Appendix D-3

Hope Bay Project: 2022 Wildlife Mitigation and Monitoring Program Compliance Report

AGNICO EAGLE

Hope Bay Project

2022 Wildlife Mitigation and Monitoring Program Compliance Report

March 2023

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The business of sustainability

March 2023

Hope Bay Project

2022 Wildlife Mitigation and Monitoring Program Compliance Report

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EXECUTIVE SUMMARY

Wildlife mitigation and monitoring requirements for the Hope Bay Project are included in the Doris Project Certificate No. 003 (NIRB 2016), the Madrid-Boston Project Certificate No. 009 (NIRB 2018) and the Framework Agreement with the Kitikmeot Inuit Association (KIA) (the Framewok Agreement, 2015). Monitoring activities are summarized in the Wildlife Mitigation and Monitoring Program Plan (WMMP), which is revised regularly. In 2022, monitoring data were collected as outlined in the WMMP (Agnico Eagle Mines Ltd. 2021). Results from the 2022 Wildlife Mitigation and Monitoring Program (hereafter referred to as the Program) are summarized in Table 1.

Table 1: Summary of 2022 Wildlife Mitigation and Monitoring Plan (WMMP) Compliance Report Results

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Habitat Loss	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Total habitat loss in 2022 was 14.94 ha for a cumulative total of 141.15 ha overall. ■ Additions to the Project footprint include the water treatment plant foundations added near the TIA, and small additions in areas already under development in Madrid North. ■ Suitable habitat loss is <0.1% of the suitable habitat available in the Madrid-Boston FEIS Regional Study Area for caribou, muskox, grizzly bear, and wolverine, with a total loss of 0.33% or less of all suitable habitat available in the Madrid-Boston FEIS Local Study Area for upland breeding birds, waterbirds, and short-eared owls.	■ The Madrid-Boston FEIS predicted a negligible magnitude effect of habitat loss for caribou, grizzly bear, and wolverine and a low magnitude effect for upland breeding birds, waterbirds, and raptors. ■ The magnitude of habitat loss in 2022 is 3% of the Madrid-Boston FEIS predictions. Hence, the conclusions of the Madrid-Boston FEIS remain valid.	2.1
Road Traffic Monitoring	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ The daily and monthly road traffic in 2022 was summarized between Roberts Bay and Doris/Madrid North, between Doris and Madrid North, and between Doris and Windy Lake (i.e., for water transport). Hauling traffic including trips in the Madrid area. ■ Water truck transport between Doris and Windy Lake was on average 22% of the predicted maximum (from the Madrid-Boston FEIS). The maximum monthly hauling records in November 2022 were at 25% of the peak monthly predicted transits from the FEIS. ■ Average daily traffic from wildlife camera 18 (monitoring Roberts Bay to Doris) and camera 35 (between Doris and Madrid North) was summarized during the period of highest caribou activity across years (December/January, May, and July). Traffic leaving Roberts Bay averaged 28% of predicted levels. Traffic between Doris and Madrid averaged 17% of predicted levels.	■ Traffic levels between Roberts Bay, Doris, Madrid North, and Windy Lake were 17-28% of the predicted maximum levels in the Madrid-Boston FEIS. Therefore the conclusions of the Madrid-Boston FEIS remain valid.	2.2

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Helicopter and Fixed-wing Flight Monitoring	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Helicopter trips around Boston, Doris, and between Boston and Doris were summarized from 2022 flight records. Helicopters logs were summarized from May through October 2022. Fixed-wing aircraft flights were active in all months from the Doris airstrip. ■ Helicopter trips between Boston and Doris and around Boston occurred at an average of 24% - 27% of the daily predicted maximum frequencies predicted in the Madrid-Boston FEIS. Daily maximum activity in the Doris area was higher than predicted in the Madrid-Boston FEIS, primarily due to a drilling program at Madrid in the summer. ■ Fixed-wing aircraft flights occurred on average at 17% of the frequencies modelled for noise disturbance in the Madrid-Boston FEIS.	■ The majority of helicopter and fixed-wing aircraft flight traffic levels were below levels predicted in the Madrid-Boston FEIS. Helicopter traffic in the Doris area exceeded daily predicted maximums due to a drilling program in the Madrid area. ■ Current levels of potential noise disturbance from helicopters and fixed wing aircraft generally within modelled predictions from the FEIS. A drilling program in the Madrid area resulted in higher helicopter activity, however this program is outside of the operations included in the Madrid-Boston FEIS.	2.3
Snowbank Height Monitoring	Addresses Project Commitment #GN-19 from Project Certificate No. 009	■ Snowbank heights along the All Weather Road were monitored monthly in the winter (January through May, and October to December). ■ Snowbank heights averaged 12.5 cm across all monitoring stations and periods. Snowbank heights were generally < 20 cm. Although some snowbank measurements were higher (i.e., > 50 cm), photos indicate that banks were bladed back from the roadway and were at low inclines rather than steep banks. Areas with higher snowbanks were isolated to small portions of the road, i.e., across a few meters. These areas would therefore not pose a crossing barrier to caribou or other wildlife at the roadway.	■ Snowbank heights were monitored along the All Weather Road in 2022. Snowbank height along the road was measured at an overall average of 12.5 cm. The measured levels do not pose a barrier to wildlife crossing the road.	2.4
Caribou Kernel Density Analysis of Beverly/Ahiak Calving Range	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Collar data from the Beverly and Ahiak sub-populations were analysed for their core calving range (50% kernel density) and the 95% kernel density calving range. ■ Neither the Beverly or Ahiak core calving ranges or 95% calving ranges overlapped with the Study Area in 2022. Generally, the calving ranges were consistent with previous years (2001-2021), with some portions of both calving areas varying in their spatial extent.	■ The Beverly and Ahiak populations calving grounds have shown variation between years, but the core areas remain consistent and do not overlap the Project Study Area.	3.4

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Caribou Kernel Density Analysis of Dolphin and Union Winter Range	Addresses comments on 2016 Compliance Report (ERM 2017)	■ At this time, the collar data from 2019 – 2022 for the Dolphin and Union caribou have not yet been delivered by the Government of Nunavut (GN). A kernel density analysis of the winter range will be conducted in future years if data are available.	■ Subject to interpretation of GN Dolphin Union herd data.	3.4
Caribou Collar Power Analysis	Addresses Project Term and Condition 45	■ This work was completed in the 2019 WMMP and the condition is considered fulfilled (ERM 2020).	■ Term and Condition 45 requires an estimate on the number of collared caribou necessary to detect a ZOI around Phase 2 infrastructure. ■ These analyses were conducted in 2019 and the condition is considered fulfilled.	3.4
Wildlife Camera Monitoring – Caribou	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ There were moderate levels of caribou observations at cameras recorded across the monitoring period from June 2016 to September 2022, with an increase in caribou occupancy across the Study Area since 2019. ■ Statistical analysis indicated that there was a significant difference in caribou occupancy between the Treatment and Control zones. However, models account for occupancy at cameras rather than the number of caribou events recorded by zone. In recent years, caribou events have become more common at some specific cameras in the Treatment zone near site roads and camp facilities, where caribou have been frequenting since roughly 2019 during peak biting insect season. Accounting for the influx of caribou events in the Treatment zone, camera data do not currently indicate caribou avoidance of Project infrastructure. Models will be updated in future years to account for caribou activity according to the number of events.	■ The Madrid-Boston FEIS predicted potential minor effects on caribou due to change in movement and behaviour from avoidance of infrastructure within < 1 to 10 km^2 of the Project, and possible avoidance of the Hope Bay Belt, a 3-4 km wide band of low lying sedge meadows and rocky dykes. ■ Camera data suggest that caribou are not avoiding the Project. However, occupancy models for caribou require updating to account for changes in caribou abundance at specific areas (near Project infrastructure during peak biting insect season). The conclusions of the Madrid-Boston FEIS remain valid based on this monitoring method.	3.4

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Wildlife Camera Monitoring - Muskox	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Detections of muskox by wildlife cameras are rare. Five muskox events were recorded during the recent monitoring period from 2020 to 2022, though no events occurred in 2021. Three events occurred in the Treatment zone while the ZOI and Control zone cameras each had one event recorded. ■ The small sample size across years prevented statistical analysis; however, the raw data indicate that muskox are more common closer to the Project (in the Treatment zone) than farther away (in the Control zone) in all years. This indicates that muskox are likely not avoiding the Project.	■ The Madrid-Boston FEIS predicted potential minor effects on muskox due to change in movement and behaviour from avoidance of infrastructure around the Project areas. ■ Muskox are rarely recorded in the Project Study Area, and do not occur commonly enough to statistically analyse a potential ZOI around the Project. ■ The muskox camera data do not indicate avoidance of the Project. The conclusions of the Madrid-Boston FEIS remain valid.	3.5
Wildlife Camera Monitoring – Grizzly Bear	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Statistical analyses indicated that the chance of detecting a grizzly bear at Treatment cameras was no different than at Control cameras, suggesting that the Project is not influencing the distribution of grizzly bears by either attraction to or by avoidance of the Project. ■ Current management practices, such as waste management practices and responses to grizzly bear interactions and incidents, appear to be effective at reducing potential Project effects to grizzly bears. ■ Given that there were no differences in the predicted number of grizzly bear events between Treatment and Control cameras, a secondary analysis for a potential ZOI was not necessary.	■ The Madrid-Boston FEIS predicted a potential minor effect due to grizzly bear altering their movement and behaviour to avoid the Project site. ■ Statistical analyses of camera data suggest that grizzly bear are neither avoiding nor being attracted to the Project. Hence, the conclusions of the Madrid-Boston FEIS remain valid based on this monitoring method.	3.6

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Wildlife Camera Monitoring – Wolverine	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Wolverine were recorded in low numbers throughout the Study Area (i.e., across all camera zones) during recent years (2020 to 2022). Events were recorded in similar numbers to previous monitoring years, with 27 wolverine events recorded during the recent monitoring period. Almost all wolverine cameras events recorded have been of one individual; a single event in July 2021 was the first time two wolverines have been recorded at once. ■ Statistical analysis of wolverine occupancy indicated that wolverine occupancy differed in the Treatment zone compared both the Control zone and the potential ZOI (2 to 10 km from infrastructure). ■ The follow up analysis for a ZOI does not indicate a distinct ZOI cut off. These results suggest that wolverine may avoid infrastructure within close distances (~2 km). ■ This result is consistent with analysis from 2021, however this is only the second year with sufficient wolverine occurrence data to conduct a full analysis. Additional years of data collection will improve the accuracy of analysis results.	■ The Madrid-Boston FEIS predicted potential minor effects on movement and behaviour of wolverine, including potential disruption of movement at the scale of the PDA or attraction to Project infrastructure. ■ The wolverine data analysed to date indicate potential avoidance of Project infrastructure within 2 km. This is greater avoidance than predicted in the Madrid-Boston FEIS; predictions in the FEIS were uncertain due to sparse data and available research on wolverines in the area. However, using the criteria for residual effects ratings from the FEIS, the residual impact on wolverines remains the same (categorized as a low magnitude, medium duration, and reversible not significant effect).	3.7
Wildlife Camera Monitoring – Nest Predators	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Red fox, Arctic fox, grey wolf, and common raven were recorded in 17 events on wildlife cameras during the bird nesting season from May 15 to August 15 in 2022. Events were generally consistent across months, but were more common in the ZOI (n = 10) than the Treatment or Control zones (n = 4 and 3 respectively). ■ There is no evidence that nest predators are more common closer to the Project area.	■ The Madrid-Boston FEIS did not predict a residual effect for attraction of nest predators to Project infrastructure. ■ Based on the camera monitoring program, there is no evidence that nest predators are more common closer to the Project area.	3.8

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Wildlife surveys – Upland Breeding Birds (TIA Monitoring)	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ No pre-clearing surveys for nesting birds were conducted in 2022 because no new areas were cleared during the bird breeding season. ■ Ground-based surveys following the Program for Regional and International Shorebird Monitoring (PRISM) protocol were completed in 2022. PRISM surveys were completed at 12 high priority plots designated by CWS. ■ Twenty-one species were detected during PRISM surveys with another ten species recorded incidentally outside of the survey areas or time. Shorebirds were present in half of plots, with five shorebird nests recorded. Lapland longspur and savannah sparrow were the most common species. ■ Hoary redpoll and red-necked phalarope were the only upland breeding bird species of conservation concern recorded in 2022; Hoary redpoll is listed as vulnerable species in Nunavut (CESCC 2016) but is not federally listed. Red-necked phalarope is listed as Special Concern by COSEWIC (COSEWIC 2015) and under Schedule 1 of the SARA (Government of Canada 2021a).	■ Pre-clearing surveys are conducted between May 15 and August 15 to avoid construction in areas with migratory bird nesting or the presence of young. Construction was minimal in 2022 and clearing did not occur during the breeding bird period, so no pre clearing surveys were conducted. ■ Upland breeding bird monitoring is scheduled to occur in two of every five years to contribute to a regional Arctic monitoring initiative by CWS. These surveys occurred for the first year in 2022.	3.9
Wildlife surveys – Waterbirds (Ground Monitoring)	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Waterbirds were monitored via ground surveys established at 15 sites with varying distances from Project infrastructure. Waterbird and upland breeding bird abundance was higher in Control sites (including Ladder sites) compared to Potential Impact sites, however, the number of species across sites was the same for Control and Potential Impact sites. Potential Impact sites had four species recorded breeding within plot (confirmed with nests or young), while Control sites had two species recording breeding. ■ This is the first year of ground monitoring for waterbirds, and more years of data are needed to establish trends in waterbird abundance and species diversity.	■ Waterbird monitoring is scheduled to occur at via ground surveys at varying distances from the Project every two years. These surveys were conducted for the first time in 2022. ■ Multiple years of monitoring are necessary to establish trends in waterbird activity.	3.10

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Waterbirds (TIA Monitoring)	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Water quality at the TIA was monitored weekly and did not exceed relevant CCME guidelines, so no ecological risk assessment was conducted.	■ Water quality was monitored at the TIA to examine if it was safe for waterbirds; water did not exceed quality guidelines.	3.10
Wildlife surveys – Raptors	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ No construction of the Madrid North area occurred in 2022 and as such no pre-construction surveys were conducted. ■ Peregrine falcon was the only species of conservation concern recorded at the Project in 2022, from incidental wildlife sightings reports.	■ Pre-construction monitoring in Madrid North was not necessary in 2022.	3.11
Marine Mammals	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021) and Project Terms and Conditions 31, 32, and 33	■ Noise monitoring for marine mammals will occur during dock construction; no construction occurred on the dock in 2022. ■ Initial monitoring for marine mammals during shipping activities in Roberts Bay was conducted in 2022. In total, 16 surveys in September recorded two seals exhibiting normal behaviour during shipping activity in the Bay. A full monitoring program will begin in 2023 based on the updated 2023 Shipping Management Plan. ■ No marine wildlife incidents or incidental sightings were reported along shipping routes. Vessel tracks from 2022 were summarized to confirm that mitigations for setbacks and designated routes were followed. ■ In 2022, one unknown seal was incidentally reported in July.	■ Initial monitoring for marine mammals during shipping activities in Roberts Bay was conducted in 2022. A full monitoring program for marine mammals in Roberts Bay during shipping season will begin in 2023 based on the updated 2023 Shipping Management Plan	3.12
Plants	Addresses commitments in WMMP (Agnico Eagle Mines Ltd. 2021)	■ Baseline data for sedge sample bioaccumulation of metals was conducted in 2018. No additional data collection is necessary at this time. ■ No content related to plants in the 2022 WMMP Report. ■ Monitoring for invasive plants will occur in 2023.	■ No specific predictions around effects on plants were included in the Madrid-Boston FEIS. ■ Monitoring for invasive plants will occur in 2023.	3.13

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Facilities Camera Monitoring	Addresses Project Term and Condition 25	■ Eleven grizzly bear events were recorded at facility cameras. Nine of the 11 events were at the Roberts Lake Outflow. One grizzly bear event was recorded at camera 21 at the Waste Management Facility. Grizzly bears are occasionally recorded in this area, but lack of repeated records indicate that bears are not being attracted to the area. ■ There were 31 events of caribou detections at specific monitoring cameras. Eleven events were recorded at the caribou crossing ramps along Windy Road. Events have been recorded at the crossing ramps consistently across years, indicating that some caribou are using these ramps for crossing. ■ Twenty caribou events were recorded across 12 days at a TIA monitoring camera. Nineteen events consisted of one adult caribou and one event involved two adult caribou. All events occurred from July 5 to July 30, on August 5 and September 3. All of the caribou photos recorded at the TIA show individuals walking or trotting, potentially to escape insect swarms as noted for incidental behavioural observations. Caribou were commonly incidentally reported throughout site during July and August 2022, with 36 reports of 1-9 individuals (Section 3.4.2.6 below). Data indicate that caribou were moving through site throughout this time window, with some individuals passing by or through the TIA. However, caribou do not appear attracted to the TIA.	■ The FEIS predicted bears and wolverine would be attracted to the site at a 'low' magnitude. One bear was observed on the Waste Management Facility cameras in 2022, indicating bears are not generally attracted to the waste site; therefore current mitigation is effective and the FEIS prediction is valid. ■ The two cameras installed at the caribou ramps on the Doris-Windy AWR recorded a total of eleven caribou events in 2022. Caribou are recorded at these cameras in most years and are likely using the ramps. ■ One of the two cameras installed at the TIA recorded twenty caribou events and one grizzly bear event. Events corresponded with an increase of caribou moving through site during post-calving (based on camera events and incidental reports) and do not appear to indicate an attraction to the TIA specifically. No wolverine, nest predators, or muskox were recorded on cameras at the TIA. The overall low levels of wildlife recorded indicates that wildlife are not frequently using the TIA area.	3.4 to 3.8 (Results within each Section)
Wildlife Interactions	Addresses Project Term and Condition 25, Framework Agreement Schedule 3.1, J. Wildlife, Items 2, 7.	■ There were two grizzly bear interactions recorded in 2022 involving pushing of bears away from the site using helicopters. ■ In both interactions, the bears left the site without incident.	■ Attraction to the Project was predicted as low in the Madrid-Boston FEIS for grizzly bear and wolverine due to smells associated with the camp. ■ There were two grizzly bear interactions and no wolverine interactions in 2022. Grizzly bears were successfully deterred. ■ The conclusions of the Madrid-Boston FEIS regarding attraction to infrastructure remain valid for the valued components assessed i.e. grizzly bear and wolverine.	3.4 to 3.11 (Results within each Section)

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
Wildlife Incidents	Addresses Project Term and Condition 25, Framework Agreement Schedule 3.1, J. Wildlife, Items 2, 7	■ There were three incidents resulting in mortality of wildlife in 2022. One red fox was found dead on the side of the road. The red fox was believed to have died of natural causes due to the lack of visible crush or impact injuries. One ptarmigan mortality was due to collision with vehicle. One snowy owl mortality was recorded and was likely due to natural causes based on carcass condition. ■ A raven's nest was identified on a satellite dish at Boston Camp and was removed after a license for removal was provided by the GN. ■ All incidents were reported to the KIA, NIRB, GN DoE, and ECCC.	■ Direct mortality of raptors and upland birds was predicted as a low magnitude effect at the extent of the PDA. ■ Occasional mortality due to bird collisions with infrastructure do not have population level effects. Therefore the conclusions of the Madrid-Boston FEIS regarding bird mortality remain valid.	3.4 to 3.11 (Results within each Section)
Wildlife Mortalities	Addresses Project Term and Condition 25, Framework Agreement Schedule 3.1, J. Wildlife, Items 2, 7	■ There were three incidents resulting in mortality of wildlife in 2022. The only mortality attributed to Project activity was one ptarmigan, due to collision with vehicle.	■ Wildlife mortalities were predicted to be negligible for all VECs. The conclusions of the Madrid-Boston FEIS remain valid.	3.4 to 3.11 (Results within each Section)
Federal Species at Risk		■ There were twelve federal or territorial species at risk observed during 2022 including: ▪ American Golden Plover (Vulnerable in Nunavut); ▪ Beverly/Ahiak herd caribou, which are barren ground caribou (Threatened by COSEWIC and Vulnerable in Nunavut); ▪ Dolphin Union herd caribou (Endangered by COSEWIC and Special Concern Schedule 1 of SARA and Vulnerable in Nunavut); ▪ Golden eagle (Vulnerable in Nunavut); ▪ Grizzly bear (Special Concern Schedule 1 of SARA and Vulnerable in Nunavut); ▪ Wolverine (Vulnerable in Nunavut); ▪ Hoary Redpoll (Vulnerable in Nunavut)	■ Results of monitoring activities for these species are summarized in other sections.	Caribou – 3.4 Grizzly bear – 3.6 Upland breeding birds – 3.9 Raptors – 3.11

Program Component	Reason for Program	Results	Comparison to Terms and Conditions, Predictions, and Program Objectives	Report Section
		▪ Peregrine Falcon (Special Concern under Schedule 1 of the SARA); ▪ Red-necked Phalarope (Special Concern under Schedule 1 of the SARA and Vulnerable in Nunavut); ▪ Semipalmated Sandpiper (Vulnerable in Nunavut); ▪ Short-eared owl (Vulnerable in Nunavut); and ▪ Snow Bunting (Vulnerable in Nunavut).		

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GLOSSARY, ACRONYMS, AND ABBREVIATIONS

Agnico Eagle	Agnico Eagle Mines Limited
AWR	All-Weather-Road
Broods	Young of the year, synonymous with clutches, particularly in birds. Broods of young may be nestlings or fledglings.
COSEWIC	Committee on the Status of Endangered Wildlife in Canada – A federal committee of experts that assesses and designates the level of threat to wildlife and vegetation species in Canada
CWS	Canadian Wildlife Service
EC	Environment Canada
ECCC	Environment and Climate Change Canada
ELC	Ecosystem Land Classification
Environment Personnel	On-site environment technicians, wildlife biologists and environment contractors
ERM	ERM Consultants Canada Ltd.
FEIS	Final Environmental Impact Statement
Framework Agreement, the	The Framework Agreement between the Kitikmeot Inuit Association and TMAC Resources Inc.
GAMM	Generalized Additive Mixed Model
gamm() function	A function in R 3.4.1 used to fit generalized additive mixed models (GAMM)
GIS	Geographical Information System
GLM	Generalized Linear Model
GN	Government of Nunavut
GN DOE	Government of Nunavut Department of Environment
Hectare (ha)	10,000 m^2 or 0.01 km^2 or 2.47 acres
Home Range	The area used by a wildlife species for living and moving. Home ranges can represent annual ranges (e.g., for animals such as caribou and grizzly bear) or seasonal ranges (e.g., for birds).
IEAC	Inuit Environment Advisory Group
IQ	Inuit Qauajimajatuqangit
KIA	Kitikmeot Inuit Association

LSA	Local Study Area. The permitted Madrid-Boston footprint of the Project plus a buffer averaging 1,000 m radius around infrastructure and roads.
M	Motion-triggered photos from wildlife cameras
Migration	The regular seasonal or daily movement of animal populations to and from different areas, often considerable distances apart. Migration often occurs in corridors between preferred habitat types.
Migratory Birds Convention Act (1994)	A federal government commitment established in 1917 to protect most migrating birds found in Canada. The Act fulfilled the terms of the Migratory Birds Convention of 1916 between Canada and the US. The Canadian government has the authority to pass and enforce regulations to protect those species of migratory birds that are included in the Convention.
Miramar	Miramar Mining Corporation
MOU	Memorandum of Understanding
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NWMB	Nunavut Wildlife Management Board
QA/QC	Quality Assurance and Quality Control
PDA	Project Development Area. The permitted Madrid-Boston footprint of the Project plus a buffer averaging 250 m radius around infrastructure and 100 m radius around roads.
PRISM	Program for Regional and International Shorebird Monitoring, used to monitor Arctic shorebird populations
Program, the	The Wildlife Mitigation and Monitoring Program. Refers to the current WMMP, the monitoring that occurs, and the associated report for any given year.
Project, the	The Hope Bay Project, including the Doris North Project and the Phase 2 expansion of Madrid and Boston
Project Certificate, the	Phase 2 Hope Bay Belt Project Certificate Nunavut Impact Review Board No. 009, issued November 18, 2018.
Phase 2 Project, the	Phase 2 development of the Madrid and Boston deposits.
Raptor	Birds of prey including hawks, eagles, falcons, and owls. Common raven is considered a functional raptor based on similar nesting preferences to other true raptor species in the Arctic.
Report, the	The Wildlife Mitigation and Monitoring Plan Compliance Report
RSA	Regional Study Area. This is the largest study area around the Madrid-Boston permitted infrastructure. The wildlife RSA encompasses an area large enough to characterize potential effects to species which may come into contact with the Hope Bay Project or Project-related activities, approximately 30 km from Project infrastructure.

SARA	*Species at Risk Act* (2002) – A Canadian federal statute which is designed to meet one of Canada's commitments under the International Convention on Biological Diversity. The goal of the Act is to protect endangered or threatened organisms and their habitats. It also manages species which are not yet threatened, but whose existence or habitat is in jeopardy.
Shorebird	Any bird that lives, breeds, or forages on or near the shores of coastal or inland waters; also known as waders of the order Charadriiformes, such as a sandpiper or a plover. It excludes gull species.
Standard Deviation (SD)	A statistical measure of the spread or variability of a set of data
Standard Error (SE)	A statistical measure of the spread or variability of a set of data
Study Area	The Wildlife Mitigation and Monitoring Program Study Area.
T	Time-triggered photos from wildlife cameras
TIA	Tailings Impoundment Area. A lake that has been dammed and is the location of the tailings deposition.
TMAC	TMAC Resources Inc.
Upland Breeding Bird	Passerines (with the exception of common raven, which is included as a functional raptor), shorebirds, and ptarmigan
VECs	Valued Ecosystem Components
WMMP	Wildlife Mitigation and Monitoring Plan. The WMMP is the official document that outlines the program to be conducted to mitigate and monitor wildlife for the Doris Project.
WRT	Wildlife Response Team
Waterbird	Umbrella term used to encompass all birds that exclusively use water habitat for foraging, breeding, or staging during the year.
ZOI	Zone of Influence

1. INTRODUCTION

This document presents the results of wildlife monitoring activities for the Hope Bay Project (the Project) conducted by Agnico Eagle Mines Ltd. (Agnico Eagle) in 2022. The wildlife monitoring program for the Project is described in the Wildlife Mitigation and Monitoring Plan (Agnico Eagle Mines Ltd. 2021) which is discussed with the Inuit Environmental Advisory Committee (IEAC) and circulated to the Kitikmeot Inuit Association (KIA) and various stakeholders for discussion before implementation. The WMMP identifies the activities to be undertaken in the WMMP Compliance Program (the Program). The results of monitoring activities are described in the WMMP Compliance Report (the Report), this document, which is required to be submitted annually.

The introduction of the Report provides a description of:

- The Project Certificate No. 003 and No. 009 requirements, the Framework Agreement, and the objectives for the WMMP (Agnico Eagle Mines Ltd. 2021) (Section 1.1);
- The 2022 Program components (Section 1.2); and
- The 2022 Program Study Area (Section 1.3).

The WMMP is designed to assess potential Project-related effects on Valued Ecosystem Components (VECs) as predicted in the Madrid-Boston Project Final Environmental Impact Statement (FEIS; TMAC Resources 2017) and to meet the commitments of NIRB Project Certificates No. 003, Amendment No. 2 (NIRB 2016) and No. 009 (NIRB 2018), and the Framework Agreement (2015) with the KIA.

The Report describes the results of the monitoring activities designed to test these predictions including:

- Habitat loss due to the Project (Section 2);
- VEC-specific monitoring (Section 3);
- Wildlife use of the Project site, including any interactions, incidents and mortalities (Section 3); and
- Traffic, helicopter and aircraft, and noise monitoring to confirm estimates used in the FEIS (Section 2).

The Report also describes monitoring conducted to guide adaptive management, such as:

- Incidental observations (within VEC subsections, Section 3), and
- Snowbank monitoring on roadways (Section 2).

1.1 Project Requirements and Monitoring Objectives

1.1.1 Project Requirements

The wildlife mitigation and monitoring requirements for the Project were set out in the Doris Project Certificate No. 003 (NIRB 2006, 2013, 2016), the Madrid-Boston Project Certificate No. 009 (NIRB 2018) and the Framework Agreement (2015) and commitments made during the review of each Environmental Impact Statement.

The Madrid-Boston FEIS identified seven terrestrial wildlife VECs, including caribou (*Rangifer tarandus*), muskox (*Ovibos moschatus*), grizzly bear (*Ursus arctos*), wolverine (*Gulo gulo*), upland breeding birds, waterbirds, and raptors. The 2017 Phase 2 FEIS predicted five residual Project effects on wildlife VECs, none of which were predicted to be significant and all with negligible or low magnitude (Table 1.1-1):

- Habitat loss;
- Disturbance;

- Disruption of movement;
- Attraction to the Project; and
- Direct mortality.

Table 1.1-1: Magnitude of Madrid-Boston Project 2017 FEIS Residual Impact Predictions

VEC	Habitat Loss	Disturbance	Disruption of Movement	Attraction	Direct Mortality
Caribou	Negligible	Low	Low	Not residual	Not residual
Muskox	Low	Low	Low	Not residual	Not residual
Grizzly Bear	Negligible	Not residual	Low	Low	Not residual
Wolverine	Negligible	Not residual	Low	Low	Not residual
Upland Breeding Birds	Low	Negligible	Not residual	Not residual	Low
Waterbirds	Low	Negligible	Not residual	Not residual	Low
Raptors	Low	Low	Not residual	Not residual	Low
Marine Mammals	Not residual	Not residual	Not residual	Not residual	Not residual
Rare Plants	Low	NA	NA	NA	NA

The Program also includes input from the NIRB, Environment and Climate Change Canada (ECCC), the Government of Nunavut Department of the Environment (GN DOE), the Canadian Wildlife Service (CWS), the KIA, and the Inuit Environment Advisory Committee (IEAC). The annual Reports are also provided to the NIRB who distributes them to stakeholders for review and comments. The WMMP is updated as needed during the life of the Project, in part based on these review comments.

1.1.2 Inclusion of Inuit Qauajimajatuqangit (IQ)

Agnico Eagle is committed to considering and incorporating Traditional Knowledge (TK) into all stages of the WMMP, including identification of mitigation measures, monitoring study design, data collection, and follow-up programs to obtain feedback. Agnico Eagle includes TK through several mechanisms:

- The Inuit Environmental Advisory Committee (IEAC) was formed under the Hope Bay Project's Inuit Impact and Benefit Agreement (IIBA) with the Kitikmeot Inuit Association (KIA). The IEAC is comprised of Inuit who are Elders and/or active land users with extensive knowledge of wildlife and the environment, and with experience in the Hope Bay study area. Typically, two meetings are held annually with the IEAC to review existing and proposed mitigation and monitoring for wildlife, describe monitoring results to date, discuss adaptive management for wildlife and fish, and gain Inuit perspectives and local knowledge on the Project site.
- A series of workshops was held with Elders and harvesters familiar with the Project area prior to the Madrid-Boston FEIS application. Further detail on the caribou workshops is provided below.
- The Inuit Traditional Knowledge report (Banci and Spicker 2016) has also been reviewed and information regarding trends in VEC species or group populations have been included in Sections 3.4 to 3.11.
- The KIA presents perspectives of Inuit and scientific review when they comment on WMMP Plans and Reports and FEIS documents, and during their regular site visits. Examples include the construction and monitoring of road crossing structures on the Doris-Windy All-Weather-Road (AWR), using incinerators for food waste management to mitigate the attraction of bears, and assistance by

land users in selecting the locations for site monitoring cameras. The WMMP and the Report are circulated to the KIA and IEAC for review and comment.

A site visit and workshop with the IEAC was held in August 2022 and was the first site visit since the onset of the Covid-19 pandemic. Agnico Eagle provided a tour of key site locations and facilities, including updates to waste management procedures (instituting a composter), planned expansion of the airstrip, ongoing water treatment and release, and a tour of the fish fence at Roberts Bay. Monitoring locations for the caribou Height of Land (HOL) surveys were visited, and methods discussed (see Section 3.4). Community members will participate in the HOL monitoring, with onsite training planned for early 2023.

Three workshops were held with Elders and harvesters in September 2016, and April and August 2017 in Cambridge Bay. Elders and harvesters visited the Doris site and reviewed the mitigations used at Doris for caribou. Participants were able to see the application of many of the caribou protection measures during the site visit to Doris. For example, workshop participants viewed markers at 250 m from the airstrip and at 2.8 km from a quarry. Caribou cannot be present within these distances for aircraft to land or take-off and blasting to occur. Participants also stopped repeatedly along the Doris to Madrid Windy Lake Road to determine how far away a person can hear the Project.

Workshop participants agreed with established protection measures and suggested additional protection measures to aid in the protection of caribou during the construction and operation of the Project.
For example, participants reiterated that workers should stay in their vehicles when wildlife are observed, as getting out of the vehicle will cause animals to feel as though they are being pursued. Participants also noted that caribou are only disturbed by noise if they can see the source of the noise. Additionally, workshop participants indicated that caribou are more likely to be disturbed by a sudden, loud, and irregular noise as opposed to a constant regular noise that is not in view. The August 2017 workshop was brought to a close with a facilitated activity through which participants decided whether they were able to support and confirm the caribou protection measures proposed for the Phase 2 Project. The group reached consensus on the workshop conclusions, with participants agreeing that caribou protection measures would keep caribou safe.

