	-	No	-	-	-
2022-12-04	A21	Yes	Oily Rags	1		No	-	-	-	No	-	-	-
2022-12-07	A21	No	-	0		No	-	-	-	No	-	-	-
2022-12-11	A21	Yes	Oil Contaminated Waste, Oily Rags, Other	5	Cardboard in non-burn	No	-	-	-	No	-	-	-
2022-12-14	A21	No	-	0		No	-	-	-	No	-	-	-
2022-12-18	A21	Yes	Gloves	1		No	-	-	-	No	-	-	-
2022-12-21	A21	Yes	Gloves, Oily Rags, Other	25	Used/oily spill pads	No	-	-	-	No	-	-	-
2022-12-25	A21	Yes	Gloves, Oil Contaminated Waste, Oily Rags	26		No	-	-	-	No	-	-	-
2022-12-28	A21	Yes	Gloves, Oil Products and Containers	4		No	-	-	-	No	-	-	-