1.2 Program Components

The 2022 WMMP Plan (Agnico Eagle Mines Ltd. 2021) identifies the monitoring and mitigation programs. The Project went into Care and Maintenance for Doris processing and underground production in February 2022; however exploration activities continued in the Madrid area. Construction at Madrid North did not occur in 2022 after it was paused in March 2020. Associated mitigation and monitoring that occurred are outlined in Table 1.2-1.

Table 1.2-1: Wildlife Monitoring in 2022

Monitoring Objective and Method	2022 – Doris Care and Maintenance
Project Infrastructure Development and Activities	
a. Habitat Loss - GIS analysis of footprint area	Section 2.1
b. Traffic Monitoring	Section 2.2
c. Helicopter and Fixed Wing Aircraft Monitoring	Section 2.3
d. Snowbank Monitoring	Section 2.4
e. Noise Monitoring	Section 2.5

Monitoring Objective and Method	2022 – Doris Care and Maintenance
VEC and Other Species Monitoring and Mitigation	
a. Monitoring Methods and Results Common Across VECs	Section 3.2 and 3.3
b. Caribou	Section 3.4
c. Muskox	Section 3.5
d. Grizzly Bear	Section 3.6
e. Wolverine	Section 3.7
f. Nest Predators	Section 3.8
g. Upland Breeding Birds	Section 3.9
h. Waterbirds	Section 3.10
i. Raptors	Section 3.11
j. Marine Mammals	Section 3.12
k. Plants; No Data in 2022	Section 3.13

1.3 Program Study Area

The 2022 Wildlife Study Area (the Study Area) used a similar area as the Madrid-Boston Project Regional Study Area (RSA; Figure 1.3-1). The Doris Study Area used in previous years is also included on Figure 1.3-1 for comparative purposes. The camera program occurs within focal areas of the Study Area, as described in Section 3.2.1.

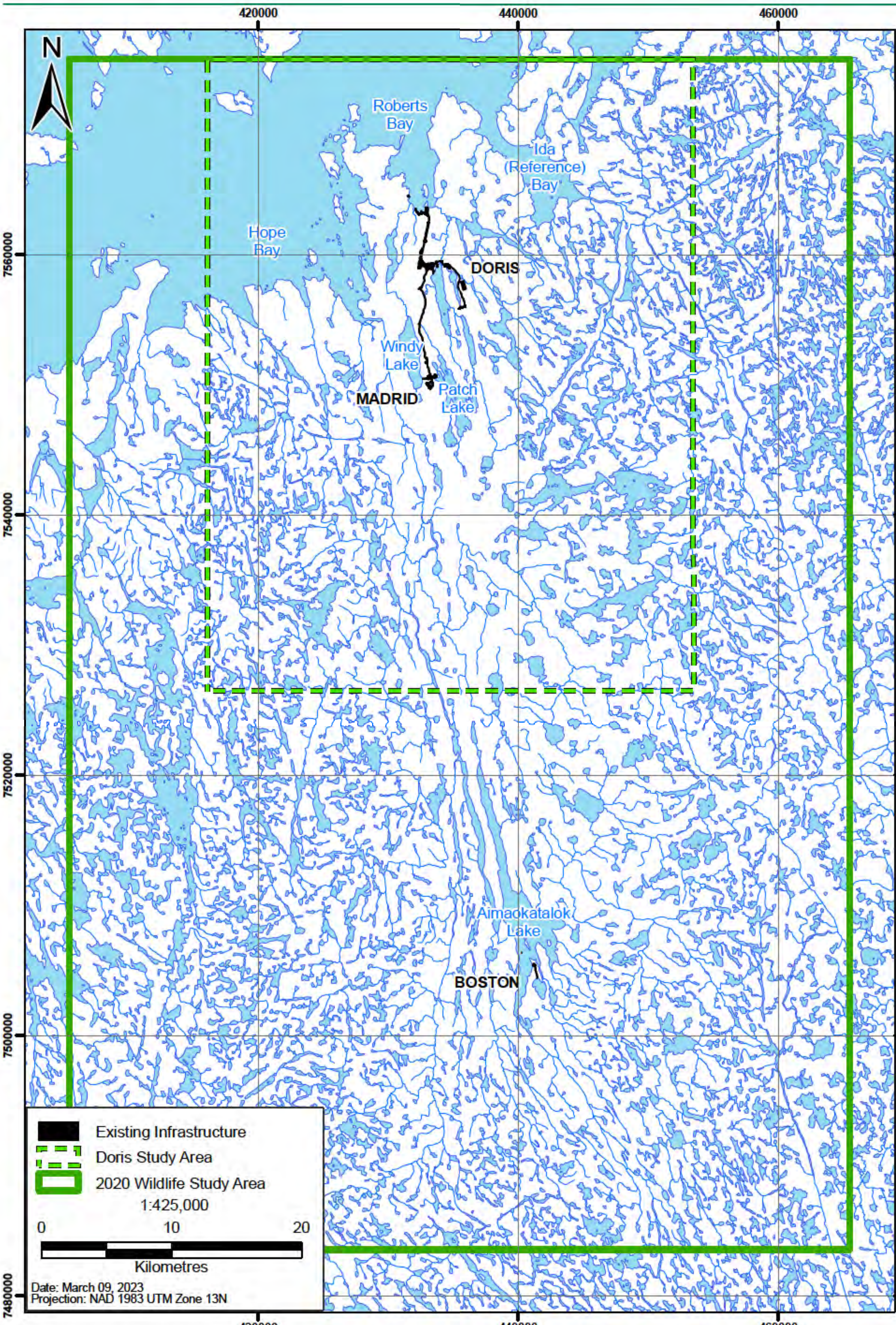


Figure 1.3-1: 2022 Wildlife Study Area

2. HABITAT LOSS AND SITE ACTIVITY MONITORING

2.1 Habitat Loss

Direct loss of wildlife habitat may occur through site clearing, infrastructure construction, and facility expansion. The amount of direct habitat loss due to the development and production phases of the Project has been monitored annually since 2006.

2.1.1 FEIS Predictions

In the Madrid-Boston FEIS (TMAC Resources 2017), wildlife habitat was predicted to be lost within a Project Development Area (PDA), which extended 500-1,500 m surrounding planned infrastructure. This larger PDA allowed for future development and operational flexibility. Infrastructure construction was predicted to result in the reduction of existing wildlife habitat. Habitat loss was predicted to be a not significant residual effect and the magnitude was classified as negligible for caribou, grizzly bear, and wolverine and low for muskox, upland breeding birds, waterbirds, and raptors. The geographic extent of habitat loss was the Project Development Area (PDA) for all wildlife VECs.

Habitat loss for rare plants was not assessed directly in the Madrid-Boston FEIS (TMAC Resources Inc. 2017) but instead was evaluated by determining the loss of special landscape features. Special landscape features include riparian ecosystems, rare or sensitive wetlands, ecosystems that can contain eskers, cliffs, bedrock lichen and outcrop ecosystems, and beaches and marine intertidal areas. Loss of special landscape features was predicated to be an effect with low magnitude that is not significant and at the geographic scale of the PDA.

2.1.2 Methods

Habitat loss is evaluated as the direct loss of vegetation communities due to the Project footprint. Habitat loss is evaluated annually and is compared to the amount of habitat available within the relevant study area using Ecological Land Classification (ELC) for the Slave Geological Province (Matthews, Epp, and Smith 2001) and Terrestrial Ecosystem Mapping (TEM) ecosystem units (Figure 2.1-1).

To evaluate the loss of suitable habitat for VEC species or groups, the loss is expressed as a proportion of available suitable habitat within the relevant study area as determined in the FEIS. For bird VECs the relevant study area is the LSA considering the overall small home ranges of these species. For mammalian VECs, which have larger home ranges, the relevant study area is the RSA (Appendix 2.1-1). Suitable habitat for each VEC species or group was modelled along with predicted habitat loss in the Madrid-Boston FEIS (TMAC Resources 2017); results of actual suitable habitat lost compared to modelled predictions are summarized with the results in Section 2.1.3.

Any loss of special landscape features designated as potential rare plant habitat (i.e., riparian areas, rare wetlands, eskers, cliffs, or marine beaches) is reported directly as number of hectares lost.

Further details on methodology for this monitoring program, including how suitable habitat for each VEC species or group is identified, can be found in Appendix 2.1-1.

2.1.3 Results

New construction in 2022 occurred primarily in areas which have already been developed, with earthworks around the Madrid North Overburden Pile and Waste Rock Pile continued from previous years (Figure 2.1-2). Additionally, the foundations for the new water treatment plant was added east of the TIA (Figure 2.1-2).

The total habitat lost in 2022 was 14.94 ha, adding to the approximately 126.21 ha already constructed (Figure 2.1-2). Collectively, the Project footprint covers 141.15 ha to date, which is 3% of the area predicted to be lost in the Madrid-Boston FEIS (4,177 ha; Table 2.1-1).

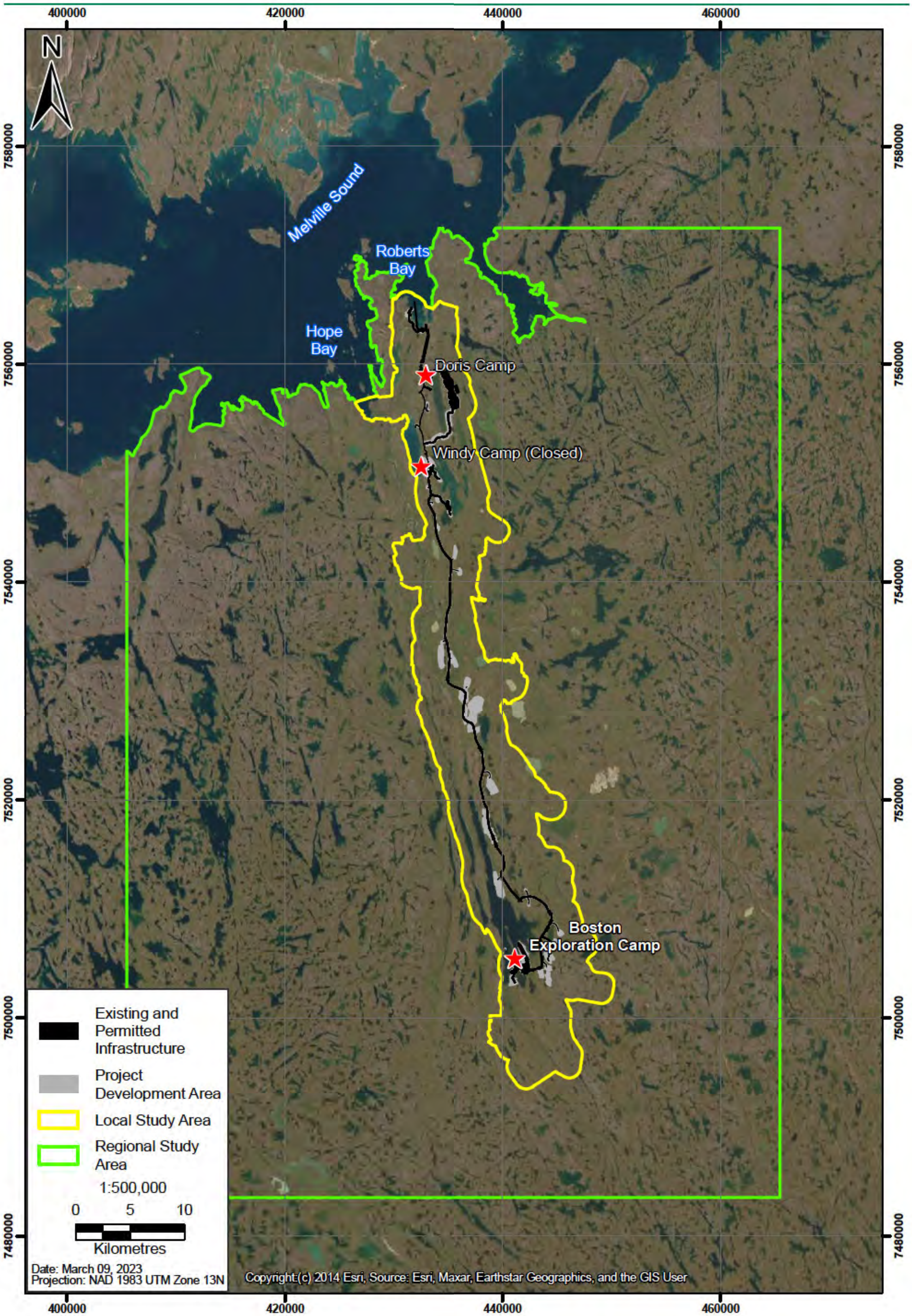


Figure 2.1-1: Wildlife Regional and Local Study Areas for the Phase 2 Project Final Environmental Impact Statement

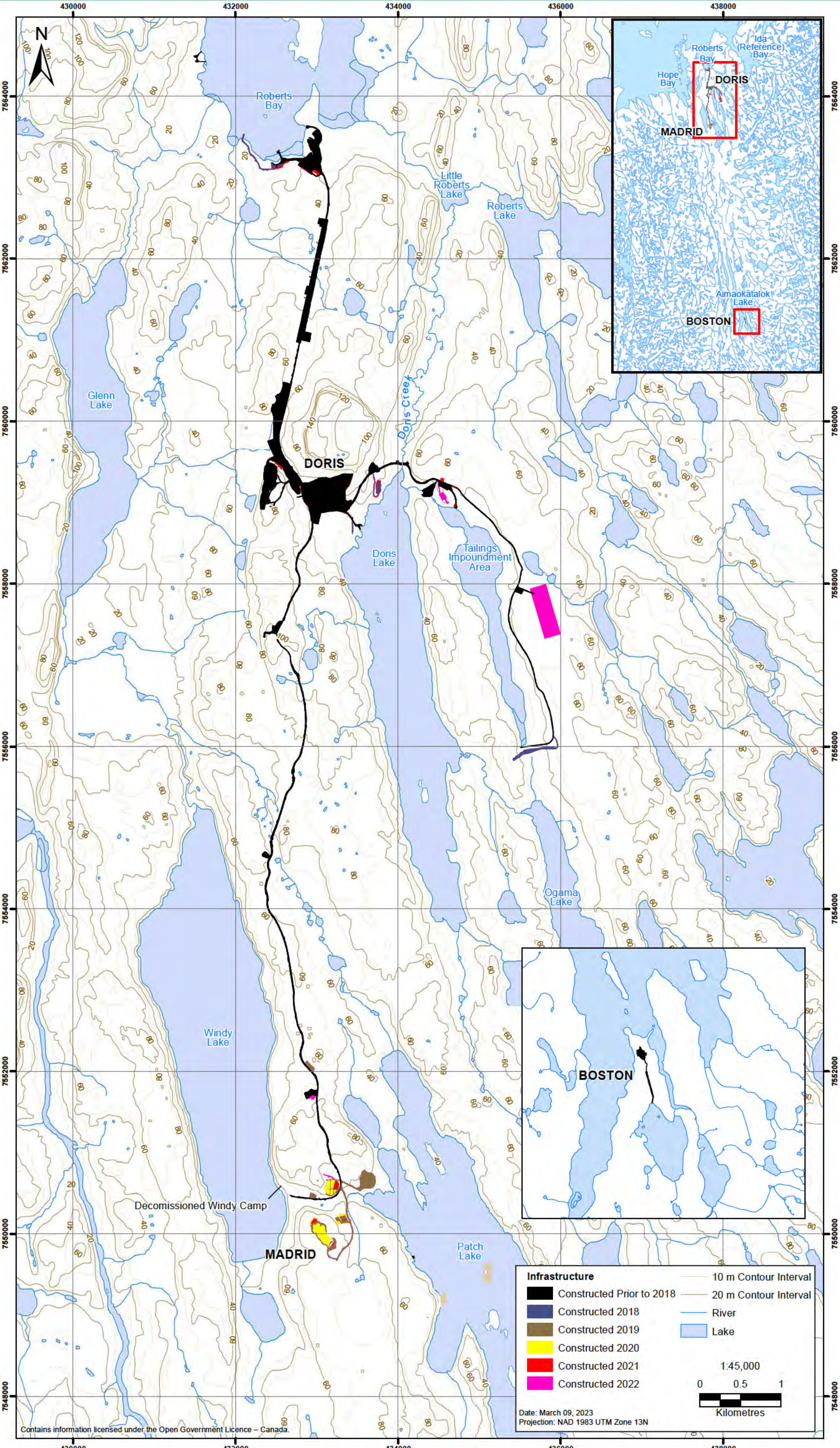


Figure 2.1-2: Infrastructure Development of the Phase 2 Project as of 2022

Table 2.1-1: Habitat Loss by VEC at Hope Bay Project through 2022

VEC	Season	Total Habitat Loss		LSA[1]			RSA[2]		
		Predicted Loss in the PDA (ha)	Actual Loss to 2022 (ha)	Suitable[3] Area (ha)	Predicted Loss (%)	Actual Loss to 2022 (%)	Suitable[3] Area (ha)	Predicted Loss (%)	Actual Loss to 2022 (%)
Caribou	Summer	3,741	136.00	46,835	8	0.29	420,608	0.9	<0.1
	Fall	1,086	17.97	14,332	7.6	0.13	302,692	0.4	<0.1
	Winter	1,875	77.51	19,782	9.5	0.39	227,934	0.8	<0.1
	Total Area	4,706	231.48	56,340	8.4	0.41	491,824	1.0	<0.1
Grizzly Bear	Spring	1,404	52.92	20,287	6.9	0.26	272,214	0.5	<0.1
	Summer	3,198	98.57	37,824	8.5	0.26	221,903	1.4	<0.1
	Fall	3,326	112.06	40,256	8.3	0.28	224,335	1.5	<0.1
	Denning (Winter)	465.6	21.99	9,132.2	5.1	0.24	86,730.7	0.5	<0.1
Muskox	Winter/Spring	2,949	68.48	34,411	8.6	0.2	141,209	2.1	<0.1
	Summer/Fall	3,630	120.97	45,657	8.0	0.26	328,236	1.1	<0.1
Wolverine	Denning	920	144.15	10,667	8.6	1.35	173,360	0.5	<0.1
Short-eared Owl	Spring Nesting	3,486	116.37	40,279	8.7	0.29	198,843	1.8	<0.1
	Summer Brooding	3,608	135.15	42,411	8.5	0.32	200,975	1.8	<0.1
Waterbirds	Waterbodies	105	0.26	9,757	1.0	0	99,612	0.1	<0.1
	Wetlands	620	27.76	10,907	5.7	0.25	58,370	1.1	<0.1
	Terrestrial Habitat	1,333	58.78	18,812	7.1	0.31	185,952	0.7	<0.1
	Total	2,058	86.80	39,476	4.9	0.22	343,935	0.6	<0.1
Upland Birds	Dry Upland	1,848	53.54	19,901	9.3	0.27	280,133	0.7	<0.1
	Moist/Wet Lowland	2,329	87.61	26,524	8.8	0.33	183,326	1.3	<0.1
	Total	4,177	141.15	46,425	9.0	0.3	463,459	0.9	<0.1

[1] *Total area of LSA = 56,340 ha.*

[2] *Total area of RSA = 491,823.9 ha.*

[3] *Habitat loss models for Caribou, Grizzly Bear, and Muskox include high + moderate quality habitat assessed in the Madrid-Boston FEIS. All other VECs are modelled directly for suitable vs. unsuitable habitat.*

This area of habitat loss represents 0.03% of the total Madrid-Boston RSA (Table 2.1-1). Among each of the mammalian VECs, for which habitat loss is evaluated relative to the RSA, less than 0.1% of available suitable habitat within the RSA was lost due to the Project. With respect to the proportion of suitable habitat available in the LSA for bird species, habitat loss accounted for 0.22 - 0.33% of suitable upland breeding bird, waterbird, or short-eared owl habitat (Table 2.1-1). No loss of special landscape features designated as potential rare plant habitat occurred.

2.1.4 Discussion

The Madrid-Boston FEIS assessed the impacts of predicted habitat loss on all VEC species or group (TMAC Resources 2017). The realized habitat loss to date is 3.4% of the predicted habitat loss within the PDA.

The magnitude of predicted habitat loss was classified as negligible for caribou, grizzly bear, and wolverine and low for muskox, upland breeding birds, waterbirds, and raptors. The predictions of the Madrid-Boston FEIS on the VECs remain valid with respect to the constructed Project footprint.

Previous studies have suggested a potential decrease in species richness and abundance for birds and mammals at critical threshold levels of 40% to 90% loss of suitable habitat (Andren 1994; Fahrig 1997). Current levels of disturbed suitable habitat for mammalian VECs are < 0.1% of the suitable habitat within the RSA, and for bird VECs, are 0.33% or less of the LSA. These percentages are considered minimal, and well below critical threshold levels.

2.2 Traffic Monitoring

Road traffic is monitored as part of the Madrid-Boston FEIS. Traffic was evaluated in the FEIS for its potential to pose a hazard to wildlife crossing roads or due to noise. Mitigation includes: conservative speed limits, road signage, and employee training for wildlife avoidance. The WMMP also includes a Road Management Plan, which describes road safety, design, and monitoring practices (Agnico Eagle Mines Ltd. 2021).

2.2.1 FEIS Predictions

Peak vehicle traffic between Project areas (Roberts Bay, Doris, Madrid, Windy Lake, and Boston in future years) was predicted in the FEIS and is summarized in Table 2.2-1. Estimates of Peak Years were based on planned Project development starting in 2019. However, Madrid and Boston development has been paused, delaying the date estimates presented in the FEIS. This means traffic is currently at a rate lower than what was predicted in the FEIS for the first 5 years of development.

Traffic levels are reported in accordance with Project Certificate No. 009 commitment 20 and Final Hearing Commitment 52 (NIRB 2018).

Table 2.2-1: Predicted Maximum Project Vehicle Traffic in Years 1 to 5

Transport Areas[1]	Peak Years[2]	No. of Daily Return Trips	Transport Categories	Vehicle Type
Roberts Bay to Doris/Madrid North	Year 1 to Year 13 (2019 to 2030)	10	Fuel, supplies, service vehicles	60 m^3 tanker, Flatbed trucks, Misc. vehicles
Doris to Madrid North	Year 1 to Year 13 (2019 to 2030)	51	Supplies, explosives, employees, service vehicles	Flatbed trucks, 40 person bus, Misc. vehicles
Windy Lake to Doris	Year 1 to Year 13 (2019 to 2030)	8	Transport of water	20 m^3 tanker

Transport Areas[1]	Peak Years[2]	No. of Daily Return Trips	Transport Categories	Vehicle Type
Roberts Bay to Boston[3]	Year 4 to Year 12 (2022 to 2023)	2	Fuel, supplies	60 m^3 tanker, Flatbed trucks
Boston to Doris[3]	Year 4 to Year 13 (2022 to 2024)	33	Hauling, fuel, supplies, service vehicles	55 t. haul truck, 60 m^3 tanker, Flatbed trucks, Misc. vehicles

[1] Traffic volume estimates relevant to Year 1 through 5 provided. Multiply return trips by 2 for number of transits. Volume taken from the Madrid-Boston FEIS (Vol. 3, Section 4.5, Table 4.5-1; TMAC Resources 2017).

[2] Peak Years and Dates are from the Madrid-Boston FEIS and do not represent current Project progress.

[3] Indicates portions of road which have not been constructed as of the current reporting year.

2.2.2 Methods

Traffic logs are recorded by on-site personnel for each vehicle hauling ore, waste rock, supplies and other mine supplies and equipment. The traffic logs from 2022 were summarized for the maximum, minimum, and average monthly traffic levels between each transport area: Roberts Bay to Doris/Madrid North, Doris to Madrid North, and Doris to Windy Lake. Records of water truck transits between Doris and Windy Lake were also summarized by monthly transits.

Additionally, data from two wildlife cameras stationed along transit routes were summarized for daily average traffic volumes. For each month, one week of motion-triggered photos were summarized by total daily traffic volume at camera 18 (route from Roberts Bay to Doris) and 35 (Doris to Madrid North; see Section 3.2 for camera placement information and methods). Data are not available after September due to the timing of camera checks. Water truck transits were not included in traffic summaries from camera data, because these are already accounted for in separate records.

2.2.3 Results

The overall average monthly traffic was lower than predicted in the FEIS; average transits were at 22% of the peak predicted levels between Doris and Windy Lake (Table 2.2-2). Transits between Roberts Bay and Doris moved supplies from the sealift to the mine site. The portion of the proposed AWR from Madrid North to Boston has not yet been constructed, and therefore there is no traffic to assess between these areas.

Hauling records were assessed for vehicles in the Madrid North area from June through November 2022 (Table 2.2-2). Hauling activity included water tankers dewatering the Nartok Crown Pillar Recovery (CPR) trench, and hauling of debris from the demolition of Windy Camp which occurred in July and August 2022. The maximum number of haul trips occurred in November, with 716 transits, which is 25% of the peak monthly predicted transits from the FEIS (Table 2.2-2).

Transits of water trucks between Windy Lake and Doris occurred in all months, with a maximum of 225 transits per month (in March), which is 53% below the maximum predicted monthly transits (Table 2.2-2).

Based on vehicle traffic captured on wildlife cameras 18 (between Roberts Bay and Doris) and 35 (between Doris and Madrid North), overall traffic levels were well below predictions from the FEIS (Table 2.2-3). Traffic between Roberts Bay and Doris averaged 5.5 daily transits, compared to a predicted 20 transits (Table 2.2-3). Traffic levels were highest in September at an average of 11 transits per day. Camera data were not available along the Roberts Bay to Doris/Madrid North route (camera 18) in January 2022 due to snow occlusion.

Table 2.2-2: Monthly Hauling Vehicle Traffic in 2022: Roberts Bay, Doris, Madrid, and Windy Lake

Transport Areas	Peak Monthly Predicted Transits[1]	Max Monthly Transits	Min Monthly Transits	Avg Monthly Transits
Roberts Bay to Doris/Madrid North	600	NA	NA	NA
Doris to Madrid North	3,060	716	0	250
Doris to Windy Lake	480	225	68	103
Roberts Bay to Boston[2]	2	NA	NA	NA
Boston to Doris[2]	1,980	NA	NA	NA

[1] Maximum predicted monthly transits were calculated from 2 x maximum daily return trips x 30 days per month

[2] Indicates portions of road which have not been constructed as of the current reporting year.

Traffic between Doris and Madrid North was well below the predicted levels, with the overall average at 17.5 daily transits, compared to a predicted 102 transits (Table 2.2-3). The highest monthly averages were in July and August with 30 and 31 transits per day respectively (Table 2.2-3). Camera data were not available along the Doris to Madrid route (camera 35) from January through April 2022 due to a camera card malfunction.

Table 2.2-3: Daily Vehicle Traffic from Wildlife Cameras in 2022

Transport Areas	Peak Daily Predicted Transits[1]	2022 Daily Avg	Daily Avg Jan-Mar 2022	Daily Avg Apr-Jun 2022	Daily Avg Jul-Sep 2022
Roberts Bay to Doris/Madrid North	20	5.5	3.6*	4.2	8.14
Doris to Madrid North	102	17.5	No Data	8.1**	23.8

[1] Maximum predicted daily transits were calculated from 2 x maximum daily return trips.

** Vehicle traffic data unavailable for January 2022.*

*** Vehicle traffic data unavailable for April 2022.*

2.2.4 Discussion

Traffic levels were monitored through water truck transits between Doris and Windy Lake, hauling logs for Madrid North, and by vehicles recorded on wildlife cameras 18 between Roberts Bay and Doris and 35 between Doris and Madrid North. The portion of the proposed AWR from Madrid North to Boston have not yet been constructed, and therefore there is no traffic to Boston.

Monthly transit of water trucks between Doris and Windy Lake averaged 22% of the peak predicted levels in the Madrid-Boston FEIS (see Section 2.2.1). Hauling records between Doris and Madrid included dewatering vehicles and hauling of debris from the Windy Camp demolition from June through November 2022. The maximum monthly hauling records in November 2022 were at 25% of the peak monthly predicted transits from the FEIS.

Transits between Roberts Bay and Doris moved supplies from the sealift to the mine site. Traffic recorded on wildlife camera 18 indicated average activity between Roberts Bay and Doris was well below predicated levels throughout the year and averaged 28% of predicted levels. Traffic between Doris and Madrid North included daily non-haul vehicle traffic recorded on wildlife camera 35. Daily vehicle traffic between Doris and Madrid in 2022 was overall 17% of predicted levels.

Final Hearing Commitment 52 establishes the need to compare current traffic levels to predictions in the FEIS; *"if the annual or season traffic rates estimated from Project monitoring exceed the established thresholds by greater than 25% in two (2) consecutive monitoring periods, the Proponent shall conduct a revised assessment of the potential impacts of this excess traffic on wildlife".* Term and Condition 20 indicates that wildlife protection measures will be enhanced if traffic levels exceed the FEIS predictions. Traffic levels have been consistently lower than predicted since reporting began.

The Road Management Plan was followed throughout 2022. One assumed mortality occurred in February of 2022 when a ptarmigan flew into the windshield of a Kubota driving on the TIA road at night (see Section 3.9.3.2). Wildlife incidents along the road are very rare, and current mitigations have overall been successful at preventing wildlife incidents on roadways. There is no current need for additional measures, given that traffic levels are below predictions.

2.3 Helicopter and Fixed-wing Aircraft Monitoring

Helicopters and fixed-wing aircraft currently operate from Doris and Boston areas. Helicopters make trips between Doris and Boston areas as well as taking supplies (e.g., drilling gear) and crews to other areas. Fixed-wing aircraft service crew and supplies movement in and out of the regional area. Aircraft noise can pose a disturbance risk to wildlife (Manci et al. 1988), but the level of disturbance depends on both the frequency and altitude of aircraft (e.g., more noise during take-off and landing).

2.3.1 FEIS Predictions

Helicopter flight traffic levels were modelled in the Madrid-Boston FEIS according to predicted frequency of routes, noise levels based on altitude, and flight duration (TMAC Resources 2017). Helicopter traffic is monitored and reported annually in accordance with Project Certificate No. 009 condition 40 (NIRB 2018). Helicopter flight frequencies were predicted and modelled by area; travel between Doris and Boston helipads were predicted at eight daily one-way trips (four round-trips), as well as eight daily trips of general activity in the area of each Doris and Boston helipad (four round trips each), and two one-way trips (one round-trip) daily for drilling equipment taken to drilling sites from each helipad. An additional scenario beyond this basic scenario predicted up to five additional round-trips daily to service drilling sites from either Doris, Boston, or Windy helipads (TMAC Resources Inc. 2017).

The wildlife chapter of the FEIS (Volume 4, Chapter 9, Section 9.8.3.2) evaluated the potential effects of noise from fixed wing aircraft using a standard noise model estimating if a 737-200 and a Dash 8 took off and landed at both Doris and Boston airstrips in both directions for a total of four take-offs and four landings per day at each airstrip. The modeling concluded that noise levels due to aircraft would reach a level of annoyance and disruption of sleep for humans at 300-600 m from the runways (Health Canada 2016). The predicted Zone of Influence (ZOI) for other Project effects on caribou was 4 km, which is much wider than the estimated effects of aircraft noise.

2.3.2 Methods

Helicopter flight logs were summarized by the origin and destination from Doris and Boston helipads. No helipad is currently in use at Windy Camp. All trips were summarized by the total flight distance and duration while the engine was running. Trips starting and ending in the same location are considered one round trip (two one-way trips) for activity in the area. Trips between a helipad and other destination are considered a one-way trip for activity in the area.

Trip distances and duration were summarized monthly during months when helicopters were active on site, then averaged to daily values for the period.

Fixed-wing aircraft flights were summarized by the number of take-offs and landings each day. Values were summarized for 2022 and compared to the predicted levels in the Madrid-Boston FEIS.

2.3.3 Results

2.3.3.1 Helicopter Flights

In 2022, data from 3,055 one-way helicopter trips were logged around the Hope Bay Project. Activity was logged on three helicopters from May through October 2022. Helicopter trips between Boston and Doris and around Boston occurred at an average of 24% - 27% of the daily predicted maximum frequency (Table 2.3-1). Trips around Doris occurred at a higher level than predicted in the FEIS (19.2 trips per day, compared to predicted 10 trips per day; Table 2.3-1). The longest trips were between Boston and Doris, averaging 63 km and 35 min per trip. Trips around Doris were the most frequent but averaged a little over half the distance (Table 2.3-1).

Table 2.3-1: Daily Helicopter Traffic in 2022

Transport Areas	Max Predicted One-way trips[1]	Average Daily Trips	Average Distance per Trip (km)	Average Duration per Trip (HH:MM)
Between Doris and Boston	8	2.7	63.12	00:35
Around Boston[2]	10	2.4	36.24	00:30
Around Doris[2]	10	19.2	39.63	00:39

[1] Maximum predicted daily transits based on the Madrid-Boston FEIS, see Section 2.3.1.

[2] The base scenario predicted 8 one-way trips each in the vicinity of Doris and Boston, plus two trips for drilling equipment deliveries and services.

2.3.3.2 Fixed-wing Aircraft Flights

Fixed-wing aircraft flights were active throughout 2022, with an overall frequency of 0.67 one-way flights (i.e., take-off or landing) per day. Daily flights were overall around 17% of predicted levels in the FEIS (Table 2.3-2); highest flight frequency occurred in July through September, with 0.79 one-way flights per day (20% of the predicted levels; Table 2.3-2). Lowest activity levels were in April through June, with 0.57 one-way flights per day.

Table 2.3-2: Daily Fixed-wing Aircraft Traffic in 2022

Airstrip	Predicted One-way Trips[1]	Average Daily Trips	Average Daily Trips Jan-Mar	Average Daily Trips Apr-Jun	Average Daily Trips Jul-Sept	Average Daily Trips Oct-Dec
Doris	4	0.67	0.69	0.57	0.79	0.61
Boston	4	0	0	0	0	0

Note:

[1]Maximum predicted daily take-offs and landings, based on the Madrid-Boston FEIS. See Section 2.3.1.

2.3.4 Discussion

Helicopter and fixed-wing aircraft traffic levels were monitored in 2022 to confirm that flight activity around the Project were within predicted levels. Fixed-wing flights occurred year-round into the Doris airstrip, while helicopter activity occurred only in May through October in both the Doris and Boston areas. Aircraft activity levels were lower in 2022 than predicted in the Madrid-Boston FEIS, except for helicopter trips around Doris (TMAC Resources 2017). Although helicopter activity between Doris and Boston and around the Boston area occurred at 24% - 27% of predicted maximum levels, helicopter trips around the Doris area were 190% of the predicted maximum. The increased helicopter traffic in the Doris area is due to a drilling program which was not part of regular operations. The Madrid area has increased exploration activities to ensure development plans are optimized. Fixed-wing aircraft flights occurred throughout the year, but daily activity was on average 0% - 18% of the level predicted in the FEIS.

Under all circumstances, helicopters avoid caribou by 300 m vertically and 600 m horizontally, following the WMMP Plan (Agnico Eagle 2021). Should caribou not be present, helicopters are allowed to fly lower than 300 m above ground. Fixed-wing aircraft have standard flight altitudes and are only expected to pose a potential noise disturbance during take-off and landing. Therefore, this report does not examine average or daily flight elevations above ground.

2.4 Snowbank Monitoring

Road maintenance includes plowing and then blading the snowbank down to reduce snow drifting across the road. This procedure minimizes snowbank height along the roadway and allows accessible crossing for caribou and other wildlife along the entire length of the roadway.

2.4.1 FEIS Predictions

Monitoring snowbank heights along Project roads is conducted to fulfill commitment #GN-19 in Project Certificate No. 009. The FEIS described plowing procedures which are designed to prevent snowbank accumulation which may pose a barrier to wildlife crossing the road.

2.4.2 Methods

Snowbank depth was monitored monthly from January through early May and October through December 2022. Monitoring locations were consistent with those from previous years; locations were selected to produce a representative sample of snowbank conditions and took into account ease of access and crew safety (Figure 2.4-1).

All monitoring locations were surveyed within a single day. Crews drove to the site locations by road. Data collection included temperature and weather conditions, number of days since last snow, photo numbers, comments, and measurement data (Appendix 2.4-1). At each site, crews measured the snowbanks in five places, spread 5 m apart, and on both sides of the road. Measurements were taken across a 20 m tag line laid parallel to the snowbank with one end at the monitoring station location. Crews measures the snowbank in 5 m intervals along the tag line, using a measuring stick or tape. Snowbank height was measured from the road surface to the top of the snowbank. Measurements were recorded as “0 cm” in locations with no snowbank. The same process was repeated on the opposite side of the road.

Therefore, each monitoring site had 10 measurements (five on each side of the road) for a given survey. The multiple measurements were averaged into a single measurement for data summary, and all measurements were plotted as boxplots for each month to show the variability of measurements.

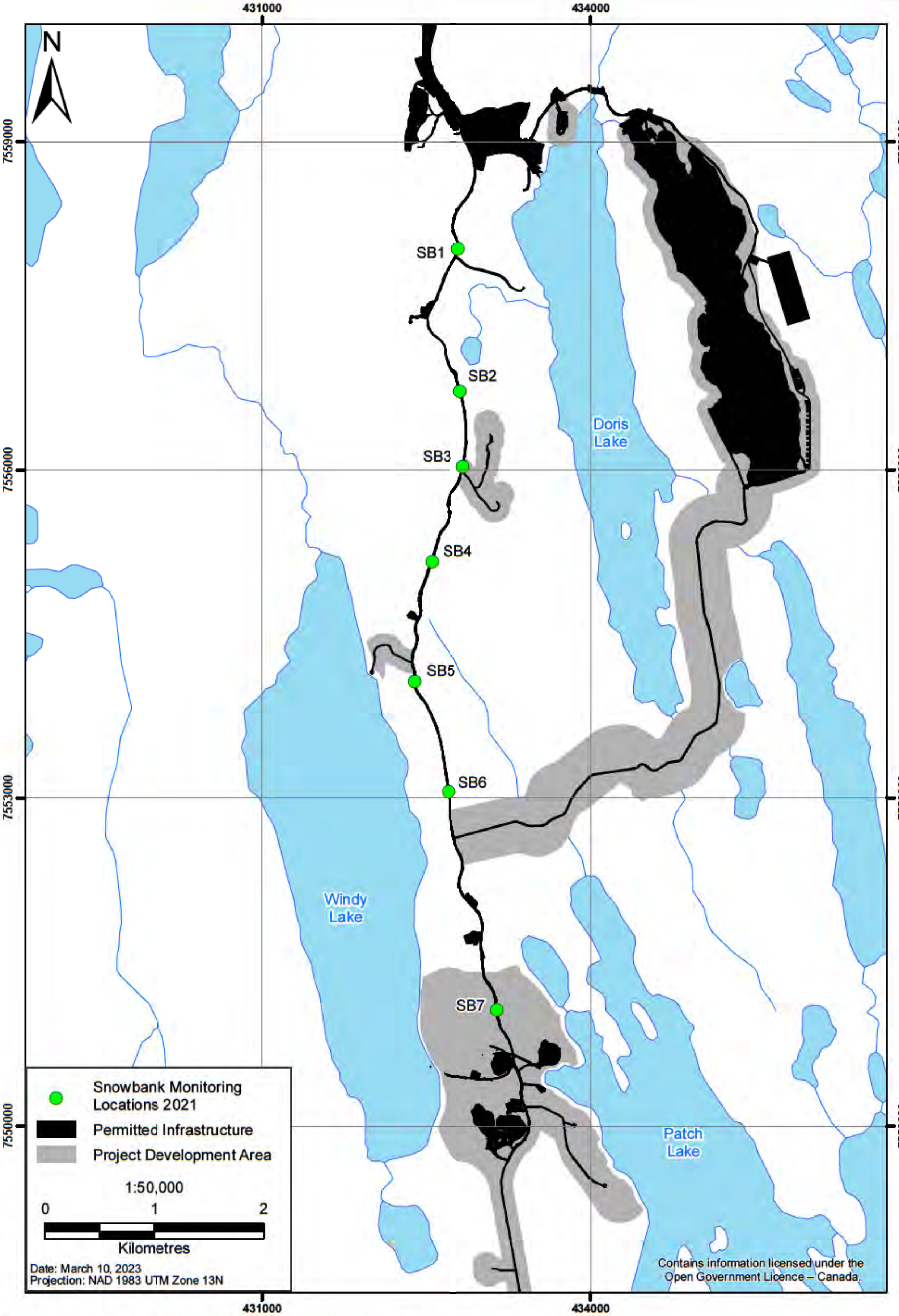


Figure 2.4-1: Snowbank Monitoring Locations

2.4.3 Results

Measured snowbank height averaged 12.35 cm across the survey period, (Table 2.4-1; Figure 2.4-2; Photo 2.4-1). The highest average snowbank height was 43.3 cm on December 23rd at station SB4. The variability in snowbank heights are indicated in Figure 2.4-2 by boxplots; the longer boxplots in November and in particular December indicate more variability among the measurements, with the bold horizontal line in the middle of each box indicating the median measurement for that month, and the outlier measurements from the distributions plotted as dots. Although two measurements in December were recorded above 75 cm (Figure 2.4-2), photos indicate that banks were bladed back from the roadway, and banks were at low inclines rather than steep banks (site SB3; Photo 2.4-1). Additionally, areas with higher snowbanks were isolated to small portions of the road, i.e., across a few meters (Photo 2.4-1).

Table 2.4-1: 2022 Snowbank Summary Table

Location	Date								Total	
	Jan 25th	Feb 14th	Mar 21st	Apr 21st	Oct 28th	Nov 23rd	Dec 9th	Dec 23rd	Mean	St. Dev.
SB1	10.5	4	14.6	13.8	4.7	8	2.8	11.3	8.71	8.02
SB2	10.5	4	14.6	19.8	4.7	8	2.8	11.3	9.11	11.28
SB3	14	8.5	20.4	20.7	0	7.5	1.2	1.5	26.95	26.10
SB4	31	13	22.6	14.4	20.4	22.9	41.7	43.3	13.54	8.97
SB5	29.5	11	15.8	2.6	5.3	15.8	6.7	9.8	3.11	5.13
SB6	0.5	0	4.9	18	0	8	6.7	2.2	12.53	6.56
SB7	20	10	16	19.9	7.3	12.4	7.2	9.3	12.53	6.85
Mean	*17.43*	*7.90*	*15.33*	*15.60*	*6.11*	*12.64*	*10.90*	*12.91*		
St. Dev.	*13.53*	*5.17*	*7.19*	*9.99*	*10.26*	*12.02*	*21.05*	*21.53*		

Notes:
All values are in cm. Values are averaged from multiple snowbank measurements on both sides of the road.

Photo 2.4-1: Highest snowbanks measurements at Site SB3 indicating gentle slopes, December 9, 2022.

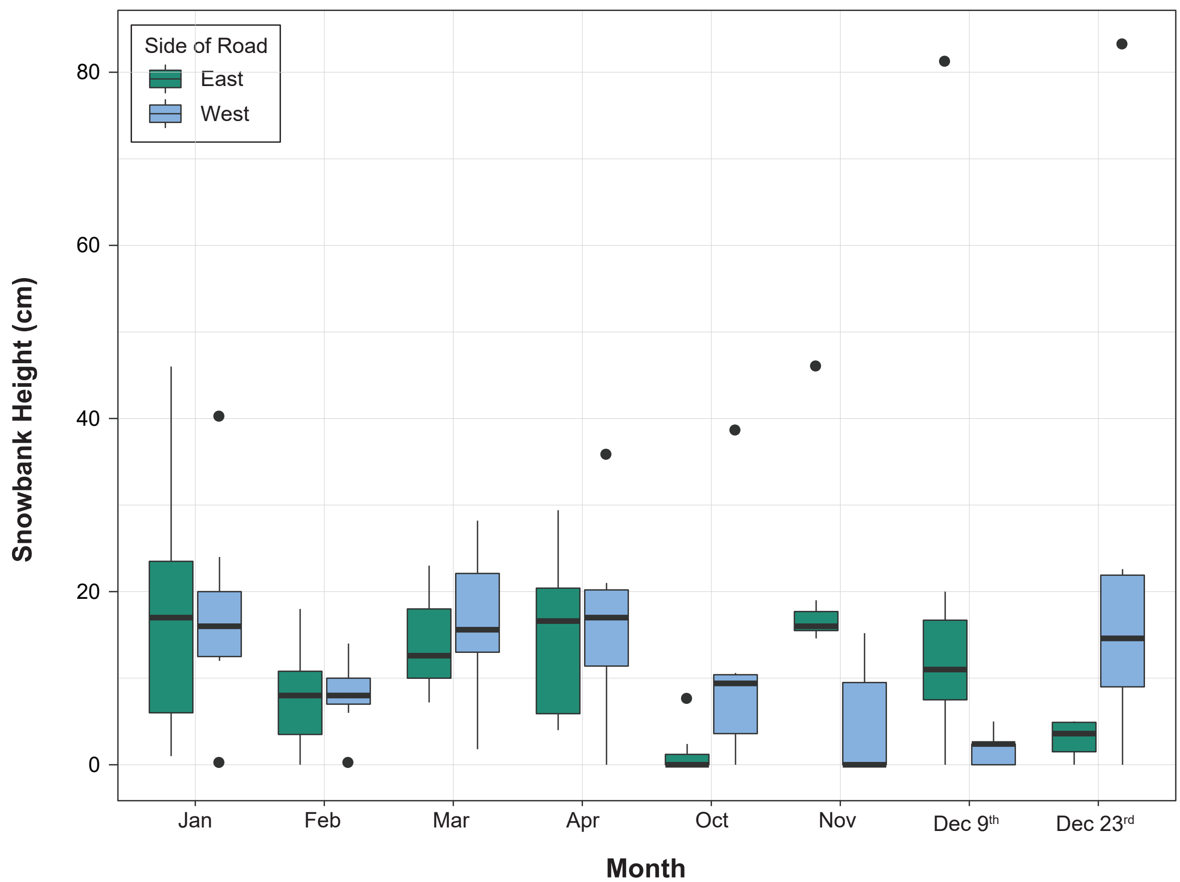


Figure 2.4-2: Snowbank Heights in 2022

2.4.4 Discussion

Snowbank heights along the All Weather Road (AWR) were monitored monthly during winter months (January to April and October to December 2022). Monitoring locations were consistent with sites permanently establish in 2021.

Overall, snowbanks along the AWR were measured at an average of 12.35 cm height. Although some snowbank measurements were higher than 2021 (i.e., > 50 cm), photos indicate that banks were bladed back from the roadway and were at low inclines rather than steep banks (Photo 2.4-1). Additionally, areas with higher snowbanks were isolated to small portions of the road, i.e., across a few meters (Photo 2.4-1). These areas would therefore not pose a crossing barrier to caribou or other wildlife at the roadway.

The FEIS did not predict or establish measurement numbers for snowbank height. However, a caribou workshop for Elders and land users held as part of the FEIS assessment included road clearing and snowbank observations, after which the group concluded that snowbanks of “several cm” would not pose a barrier to caribou crossing roads (FEIS Vol. 4, Section 9.8.3.3; TMAC Resources 2017).

2.5 Noise Monitoring

Noise monitoring during blasting may be conducted to refine the setback distances required for caribou presence near a blast, which was set at 2.8 km based on noise modelling conducted in the FEIS (NIRB 2018). The 2.8 km was deemed as an extremely conservative as an estimate of the distance where a blast may produce 96 dB Lpeak noise with potential to produce a freeze or startle response in caribou. However, testing for the actual distance at which 96 dB Lpeak noise is produced will provide a more precise estimate of a setback distance from caribou during blasts. However, this monitoring is not required as a compliance activity.

A standard operating procedure (SOP) for noise measurement during quarry blasts has been in development and testing since 2018. The current draft of this SOP is provided in Appendix 2.5-1. Noise monitoring testing was conducted on three occurrences in August 2022. Tests were conducted using a SoundAdvisor™ Model 831C, which is different than the measurement equipment indicated in the SOP. Testing indicated that equipment was functional but additional work is required to update the SOP and obtain results sufficient for testing the sound level at varied distances from blasts.

3. VEC AND OTHER SPECIES MONITORING AND MITIGATION

3.1 Objectives

The objective of this section is to test the FEIS predictions of Project effects on VECs (TMAC Resources 2017). The wildlife VECs identified in the FEIS included caribou, muskox, grizzly bear, wolverine, upland breeding birds, waterbirds, and raptors. Nest predators are not considered a VEC but are monitored in the Project area during the bird breeding season (May 15 – August 15) to detect possible attraction to the Project and indirect impact on upland breeding birds. Marine mammals and plants are also included in this section for conformity with Project Certificate No. 009 (NIRB 2018) commitments.

3.2 Methods Common to Multiple VECs

3.2.1 Wildlife Camera Monitoring

A total of 59 Reconyx PC800 HyperFire Professional wildlife cameras are being used to monitor caribou, muskox, grizzly bear, wolverine, nest predators, and other wildlife in the Doris and Madrid areas. Cameras are currently placed in three primary zones, including a Treatment zone within 2 km of the Project, a ZOI zone from 2 to 10 km from the Project, and a Control zone beyond 10 km from the Project (Figure 3.2-1). There is also the Ladder area which is part of the ZOI zone and will be included in the Treatment zone once Madrid is developed. Some cameras also have site specific monitoring objectives and monitor specific Project facilities.

Camera monitoring has been conducted at the Project for over nine years, with cameras first installed in September 2012. The camera program study design was revised in June 2016 in collaboration with representatives of the KIA and the GN at a workshop held in Vancouver, BC, following comments from these parties on the initial 2012 study design. The study design was updated to have three experimental areas; Treatment, ZOI, and Control zones. The camera study design was evaluated in 2016 for balance in terms of distances to water features for cameras in all zones (Treatment, ZOI, and Control) as well as spatial distance among cameras (ERM 2017b Appendix 2). Two additional wildlife cameras were deployed near a culvert on Windy Road to investigate potential caribou use (as an alternative road crossing) in August 2022.

Wildlife events (and the number of individuals recorded on events) were corrected for a monthly darkness factor supplied by the KIA (Table A-5; KIA 2017). This correction is used to make events and individuals recorded during the months with shorter day length more comparable to events recorded in the summer with long day length, as the reported detection radius of the Reconyx™ PC800 HyperFire camera is smaller in the dark relative to the daylight. This correction factor was used when qualitatively comparing between events and individuals recorded between cameras in the three monitoring zones.

Further details on methodology for this monitoring program, details on study design (including descriptions of cameras with site specific monitoring objectives) and data analyses, can be found in Appendix 2.1-1. Further details on camera locations and effort, as well as detection event data, can be found in Appendices 3.2-1 to 3.2-3.

Twenty-six wildlife cameras were deployed in the Boston camera study area in September 2017. An additional three cameras were deployed in June of 2018. Five cameras were deployed in the Treatment zone, five in the ZOI, five in the Control zone, and 14 along the proposed AWR route (Figure 3.2-2). The data from these cameras are currently considered baseline data.

Habitat differences between the coastal areas surrounding the Doris Project and inland areas surrounding Boston lead to fundamentally different densities of wildlife between these areas, with more grizzly bears near the coast, and more caribou inland – closer to their core range. Therefore, data from these two regions are addressed separately to avoid biasing the results. Summaries of the current Boston baseline data from September 2021 to September 2022 are provided in Section 3.3 below.

3.2.2 Wildlife Interactions, Incidents, and Mortalities

Wildlife interactions, incidents, and mortalities are recorded as part of the Wildlife Sightings/Reporting program by Agnico Eagle and are reported to the NIRB.

An **interaction** occurs when wildlife interacts with people or Project infrastructure (e.g., a bear being observed from a road); deterrents may be used, but direct harm, injury, damage, or wildlife mortality does not take place.

An **incident** is an interaction where there is active deterrent and direct harm, injury, damage, or wildlife mortality occurs.

Various processes are in place and are undertaken by Agnico Eagle to mitigate for interactions, incidents, and mortalities. Information about interactions, incidents, and mortalities recorded in the 2022 calendar year are included with the relevant section for each VEC (Sections 3.4 to 3.11); data are summarized in Appendix 3.2-4. Further details on methodology for this monitoring program, including lists of on-site mitigation and monitoring undertaken by Agnico Eagle, can be found in Appendix 2.1-1.

3.2.3 Incidental Wildlife Observations

Incidental observations of wildlife are collected through various sources, which include the Agnico Eagle wildlife sightings log (as part of the Wildlife Sightings/Reporting process), and by environment personnel including wildlife biologists (Appendices 3.2-5 and 3.2-6). Incidental observations collected by wildlife biologists have been collected since 1996 and the wildlife sightings log has been maintained since 2009 (Appendix 3.2-7). Incidental observations recorded in the 2022 calendar year are summarized in the relevant VEC section.

Incidental wildlife observations are summarized and qualitative temporal trends are investigated. Agnico Eagle wildlife sightings log data are corrected for the average number of employees and contractors on site as a measure of standardization (Appendix 3.2-8). However, incidental wildlife data cannot be used more quantitatively, e.g., to estimate population sizes or density. Further details on methodology for this monitoring program, including a full list of limitations on incidental data, can be found in Appendix 2.1-1.

3.2.4 Species of Conservation Concern

Occurrences of species of conservation concern, those either listed federally or territorially in Nunavut, are summarized in the relevant section of each VEC. In 2022 these data were summarized from wildlife camera data, incidental wildlife sightings log, and the interactions, incidents, and mortalities program as described in Sections 3.2.1 to 3.2.3. Species listings and records of occurrence around the Project are also summarized in Appendix 3.2-7.

Figure 3.2-1: Wildlife Camera Locations, Doris and Madrid Areas, June 2016 to September 2022

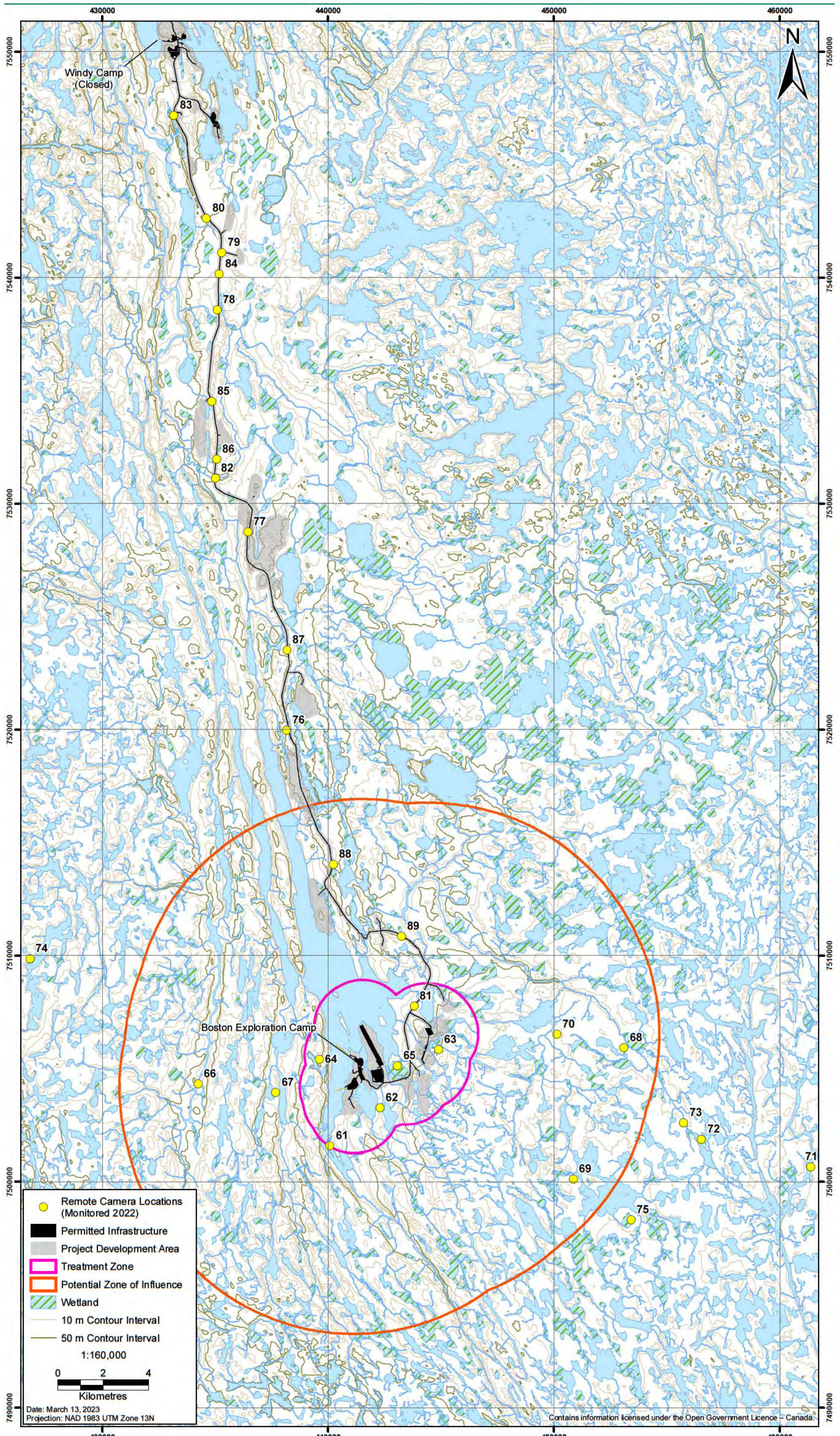


Figure 3.2-2: Wildlife Camera Locations, Boston Area, September 2018 to September 2022

3.3 Results Common to Multiple VECs

3.3.1 Camera Effort

Camera effort is determined to correct for periods when cameras are knocked down or obscured by snow/fog. Effort is summarized by the number of functional days for each camera in each month from September 2021 to September 2022.

The range and the average number of camera days (± standard deviation) for available cameras are presented in Table 3.3-1. The total number of camera days observed for individual cameras is provided in Appendix 3.2-1, as well as summaries of the average camera days (± standard deviation) by individual camera.

Consistent with previous years of the camera program, effort was low during from December through February from snow occluding the camera lenses, resulting in loss of effort for most days (Table 3.3-1). Effort was generally consistent across the three zones, with slightly higher effort in winter in the Treatment zone. This typically occurs because some Treatment zone cameras are easily accessible from site facilities or roads, so the cameras can be cleared of snow more frequently.

Based on 2019 data, it was noted that an increasing number of cameras were knocked down each period, typically by grizzly bears. This issue was discussed with the IEAC in 2020 and 2021 along with plans to improve the camera tripod infrastructure to reduce the instances of grizzly bear damage. In 2022, camera tripods were repaired and rebuilt as needed (based on visual assessment) during camera checks. Four Doris tripods and one Boston tripod were repaired or rebuilt in 2022 (Table 3.3-2; Photo 3.3-1). Of the 60 Doris cameras, eight were found knocked down during camera checks in September 2022; this is 13%, which is less than half of the rate noted in 2019 (up to 30% knock-down rate).

Photo 3.3-1: Doris camera 3 tripod repair. September 22, 2022.

Table 3.3-1: Summary of Camera Effort Recorded at Treatment, ZOI, and Control Cameras by Month, September 2021 to September 2022

Year	Month	Treatment					ZOI					Control				
		No. Cameras[1]		Camera Days			No. Cameras[1]		Camera Days			No. Cameras[1]		Camera Days		
		Active	Un obscured	Avg.[2]	± SD[2]	Range (Min to Max)	Active	Un obscured	Avg.[2]	± SD[2]	Range (Min to Max)	Active	Un obscured	Avg.[2]	± SD[2]	Range (Min to Max)
2021	Sept	21	20	25.90	9.41	0-30	17	16	17.35	14.09	0-30	19	18	17.47	13.31	0-30
	Oct	21	19	24.57	10.25	0-31	16	16	23.75	10.27	5-31	19	17	18.95	11.17	0-31
	Nov	21	17	13.24	7.77	0-23	16	11	10.44	9.21	0-30	19	9	6.53	8.57	0-30
	Dec	21	6	2.86	4.78	0-14	16	3	1.56	4.77	0-19	19	1	0.58	2.52	0-11
2022	Jan	21	3	1.95	6.82	0-31	16	0	0.00	0.00	-	19	0	0.00	0.00	-
	Feb	21	9	3.62	6.97	0-28	16	4	0.94	2.05	0-6	19	0	0.00	0.00	-
	Mar	21	15	14.10	11.91	0-31	16	7	9.13	13.40	0-31	19	6	4.47	8.64	0-27
	Apr	21	16	21.14	13.27	0-30	16	11	17.44	13.90	0-30	19	11	12.74	13.21	0-30
	May	21	19	23.90	10.77	0-31	16	16	24.00	9.37	9-31	19	18	19.32	11.79	0-31
	Jun	21	18	22.71	12.36	0-30	16	16	28.63	5.50	8-30	19	15	21.32	13.42	0-30
	Jul	21	15	22.14	14.35	0-31	16	15	27.44	9.78	0-31	19	14	21.47	14.45	0-31
	Aug	21	17	23.71	13.36	0-31	16	14	26.94	10.54	0-31	19	14	19.63	13.60	0-31
	Sept	21	17	18.8	9.50	0-25	16	13	17.88	10.08	0-25	19	11	11.74	11.84	0-25

Notes:

[1] Represents the number of cameras within a month that were set out and recorded images (active) and were not knocked over or obscured by snow for the entire month.

[2] Averages and Standard Deviation (SD) are based on the number of cameras that are active in a given month.

Table 3.3-2: Camera Tripod Repairs, September 2022

Camera Number	Repair Notes
CM03	Completely rebuilt
CM11	Partially rebuilt
CM41	Completely rebuilt
CM60	Side panel replaced
CM66	Completely rebuilt

3.3.2 Baseline Results of Boston Camera Program

Boston cameras were checked in September/October 2021 and May 2022. Eighteen cameras were properly functioning after the fall 2021 check, and 26 cameras were functional after the May 2022 check (Table 3.3-3; Appendix 3.3-1). The Boston area has 29 camera locations deployed, but accessibility issues and programming errors reduced the number of functional cameras in 2020 and 2021. Helicopter access was halted in fall 2021, preventing servicing of some cameras overwinter 2021-2022. Boston camera event and effort data are recorded in Appendix 3.3-1.

Consistent with the Doris and Madrid camera program, camera effort was lowest in winter months, particularly from November 2021 through April 2022 (Table 3.3-3). Across all VECs, caribou were recorded the most frequently in the Boston area (Table 3.3-3). Caribou activity was highest in spring and summer, with the most active month being July and August 2022 during which 28 total caribou events were recorded (Table 3.3-3). Grizzly bear were recorded in low numbers in late spring through early fall in both years, with events in September 2021 and May 2022 through August 2022 (Table 3.3-3; Photo 3.3-2). Two new wolverine events were recorded, one each in July 2022 and September 2022. Only two other wolverine events have been recorded since the beginning of the Boston baseline monitoring in 2018. Muskox were recorded for the second time on Boston cameras, with two events recorded, one each in September 2021 and August 2022. (Table 3.3-3).

Baseline data collection will continue through 2023; in-depth analyses of camera detections of each VEC in the Boston area will be conducted once data have been collected during both baseline and construction phases.

3.3.3 Non-VEC Wildlife Sightings Log and Incidental Observations

Moose (*Alces alces*) were sighted in the Hope Bay area for the first time in 2021, with a single moose sighting recorded in 2021. In 2022, six moose were observed over three sightings (Appendix 3.2-5). Sightings occurred south of Patch Lake, near wildlife camera 85, and 20 km south of Doris Camp in March, August, and October. All sightings were within tundra habitat and the moose were either resting, napping by a creek in the snow, or walking.

Table 3.3-3: Summary of Baseline Camera Data at the Boston Project by Month, September 2021 to September 2022

Year	Month	Camera Effort[1]	Caribou			Grizzly Bear			Wolverine			Muskox		
			Cameras with Events[2]	No. Events	No. Images[2]	Cameras with Events[2]	No. Events	No. Images[2]	Cameras with Events[2]	No. Events	No. Images[2]	Cameras with Events[2]	No. Events	No. Images[2]
2021	Sept	522 (18)	4	6	289	2	2	20	-	-	-	1	1	50
	Oct	395 (18)	2	2	20	-	-	-	-	-	-	-	-	-
	Nov	67 (5)	-	-	-	-	-	-	-	-	-	-	-	-
	Dec	0 (0)	-	-	-	-	-	-	-	-	-	-	-	-
2022	Jan	0 (0)	-	-	-	-	-	-	-	-	-	-	-	-
	Feb	6 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	Mar	48 (2)	-	-	-	-	-	-	-	-	-	-	-	-
	Apr	220 (14)	-	-	-	-	-	-	-	-	-	-	-	-
	May	409 (15)	2	6	260	2	2	100	-	-	-	-	-	-
	Jun	530 (25)	4	5	160	1	1	10	-	-	-	-	-	-
	Jul	710 (23)	4	15	120	1	1	20	1	1	30	-	-	-
	Aug	653 (22)	7	13	303	1	3	10	-	-	-	1	1	15
	Sept	531 (21)	4	5	190	-	-	-	1	1	100	-	-	-
	Total[3]	**-**	**27**	**52**	**1342**	**7**	**9**	**160**	**2**	**2**	**130**	**2**	**2**	**65**

Notes:

Events and Photos are compiled across all cameras, not split into study zones (Treatment, ZOI, Control).

[1] Camera effort is presented as the total number of camera days by month; number of cameras with at least one camera day (i.e., unobscured) presented in parenthesis.

[2] Number of images represents the total number of images that are recorded from cameras that are upright and facing the detection area; images recorded when cameras are knocked over are not included.

[3] Total number of cameras with events represents the number of unique cameras with events across the entire monitoring period. Total number of events is the cumulative total across the entire monitoring period.

Photo 3.3-2: Grizzly Bear recorded on Boston camera 79. April 30, 2022.

3.4 Caribou

Two caribou herds use habitat near the Project area. The Project overlaps with the winter range of the Dolphin and Union herd and is near the summer, fall, and winter range of the Beverly/Ahiak herd.

The Dolphin and Union herd winters on the mainland near the coast, both east and west of Bathurst Inlet, and travels on the sea ice in spring to Victoria Island to calve and spend the summer and fall (Poole et al. 2010). They return across the sea ice following freeze-up in November. The Dolphin and Union herd are listed as Special Concern under Schedule 1 of the *Species at Risk Act* (SARA) and as Endangered by the Committee on the Status of Wildlife in Canada (COSEWIC; Government of Canada 2021b). Territorially, caribou are a vulnerable species (S3S4) suggesting they are at moderate risk of extirpation (CESCC 2022).

The Beverly/Ahiak herd calves to the east of the Project area in the Queen Maude Gulf Bird Sanctuary and the herd then spreads south and west from the Queen Maude Gulf for the late summer and fall (Gunn, Fournier, and Nishi 2000; Banci and Spicker 2016). The Beverly/Ahiak herd are barren ground caribou assessed as Threatened by COSEWIC (Government of Canada 2021b) but not yet listed under SARA. Caribou of the Beverly/Ahiak herd winter above the tree-line on the tundra and also below the tree-line in the Northwest Territories and northern Saskatchewan.

Currently there is some disagreement over whether Beverly/Ahiak herd should be referred to separately or together. The Government of Nunavut surveys the two herds separately and refers to them as two subpopulations in their population survey reports rather than a distinct herd or separate herds. This document refers to these caribou either separately (as sub-populations) or together as the Beverly/Ahiak herd where relevant. Calving areas for these two sub-populations are calculated separately, in response to a request from the Government of Nunavut on a previous Report.

At the time of publishing the report, collar data from the Dolphin and Union caribou for 2020-2022 had not yet been delivered by the GN. The winter range analysis for the Dolphin Union caribou will be conducted again in future years, provided that collar data are made available. Traditional Knowledge and land users from the Inuit Environmental Advisory Committee (IEAC) indicate that Dolphin and Union caribou now cross the sea-ice to the west of Cambridge Bay, near Wellington Bay. IEAC members also indicated that Dolphin and Union caribou are no longer wintering on the northern part of the Kent peninsula. Other than these shifts, which began before 2019, the Dolphin and Union caribou have maintained a consistent usage of the area surrounding the Hope Bay Project area for over 20 years, with some animals transiting the area during spring and fall migration and low numbers of caribou in the area during winter.

Agnico Eagle and the GN have signed a new Memorandum of Understanding (MOU) for collaborative monitoring for Dolphin and Union caribou as of March 2023, after the previous MOU with TMAC expired in 2019. Agnico Eagle donated fuel for caribou work in 2020, directly donated to the muskox program in 2022, and provided in-kind support by shipping fuel and lumber to Hope Bay to assist with the GN's 2023 grizzly bear monitoring program.

3.4.1 FEIS Predictions

The Madrid-Boston FEIS predictions included not significant and low magnitude residual effects of disturbance and disruption of movement on caribou at a geographical extent of the RSA (TMAC Resources Inc. 2017).

3.4.2 Methods

Monitoring for caribou is conducted using multiple approaches. The first approach is through analysis of collar data during specific seasonal periods for the two herds that use habitat near the Project. This approach is for the purpose of monitoring for shifts in the calving range for the Beverly/Ahiak herd, which may trigger additional mitigation measures for caribou should the calving grounds shift towards or overlap the Project. For Dolphin and Union caribou, winter range analyses are conducted to examine the amount of overlap between the Project and this seasonal range, following a request from the KIA to do so (KIA 2017). These collar data are analysed using kernel density analyses (ERM 2016b).

The second approach is using wildlife cameras (see general camera Methods in Section 3.2.1). Camera data are statistically analysed to investigate for potential ZOI-type effects on caribou.

Lastly, the Wildlife Sightings/Reporting program documents caribou reported by personnel on site, including environmental technicians and wildlife biologists; these data are summarized and qualitatively assessed for trends (see Methods Sections 3.2.2, 3.2.3).

Height of Land (HOL) surveys are in preparation for implementation as a monitoring method for caribou. These surveys were requested by the IEAC as a traditional Inuit way to identify caribou from a distance; surveyors stand at high points and search for caribou across the landscape. During a site visit in 2022, the IEAC confirmed support for three HOL monitoring sites. A draft Standard Operating Procedure (SOP) was drafted based on methods discussed with the IEAC in August 2022. The SOP will be discussed in detail with the IEAC during an upcoming 2023 consultation meeting. Additionally, onsite training will be provided to community members who will participate in the HOL monitoring.

3.4.2.1 Analysis of Caribou Collar Data

Calving Ground and Winter Locations

An analysis of the calving range of the Beverly and Ahiak sub-populations was performed using caribou collar data supplied by the Government of Northwest Territories (GNWT) Department of Environment and Natural Resources (ENR) for both the current year (2022) as well a compilation of historical years (2001 to 2022).

The kernel density and utilization distribution (UD) methods assess caribou use of space through a bivariate probability function. This analysis generates UD surface for calving ranges for each sub-population. Kernel density estimates were created and the 50% UD, which represents the "core" range, as well as the 95% UD representing the overall range are presented. Further details on the methodology for this monitoring program can be found in Appendix 2.1-1.

3.4.2.2 Analysis of Wildlife Camera Data

An analysis was carried out to investigate differences between caribou occupancy at cameras located in the Treatment zone (< 2 km from existing infrastructure) and in the Control zone (> 10 km from existing infrastructure). Caribou occupancy at a camera was defined as one or more caribou events at a camera in a month. Therefore occupancy was modelled as a binomial distribution between cameras with no observations in a given month and cameras with at least one caribou event at a camera in a given month. A secondary analysis was completed to assess a potential ZOI should a significant difference in the predicted occupancy between Treatment zone and Control zone cameras be detected. The models accounted for spatiotemporal variation in occupancy by including smoothed terms for Northing and Easting as well as Month, and random variables for Camera ID and Year where these terms improved model fit to the data.

Camera data were corrected for daily effort, where the camera was considered to have no effort during periods of more than 24 hours with snow obscuring the camera or if the camera was knocked over. Camera effort in December and January was deemed to be too low across cameras for inclusion in the analysis, so these months were removed from the regression analyses in all years. Additionally, to account for variable effort per camera, data were removed for individual cameras during months with effort less than seven days. A sensitivity analysis conducted in 2017 did not indicate any difference when using lower effort cut points (i.e., effort ≥ 4 days or ≥1 day per month) because few caribou events were recorded on cameras when effort was less than seven days (ERM 2018b).

Further details on methodology for this monitoring program can be found in Appendix 2.1-1 and in Methods Section 3.2. Datasets of 2022 camera effort and detection events are presented in Appendices 3.2-1 to 3.2-3. Compiled datasets of caribou detection events from June 2016 to September 2022 are presented in Appendix 3.4-1.

3.4.3 Results

The collar data for the Dolphin and Union caribou from 2020 and 2021 is currently outstanding from the GN and is not included in the 2021 WMMP Report.

3.4.3.1 Caribou Collar Data

Calving Ground Locations

The results of the range analyses for the 2022 calving season show that the 50% UD of the Ahiak sub-population extends south of the long-term (2001 to 2021) 50% UD for the sub-population, but still has significant overlap (Figure 3.4-1). The core calving range in 2022 occurs further south of the Queen Maud Gulf compared to the long-term range (Figure 3.4-1). The 95% UD for the Ahiak sub-population occurs primarily within the boundaries of the long-term range from 2001 to 2022. The 95% UD has expanded in recent years to overlap the Beverly range; the long-term range also includes a portion north-east of the Queen Maud Gulf (Figure 3.4-2). Neither the core 50% nor the 95% UD overlap the Project Study Area.

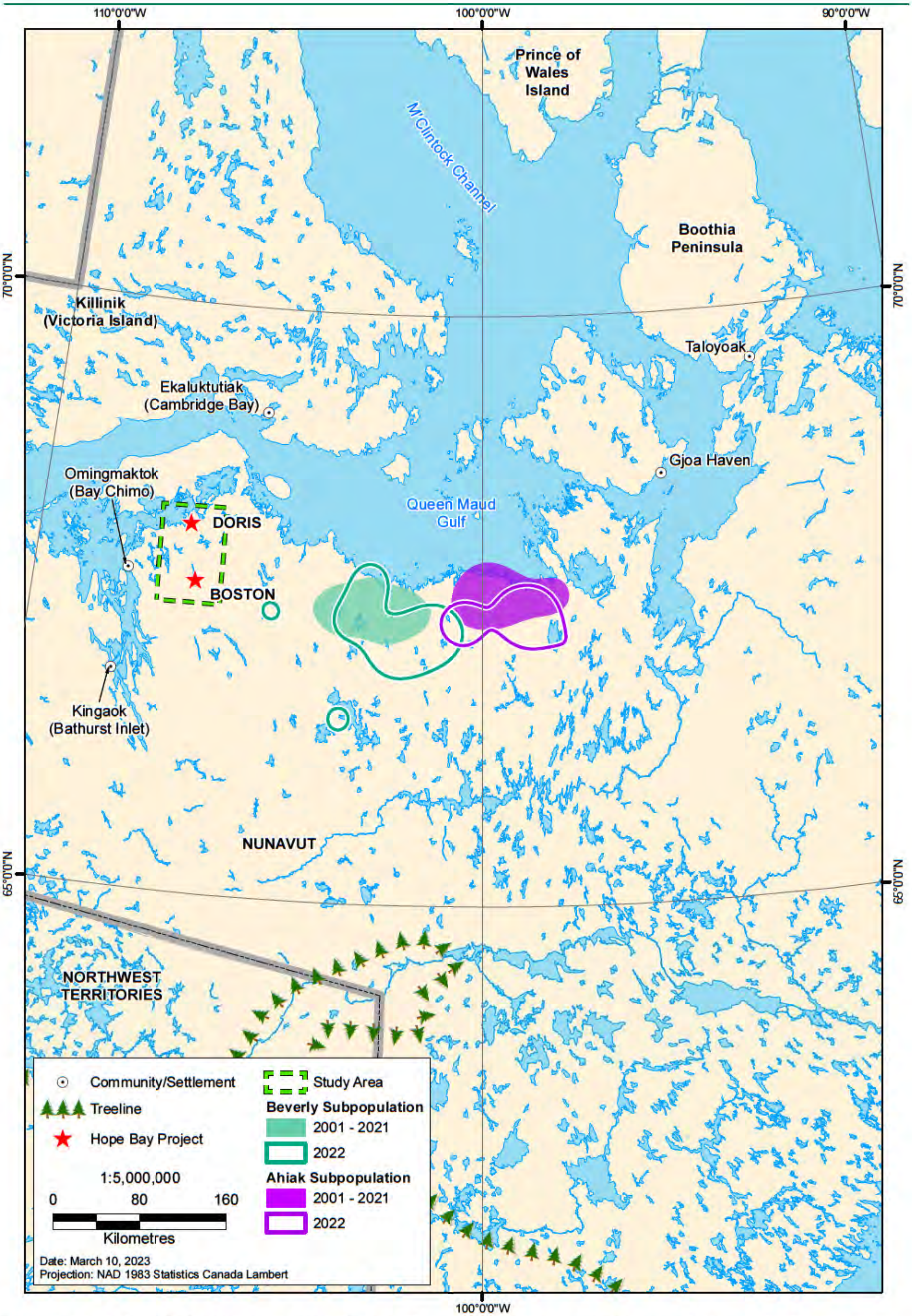


Figure 3.4-1: 50% Kernal Density Estimates of Calving Home Range on Beverly and Ahiak Sub-Populations Collar Data, 2001-2021 and 2022

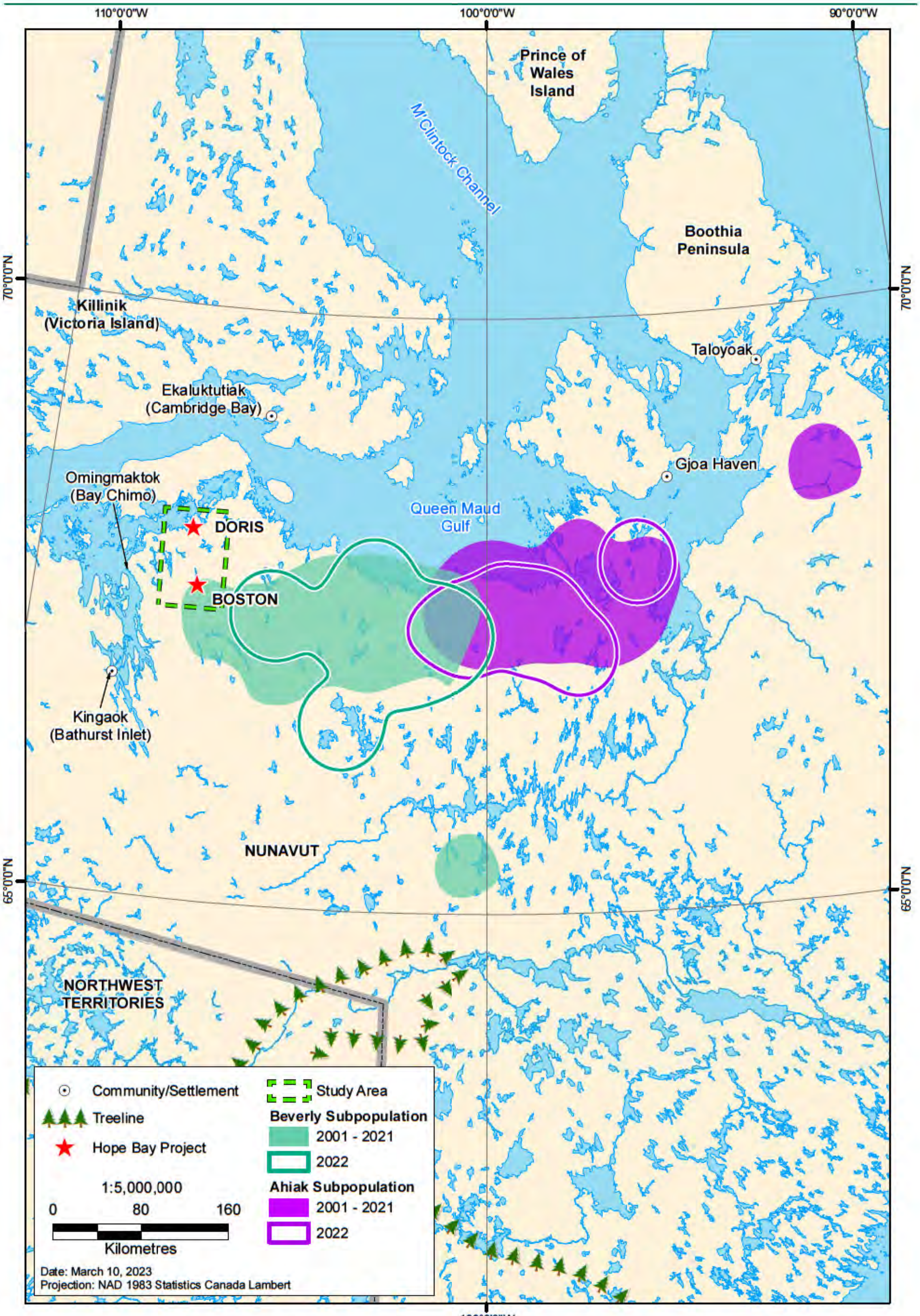


Figure 3.4-2: 95% Kernal Density Estimates of Calving Home Range on Beverly and Ahiak Sub-Populations Collar Data, 2001-2021 and 2022

For the Beverly sub-population, the 2022 calving season 50% UD expands further south-east than the long-term calving range (Figure 3.4-1). There are also two portions of the Beverly sub-population 2022 50% UD that occur south and west of the core range by roughly 80 km (Figure 3.4-1). The southern portion of the 50% UD occurs around MacAlpine Lake and has also been noted in previous years, but was not substantial enough to be included in the long-term distribution. The 2022 95% UD shows a broader southern expansion outside of the long-term range (Figure 3.4-2). Additionally, the long-term 95% Beverly UD shows some overlap with the Project Study Area, due to a broader westward expansion of the range in 2021 (Figure 3.4-2). The 2021 calving range was not consistent with previous years of analysis, however these changes do not appear to have carried into 2022, given that no overlap with the Study Area is seen in either the 2022 50% or 95% UDs (Figures 3.4-1 and 3.4-2). Changes between years can represent relatively few females outside of the typical core calving range, and does not necessarily indicate a permanent shift in the calving range.

3.4.3.2 Camera Monitoring

Across the period from June 2016 to September 2022, cameras were active and recording for a total of approximately 65,203 camera days (Table 3.4-1; Figure 3.4-3; Appendix 3.2-1). Camera effort within monitoring zones by month is summarized in Table 3.3-1; effort summaries per camera are provided in Appendix 3.2-1. A brief summary of the images and caribou events recorded across all cameras during the current and total monitoring periods is provided below. Data from cameras 2 and 35 (the cameras for monitoring the road crossing ramps) are also included in the summary below.

From the recent monitoring periods (2020-2022), 574 caribou events were recorded (Table 3.4-1; Appendix 3.2-3). Caribou events occurred in all recent years from June through September, but most common in July (Table 3.4-1; Photos 3.4-1 and 3.4-2). Occasional events were also recorded in winter and spring months across recent years. In July 2022, caribou were recorded in higher numbers than any single month to date. In particular, the Treatment zone had 113 events recorded in July, across 11 cameras. Roughly half of these events (n = 59) were recorded on Treatment zone camera 21 in the waste management facility (Appendix 3.4-1). Events in this density at a single camera likely represent multiple instances of the same individuals. The waste management facility is in Roberts Bay, which is cooler and has fewer insects than other areas due to the proximity to the ocean, likely explaining the higher activity at camera 21. An increase in caribou around site roads and facilities in July were first noticed in 2019; based on the behaviour of the animals, the gravel roads and pads are utilized to escape biting insects.

Facilities Camera Monitoring

Under the current camera program design, there are four cameras that have site specific monitoring objectives for caribou. These are cameras 2 and 35 installed at the two caribou crossing ramps along the Doris-Windy AWR, and cameras 51 and 52 installed at the north and south end of the Tailings Impoundment Area (TIA). Individual camera effort information is provided in Appendix 3.2-1.

During the monitoring period from September 2021 to September 2022, there were 31 events of caribou detections at specific monitoring cameras. Six events were recorded at the caribou crossing ramp at camera 2 and five events occurred at the caribou crossing ramp at camera 35, all occurred in July and August 2022.

Twenty caribou events were recorded across 12 days in July to September 2022 at the TIA monitoring camera 51. Nineteen events consisted of one adult caribou and one event involved two adult caribou. All events occurred from July 5 to July 30, on August 5 and September 3. All of the caribou photos recorded at the TIA show individuals walking or trotting, potentially to escape insect swarms as noted for incidental behavioural observations. Caribou presence around site may also be noted through the Wildlife Sightings/Reporting process, discussed in Section 3.4.3.4.

Table 3.4-1: Caribou Events Recorded by Month at Treatment, ZOI, and Control Cameras, January 2020 to September 2022

Year	Month	Treatment Cameras				ZOI Cameras				Control Cameras			
		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]	
				Raw	Corrected			Raw	Corrected			Raw	Corrected
2020	Jan.	83 (10)	-	-	-	7 (2)	-	-	-	0 (0)	-	-	-
	Feb.	185 (14)	1	1	1.2	78 (7)	-	-	-	20 (2)	-	-	-
	Mar.	398 (17)	-	-	-	225 (9)	1	1	1.15	80 (5)	-	-	-
	April	491 (18)	-	-	-	325 (12)	1	1	1.1	276 (12)	1	1	1.1
	May	504 (17)	-	-	-	349 (12)	-	-	-	369 (12)	-	-	-
	June	601 (21)	2	3	3	370 (13)	-	-	-	416 (14)	1	1	1
	July	651 (21)	10	38	39.14	351 (12)	6	12	12.36	376 (13)	7	41	42.23
	Aug.	632 (21)	8	8	8.72	279 (9)	-	-	-	338 (12)	3	5	5.45
	Sept.	585 (21)	1	1	1.14	262 (9)	-	-	-	260 (10)	-	-	-
	Oct.	460 (19)	-	-	-	147 (7)	-	-	-	127 (7)	-	-	-
	Nov.	154 (15)	-	-	-	26 (3)	-	-	-	10 (3)	-	-	-
	Dec.	47 (10)	-	-	-	3 (1)	-	-	-	9 (2)	-	-	-
2021	Jan.	84 (7)	-	-	-	2 (1)	-	-	-	0 (0)	-	-	-
	Feb.	179 (16)	-	-	-	17 (2)	-	-	-	3 (1)	-	-	-
	Mar.	397 (18)	-	-	-	77 (3)	-	-	-	66 (4)	-	-	-
	April	497 (18)	-	-	-	77 (4)	-	-	-	78 (4)	-	-	-
	May	530 (19)	-	-	-	122 (4)	-	-	-	123 (4)	1	1	1.04
	June	510 (19)	-	-	-	302 (13)	3	4	4	451 (19)	8	13	13
	July	546 (18)	10	42	43.26	379 (13)	8	34	35.02	443 (16)	7	25	25.75
	Aug.	556 (18)	12	29	31.61	322 (12)	2	4	4.36	379 (13)	8	20	21.8
	Sept.	544 (20)	2	2	2.28	294 (15)	2	3	3.42	331 (17)	2	4	4.56
	Oct.	516 (19)	-	-	-	380 (16)	-	-	-	360 (17)	-	-	-
	Nov.	278 (17)	-	-	-	167 (11)	-	-	-	124 (9)	-	-	-
	Dec.	60 (6)	-	-	-	25 (3)	-	-	-	11 (1)	1	1	1.3

Year	Month	Treatment Cameras				ZOI Cameras				Control Cameras			
		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]	
				Raw	Corrected			Raw	Corrected			Raw	Corrected
2022	Jan.	41 (3)	-	-	-	-	-	-	-	-	-	-	-
	Feb.	76 (9)	-	-	-	14 (3)	-	-	-	-	-	-	-
	Mar.	296 (15)	-	-	-	146 (7)	-	-	-	85 (6)	-	-	-
	April	444 (16)	-	-	-	279 (11)	-	-	-	242 (11)	-	-	-
	May	502 (19)	-	-	-	384 (16)	-	-	-	367 (18)	4	5	5.2
	June	476 (17)	7	12	12	458 (16)	7	19	19	405 (15)	9	12	12
	July	465 (15)	11	113	116.39	439 (15)	12	43	44.29	408 (14)	7	11	11.33
	Aug.	498 (17)	7	12	13.08	431 (14)	7	13	14.17	373 (14)	6	14	15.26
	Sept.	395 (17)	2	2	2.28	286 (13)	6	14	15.96	223 (11)	6	9	10.26
	Total[3]	**-**	**73**	**263**	**274.1**	**-**	**55**	**148**	**154.83**	**-**	**71**	**163**	**121.5**

[1] Camera effort is presented as the total number of camera days by month; number of cameras with at least one camera day (i.e., unobscured) presented in parenthesis.

[2] Events are presented as the number recorded by cameras (raw) as well as the number of events corrected for the monthly darkness factor (corrected).

[3] Total number of cameras with events represents the number of unique cameras with events across the monitoring period. Total number of events is the cumulative total across the monitoring period.

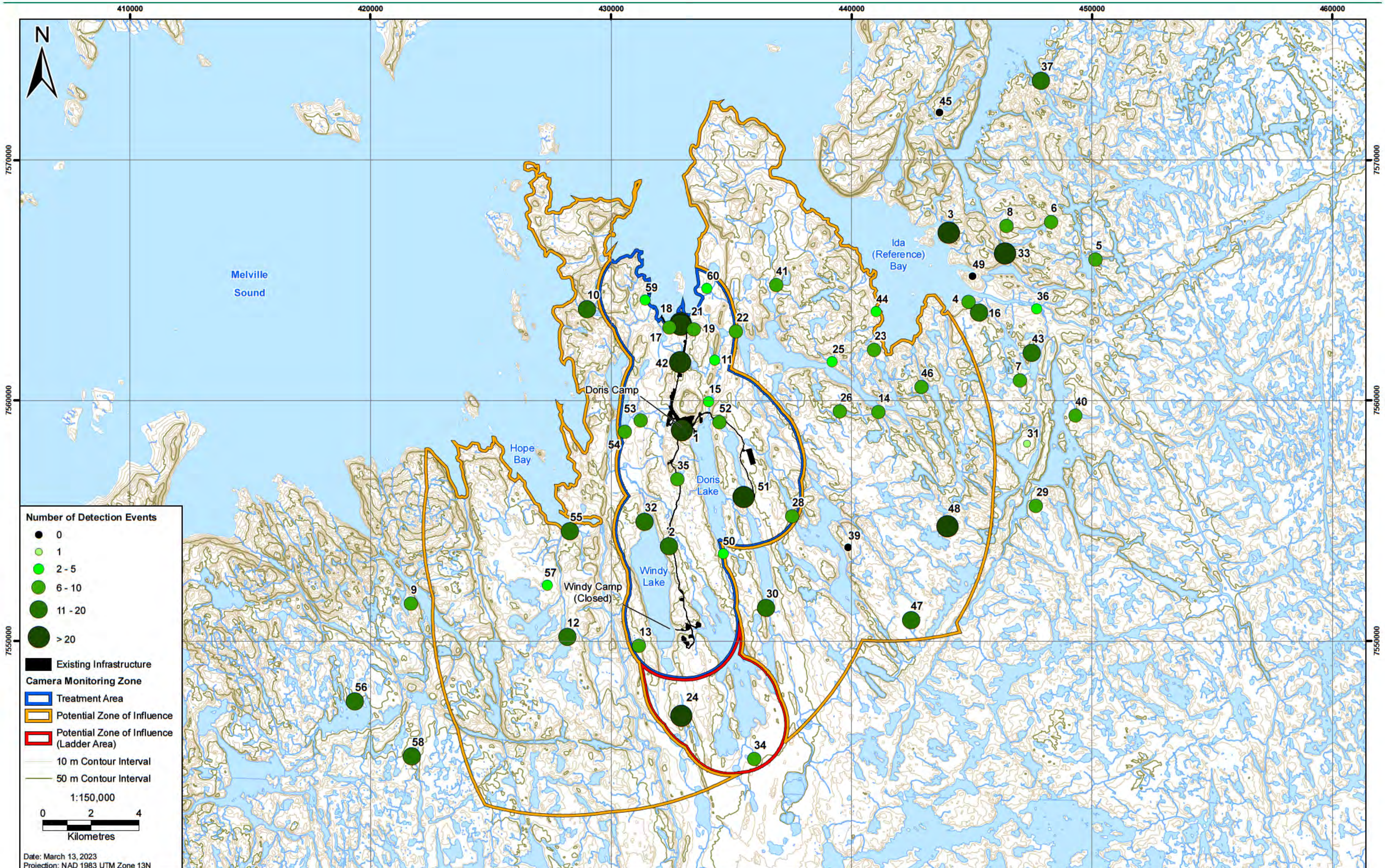


Figure 3.4-3: Detections of Caribou on Motion-triggered Photos Recorded by Wildlife Cameras, Doris and Madrid Areas, June 2016 to September 2022

Photo 3.4-1: Caribou at Treatment zone camera 58. September 20, 2022.

Photo 3.4-2: Caribou captured on ZOI camera 47. July 31, 2022.

During the August 2022 IEAC site visit, it was noted that caribou trails may be present around a culvert under Windy Road (Photo 3.4-3). The culvert is roughly 160 m north of one of the caribou crossing ramps, which also has visible trails from caribou use (Photo 3.4-3). Two additional wildlife cameras were deployed on either side of the culvert on August 21, 2022 to record potential caribou activity using the culvert as a road crossing alternative (camera position and deployment details in Appendix 2.1-1). Data from these cameras were not included in other camera summaries due to the difference in deployment timing. One caribou event of a single male caribou was recorded on a culvert camera on September 11, 2022. No other wildlife events were recorded on these cameras, however due to the deployment timing data are only available for one month in 2022. These two cameras can be incorporated into the facility-specific camera monitoring for caribou in future years.

Photo 3.4-3: Aerial view of caribou crossing ramp with trails (left), and culvert where two additional cameras were deployed to monitor caribou activity in relation to crossing ramp (right) on Windy Road, August 2022.

Statistical Analysis

A statistical analysis was conducted on caribou camera occupancy data from 55 cameras. Cameras 2 and 35 were excluded from analysis because they were at caribou crossing ramps on the Doris-Windy AWR which may have higher caribou occurrence than other areas near the Project and beyond. Camera effort was deemed too low in December and January across years and therefore these months were removed from analysis altogether (see Methods Section 3.4.2.2.; Table 3.4-1). To account for additional periods of low effort which were variable across cameras, observations were only included if the monthly camera effort was ≥ 7 days per month. There were only three caribou events recorded on cameras with less than a week of effort (this is only considering events recorded when the camera was upright and unobscured). No records were eliminated from Treatment cameras.

Predicted caribou occupancy was significantly different at Control cameras compared to Treatment cameras within 2 km of the Project ($p = 0.024$; Table 3.4-2). However, there was no significant difference in caribou occupancy at ZOI cameras compared to Treatment cameras (p = 0.63; Table 3.4-2). The model also included smooths for month and northing, which provided a better fit to the data despite the individual terms lacking significance (Table 3.4-2).

Table 3.4-2: Summary of Treatment vs. Control Model Coefficients and Significance Level for Caribou Camera Occupancy Data

Coefficient	β Value	Standard Error (se)	t-Value	p-Value
Camera Zone, ZOI	0.23	0.29	0.80	0.424
Camera Zone, Control	0.63	0.27	2.31	0.024*
Smooth (Northing)	-0.14	0.11	-1.27	0.210
Smooth (Month)	-0.65	1.91	-0.34	0.733

** Indicates significant difference in caribou occupancy compared to Treatment zone.*

Although caribou occupancy is lower in the Treatment zone (according to the number of cameras with at least one event in a given month; Table 3.4-3), the number of events between zones is actually highest in the Treatment zone (n = 473 events), followed by the Control zone (n = 423), and then the ZOI (n = 310). In recent years, caribou activity has increased across all zones, but particularly in the Treatment zone (Table 3.4-1).

Table 3.4-3: Summary of Months and Cameras and Caribou Occupancy

Occupancy[1]		Treatment	ZOI	Control
Unoccupied (no events)	No. Camera*Months[2]	726	461	482
	Percentage (%; of Total)	86	82	77
Occupied (1 or more events)	No. Camera*Months[2]	115	98	141
	Percentage (%; of Total)	14	18	23
Total Events		**473**	**310**	**423**

Notes:

[1] Table summaries does not include event or effort data collected from Cameras 2 and 35 from June 2016 to September 2022. These data are included in Table 3.4-1 and therefore event summaries will be different.

*[2] Represents individual camera and month combinations. For example, for a single camera that had over a week of camera effort for the monitoring period from June 2016 to September 2022 (except December and January, i.e., 62 months) and did not record a caribou event, this camera would have a total of 62 unoccupied camera*months. If the same camera were to have recorded caribou events in four months, the camera would have a total of four occupied camera*months and 58 unoccupied camera*months.*

The occupancy model for caribou was designed when caribou events were less frequent (fewer events per month) and less common across the study area (fewer cameras with any event, measured by occupancy). While both of these measures of caribou activity have increased, there are differences between the apparent occupancy compared to the number of events. Caribou occupancy across cameras has increased from ~10% or less (e.g., WMMP Report in 2018; ERM 2019) to 14 to 23% now (Table 3.4-3). The increase in caribou events has been greatest at specific cameras within in the Treatment zone and is not equal across all cameras. For example, camera 21 (Treatment zone) had 56 caribou events in July 2022, but only represents a single occupied camera for the current model—the same occupancy as a camera with a single caribou. This difference creates an artefact wherein occupancy by number of cameras is lower in the Treatment area (14% in Treatment, 23% in Control), but the total number of caribou events are similar between zones (473 in Treatment, 423 in Control).

With the increase in caribou events at specific cameras, the occupancy model is no longer providing an accurate test of whether caribou are avoiding the Project. The occupancy model was utilized due to the low number of caribou events in early years of monitoring. Given the increases in caribou data available, future analyses will model caribou activity according to the total number of events (i.e., the same approach as grizzly bear models). This update is anticipated to reflect a more accurate test for caribou presence across the Study Area.

3.4.3.3 Interactions, Incidents, and Mortalities

Four caribou interactions occurred in 2022 to deter animals on the airstrip (Appendix 3.2-4). Individual caribou were pushed from the airstrip (using a pickup truck approaching slowly) on July 6, 7, 19, and 27. July is the peak time period when caribou frequent site in order to escape biting insects. Caribou are only deterred in situations where their presence poses risk of harm. In 2022, all cases were caribou on the airstrip when a plane was approaching.

3.4.3.4 Wildlife Sightings Log and Incidental Observations

In 2022, 71 sightings of 233 caribou were recorded in the wildlife sightings log (Appendix 3.2-5). Most of these sightings took place in July (n = 37) and August (n = 13) and were mainly sightings of more than two animals (36 sightings of 198 individuals). One sighting in late December was a group of 24 caribou along Windy Road. Sightings of solo individuals (n = 35) only occurred in June, July, and August. No caribou were sighted in January through March. Several reported sightings were likely the same individuals moving through the area (e.g., caribou reported in the same group size and date along nearby kilometers of Windy Road; Appendix 3.2-5).

The majority of caribou sightings occurred near or on Windy Road or in the Madrid area (n = 26) and near or on the airstrip (n = 9; Table 3.4-4). Four sightings of caribou occurred near the TIA and TLR access road, however only one sighting of two individuals were actually on the TIA footprint (Appendix 3.2-5). Caribou seen near the TIA were monitored to ensure they left the area. Additionally, a blast was delayed to the following day due to the presence of five caribou near the TLR road (Appendix 3.2-5). Site personnel were made aware when caribou were sighted near active camp areas in order to avoid disturbing the caribou until they left the area.

Table 3.4-4: Caribou Sightings and Incidental Observations 2022

General Location	Months	Total Sightings	Total Individuals
Doris Area	April, May, July, August	13	46
Windy road/ Madrid	June, July, August, December	26	95
Airstrip	April, July, August	9	32
TLR/TIA	August, September, December	4	13
Boston	October	2	19
Not Specified	July, August	17	28

Based on the time periods when Dolphin and Union and Beverly/Ahiak caribou are anticipated to be present near the Project, the majority of sightings in 2022 (those in July and August, n = 50) were of Beverly/Ahiak caribou. Sightings reported in January through May and November to December (i.e., sightings in March through May 2022 and November through December 2022) can be either Dolphin and Union caribou or tundra-wintering caribou from the Beverly/Ahiak herd (Figure 3.4-4). Sightings in November are most likely of Beverly/Ahiak caribou but could also be Dolphin and Union caribou, as this herd typically starts crossing the sea ice in the Coronation Gulf in early November (Poole et al. 2010) and thus could arrive to the mainland later in November (Figure 3.4-4).

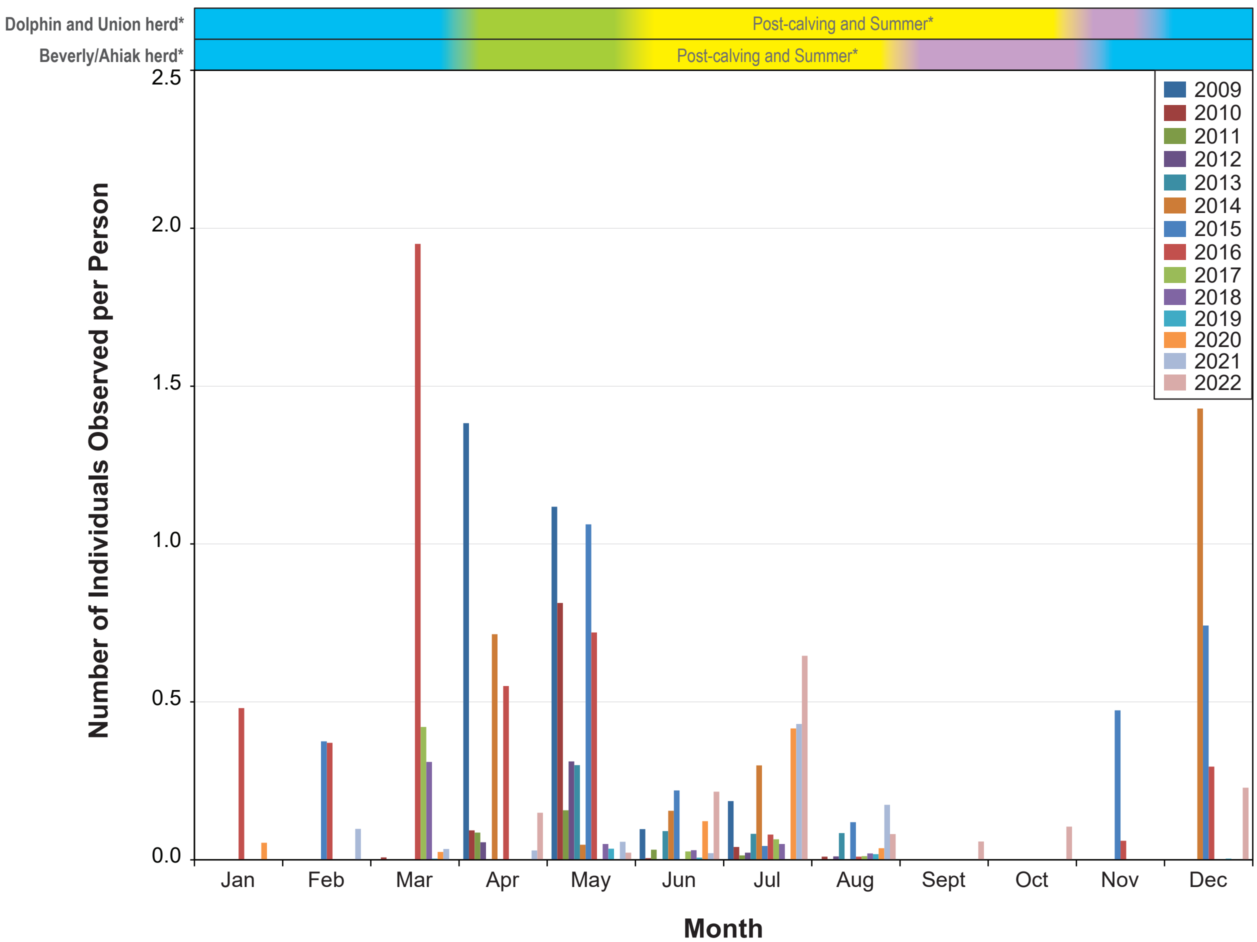


Figure 3.4-4: Number of Caribou Individuals Recorded per Personnel Present, Hope Bay Project, 2009 to 2022

Generally, over time, the largest numbers of caribou observed per personnel from 2009 to 2022 have been recorded from November to May, with the peak being in March 2016 (152 individuals, 1.95 caribou per personnel) and December 2014 (10 individuals, 1.43 caribou per personnel; Figure 3.4-4). In 2022, the largest number of caribou observed per personnel occurred in July, at 0.65 caribou per personnel (Figure 3.4-4).

3.4.3.5 Height of Land

In 2017, initial Height of Land (HOL) survey points were identified by ERM consultants, but it was determined that the locations would not be readily accessible during winter months. In 2021, HOL reconnaissance was again conducted by ERM consultants, focusing on sites which would be accessible year-round. Ten locations along Windy Road were identified, all within 50 m of the road.

In 2022, ideal HOL monitoring sites were independently selected by an Inuit environmental team member with over ten years' experience working in the Hope Bay area. The three sites which were selected by the Inuit environmental team member aligned with those selected by consultants and were further scoped by the IEAC during a site visit in August 2022. The IEAC agreed that the three monitoring locations were ideal for HOL surveys (Figure 3.4-5). A draft Standard Operating Procedure (SOP) for these surveys was developed in late 2022 based on these locations and methods discussed with the IEAC. Another IEAC meeting is planned for March 2023 which will include a review of the draft SOP and onsite training of the HOL methods for community members from Cambridge Bay with potential to participate in HOL monitoring.

3.4.4 Discussion

3.4.4.1 Caribou Collar Data

The 50% and 95% UD calving ranges of the Ahiak sub-population extended further south in 2022 than the long-term distribution from 2001-2021 but did not overlap the Project Study Area. A small eastern shift in the Ahiak UD has also occurred in all of the last three years (i.e., is indicated in the long-term distribution and the 2022 UD). This indicates that some females have shifted to calving further east along the Queen Maud Gulf than previously recorded. The UDs for the Beverly sub-population have varied through time, and the 2022 UDs extended beyond the long-term range from 2001 to 2021 to the southeast, as well as portions extending south and west by roughly 80 km from the rest of the range. The long-term 95% Beverly UD overlapped with the southern portions of the Study Area, around the Boston Project. This is driven by the 2021 data, which included this westward range extension for the first time. This difference from the 2021 calving range is likely due to annual variation, given that the change was not seen in 2022.

3.4.4.2 Camera Monitoring

Caribou camera events occurred in all recent years (2020-2022) from June through September, but were most common in July. In July 2022, caribou were recorded in higher numbers than any single month to date, including 113 events recorded in the Treatment zone. An increase in caribou around site roads and facilities in July were first noticed in 2019; based on the behaviour of the animals, the gravel roads and pads are utilized to escape biting insects. No caribou incidents have occurred despite the increase in activity, indicating that current management and mitigation efforts are effective.

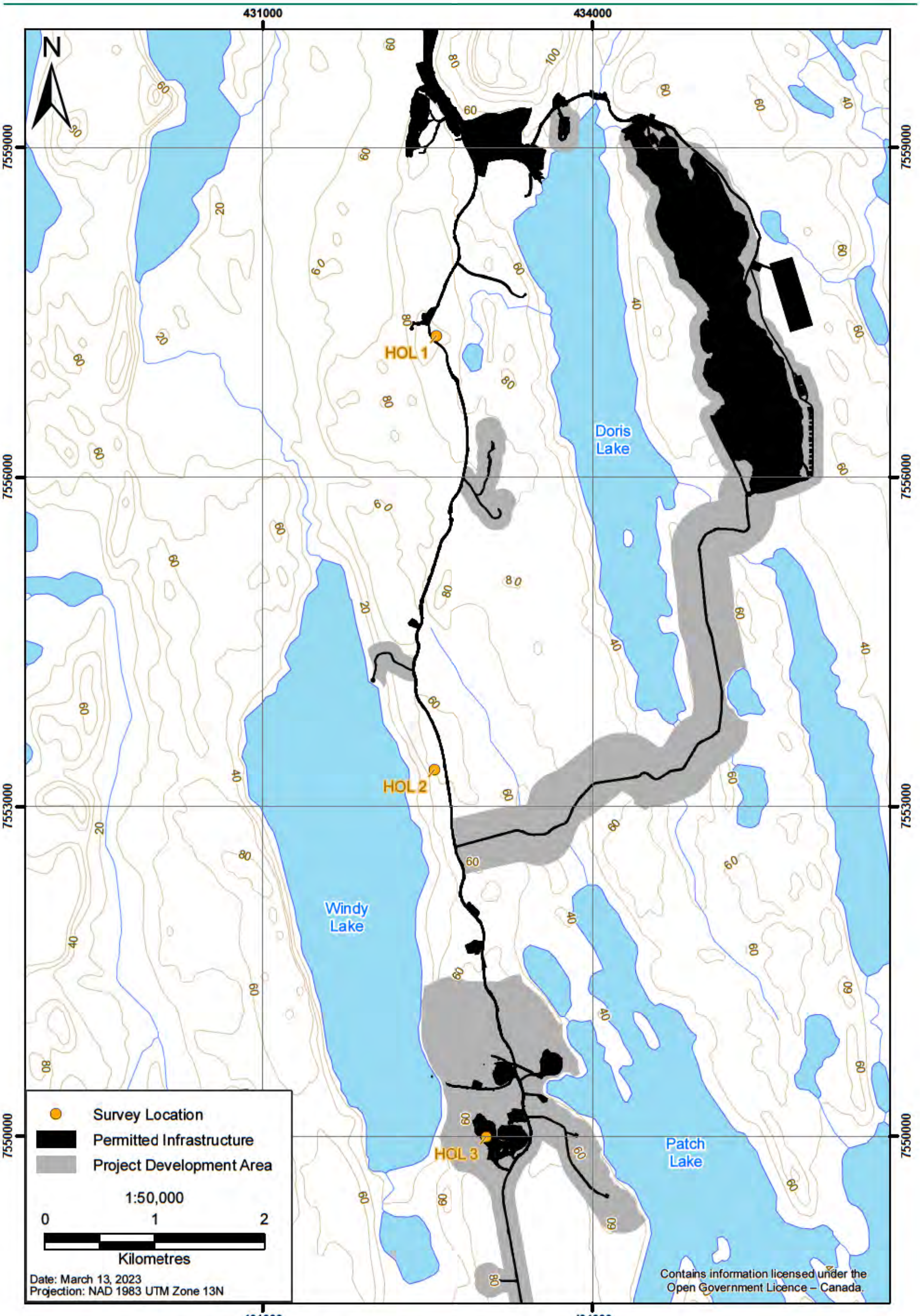


Figure 3.4-5: Height of Land Survey Locations Finalized in 2022

Statistical analyses were conducted to test whether caribou occupancy (probability of recording at least one caribou event at a camera in a given month) differed between cameras in the Treatment zone (< 2 km from existing infrastructure) and Control zone (> 10 km from existing infrastructure). The results of the statistical analyses indicated that the predicted caribou occupancy was significantly different between cameras in the Treatment zone and Control zone. However, models account for occupancy at cameras rather than the number of caribou events recorded by zone; this was necessary in previous years because caribou events were less common and data were not sufficient to run models based on the total number of events recorded. In recent years, caribou events have become more common – particularly at some cameras in the Treatment zone near site roads and camp facilities, where caribou have been frequenting since roughly 2019 during peak biting insect season. Accounting for the influx of caribou events in the Treatment zone, camera data do not currently indicate caribou avoidance of Project infrastructure. Models will be updated in future years to account for caribou activity according to the number of events. The Madrid-Boston FEIS predicted a geographic extent of caribou avoidance of Project infrastructure of 4 km^2 (with a 1.5 km^2 ZOI around the AWR).

Outside of the caribou presence near site in summer, caribou are more commonly recorded throughout the year in the ZOI and Control zone. This difference is likely attributed to the Project location and relative geography. The Project is located at the north end of the Greenstone Belt, which is a low lying area surrounded by rocky upland areas to the east and west. The low lying areas closest to the Project contain large, open sedge meadows that collect snow in winter. In contrast, on either side of the Project are low rocky hills which are wind-blown of snow during winter and make better winter habitat and travel corridors. These differences may cause caribou to avoid using habitat nearest the Project during the winter, spring, and fall seasons when deeper snow makes forage less accessible and movement difficult compared to the surrounding areas. These natural differences in occurrence are difficult to disentangle from potential Project effects and may affect analysis results.

Thirty-one caribou events were recorded in total at three of the four cameras with caribou-specific monitoring objectives in 2022, which included cameras at the crossing ramps along the Doris-Windy AWR and near the TIA. Eleven caribou events recorded at cameras monitoring the two crossing ramps along the AWR indicate that caribou are using the ramp to cross the road. Events at both road crossing cameras have also occurred in the majority of previous study years.

Twenty caribou events were recorded across twelve separate days at the TIA monitoring camera 51. Events occurred during the last week of July to the first week of August 2022, with one additional event in early September. All of the caribou photos recorded at the TIA show individuals walking or trotting, potentially to escape insect swarms as noted for incidental behavioural observations. Caribou were commonly incidentally reported throughout site during July and August 2022, with 36 reports of one to nine individuals. Across other Treatment cameras, over 106 caribou events were recorded at 10 unique cameras during the same two-month period. These data indicate that caribou were moving through site throughout this time window, with some individuals passing by or through the TIA. However, the majority of camera events and incidental sightings were not at the TIA, suggesting that caribou were not attracted to the TIA or more likely to interact with the TIA than other infrastructure. The KIA expressed concern during the review of the Boston-Madrid FEIS that caribou may frequent the TIA to drink water if it is salty, but this does not appear to be occurring.

Two additional cameras were deployed in August 2022 to specifically monitor potential caribou activity at a culvert under Windy Road after was noted that caribou trails may be present around the culvert during an IEAC site visit. One caribou event of a single male caribou was recorded on a culvert camera. Due to the deployment timing, data were only available on these cameras for one month in 2022. These two cameras can be incorporated into the facility-specific camera monitoring for caribou in future years.

3.4.4.3 Wildlife Sightings and Observations Log

In 2022, 71 sightings of 233 caribou were recorded in the wildlife sightings log. Most of these sightings took place in July and August (n = 50). The majority of caribou sightings occurred near or on Windy Road or in the Madrid area (n = 26) and near or on the airstrip (n = 9). Four sightings of caribou occurred near the TIA and TLR access road, however only one sighting of two individuals were actually on the TIA footprint. Caribou seen near the TIA were monitored to ensure they left the area. Additionally, a blast was delayed to the following day due to the presence of five caribou near the TLR road (Appendix 3.2-5). Site personnel were made aware when caribou were sighted near active camp areas in order to avoid disturbing the caribou until they left the area.

3.4.4.4 Height of Land

Three final Height of Land survey locations were chosen based on additional reconnaissance work with an Inuit environment team member, and approved by the IEAC during a site visit in August 2022. An initial Standard Operating Procedure draft will be discussed with the IEAC in-person meeting scheduled for March 2023. On site training for the HOL monitoring methods will also be provided for Inuit community members who are likely to participate in monitoring.

3.5 Muskox

Muskox inhabit Arctic tundra environments and occur in varying densities throughout Nunavut, including the northern islands archipelago (Leclerc 2015). Muskox are not migratory, but may vary in group size throughout the year, with larger herds forming through the winter (Leclerc 2015). In recent years, possible declines in some muskox populations have been reported; the cause and extent of these declines are still uncertain, but likely has to do with disease, climate, and anthropogenic pressures (Cuyler et al. 2020). These concerns have led to increased monitoring and research efforts throughout the Arctic, even though muskox are not listed as a species of conservation concern federally or in Nunavut.

3.5.1 FEIS Predictions

The Madrid-Boston FEIS predictions for muskox included a not significant residual effect of disturbance at a geographic extent of the RSA and a low magnitude residual effect for disruption of movement at the extent of the PDA (TMAC Resources Inc. 2017). The previous Doris FEIS did not include muskox as a VEC (Miramar 2005); inclusion in the Madrid-Boston FEIS is a reflection of increased interest in monitoring muskox throughout the Canadian Arctic.

3.5.2 Methods

The potential effects of Project-related activities on muskox are monitored through the wildlife camera monitoring program as well as through the Wildlife Sightings/Reporting program, results of which are presented as wildlife interactions, incidents, and mortalities and incidental sightings (see Section 3.2). Summarized data are also provided in Appendices 3.2-1 through 3.2-5, and 3.5-1.

Although detections of muskox have been recorded since 2016, very few camera events are recorded each year. Modelling capabilities are currently restricted due to the low volume of muskox camera data available. Therefore, data from wildlife cameras are not yet sufficient for statistical analysis to test for possible effects on muskox distribution. Analysis to test for a potential ZOI for muskox around the Doris and Madrid monitoring areas may be conducted in future years once additional data are available.

3.5.3 Results

3.5.3.1 Camera Monitoring

Across the period from June 2016 to September 2022, cameras were active and recording for a total of approximately 65,203 camera days (Table 3.5-1; Appendix 3.2-1). Camera effort within monitoring zones by month is summarized in Table 3.2-1; effort summaries per camera are provided in Appendix 3.2-1. A brief summary of the muskox events recorded across all cameras during the recent monitoring period is provided below.

From the recent monitoring periods (2020-2022), a total of 5 unique events of muskox were recorded (Table 3.5-1; Figure 3.5-1; Appendix 3.2-3; Appendix 3.5-1). These events occurred in November 2020, June 2022, and August 2022—no muskox were recorded on wildlife cameras in 2021 (Table 3.5-1). Three events occurred at Treatment cameras while ZOI and Control cameras each recorded one event (Table 3.5-1; Photo 3.5-1). The small number of events overall proved inadequate for statistical modelling, particularly because only one Control zone camera had an event.

Facilities Camera Monitoring

Two cameras have site specific monitoring objectives for muskox: cameras 51 and 52 installed at the north and south end of the TIA. No muskox were recorded on motion-triggered or timed photo events at these two cameras from September 2021 to September 2022, which suggests that muskox use of the areas surrounding the TIA is infrequent. Muskox presence in this area may also be noted through the Wildlife Sightings/Reporting process, presented in the following sections.

3.5.3.2 Interactions, Incidents, and Mortalities

No interactions, incidents or mortalities were recorded during 2022 (Appendix 3.2-4).

3.5.3.3 Wildlife Sightings Log and Incidental Observations

A total of 21 muskox sightings in 2022, though several sightings were likely repeats of the same group based on the date, location, and group size (Appendix 3.2-5). A group of 8 muskox were noted over two weeks in February near Windy Road km 2 to 4 (Appendix 3.2-5). In late October and early November, a group of 20 muskox were repeatedly noted near Windy Road km 5 to 8 (Appendix 3.2-5). Herd sizes from all sightings ranged from four to 20 individuals with a mean of 13 individuals. Nearly all sightings of muskox occurred east or west of Windy Road, with one sighting in the Doris area, north of camp (Table 3.5-2; Appendix 3.2-5).

Muskox observations from the wildlife sightings log were corrected for the number of people on site each month from 2009 to 2022 (Figure 3.5-2). Across years, sightings are variable and have occurred in all months. Peaks in muskox sightings typically represent sightings of larger herds, rather than more sightings of a few individuals (Figure 3.5-2).

Table 3.5-1: Muskox Events Recorded by Month at Treatment, ZOI, and Control Cameras, January 2020 to September 2022

Year	Month	Treatment Cameras				ZOI Cameras				Control Cameras			
		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]	
				Raw	Corrected			Raw	Corrected			Raw	Corrected
2020	Jan.	83 (10)	-	-	-	7 (2)	-	-	-	0 (0)	-	-	-
	Feb.	185 (14)	-	-	-	78 (7)	-	-	-	20 (2)	-	-	-
	Mar.	398 (17)	-	-	-	225 (9)	-	-	-	80 (5)	-	-	-
	April	491 (18)	-	-	-	325 (12)	-	-	-	276 (12)	-	-	-
	May	504 (17)	-	-	-	349 (12)	-	-	-	369 (12)	-	-	-
	June	601 (21)	-	-	-	370 (13)	-	-	-	416 (14)	-	-	-
	July	651 (21)	-	-	-	351 (12)	-	-	-	376 (13)	-	-	-
	Aug.	632 (21)	-	-	-	279 (9)	-	-	-	338 (12)	-	-	-
	Sept.	585 (21)	-	-	-	262 (9)	-	-	-	260 (10)	-	-	-
	Oct.	460 (19)	-	-	-	147 (7)	-	-	-	127 (7)	-	-	-
	Nov.	154 (15)	1	2	2.48	26 (3)	-	-	-	10 (3)	-	-	-
	Dec.	47 (10)	-	-	-	3 (1)	-	-	-	9 (2)	-	-	-
2021	Jan.	84 (7)	-	-	-	2 (1)	-	-	-	0 (0)	-	-	-
	Feb.	179 (16)	-	-	-	17 (2)	-	-	-	3 (1)	-	-	-
	Mar.	397 (18)	-	-	-	77 (3)	-	-	-	66 (4)	-	-	-
	April	497 (18)	-	-	-	77 (4)	-	-	-	78 (4)	-	-	-
	May	530 (19)	-	-	-	122 (4)	-	-	-	123 (4)	-	-	-
	June	510 (19)	-	-	-	302 (13)	-	-	-	451 (19)	-	-	-
	July	546 (18)	-	-	-	379 (13)	-	-	-	443 (16)	-	-	-
	Aug.	556 (18)	-	-	-	322 (12)	-	-	-	379 (13)	-	-	-
	Sept.	544 (20)	-	-	-	294 (15)	-	-	-	331 (17)	-	-	-
	Oct.	516 (19)	-	-	-	380 (16)	-	-	-	360 (17)	-	-	-
	Nov.	278 (17)	-	-	-	167 (11)	-	-	-	124 (9)	-	-	-
	Dec.	60 (6)	-	-	-	25 (3)	-	-	-	11 (1)	-	-	-

Year	Month	Treatment Cameras				ZOI Cameras				Control Cameras			
		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]	
				Raw	Corrected			Raw	Corrected			Raw	Corrected
2022	Jan.	41 (3)	-	-	-	0 (0)	-	-	-	0 (0)	-	-	-
	Feb.	76 (9)	-	-	-	14 (3)	-	-	-	0 (0)	-	-	-
	Mar.	296 (15)	-	-	-	146 (7)	-	-	-	85 (6)	-	-	-
	April	444 (16)	-	-	-	279 (11)	-	-	-	242 (11)	-	-	-
	May	502 (19)	-	-	-	384 (16)	-	-	-	367 (18)	-	-	-
	June	476 (17)	-	-	-	458 (16)	1	1	1	405 (15)	1	1	1
	July	465 (15)	-	-	-	439 (15)	-	-	-	408 (14)	-	-	-
	Aug.	498 (17)	1	1	1.09	431 (14)	-	-	-	373 (14)	-	-	-
	Sept.	395 (17)	-	-	-	286 (13)	-	-	-	223 (11)	-	-	-
	Total[3]	**-**	**2**	**3**	**3.57**	**-**	**1**	**1**	**1**	**-**	**1**	**1**	**1**

[1] Camera effort is presented as the total number of camera days by month; number of cameras with at least one camera day (i.e., unobscured) presented in parenthesis.

[2] Events are presented as the number recorded by cameras (raw) as well as the number of events corrected for the monthly darkness factor (corrected).

[3] Total number of cameras with events represents the number of unique cameras with events across the monitoring period. Total number of events is the cumulative total across the monitoring period.

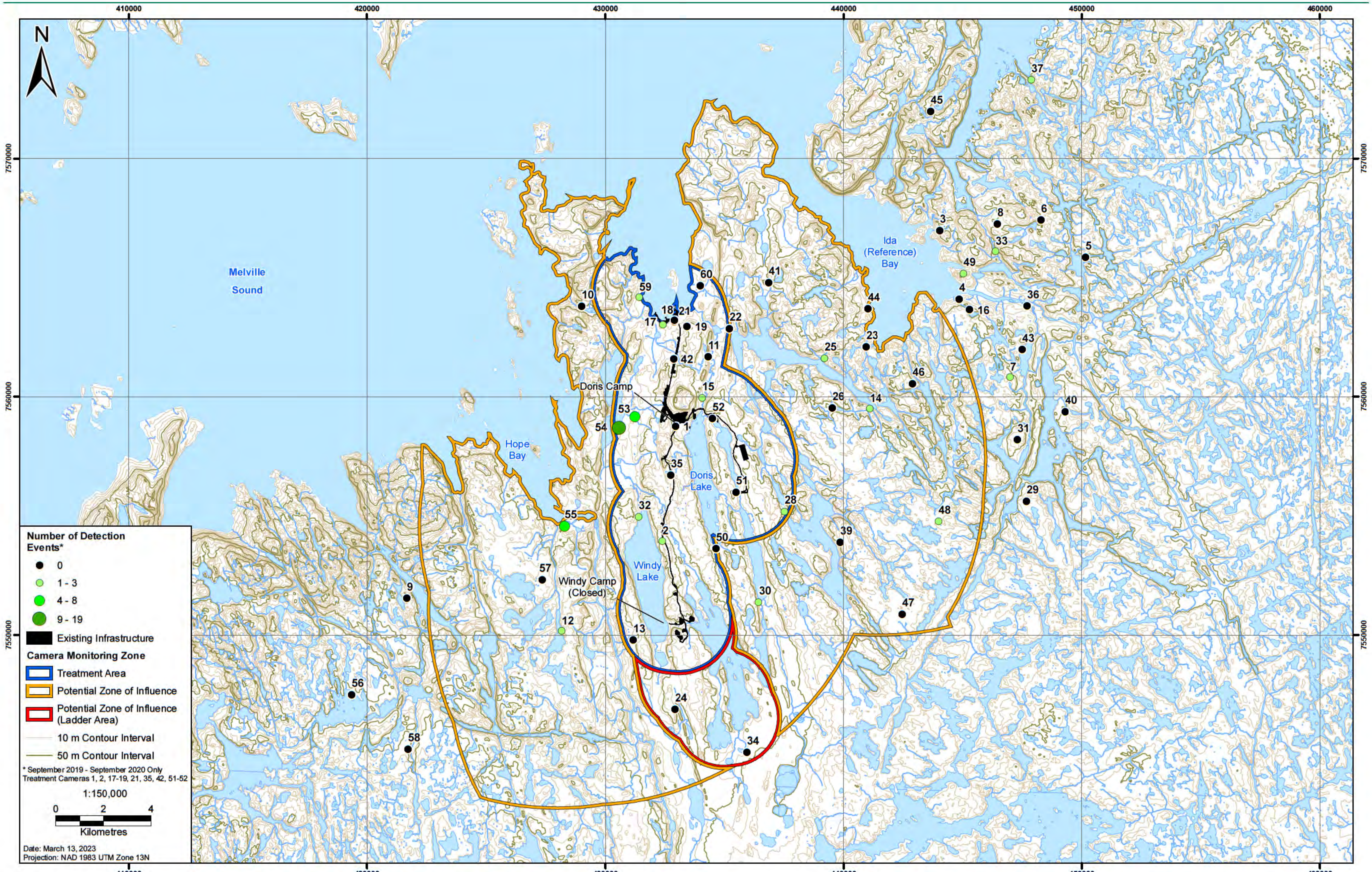


Figure 3.5-1: Detections of Muskox on Motion-triggered Photos Recorded by Remote Cameras, Doris and Madrid Areas, June 2016 to September 2022

Photo 3.5-1: Muskox calves captured on Treatment zone camera 28. August 21, 2022.

Table 3.5-2: Muskox Sightings and Incidental Observations 2022

General Location	Months	Total Sightings	Total Individuals*
Doris Area	May	1	20
Windy Road/ Madrid	January to March, May, June, October, November	20	247

**Total Individuals does not account for repeat records of the same group, and is therefore likely an overestimate of actual individuals present*

3.5.4 Discussion

Detections of muskox by wildlife cameras are rare. Five muskox events were recorded during the recent monitoring period from 2020 to 2022, though no events occurred in 2021. Three events occurred in the Treatment zone while the ZOI and Control zone cameras each had one event recorded. The small sample size across years prevented statistical analysis; however, the raw data indicate that muskox are more common closer to the Project (in the Treatment zone) than farther away (in the Control zone) in all years. This indicates that muskox are likely not avoiding the Project.

No muskox have been recorded on cameras located at the TIA. This result suggests that muskox do not make use of the area near the TIA, which is supported by information collected through the wildlife sightings log (one sighting of a muskox near the TIA in 2018; no muskox near the TIA in 2022).

Twenty-one incidental sightings muskox occurred in 2022, with several sightings of a group of eight muskox in February 2022, and a group of 20 in October and November 2022. The number of individuals recorded in the wildlife sightings log should not be interpreted as observations of unique individuals (e.g., a population estimate) as it is likely that the same individuals are counted across time by different observers. No other interactions, incidents, mortalities, or incidental sightings of muskox were reported in 2022.

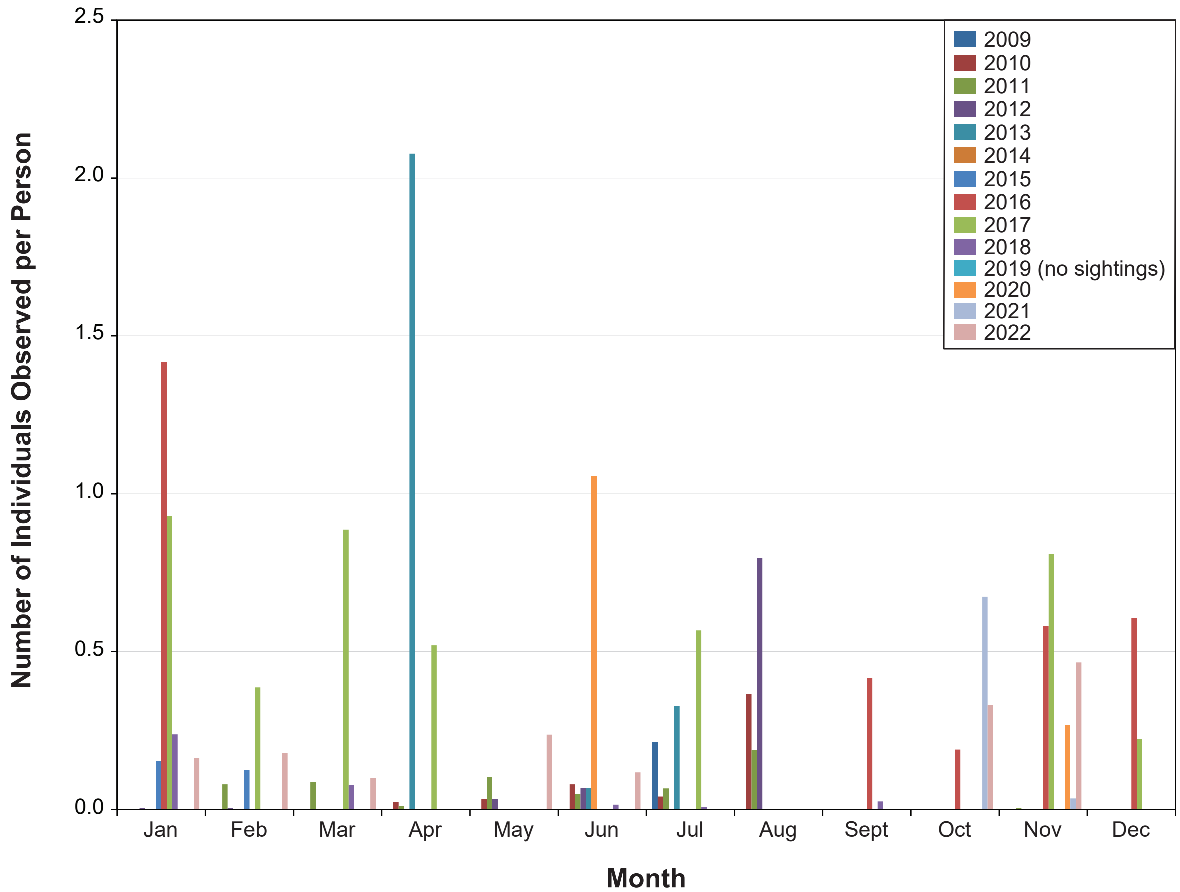


Figure 3.5-2: Number of Muskox Individuals Recorded per Personnel Present, Hope Bay Project, 2009 to 2022

3.6 Grizzly Bear

Grizzly bears are considered a species of Special Concern by the COSEWIC and on Schedule 1 of the SARA (COSEWIC 2002, 2012; Government of Canada 2021b). Additionally, in Nunavut grizzly bears are territorially listed as vulnerable (S3) suggesting they are at moderate risk of extirpation (CESCC 2020). Barren ground grizzly bears are at the most northern and eastern limits of the continental grizzly bear range. Consequently, grizzly bears in the central Arctic have the largest annual home ranges and likely have the lowest densities of any grizzly bear population studied in North America (McLoughlin et al. 1999).

The distribution and abundance of grizzly bears has increased in the region since the 1970s (Banci and Spicker 2016). Grizzly bears have been associated with major river systems, their associated watersheds, and the coast, and are most often seen in the spring and fall during fish-spawning periods and following migrating caribou.

3.6.1 FEIS Predictions

The Madrid-Boston FEIS predictions included not significant and low magnitude residual effects of disruption of movement and attraction at a geographic extent of the PDA for grizzly bear (TMAC Resources Inc. 2017).

3.6.2 Methods

The potential effects of Project-related activities on grizzly bear are monitored through the wildlife camera monitoring program as well as through the Wildlife Sightings/Reporting program, results of which are presented as wildlife interactions, incidents, and mortalities and incidental sightings in Sections 3.6.3.2 and 3.6.3.3.

Camera data from June 2016 to September 2022 were summarized and compiled for the purposes of conducting a statistical analysis to investigate whether there were differences between the number of grizzly bear events at cameras located in the Treatment zone (< 2 km from existing infrastructure) and in the Control zone (> 10 km from existing infrastructure). There were a sufficient number of events per month to permit statistical analyses of the predicted number of events recorded rather than predicted occupancy (probability of at least one event per month). A secondary analysis was completed to investigate a potential ZOI should a significant difference in the predicted number of events be detected. The models accounted for spatiotemporal variation in detections by including smoothed terms for northing and easting as well as month, and random variables for camera number and year where these terms improved model fit to the data.

Cameras 18, 21, and 22 monitor areas of possible bear attractants; cameras 18 and 21 monitor the Roberts Bay Waste Management Facility and camera 22 monitors an area at the Roberts Lake Outflow and fish fence (though the fish fence was not active in all camera monitoring years). Bears may be attracted to these areas—despite mitigations to reduce the attractiveness—resulting in these cameras recording more events than other areas near the Project (where avoidance is anticipated).

Further details on methodology for this monitoring program can be found in Appendix 2.1-1 and in Methods Section 3.2. Datasets of 2022 camera effort and detection events are presented in Appendices 3.2-1 to 3.2-3. Compiled datasets of grizzly bear detection events from June 2016 to September 2022 are presented in Appendix 3.6-1.

3.6.3 Results

3.6.3.1 Camera Monitoring

Across the period from June 2016 to September 2022, cameras were active and recording for a total of approximately 65,203 camera days (Table 3.4-1; Appendix 3.2-1). Camera effort within monitoring zones by month is summarized in Table 3.2-1; effort summaries per camera are provided in Appendix 3.2-1. A brief summary of the grizzly bear events recorded across all cameras during the current and monitoring period is provided below. Data from facility monitoring cameras 18, 21, and 22 are also included in the summary below (see Section 3.2.1).

From the recent monitoring periods (2020-2022), 233 grizzly bear events were recorded (Figure 3.6-1). Temporally, grizzly bear were recorded in April through October, with no events in November through March (when grizzly bears are in hibernation; Table 3.6-1; Photo 3.6-1; Photo 3.6-2). Grizzly bear events were recorded in all zones in June through August of all recent years (Table 3.6-1). Events in the Treatment zone occurred more frequently (*n* = 109) than the ZOI or Control zones (*n* = 43 and 58 respectively) in recent monitoring years (Table 3.6-1; Appendix 3.6-1). This difference is primarily attributed to abundant grizzly bear events in the summer of 2020 in the Treatment zone, with 49 events from July to September 2020, compared to 15 events in the ZOI and 12 in the Control zone for the same months (Table 3.6-1). However, 2021 and 2022 had more balanced occurrences of grizzly bears across all zones.

Photo 3.6-1: Grizzly bear sow with young of year cub captured on Control zone camera 45. June 2, 2022.

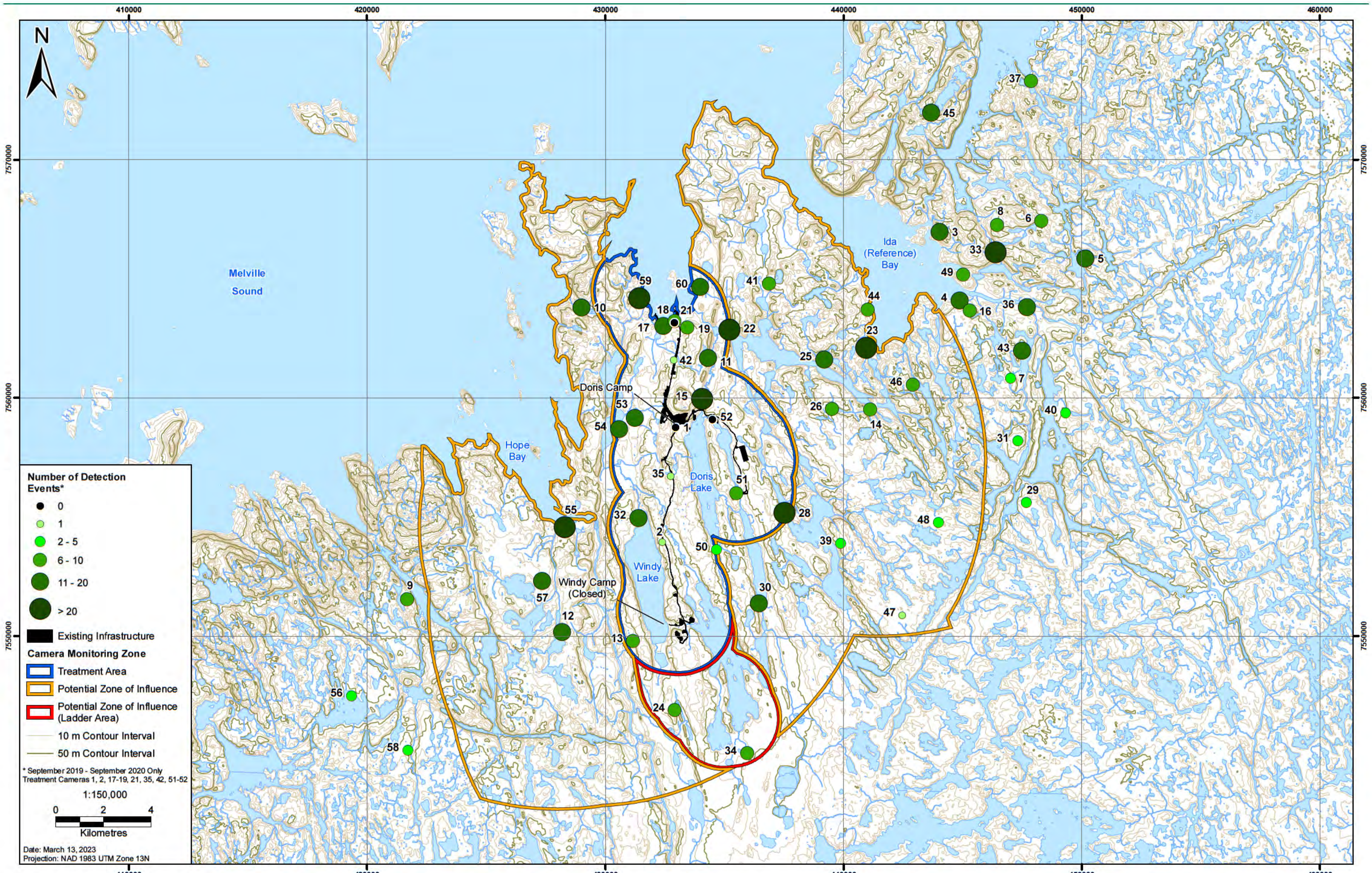


Figure 3.6-1: Detections of Grizzly Bear on Motion-triggered Photos Recorded by Remote Cameras, Doris and Madrid Areas, June 2016 to September 2022

Table 3.6-1: Grizzly Bear Events Recorded by Month at Treatment, ZOI, and Control Cameras, March 2020 to September 2022

Year	Month	Treatment Cameras				ZOI Cameras				Control Cameras			
		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]	
				Raw	Corrected			Raw	Corrected			Raw	Corrected
2020	Mar.	398 (17)	-	-	-	225 (9)	-	-	-	80 (5)	-	-	-
	April	491 (18)	-	-	-	325 (12)	-	-	-	276 (12)	-	-	-
	May	504 (17)	-	-	-	349 (12)	-	-	-	369 (12)	-	-	-
	June	601 (21)	3	3	3	370 (13)	1	1	1	416 (14)	3	4	4
	July	651 (21)	10	19	19.57	351 (12)	5	8	8.24	376 (13)	7	10	10.3
	Aug.	632 (21)	8	18	19.62	279 (9)	1	2	2.18	338 (12)	2	2	2.18
	Sept.	585 (21)	8	12	13.68	262 (9)	2	5	5.7	260 (10)	-	-	-
	Oct.	460 (19)	3	3	3.57	147 (7)	1	1	1.19	127 (7)	1	1	1.19
2021	Mar.	397 (18)	-	-	-	77 (3)	-	-	-	66 (4)	-	-	-
	April	497 (18)	-	-	-	77 (4)	-	-	-	78 (4)	-	-	-
	May	530 (19)	-	-	-	122 (4)	-	-	-	123 (4)	1	1	1.04
	June	510 (19)	4	9	9	302 (13)	3	3	3	451 (19)	5	5	5
	July	546 (18)	6	7	7.21	379 (13)	4	6	6.18	443 (16)	8	13	13.39
	Aug.	556 (18)	7	10	10.9	322 (12)	4	6	6.54	379 (13)	6	6	6.54
	Sept.	544 (20)	2	3	3.42	294 (15)	3	3	3.42	331 (17)	1	1	1.14
	Oct.	516 (19)	1	1	1.19	380 (16)	-	-	-	360 (17)	5	6	7.14
2022	Mar.	296 (15)	-	-	-	146 (7)	-	-	-	85 (6)	-	-	-
	April	444 (16)	1	1	1.1	279 (11)	1	1	1.1	242 (11)	1	1	1.1
	May	502 (19)	-	-	-	384 (16)	2	2	2.08	367 (18)	5	5	5.2
	June	476 (17)	2	3	3	458 (16)	2	2	2	405 (15)	3	3	3
	July	465 (15)	5	5	5.15	439 (15)	3	3	3.09	408 (14)	3	3	3.09
	Aug.	498 (17)	4	9	9.81	431 (14)	4	6	6.54	373 (14)	1	1	1.09
	Sept.	395 (17)	3	4	4.56	286 (13)	2	3	3.42	223 (11)	3	3	3.42
	Total[3]	**-**	**69**	**109**	**117.07**	**-**	**42**	**56**	**59.91**	**-**	**58**	**68**	**72.04**

[1] *Camera effort is presented as the total number of camera days by month; number of cameras with at least one camera day (i.e., unobscured) presented in parenthesis.*

[2] *Events are presented as the number recorded by cameras (raw) as well as the number of events corrected for the monthly darkness factor (corrected).*

[3] *Total number of cameras with events represents the number of unique cameras with events across the monitoring period. Total number of events is the cumulative total across the monitoring period.*

Photo 3.6-2: Lone adult grizzly bear walking captured on Treatment camera 51. October 5, 2021.

Facilities Camera Monitoring

Under the current camera design, there are five cameras that have site specific monitoring objectives for grizzly bear: cameras 18 and 21 at the Roberts Bay Waste Management Facility, camera 22 at the Roberts Lake Outflow/ Fish Fence, and cameras 51 and 52 at the north and south end of the TIA.

During the monitoring period from September 2021 - September 2022, two grizzly bear events were recorded at these cameras. One grizzly bear event was recorded at camera 21 at the Waste Management Facility. The bear was recorded in a single set of motion triggered images walking through, with no evidence of stopping or investigating the area (Photo 3.6-3). Grizzly bears are occasionally recorded in this area, but lack of repeated records indicate that bears are not being attracted to the area. An adult female grizzly bear and single young of year cub was recorded on the TIA camera 51 in early July 2022. One set of motion triggered photos show the sow and cub walking across the length of the TIA (Photo 3.6-4). Camera 22 located at the Fish Fence was only operational until June 8, 2022 at which point it was knocked down until being serviced in the fall, and therefore could have missed grizzly bear events.

Statistical Analysis

A spatiotemporal analysis was conducted on grizzly bear event data from 57 cameras; cameras 18, 21, and 22 were excluded from the analyses (see Methods Section 3.6.2).

Effort and event data for the 57 cameras were included for cameras and months with effort ≥ 7 days. Eight grizzly bear events were recorded on cameras with less than a week of effort per month, two from ZOI cameras and five from Control zone cameras. The events on cameras with low effort per month were primarily due to grizzly bears knocking cameras over very early in the month.

Photo 3.6-3: Grizzly bear walking through the Waste Management Facility camera 21. August 3, 2022.

Photo 3.6-4: Grizzly bear sow and single young of year cub walking through TIA camera 51. July 9, 2022.

In the main analysis predicting grizzly bear occurrence by camera zone, the best fit model included smooth functions for month and northing as well as random variables for camera number and year. There was no significant difference in the predicted number of grizzly bear events between Treatment and Control cameras ($p = 0.851$; Table 3.6-2). Differences between ZOI and Control were also non-significant with ($p = 0.181$; Table 3.6-2). Month and northing were each included as a smooth function in the regression analysis as they provided better model fit to the data, though only the effect of northing was significant ($p < 0.05$; Table 3.6-2).

Table 3.6-2: Summary of Treatment vs. Control Model Coefficients and Significance Level for Grizzly Bear Camera Event Data

Coefficient	β Value	Standard Error (se)	t-Value	p-Value
Camera Type, ZOI	0.40	0.22	1.34	0.181
Camera Type, Control	0.06	0.30	0.19	0.851
Smooth (Northing)	0.29	0.13	2.28	0.027
Smooth (Month)	0.61	0.83	0.73	0.464

There were a modest number of cameras that recorded grizzly bear events in each of the three zones; the percentage of Camera*Months in the main analysis (effort ≥ 7 days per month) that had at least one event was 21% for Treatment cameras, 29% for ZOI cameras, and 27% for Control cameras (Table 3.6-3). A total of 271 events were recorded on Treatment cameras and 193 on Control cameras (Table 3.6-3). Statistical analyses were carried out on the number of events (rather than occupancy, as for caribou and wolverine). These numbers suggest that there were robust sample sizes to draw predictions in both the Treatment and Control zones.

Table 3.6-3: Summary of Cameras with Months ≥ 7 Days Effort and Total Grizzly Bear Events Recorded

Occupancy[1]		Treatment	ZOI	Control
Unoccupied (no events)	No. Camera*Months[2]	538	321	369
	Percentage (%; of Total)	79	71	73
Occupied (1 or more events)	No. Camera*Months[2]	144	133	135
	Percentage (%; of Total)	21	29	27
	Total Events	**271**	**245**	**193**

Notes:

[1] Table summaries does not include event or effort data collected from Cameras 18, 21, and 22 from June 2016 to September 2022. These data are included in Table 3.6-1 and therefore event summaries will be different.

*[2] Represents individual camera and month combinations. For example, for a single camera that had over a week of camera effort for the monitoring period from June 2016 to September 2022 (except hibernation months November-February, i.e., 51 months) and did not record a bear event, this camera would have a total of 51 unoccupied camera*months. If the same camera were to have recorded bear events in four months, the camera would have a total of four occupied camera*months and 39 unoccupied camera*months.*

Given that there were no differences in the predicted number of grizzly bear events between Treatment and Control cameras, a secondary analysis for a potential ZOI was not necessary. The secondary analysis is performed when a statistical difference is obtained between Treatment and Control zones to determine at what distance the effect may be occurring.

3.6.3.2 Interactions, Incidents, and Mortalities

Two grizzly bear interactions were recorded in 2022. In May 2022, one female and one cub was pushed from the site using a helicopter on the south face of Doris mountain. In August 2022, two bears were pushed by helicopter for four minutes. The bears were foraging along Doris Creek before entering the site. They continued across the underground laydown area and were pushed with a helicopter towards Doris Mountain (Appendix 3.2-4).

3.6.3.3 Wildlife Sightings Log and Incidental Observations

A total of 61 grizzly bears were observed in 2022 in 34 separate sightings (Table 3.6-4; Appendix 3.2-5). Sightings occurred between May and October, with the majority of events in September (n = 11) and July (n = 10). The latest sighting occurred on October 19, 2022. Most of the sightings (n = 20) were of more than one bear and often included young (n = 15). Five sightings were recorded near the TIA and TLR access road, however no bears were noted in the TIA footprint or interacting with the tailings.

Table 3.6-4: Grizzly Bear Sightings and Incidental Observations 2022

General Location	Months	Total Sightings	Total Individuals
Doris Area	May, June, July, August, September, October	15	27
Windy road/ Madrid	May, June, July, September, October	11	17
Airstrip	June, July, August	3	6
TLR/TIA	May, July, September	5	11

The number of grizzly bears observed per on-site personnel each month were calculated (Figure 3.6-2; Appendix 3.2-8); across years, grizzly bear sightings peak in July and August.

3.6.4 Discussion

Grizzly bear were recorded in 233 events throughout the Study Area (i.e., across all camera zones) during the most recent data collection periods in 2020 – 2022. Grizzly bear events were commonly recorded in June through September of all years. Events in the Treatment zone occurred at almost twice the frequency in the Treatment zone compared to the ZOI or Control zones in recent monitoring years. This difference is primarily attributed to abundant grizzly bear events in the summer of 2020 in the Treatment zone. In most years, grizzly bear events are relatively equally common across all camera zones.

Grizzly bear occurrences recorded on remote cameras from June 2016 to September 2021 were compiled and analysed to assess Project related effects on bear occurrence between the Treatment zone (< 2 km from infrastructure) and the Control Zone (> 10 km from infrastructure). Statistical analyses indicated that the chance of detecting a grizzly bear at Treatment cameras was no different than at Control cameras, suggesting that the Project is not influencing the distribution of grizzly bears by either attraction to or by avoidance of the Project. Current management practices, such as waste management practices and responses to grizzly bear interactions and incidents, appear to be effective at reducing potential Project effects to grizzly bears.

One grizzly bear event was recorded by camera 21 at the Roberts Bay Waste Management Facility between September 2021 and September 2022, suggesting effective waste management practices are in place. The bear was recorded in a single set of motion triggered images walking through the area, with no evidence of stopping or investigating. Grizzly bears are occasionally recorded in this area, but lack of repeated records indicate that bears are not being attracted to the Waste Management Facility.

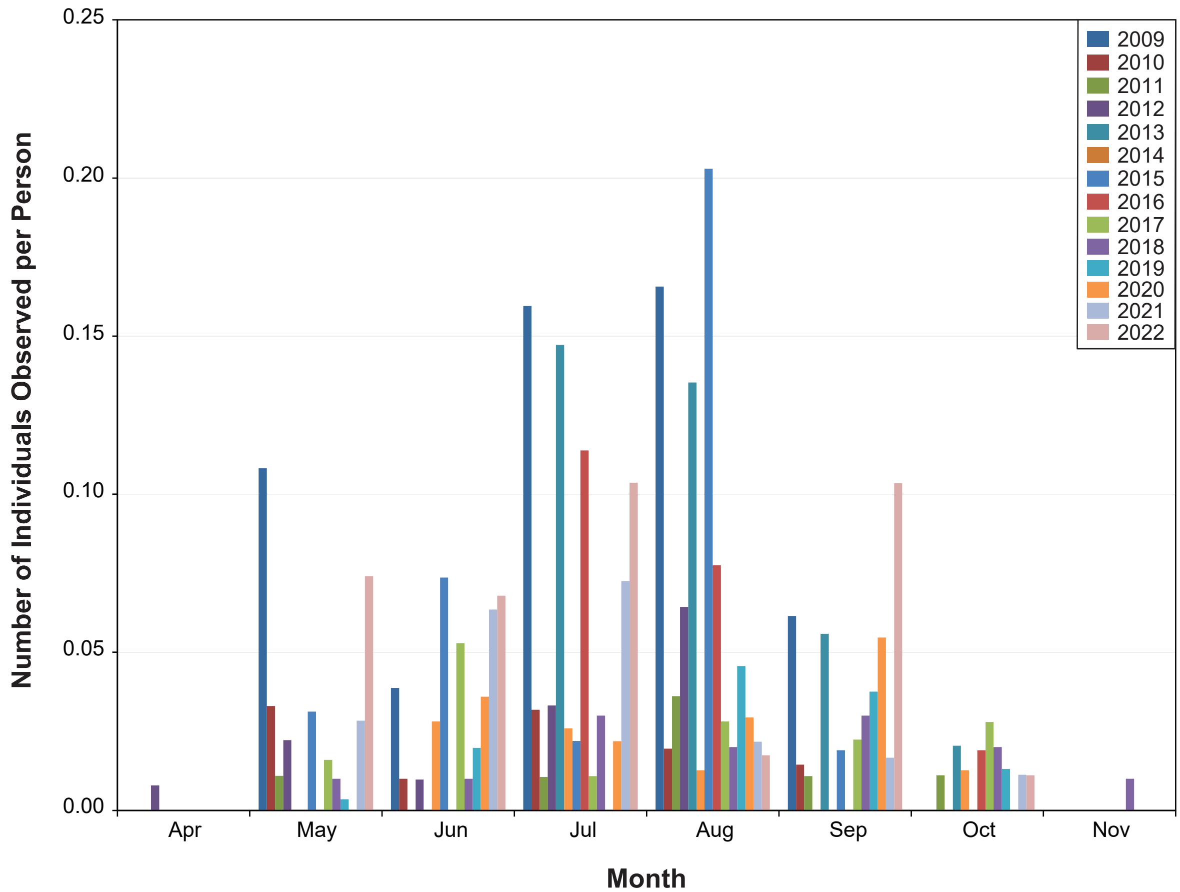


Figure 3.6-2: Number of Grizzly Bear Individuals Recorded per Personnel Present, Hope Bay Project, 2009 to 2022

Grizzly bears were reported in the wildlife sightings log and as part of the interactions, incidents, and mortalities program. In 2022, there were two interactions in which a grizzly bear required helicopter deterrence from the site towards Doris Mountain. There were 34 incidental sightings reported; five sightings recorded near the TIA and TLR access road, however no bears were noted in the TIA footprint or interacting with the tailings. TIA camera 51 also recorded one adult female grizzly bear and single young of year cub in early July 2022. This number is similar to or lower than the number of grizzly bears incidentally reported in other years. The lack of repeated attraction to site facilities indicates that effective mitigation practices are in place. The number of individuals recorded in the wildlife sightings log should not be interpreted as observations of unique individuals (e.g., a population estimate) as it is likely that the same individuals can be counted across time by different observers.

3.7 Wolverine

Wolverine have large home ranges and populations are generally low in the central Arctic (Mulders 2000). This species is an important cultural and economic resource for people in Nunavut and the Northwest Territories. The Canada population of wolverine, including Nunavut, is considered a species of Special Concern by COSEWIC (2014) and under Schedule 1 of the SARA (Government of Canada 2021b). Additionally, in Nunavut wolverines are territorially listed as vulnerable (S3) suggesting they are at moderate risk of extirpation (CESCC 2020). Due to the reliance of wolverine on caribou as their main food source, the distribution and abundance of wolverine is affected by the trends in caribou populations (Banci and Spicker 2016). For example, the abundance of wolverine on Victoria Island was low after caribou abundance decreased in the early 20th century. However, with increasing abundance of caribou on Victoria Island in the 1990s, the wolverine abundance also increased.

3.7.1 FEIS Predictions

The Madrid-Boston predictions included not significant and low magnitude residual effects of disruption of movement and attraction at a geographic extent of the PDA for wolverine (TMAC Resources Inc. 2017).

3.7.2 Methods

The potential effects of Project-related activities on wolverine are monitored through the wildlife camera monitoring program as well as through the Wildlife Sightings/Reporting program, results of which are presented as wildlife interactions, incidents, and mortalities and incidental sightings in Sections 3.7.3.2 and 3.7.3.3. General methods for these programs are described in Section 3.2 and Appendix 2.1-1.

Camera data from June 2016 to September 2022 were summarized and compiled for the purposes of conducting a statistical analysis to investigate whether there were differences between wolverine occupancy at cameras located in the Treatment zone (< 2 km from existing infrastructure) and in the Control zone (> 10 km from existing infrastructure). Wolverine occupancy at a camera was defined as one or more wolverine events at a camera in a month. Therefore, occupancy was modelled as a binomial distribution between cameras with no observations in a given month and cameras with at least one wolverine event at a camera in a given month. A secondary analysis was completed to assess a potential ZOI should a significant difference in the predicted occupancy between Treatment zone and Control zone cameras be detected. The models accounted for spatiotemporal variation in detections by including smoothed terms for northing and easting as well as month, and random variables for camera number and year where these terms improved model fit to the data.

Datasets of 2022 camera effort and detection events are presented in Appendices 3.2-1 to 3.2-3. Compiled datasets of detection events from June 2016 to September 2022 are presented in Appendix 3.7-1.

3.7.3 Results

3.7.3.1 Camera Monitoring

Across the period from June 2016 to September 2022, cameras were active and recording for a total of approximately 65,203 camera days (Table 3.4-1; Appendix 3.2-1). Camera effort within monitoring zones by month is summarized in Table 3.2-1; effort summaries per camera are provided in Appendix 3.2-1. A brief summary of the wolverine events recorded across all cameras during the current monitoring period is provided below. Data from cameras 18, 21, and 22 with specific monitoring objectives are also included in the summary below (see Methods Section 3.2.1).

From the recent monitoring periods (2020-2022), 26 wolverine events were recorded (Figure 3.7-1; Table 3.7-1). Temporally, wolverine events were recorded consistently in April to August of recent years, with occasional records in March (Table 3.7-1; Photo 3.7-1; Appendix 3.2-3). Events were most common in the Control zone (*n* = 12), followed by the ZOI (*n* = 10) and Treatment zone (*n* = 4 Table 3.7-1). In previous years, wolverine events occurred at similar rates and in similar proportions across the camera zones (i.e., lowest in the Treatment zone). Wolverine are almost always recorded as single individuals (Photo 3.7-2).

Photo 3.7-1: Wolverine captured on Control zone camera 33. May 5, 2022.

Facilities Camera Monitoring

Under the current camera design, five cameras have a site specific monitoring objective for wolverine (the same cameras with site specific monitoring objectives for grizzly bear): cameras 18 and 21 at the Roberts Bay Waste Management Facility, camera 22 at the Roberts Lake Outflow and Fish Fence, and cameras 51 and 52 at the north and south end of the TIA. Camera 22 at Roberts Lake Outflow had the only wolverine event among these cameras. One wolverine was recorded on September 14, 2021 and involved a single adult wolverine moving through the area. Camera 22 was knocked down on June 8, 2022, and not fixed until fall servicing, and could have therefore missed wolverine events.

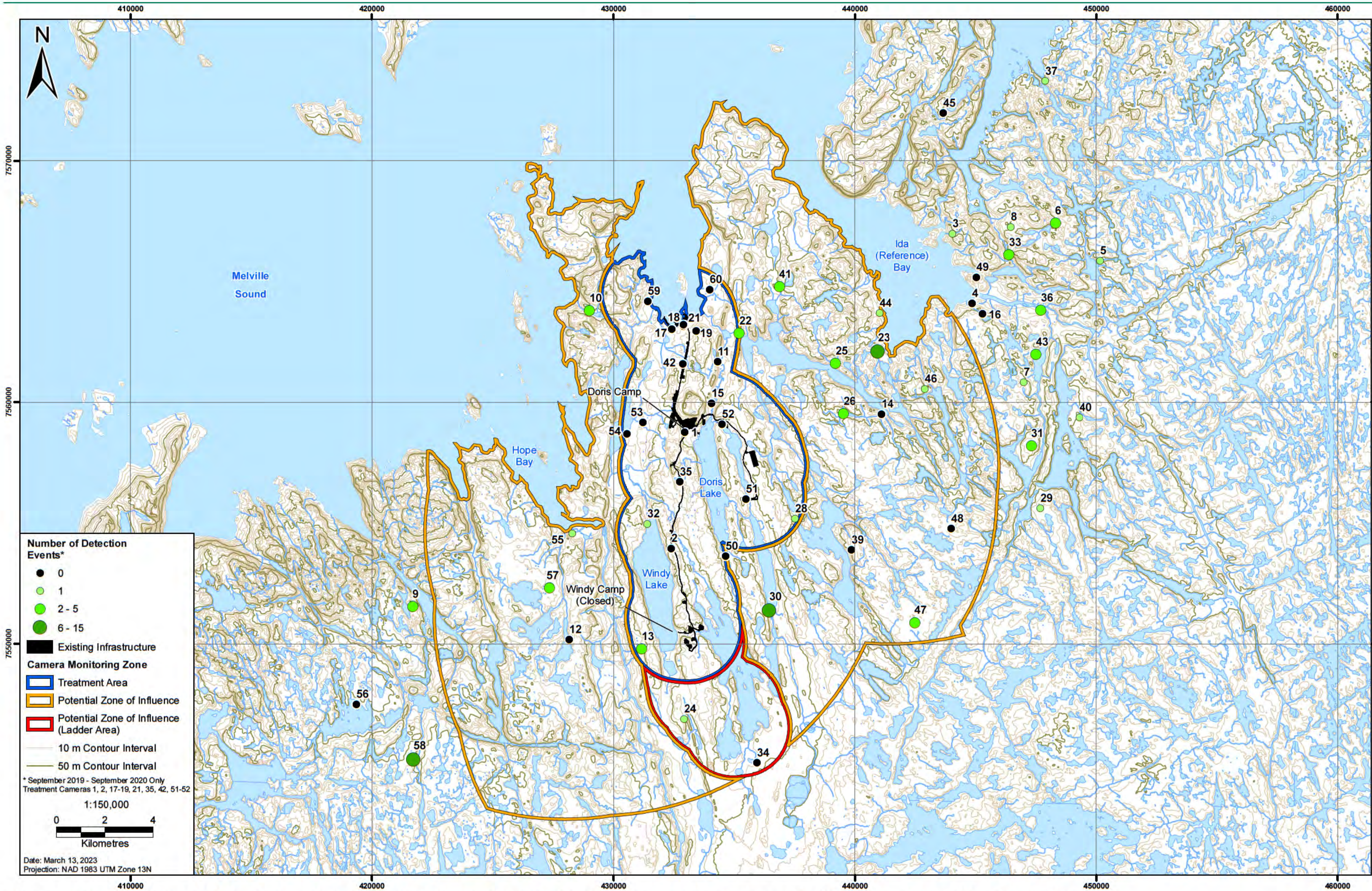


Figure 3.7-1: Detections of Wolverine on Motion-triggered Photos Recorded by Wildlife Cameras, Doris and Madrid Areas, June 2016 to September 2022

Table 3.7-1: Wolverine Events Recorded by Month at Treatment, ZOI, and Control Cameras, January 2020 to September 2022

Year	Month	Treatment Cameras				ZOI Cameras				Control Cameras			
		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]	
				Raw	Corrected			Raw	Corrected			Raw	Corrected
2020	Jan.	83 (10)	-	-	-	7 (2)	-	-	-	0 (0)	-	-	-
	Feb.	185 (14)	-	-	-	78 (7)	-	-	-	20 (2)	-	-	-
	Mar.	398 (17)	-	-	-	225 (9)	-	-	-	80 (5)	1	1	1.15
	April	491 (18)	1	1	1.1	325 (12)	2	2	2.2	276 (12)			
	May	504 (17)	1	1	1.04	349 (12)	1	1	1.04	369 (12)	2	2	2.08
	June	601 (21)	-	-	-	370 (13)	-	-	-	416 (14)	2	3	3
	July	651 (21)	-	-	-	351 (12)	-	-	-	376 (13)	-	-	-
	Aug.	632 (21)	-	-	-	279 (9)	-	-	-	338 (12)	-	-	-
	Sept.	585 (21)	-	-	-	262 (9)	-	-	-	260 (10)	-	-	-
	Oct.	460 (19)	-	-	-	147 (7)	-	-	-	127 (7)	-	-	-
	Nov.	154 (15)	-	-	-	26 (3)	-	-	-	10 (3)	-	-	-
	Dec.	47 (10)	-	-	-	3 (1)	-	-	-	9 (2)	-	-	-
2021	Jan.	84 (7)	-	-	-	2 (1)	-	-	-	0 (0)	-	-	-
	Feb.	179 (16)	-	-	-	17 (2)	-	-	-	3 (1)	-	-	-
	Mar.	397 (18)	-	-	-	77 (3)	1	1	1.15	66 (4)	-	-	-
	April	497 (18)	-	-	-	77 (4)	-	-	-	78 (4)	-	-	-
	May	530 (19)	-	-	-	122 (4)	-	-	-	123 (4)	-	-	-
	June	510 (19)	-	-	-	302 (13)	-	-	-	451 (19)	2	2	2
	July	546 (18)	-	-	-	379 (13)	1	1	1.03	443 (16)	-	-	-
	Aug.	556 (18)	-	-	-	322 (12)	1	1	1.09	379 (13)	-	-	-
	Sept.	544 (20)	1	1	1.14	294 (15)	-	-	-	331 (17)	-	-	-
	Oct.	516 (19)	-	-	-	380 (16)	-	-	-	360 (17)	1	1	1.19
	Nov.	278 (17)	-	-	-	167 (11)	-	-	-	124 (9)	-	-	-
	Dec.	60 (6)	-	-	-	25 (3)	-	-	-	11 (1)	-	-	-

Year	Month	Treatment Cameras				ZOI Cameras				Control Cameras			
		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]	
				Raw	Corrected			Raw	Corrected			Raw	Corrected
2022	Jan.	41 (3)	-	-	-	0 (0)	-	-	-	0 (0)	-	-	-
	Feb.	76 (9)	-	-	-	14 (3)	-	-	-	0 (0)	-	-	-
	Mar.	296 (15)	1	1	1.15	146 (7)	-	-	-	85 (6)	1	1	1.15
	April	444 (16)	-	-	-	279 (11)	1	1	1.1	242 (11)	-	-	-
	May	502 (19)	-	-	-	384 (16)	1	1	1.04	367 (18)	1	1	1.04
	June	476 (17)	-	-	-	458 (16)	1	1	1	405 (15)	-	-	-
	July	465 (15)	-	-	-	439 (15)	-	-	-	408 (14)	1	1	1.03
	Aug.	498 (17)	-	-	-	431 (14)	1	1	1.09	373 (14)	-	-	-
	Sept.	395 (17)	-	-	-	286 (13)	-	-	-	223 (11)	-	-	-
	Total[3]	**-**	**4**	**4**	**4.43**	**-**	**10**	**10**	**10.74**	**-**	**11**	**12**	**12.64**

[1] *Camera effort is presented as the total number of camera days by month; number of cameras with at least one camera day (i.e., unobscured) presented in parenthesis.*

[2] *Events are presented as the number recorded by cameras (raw) as well as the number of events corrected for the monthly darkness factor (corrected).*

[3] *Total number of cameras with events represents the number of unique cameras with events across the monitoring period. Total number of events is the cumulative total across the monitoring period.*

Photo 3.7-2: Wolverine captured on ZOI zone camera 41. May 23, 2022.

Statistical Analysis

A statistical analysis was conducted to determine whether wolverine occupancy (probability of at least one wolverine event at a camera in a month) was different between the Treatment zone and Control zone. Wolverine events are generally rare, and previous modelling had been constrained by low data availability. Model selection included variables controlling for spatial and temporal correlation, with a smooth function for location (northing and easting) and month, in addition to the main effect variable for camera zone.

There was a significant difference in predicted wolverine occupancy between the Control and Treatment zones ($p < 0.01$), and between the Treatment zone and potential ZOI ($p < 0.01$; Table 3.7-2). The best fitting model did not include the smooth functions for easting, northing, or month, indicating that these variables are not impacting the probability of wolverine occurrence at cameras. The significant difference between the Treatment and ZOI camera zones in the main analysis indicates a potential ZOI is occurring within 2 km of infrastructure.

Table 3.7-2: Summary of Treatment vs. Control Model Coefficients and Significance Level for Wolverine Camera Occupancy Data

Coefficient	β Value	Standard Error (se)	t-Value	p-Value
Camera Type, ZOI	2.233	0.599	3.727	0.0002*
Camera Type, Control	2.450	0.588	4.160	0.0001*

** Indicates significant difference in wolverine occupancy compared to Treatment zone.*

A secondary regression analysis was conducted to investigate for a potential ZOI for wolverine. The best fit model was similar to the categorical model, with only the distance from infrastructure variable providing optimal model fit. The significant effect of distance to infrastructure in the follow up regression ($p < 0.001$;

Table 3.7-3) suggests that a ZOI is occurring for wolverine around the Study Area, and wolverines may be avoiding Project infrastructure. However, the model did not indicate a clear cut point (levelling of the predicted occupancy with greater distance to infrastructure), which therefore does not provide a conclusive ZOI for wolverine. The probability of wolverine occupancy at wildlife cameras, visualized with a linear model in Figure 3.7-2, indicates generally very low wolverine occupancy across the Study Area. The probability of occupancy increases from roughly 0.025 to 0.10 (i.e., 2.5 to 10% probability) between 0 km and 20 km from infrastructure. The predicted probability of occupancy values vary across distances, showing variation in wolverine occupancy among both closer distances to infrastructure (< 5 km) and farther distances (> 10 km; indicated by the predicted values plotted along with the model lines). This variation suggests that wolverines are not altogether avoiding the Project area, but are more likely to occur at greater distances from infrastructure.

Table 3.7-3: Summary of Smoothed Term Outputs and Significance Level for the Potential ZOI Model for Wolverine Camera Occupancy Data

Term/Coefficient	β Value	Standard Error (se)	t-Value	p-Value
Distance to Infrastructure	0.724	0.206	3.518	0.0005*

Note: model terms are smoothed with non-linear splines.

** Indicates significant difference in wolverine occupancy compared to Treatment zone.*

These results should be interpreted with caution because wolverine events remain extremely low compared to the number of active camera months. Less than 1% Camera*Months (effort ≥ 7 days per month) had at least one wolverine event in the Treatment zone, while the ZOI had 5% and the Control zone had 6% Camera*Months with at least one event (Table 3.7-4).

Table 3.7-4: Summary of Cameras with Effort ≥ 7 Days in a Month and Wolverine Occupancy

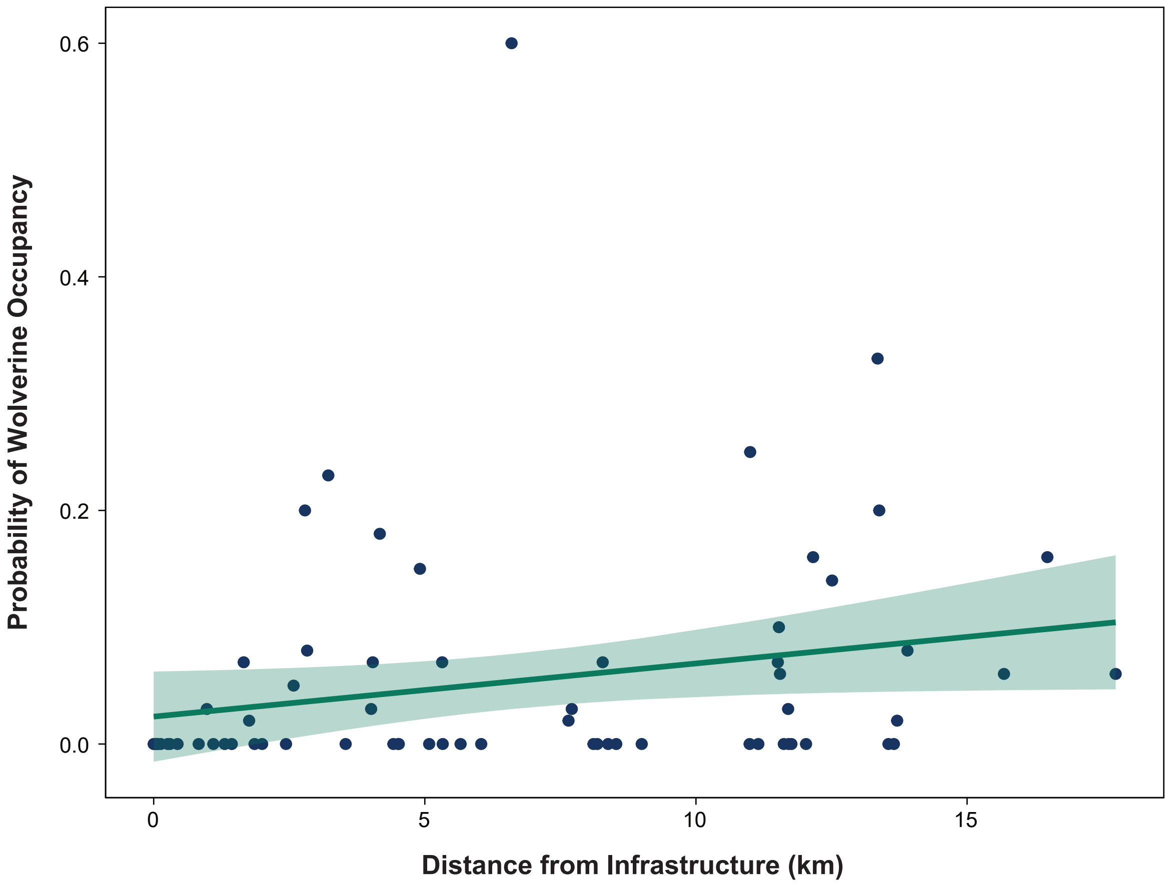
Occupancy[1]		Treatment	ZOI	Control
Unoccupied (no events)	No. Camera*Months[2]	742	461	482
	Percentage (%; of Total)	99.33	94.66	93.59
Occupied (1 or more events)	No. Camera*Months[2]	5	26	33
	Percentage (%; of Total)	0.67	5.34	6.41
Total Events		**6**	**35**	**47**

[1] Table summaries does not include event or effort data collected from Cameras 18, 21, and 22 from June 2016 to September 2021. Effort data for these three cameras are included in Table 3.7-1.

*[2] Represents individual camera and month combinations. For example, for a single camera that had over a week of camera effort for the monitoring period from June 2016 to September 2022 (except December and January, i.e., 64 months) and did not record a wolverine event, this camera would have a total of 64 unoccupied camera*months. If the same camera were to have recorded wolverine events in four months, the camera would have a total of four occupied camera*months and 60 unoccupied camera*months.*

3.7.3.2 Interactions, Incidents, and Mortalities

No wolverine interactions, incidents or mortalities were recorded during 2022.



Note: Shaded area indicates 95% Confidence Intervals.

Figure 3.7-2: Probability of Wolverine Occupancy at Wildlife Cameras by Distance from Infrastructure

3.7.3.3 Wildlife Sightings Log and Incidental Observations

No sightings or incidental observations of wolverines were recorded during 2022.

Wolverines have been recorded variably across years, with sightings most commonly occurring in late winter (January to May; Figure 3.7-3). Very few individual wolverines are typically seen in a given year compared to other large mammal VECs (see Sections 3.4 to 3.6).

3.7.4 Discussion

Wolverine were recorded in low numbers throughout the Study Area (i.e., across all camera zones) during recent years (2020-2022). Events were recorded in similar numbers to previous monitoring years, with 27 wolverine events recorded during the recent monitoring period. Almost all wolverine cameras events recorded have been of one individual; a single event in July 2021 was the first time two wolverines have been recorded at once.

Wolverine occupancy (at least one event at a camera in a month) was compiled from wildlife cameras using data from June 2016 to September 2022. Analysis was conducted to assess Project related effects on wolverine occupancy between the Treatment zone (< 2 km to infrastructure) and the Control zone (> 10 km from infrastructure). The analysis accounted for spatiotemporal variation in the data by including smooth functions for month and location (northing and easting) and random variables for camera number and year.

Consistent with results from 2021, the analyses indicated that wolverine occupancy differed in the Treatment zone compared both the Control zone and the potential ZOI (2 to 10 km from infrastructure). A secondary analysis was conducted using continuous distance from infrastructure as a variable, with visualization showing that the probability of wolverine occupancy at wildlife cameras is very low overall but gradually increases from 2.5% to 10% as the distance from infrastructure increases to 20 km. The secondary analysis did not indicate any cut point (levelling of the predicted occupancy with greater distance to infrastructure), which therefore does not provide a conclusive ZOI for wolverine. The significant difference between the Treatment and ZOI camera zones in the main analysis indicates a potential ZOI is occurring within 2 km of Infrastructure. Current results should be interpreted with caution because wolverine detections through the camera program remain rare. This is the second year that wolverine data have been sufficient to run full hypothesis test models, and data volume is likely to continue improving with additional years of the camera program. Therefore, results may change and are likely to improve in accuracy in future years.

The Madrid-Boston predictions included not significant and low magnitude residual effects of disruption of movement and attraction at a geographic extent of the PDA for wolverine (TMAC Resources Inc. 2017). Current analyses indicate that wolverine may be exhibiting avoidance of Project infrastructure at greater distances, potentially within around 2 km of infrastructure. This result is contrary to the FEIS prediction that wolverine may be attracted to the Project. Using the criteria for residual effects ratings from the FEIS, the current effect would be categorized as a low magnitude, medium duration, and reversible not significant effect (TMAC Resources 2017). Wolverine have very large home ranges compared to the Project area, and potential avoidance is unlikely to impact a significant portion of any individual's territory. Home ranges of wolverines vary by sex, ranging from 100 km^2 for an adult female to over 600 km^2 for an adult male (Copeland and Whitman 2003).

The baseline data from the FEIS and supporting research for wolverine around industry projects are very sparse, in large part due to the low density of wolverine populations in the Study Area and subsequent difficulty studying them. Low densities of wolverine in this area have been confirmed through other studies. A two-year wolverine DNA study in the northern portion of the Project Study Area in 2010 and 2011 estimated a relative density of 5.4 to 6.4 wolverine per 1,000 km^2 (Rescan 2011). Population densities of wolverine in other areas of the Canadian tundra are approximately 1.25 to 25 individuals per 1,000 km^2, depending on habitat and the availability of prey (Persson, Wedholm, and Segerstrom 2010; Inman et al. 2012).

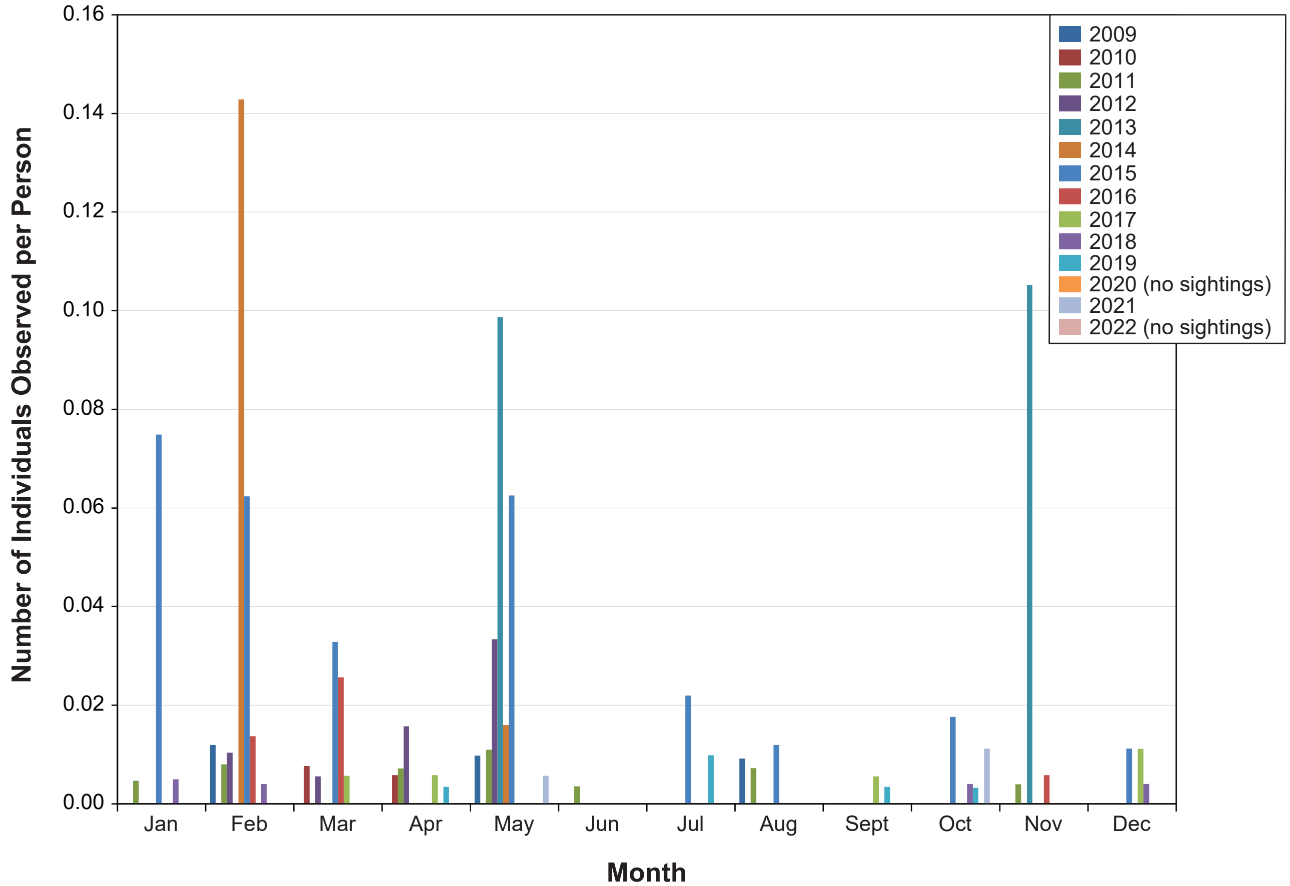


Figure 3.7-3: Number of Wolverine Individuals Recorded per Personnel Present, Hope Bay Project, 2009 to 2022

Wolverine occupancy may also vary in the Project area due to natural differences in habitat and prey availability. For example, in winter caribou have been noted to be more common through the rocky areas surrounding the Project, rather than the low lying Green Belt where the mine site is situated. Wolverine may follow similar patterns, tracking caribou as their main form of prey. Because the camera program was implemented in its current design in 2016 after Project construction had commenced, there is no way to distinguish between natural environmental variation in species occurrence compared to distribution changes due to the presence of the Project.

From specific facility monitoring cameras, one wolverine was recorded on camera 22 at the Roberts Bay Outflow/ Fish Fence in September 2021. Wolverine were not recorded at the other cameras that monitor areas which may be attractants, or in the vicinity of the TIA in 2022. The FEIS predicted a low magnitude residual effect for attraction to the Project for wolverine, but monitoring to date does not indicate any attraction of wolverine to the Project.

There were no incidents, interactions or mortalities of wolverine or incidental sightings of wolverines in 2022.

3.8 Nest Predators

Nest predators include omnivorous or carnivorous species that frequently depredate bird nests. In the Project area, this includes Arctic fox (*Vulpes lagopus*), red fox (*Vulpes vulpes*), grey wolf (*Canis lupus*), common raven (*Corvus corax*), gulls (*Laridae sp.*), and small-bodied mammals such as weasels (*Mustilidae sp.*).

3.8.1 FEIS Predictions

The attraction of nest predators to Project infrastructure, which could cause indirect mortality of nesting upland breeding birds and waterbirds, was not predicted to be a residual effect (TMAC Resources Inc. 2017).

3.8.2 Methods

Nest predators are monitored through the wildlife camera monitoring program as well as through the Wildlife Sightings/Reporting program. General methods for these programs are described in Section 3.2.

For nest predators detected at cameras, small-bodied mammals such as weasels are excluded from analysis because of very low detections of these species by wildlife cameras.

3.8.3 Results

3.8.3.1 Camera Monitoring

The following section presents the results of detections of potential nest predators from May 15 to August 15, in 2022 (i.e., during the bird nesting period in the Arctic). Across this period from May to August, available cameras were active and recording for a total of 5,206 camera days (Table 3.8-1).

From May 15 to August 15, 2022, there were a total of 17 unique events recorded that contained potential nest predators (Table 3.8-1; Figure 3.8-1; Appendix 3.2-3). Events were generally consistent across months, but were more common in the ZOI (*n* = 10) than the Treatment or Control zones (*n* = 4 and 3 respectively; Table 3.8-1). Recorded nest predators in the 2022 bird nesting period included red fox (*n* = 2; Photo 3.8-1), unspecified fox (*n* = 13), and common raven (*n* = 2). Nest predator events typically consist of one individual. The observed number of individuals does not represent the total number of unique individuals that were present due to the possibility of double-counting the same individuals both temporally and spatially.

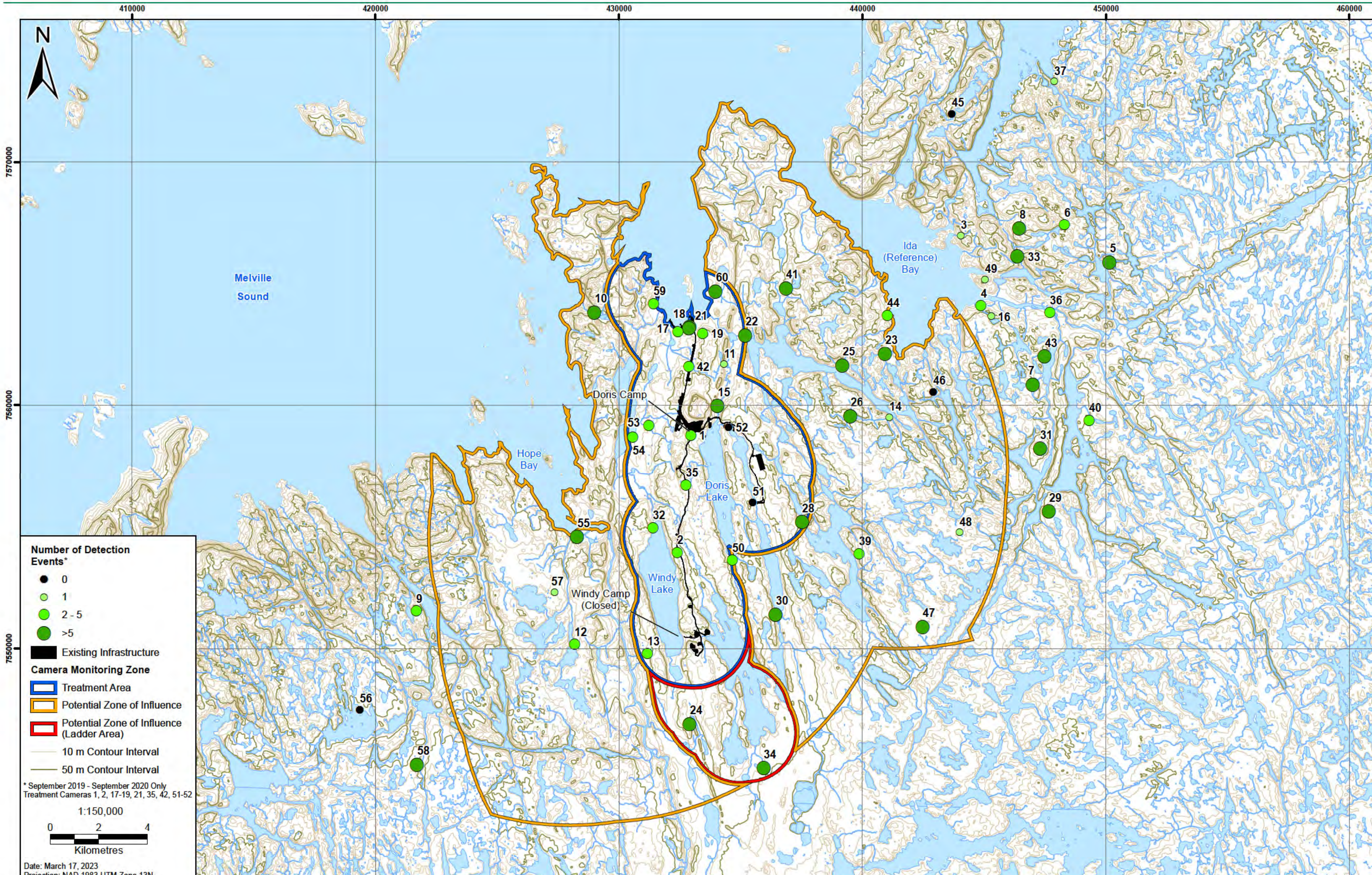


Figure 3.8-1: Detections of Nest Predators on Motion-triggered Photos Recorded by Remote Cameras, Doris and Madrid Areas, September 2018 to September 2022

Table 3.8-1: Nest Predator Events Recorded by Month at Treatment, ZOI, and Control Cameras, May 15 to August 15, 2022

Year	Month	Treatment Cameras				ZOI Cameras				Control Cameras			
		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]		Camera Effort[1]	No. Cameras with Events	No. Events[2]	
				Raw	Corrected			Raw	Corrected			Raw	Corrected
2022	May	502 (19)	2	3	3.12	384 (16)	3	4	4.16	367 (18)	1	2	2.08
	June	476 (17)	1	1	1	458 (16)	2	3	3	405 (15)	-	-	-
	July	465 (15)	-	-	-	439 (15)	1	1	1.03	408 (14)	1	1	1.03
	Aug.	498 (17)	-	-	-	431 (14)	1	2	2.18	379 (13)	-	-	-
	Total[3]	**-**	**3**	**4**	**4.12**	**-**	**4**	**10**	**10.37**	**-**	**2**	**3**	**3.11**

[1] Camera effort is presented as the total number of camera days by month; number of cameras with at least one camera day (i.e., upright) presented in parenthesis.

[2] Events are presented as the number recorded by cameras (raw) as well as the number of events corrected for the monthly darkness factor (corrected).

[3] Total number of cameras with events represents the number of unique cameras with events across the entire monitoring period. Total number of events is the cumulative total across the entire monitoring period

Photo 3.8-1: Red fox captured on Treatment zone camera 50. May 22, 2022.

Facilities Camera Monitoring

Under the current camera design, there are five cameras that have site specific monitoring objectives for nest predators (the same cameras with site specific monitoring objectives for grizzly bear): cameras 18 and 21 at the Roberts Bay Waste Management Facility, camera 22 at the Roberts Lake Outflow/ Fish Fence, and cameras 51 and 52 at the north and south end of the TIA. Individual camera effort information is in Appendix 3.2-1.

The only nest predator event during the breeding bird period from May 15 to August 15 2022 consisted of one red fox recorded on camera 21 at the Roberts Bay Waste Management Facility.

No nest predators have ever been recorded at the TIA cameras (cameras 51 and 52), which suggests that use of the areas surrounding the tailings dams by nest predators is infrequent at present. The presence of nest predators such as foxes and wolves in this area may also be noted through the Wildlife Sightings/Reporting process, as discussed below.

3.8.3.2 Interactions, Incidents and Mortalities

One incident involving nest predators was recorded in 2022 (Appendix 3.2-4). The incident involved a dead red fox found on the side of the road on February 7th, 2022. The red fox was believed to have died of natural causes due to the lack of visible crush or impact injuries. Under the Wildlife Mitigation and Monitoring Plan (Agnico Eagle Mines Ltd. 2021), this incident was reported to the Kitikmeot Inuit Association (KIA), Nunavut Impact Review Board (NIRB) and the Government of Nunavut Department of Environment (GN DoE).

3.8.3.3 Wildlife Sightings Log and Incidental Observations

Forty incidental sightings of potential nest predators were recorded in 2022, primarily red foxes (*n* = 30 sightings; Appendix 3.2-5). Additional records include three wolf sightings, two arctic fox sightings, two unidentified fox sightings, two raven sightings, and one gull sighting (Appendix 3.2-5). All red fox sightings were of single individuals, except for a pair observed in April and two sightings with kits in July. Sightings generally occurred in the Doris area (*n* = 16) and Windy Road/ Madrid area (*n* = 15; Table 3.8-2). All four sightings near the TIA and TLR access road were of red foxes, and did not include any records of animals on the footprint of the TIA or interacting with tailings.

Table 3.8-2: Nest Predator Sightings Log and Incidental Observations 2022

General Location	Months	Total Sightings	Total Individuals
Doris Area	January, February, April to June, September, October, December	16	18
Windy road/ Madrid	March, April, May, June, July, October, November	15	22
Airstrip	September	1	1
TLR/TIA	March, November	4	4
Boston	June, August	3	3
Not Specified	July	1	1

Observations of nest predators recorded on site per personnel between May and August across years are illustrated in Figure 3.8-2. Observations typically peak in May and decrease through the summer, with the highest proportion of nest predators per on site personnel from 2013-2014 (Figure 3.8-2).

3.8.3.4 Species of Conservation Concern

None of the nest predator species known to occur in the Study Area are listed as species of conservation concern federally or in Nunavut.

3.8.4 Discussion

Nest predator events in 2022 were summarized during the breeding period for migratory birds (May 15 to August 15). Nest predator observations included red fox, unidentified fox, and common raven. Events were generally consistent across all camera zones and all monitoring months (May to August). A lone red fox was the only nest predator recorded at a camera with specific monitoring objectives. This event occurred at camera 21, which monitors activity at the Roberts Bay Waste Management Facility. There were no potential nest predator camera events or sightings recorded at the TIA, indicating that use of this area by nest predators is likely low.

Forty sightings of nest predators, the majority red fox individuals were recorded in the wildlife sightings log in 2022. The number of individuals recorded in the wildlife sightings log should not be interpreted as observations of unique individuals (e.g., a population estimate) as the same individuals can be counted across time. No den sites were noted on or under infrastructure. These sightings indicate that building skirting (to prevent wildlife access) and routine inspections for denning potential have been effective mitigation strategies for preventing potential nest predators from denning on infrastructure. Overall, sightings of nest predator species are more common in May than June through August (Figure 3.8-2). Red fox, grey wolf, and common raven are the most commonly detected nest predator species, while Arctic fox and birds (gulls and jaegers) are less frequently recorded.

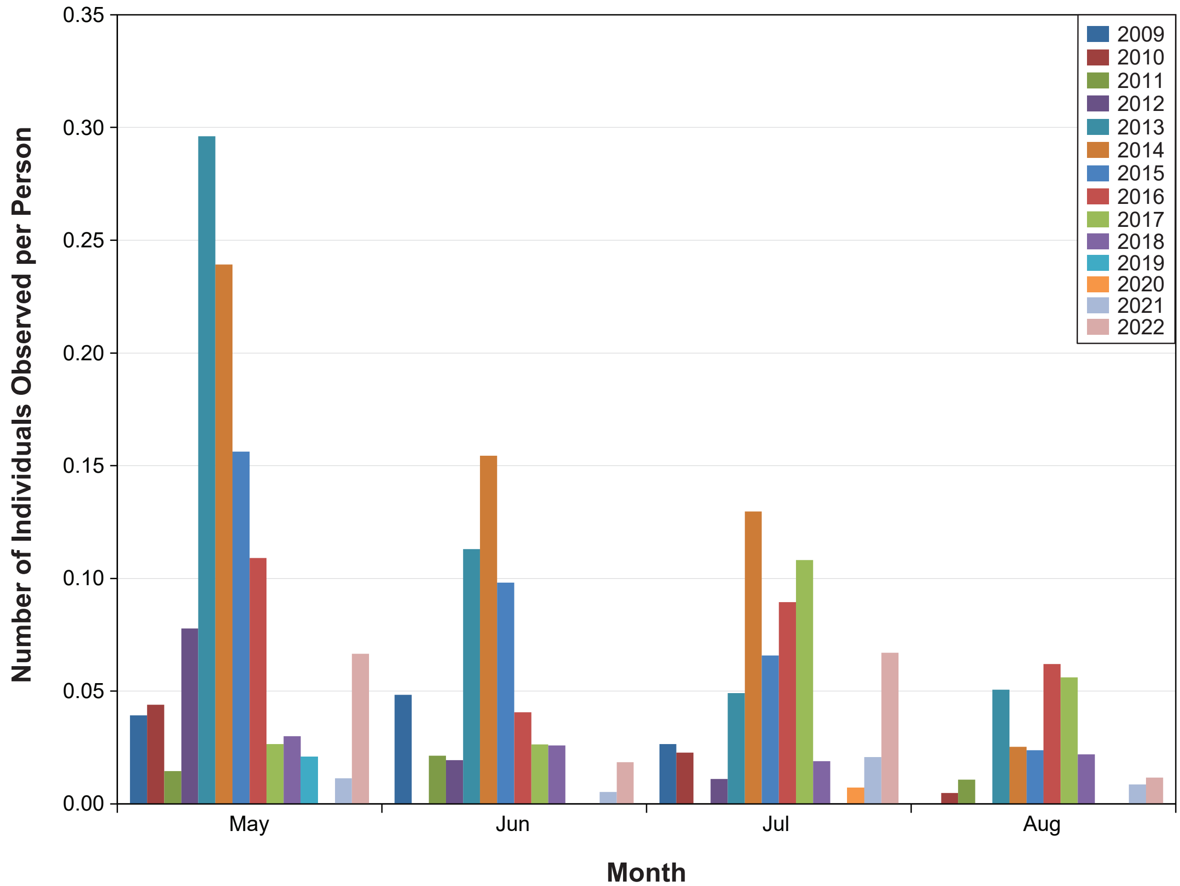


Figure 3.8-2: Number of Nest Predator Individuals Recorded per Personnel Present between May and August, Hope Bay Project, 2009 to 2022

3.9 Upland Breeding Birds

Upland breeding birds include passerines and shorebirds. Upland breeding bird monitoring was conducted in 2022 to contribute a regional upland bird monitoring program for the Canadian Arctic led by CWS, as described in the WMMP Plan (Agnico Eagle Mines Ltd. 2021).

The Doris upland bird monitoring compliance program was paused from 2018-2021 while under active discussion and review with CWS and the KIA. Long term monitoring and analyses from 2006 to 2019 concluded that effects of the Project could not be detected beyond 100-200 m, which is within the predicted effects of 500-1,000 m from the 2006 FEIS.

In early 2021 the upland bird program was officially discontinued for Project effects purposes; monitoring has shifted to contribute to the CWS regional monitoring program. As described in the WMMP, survey plots were selected by CWS from the Program for Regional and International Shorebird Monitoring (PRISM) database and monitored every 5 years. Where possible, the monitoring will be split into two consecutive years of monitoring (i.e., 12 plots one year, and the remaining 12 plots the following year; (Agnico Eagle Mines Ltd. 2021)). The first year of PRISM surveys for the regional upland bird monitoring program was conducted in 2022.

Upland breeding bird monitoring is also conducted every two years to monitor bird use of the habitat around the TIA, in compliance with Term and Condition 26 of Project Certificate No. 009 (NIRB 2018, Agnico Eagle Mines Ltd. 2021). This monitoring was conducted in 2021, and therefore was not repeated in 2022.

Pre-clearing surveys for upland bird nests are conducted if clearing of natural vegetation occurs within the reproductive period for birds in the Arctic (May to August; ECCC 2016). However, pre-clearing surveys for nesting birds were not conducted in 2022, because clearing of new areas did not occur during the breeding bird period in 2022 (see Section 2.1).

3.9.1 FEIS Predictions

The Madrid-Boston FEIS predictions included two potential residual effects for upland breeding birds: a not significant and a negligible magnitude residual effect of disturbance at a geographic extent of the LSA, and a not significant and low magnitude residual effect of direct mortality at the geographic extent of the PDA for upland breeding birds (TMAC Resources Inc. 2017).

3.9.2 Methods

The potential effects of Project-related activities on upland breeding birds are monitored through the wildlife interactions, incidents, and mortalities program and incidental sightings program; these records are qualitatively assessed for trends. General methods for these programs are described in Section 3.2 and raw data are in Appendices 3.2-5 to 3.2-7.

3.9.2.1 Regional PRISM Plots

Ground-based surveys following the Program for Regional and International Shorebird Monitoring (PRISM) protocol were completed in 2022. PRISM surveys were completed at 12 high priority plots designated by CWS. All plots have been previously surveyed by CWS prior to 2022. Field surveys were conducted in late June and early July to correspond to the upland bird nesting season. Plots are 300 m × 400 m in size (12 ha) and location coordinates were provided by CWS.

PRISM plots were surveyed following protocols developed by CWS, except surveys were conducted with three observers instead of two (CWS 2017). Sites were accessed by helicopter, with landing locations spaced at least 200 m from plots to minimize disturbance to birds. Habitat, weather, and noise variables were recorded at the beginning of each survey to North American Breeding Bird Survey standards (Environment Canada 2017), and plot photos were taken from at least one corner of the plot. Observers systematically surveyed the plot area starting from one corner and walking in tandem along north south transects at a distance of approximately 15-20 m from one another (see Figure 6.1-1 in Appendix 2.2-1).

During each PRISM plot survey, the team mapped all bird species within the plot area according to species and, when possible, to sex. As surveys proceeded, one observer characterized and mapped the specific vegetation types within each plot area. Breeding territories within a plot were determined based on behavioural cues of breeding (carrying food or nest materials, observed in courtship or copulation, being paired, alarm calling, distraction displays, tending to a nest, or flushing), and any active nests found during surveys. All nests located during PRISM surveys were geo-referenced and photographed at the time of detection. Some breeding birds were recorded as nesting within the plot based on behaviour, even when the precise nest location was not determined (to avoid potentially disrupting a nest). Appendix 2.2-1 provides further methods details for PRISM plots.

3.9.3 Results

3.9.3.1 Regional PRISM Plots

PRISM surveys of 12 plots were conducted between June 30 and July 5, 2022 (Figure 3.9-1; Appendix 3.9-1). Most plots had mixed habitat types with aquatic portions; seven of the plots contained or partially contained ponds and three plots contained small streams. Plot topography ranged between flat, hilly, undulating, and rolling. Plots varied extensively in the proportions of upland and lowland habitat types (e.g., barren, herbaceous, shrubby, etc.).

PRISM plot surveys averaged 1 hour 21 minutes per plot (range: 1 to 2 hours) for a total survey time of 16.33 hours for completion of 12 PRISM plots. Weather was generally mild, with an average temperature of 12.6°C (range: 7 to 20°C) and average wind speed 0 to 16 km/h (0 to 4 on the Beaufort scale; Appendix 3.9-1).

Among the 12 PRISM plots, a total of 257 individuals (47 solo males, 12 solo females, 55 pairs, 74 unknown, and 14 nestlings or fledglings; Appendix 3.9-2) of 21 species were detected (Table 3.9-1). Three unknown birds were also recorded. Eight upland breeding bird species, six shorebird, and seven waterbird species were recorded (Table 3.9-1). Six species, four waterbird and two upland breeding species, were only detected incidentally (i.e., did not land in the survey plot or were seen before or after surveying; Table 3.9-1). Shorebirds were recorded in six of 12 PRISM plots. Least sandpiper (*n* = 24) was the most abundant shorebird species and was detected at six PRISM plots. Five shorebird nests were detected, and two nests (least sandpiper and pectoral sandpiper) contained young (Appendix 3.9-2).

The most abundant species throughout all PRISM plots was the Lapland longspur (*n* = 78), with individuals observed at 11 of the 12 PRISM plots (Table 3.9-1; Appendix 3.9-2). Savannah sparrows (*n* = 42) were the second most abundant species and were observed at all 12 PRISM plots. A total of 21 upland breeding bird nests were detected during PRISM surveys (Photo 3.9-1). Of the 21 detected nests, eight had confirmed nestlings or fledglings. Higher densities of nesting were observed in moist and lowland habitats compared to dry upland, rocky habitats.

Species abundance at plots ranged from two to nine species with a mean of six species observed. PRISM plots HOB-003 (*n* = 9) had the highest number of observed species observed while HOB-002 (*n* = 2) had the lowest number of observed species.

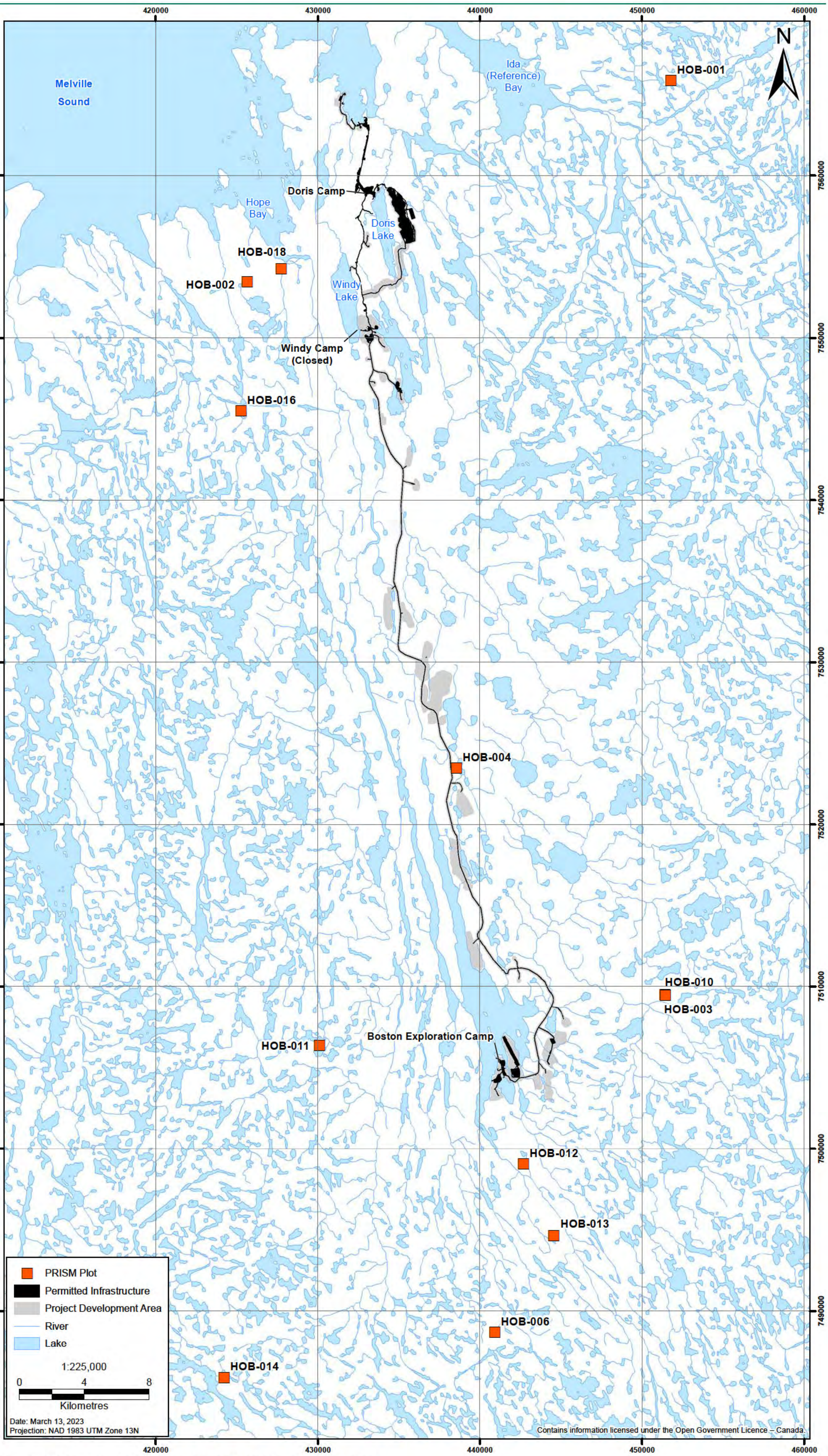


Figure 3.9-1: Locations of PRISM Plot Surveys, 2022

Table 3.9-1: Species Observations during PRISM Plot Surveys 2022

Species Group	Species Common Name	Scientific Name	Number of PRISM Plots
Upland Breeding Birds	American Pipit	*Anthus rubescens*	Incidental
	American Tree Sparrow	*Spizella arborea*	4
	Common Redpoll	*Acanthis flammea*	8
	Harris's Sparrow	*Zonotrichia querula*	Incidental
	Horned Lark	*Eremophila alpestris*	4
	Hoary Redpoll	***Acanthis hornemanni***	**1**
	Lapland Longspur	*Calcarius lapponicus*	11
	Savannah Sparrow	*Passerculus sandwichensis*	12
	White-crowned Sparrow	*Zonotrichia leucophrys*	2
	Willow Ptarmigan	*Lagopus lagopus*	3
Shorebirds	American Golden Plover	*Pluvialis dominica*	1
	Dunlin	*Calidris alpina*	1
	Least Sandpiper	*Calidris minutilla*	6
	Pectoral Sandpiper	*Calidris melanotos*	1
	Red-necked Phalarope	***Phalaropus lobatus***	**2**
	Semipalmated Sandpiper	*Calidris pusilla*	2
Waterbirds	Canada Goose	*Branta canadensis*	1
	Common Loon	*Gavia immer*	Incidental
	Greater Scaup	*Aythya marila*	3
	Greater White-fronted Goose	*Anser albifrons*	Incidental
	Green-winged Teal	*Anas carolinensis*	1
	Herring Gull[†]	*Larus argentatus*	1
	Long-tailed duck	*Clangula hyemalis*	3
	Pacific Loon	*Gavia pacifica*	2
	Red-breasted Merganser	*Mergus serrator*	1
	Red-throated Loon	*Gavia stellata*	Incidental
	Tundra Swan	*Cygnus columbianus*	Incidental
Unknown	Unknown		3

*Notes: Species of conservation concern in **bold.***

[†] Refers to bird species considered nest predators.

3.9.3.2 Interactions, Incidents, and Mortalities

One incident involving upland breeding birds was recorded in 2022 (Appendix 3.2-4). The incident involved a ptarmigan on February 11, 2022. While traveling on the TLR at night in a Kubota, a flock of ptarmigan took flight in front of the vehicle. One ptarmigan made contact with the windshield and was displaced off the road. No remains were found the next day and it is assumed the carcass was taken by a predator. Under the Wildlife Mitigation and Monitoring Plan (Agnico Eagle Mines Ltd. 2021), the incident was reported to the Kitikmeot Inuit Association (KIA), Nunavut Impact Review Board (NIRB) and the Government of Nunavut Department of Environment (GN DoE).

Photo 3.9-1: Lapland longspur nest with nestlings detected during PRISM plot surveys at HOB-003. July 03, 2022.

3.9.3.3 Wildlife Sightings Log and Incidental Observations

Upland breeding birds were observed in 33 separate sightings in 2022 (Appendix 3.2-5). The majority of sightings (*n* = 28) were of ptarmigan (willow and unspecified). Groups of more than 20 ptarmigan were observed on 8 occasions, including one group of 60 on April 23, south of the helipad. Most sightings were in the Doris area (Table 3.9-2). Additional sightings included eight snow buntings flying over Windy Road, four semipalmated plovers at the fish fence at Roberts Bay Outflow, one snow bunting at Roberts Bay, and one American robin near Doris Creek bridge.

Table 3.9-2: Upland Breeding Birds Sightings and Incidental Observations 2022

General Location	Months	Total Sightings	Total Individuals
Doris Area	January to April, July, August, December	20	228
Windy road/ Madrid	March, April, November	8	212
Airstrip	April	2	12
TLR/TIA	January, February, October	3	34

3.9.3.4 Species of Conservation Concern

Hoary redpoll, listed as vulnerable species in Nunavut (CESCC 2020), were recorded at one PRISM plot. Red-necked phalarope (*Phalaropus lobatus*) was observed at two PRISM survey plots and a nest was detected at plot HOB-012. Red-necked phalarope is listed as Special Concern by COSEWIC (COSEWIC 2015) and under Schedule 1 of the SARA (Government of Canada 2021a). Records of species of conservation concern observed at the Project since 1996 are reported in Appendix 3.2-7.

3.9.4 Discussion

No pre-clearing surveys for upland breeding birds were conducted in 2022 because clearing activities did not occur in natural habitats which support nesting birds during the bird breeding season. One incident occurred, wherein a ptarmigan collided with a kubota windshield. Vehicle collisions with wildlife, including birds, are rare occurrences. Implemented road safety measures, including speed limits and radio calls for wildlife sightings, are broadly effective at preventing wildlife incidents on roads. Forty incidental observations were recorded in the wildlife sightings log, primarily of ptarmigan in the Doris area.

PRISM surveys were conducted to contribute to CWS regional monitoring data. Twelve plots were surveyed in 2022. Twenty-one species were detected during PRISM surveys with another ten species recorded incidentally outside of the survey areas or time. Shorebirds were present in half of plots, with five shorebird nests recorded. Lapland longspur and savannah sparrow were the most common species. Regional PRISM surveys are set to be conducted on an ongoing basis in two of every five years.

3.10 Waterbirds

Waterbird field surveys for the Doris compliance program have been scaled back from previous years after comprehensive analyses of the dataset from 2006-2018 and discussion with CWS. Beginning in 2022, shoreline ground monitoring locations for the Project area were established to monitor waterbird abundance and species diversity by distance from Project infrastructure (Agnico Eagle Mines Ltd. 2021).

Water quality at the TIA was monitored in 2022 in accordance with Commitment 31 and Condition 26 (NIRB 2018). Should water quality exceed guidelines for waterbirds, Agnico Eagle will conduct a toxicological risk assessment to determine if birds are safe using or nesting on the TIA. If that assessment determines that there is a risk to waterbird health, then waterbirds will be deterred from the TIA. Water quality was monitored at the TIA and did not exceed guidelines for wildlife in 2022, so no risk assessment was warranted (Section 3.10.3.2; Appendix 3.10-1).

3.10.1 FEIS Predictions

The Madrid-Boston FEIS predictions included a not significant and a negligible magnitude residual effect of disturbance at a geographic extent of the LSA and a not significant and low magnitude residual effect of direct mortality at the geographic extent of the PDA for waterbirds (TMAC Resources Inc. 2017).

3.10.2 Methods

In 2022 the potential effects of Project-related activities on waterbirds were monitored through:

1. shoreline ground surveys sites at varying distances from Project built infrastructure (Section 3.10.2.1 below), and
2. the interactions, incidents, and mortalities program, as well as the wildlife sightings log. These data are summarized and qualitatively assessed for trends; general methods for these programs are reported in Section 3.2.

3.10.2.1 Ground Surveys

Ground-based counts were completed for waterbirds along the shorelines of sites at varying distances from site infrastructure. These surveys were conducted for the first time in 2022 and monitoring will continue every two years to gather information on ongoing waterbird habitat use and the potential presence of species at risk in the area.

Sampling occurred at 15 sites ranging from 26 m to 7.8 km from built infrastructure (Table 3.10-1; Figure 3.10-1). Sites were separated into three categories: potential impact sites within 2 km of infrastructure (*n* = 6 sites), Control sites farther from infrastructure (*n* = 6 sites), and “Ladder” sites which currently more than 2 km from existing infrastructure but may change in future years as development continues (*n* =3 sites; Table 3.10-1; Figure 3.10-1).

Table 3.10-1: Waterbird Ground Survey Sites

Category	Site Name	Distance from Infrastructure (m)
Potential Impact	WB003	57
	WB004	26
	WB005	145
	WB007	1,724
	WB008	2,094
	WB011	116
Control	WB001	5,210
	WB002	6,805
	WB006	2,647
	WB012	4,868
	WB014	7,803
	WB015	3,212
Ladder (Currently Control)	WB009	2,999
	WB010	3,001
	WB013	4,560

Surveys were completed during the spring pairing season (early July) to coincide with the establishment of nesting territories. Two biologists and one additional observer/recorder conducted all surveys.
The team approached survey locations on foot from at least 200 meters away (i.e., left trucks or landed in helicopter from a distance to avoid flushing birds). Ground surveys were conducted within a fixed radius (200 m from the observer) for a set time of 20 minutes. At each survey location, all bird observations were recorded according to species, number of individuals, sex, age (adult/young), and behaviour. Site specific information was recorded as well (e.g., weather, time, date, location, habitat information).
Bird observations were marked as incidental if they were observed more than 200 m from the observer or flying over, or if they were seen or heard before or after the survey was completed. All mammal observations were recorded as incidentals.

The total number of species (i.e., species richness), the number of individuals, the total count of nests, species of conservation concern, and behavior were summarized.

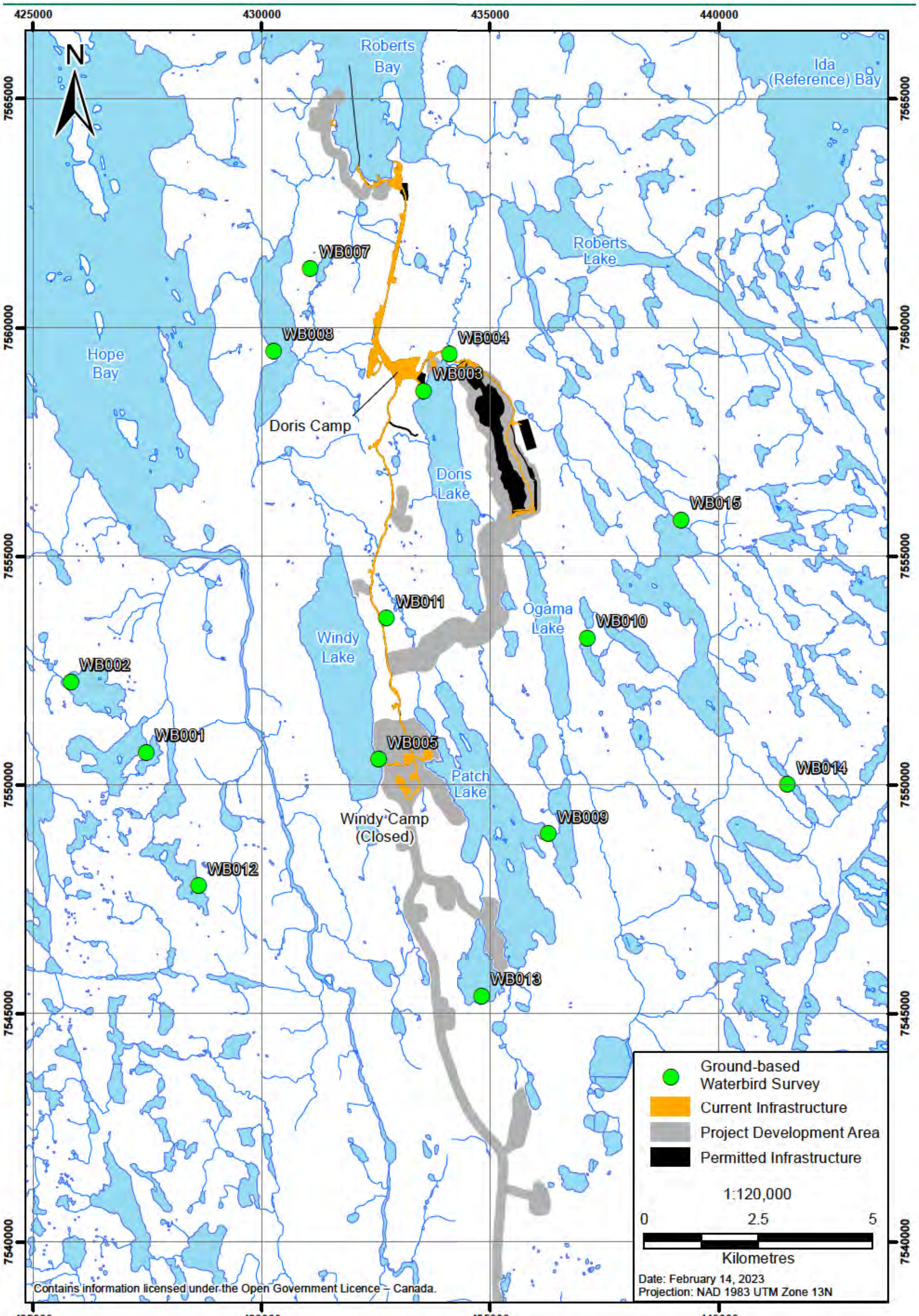


Figure 3.10-1: Locations of Ground-based Waterbird Surveys, 2022

3.10.2.2 Water Quality Monitoring in the TIA for Waterbirds

Water quality in the TIA at location TL-1 was measured at a minimum weekly in 2022 (n = 199 samples including duplicates and multiple sites) by onsite staff as part of the existing water license requirements. Water quality data for parameters with guidelines relevant to wildlife (i.e., arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc) are presented in Appendix 3.10-1. Summary statistics (maximum concentrations) were compared to the CCME *Water quality guidelines for the Protection of Agriculture – Livestock* as those are the guidelines that are available and most relevant for wildlife.

3.10.3 Results

3.10.3.1 Ground Surveys

Surveys were conducted at 15 sites between June 30 through July 5, 2022 (Figure 3.10-1). Surveys generally averaged 22 minutes (range: 20 minutes to 25 minutes) for a total survey time of 5 hours and 35 minutes for completion of 15 surveys. Weather conditions were generally mild. Temperatures averaged 13.53°C (range: 5 to 22°C; Appendix 3.10-2). Wind conditions were recorded between 4 and 25 km/h, 1 to 4 on the Beaufort scale).

A total of 26 species (including three unidentified species) and 150 individual birds were observed (Table 3.10-2; Appendix 3.10-3). Fifteen species of waterbirds (including three unknown species), one shorebird species, and ten upland breeding bird species were recorded across all surveys. Unknown species were those which were not fully visible due to lighting or movement (e.g., in flight) but were identified to groups such as loon or gull (Table 3.10-2). No additional species were recorded from incidental records of birds outside of the survey distance or time.

Table 3.10-2: Species Observations during Ground-based Waterbird Surveys, 2022

Species Group	Species Common Name	Scientific Name	Control Sites	Potential Impact Sites	Total
Waterbirds (Including Shorebirds)	Cackling Goose	*Branta hutchinsii*	-	2	2
	Canada Goose	*Branta canadensis*	1	1*	2
	Greater Scaup	*Aythya marila*	20	-	20
	Greater White-fronted Goose	*Anser albifrons*	-	9*	9
	Green-winged Teal	*Anas crecca*	4	-	4
	Herring Gull	*Larus argentatus*	7	-	7
	Least Sandpiper	***Calidris minutilla***	1	1	2
	Long-tailed duck	*Clangula hyemalis*	9	-	9
	Pacific Loon	*Gavia pacifica*	10	4*	14
	Red-breasted Merganser	*Mergus serrator*	19	1	20
	Red-throated Loon	*Gavia stellata*	1	2*	3
	Tundra Swan	*Cygnus columbianus*	4	2	6
	Yellow-billed Loon	*Gavia adamsii*	1	-	1
	Unidentified Duck	*Unidentified Duck*	1	-	1
	Unidentified Gull	*Unidentified Gull*	1	-	1
	Unidentified Loon	-	-	1†	1
		Waterbird Total	**79**	**23**	**102**

Species Group	Species Common Name	Scientific Name	Control Sites	Potential Impact Sites	Total
Upland Breeding Birds	American Pipit	*Anthus rubescens*	4*	-	4
	American Robin	*Turdus migratorius*	-	1	1
	American Tree Sparrow	*Spizelloides arborea*	3	-	3
	Common Redpoll	*Acanthis flammea*	8	5	13
	Harris's Sparrow	*Zonotrichia querula*	1	-	1
	Lapland Longspur	*Calcarius lapponicus*	5	-	5
	Savannah Sparrow	*Passerculus sandwichensis*	5*	2	7
	Semipalmated Plover	*Charadrius semipalmatus*	-	2	2
	White-crowned Sparrow	*Zonotrichia leucophrys*	7	2	9
	Yellow Warbler	*Setophaga petechia*	3	-	3
		Upland Birds Total	**36**	**12**	**48**
		Total	***115***	***35***	***150***

Notes:

*Shorebird species in **bold**.*

** Refers to species recorded with nests or young in the plot.*

† Refers to species only seen incidentally.

Waterbird and upland breeding bird abundance was higher in Control sites (including Ladder sites) compared to Potential Impact sites, with approximately 13 birds per site in Control, and six birds per site in Potential Impact. However, the number of species across sites was the same for Control and Potential Impact sites (21 species at nine Control sites, and 14 species in six Potential Impact sites; Table 3.10-2). Additionally, Potential Impact sites had four species recorded breeding within plot (confirmed with nests or young), while Control sites had two species recording breeding (Table 3.10-2). Greater scaup (*Aythya marila*) and red-breasted merganser (*Mergus serrator)* were the most abundant species, each with 20 individuals observed. Both species were observed in Control sites and red-breasted mergansers were also observed in Potential Impact sites.

3.10.3.2 Water Quality Monitoring in the TIA for Waterbirds

Table 3.10-3 presents summary statistics (mean, standard deviation, and maximum concentrations) for water quality parameters measured at TL-1 in the TIA in 2022 and the corresponding CCME water quality guidelines. The comparison of maximum concentrations to respective guideline values indicates that water quality in the TIA meets guidelines for the protection of livestock and therefore no parameter was screened in for further assessment in an ecological risk assessment.

Table 3.10-3: Summary Statistics for Water Quality Parameters with CCME Guidelines at the TIA (TL-1)

Parameter	CCME Water Quality Criteria, Livestock [1]	Mean	Standard Deviation	Maximum	Selected for Further Assessment?
Arsenic (As)-Total	0.025	0.0001	0	0.0001	No
Cadmium (Cd)-Total	0.08	3.11E-05	1.08E-05	0.00005	No
Copper (Cu)-Total	5 [2]	0.0005	0	0.0005	No

Parameter	CCME Water Quality Criteria, Livestock [1]	Mean	Standard Deviation	Maximum	Selected for Further Assessment?
Lead (Pb)-Total	0.1	0.000311628	0.000102127	0.0005	No
Mercury (Hg)-Total	0.003	5.00E-06	8.47E-21	0.000005	No
Nickel (Ni)-Total	1	0.0005	0	0.0005	No
Selenium (Se)-Total	0.05	0.000336111	0.000138249	0.0005	No
Zinc (Zn)-Total	50	0.018132353	0.006475984	0.03	No

Notes: Concentrations are in mg/L.

[1] Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Agriculture, Livestock.

[2] Guideline is variable. 5 mg/L for poultry was used, from Canadian Council of Resource and Environment Ministers (CCREM) 1987 (updated 2008) Canadian Water Quality Guidelines (CWQG).

3.10.3.3 Interactions, Incidents, and Mortalities

No incidents, interactions, or mortalities with waterbirds were recorded in 2022.

3.10.3.4 Wildlife Sightings Log and Incidental Observations

Waterbirds were sighted on 32 occasions (Table 3.10-4), primarily in June (n = 11), July (n = 7) and May (n = 6) (Appendix 3.2-5). The majority of sightings (n = 13) consisted of geese, including snow geese, cackling geese, Canada geese, and greater white-fronted geese, where sightings ranged from 1 to 36 individuals, for a total of 115 individual geese. Thirty-eight sandhill cranes were observed on 11 different occasions in varying group sizes from 1 to 15. Six swans were observed in two separate sightings, two hooded mergansers, and two common mergansers were recorded. Hooded mergansers are out of range in the Hope Bay area, but this sighting may be another merganser species. Twelve loons were also sighted on four occasions (including Pacific loon and red-throated loon). Waterbird sightings were on the tundra (n = 16), on water or shoreline (n = 9), in the air (n = 3), within a wetland (n = 2), and on site (n = 2).

The number of individuals recorded in the wildlife sightings log should not be interpreted as observations of unique individuals (e.g., a population estimate) as it is likely that the same individuals can be counted across time by different observers.

Table 3.10-4: Waterbird Sightings and Incidental Observations 2022

General Location	Months	Total Sightings	Total Individuals
Doris Area	May-September	11	64
Windy road/ Madrid	May-July, September	12	55
TLR/TIA	May, September	2	19
Boston	June	1	12
Not Specified	June-August	6	21

3.10.3.5 Species of Conservation Concern

None of the waterbird species known to occur in the Study Area are listed as species of conservation concern federally or in Nunavut.

3.10.4 Discussion

Waterbirds were monitored via ground surveys established at 15 sites with varying distances from Project infrastructure. Waterbird and upland breeding bird abundance was higher in Control sites (including Ladder sites) compared to Potential Impact sites, however, the number of species across sites was the same for Control and Potential Impact sites. Potential Impact sites had four species recorded breeding within plot (confirmed with nests or young), while Control sites had two species recording breeding (Table 3.10-1). This is the first year of ground monitoring for waterbirds, and more years of data are needed to establish trends in waterbird abundance and species diversity. Additionally, trends according to other habitat characteristics, such as waterbody size, can be investigated once more years of monitoring data are available.

No chemical parameters were scoped for an ecological risk assessment for waterbirds detected on the TIA, based on a comparison to the only water quality guidelines applicable to wildlife, CCME *Water quality guidelines for the Protection of Agriculture – Livestock (Canadian Council of Ministers of the Environment 1999).* These guidelines have been developed primarily for the protection of livestock including poultry and are assumed to be protective of waterbirds.

Geese, sandhill cranes, ducks, swans and loons were incidentally observed on 32 occasions from May to the end of September. The number of individuals recorded in the wildlife sightings log should not be interpreted as observations of unique individuals (e.g., a population estimate) as it is likely that the same individuals can be counted across time by different observers. Nineteen waterbirds were incidentally observed at the TIA in 2022; however, 15 of these individuals were flying overhead.

3.11 Raptors

Raptor field surveys for the Doris compliance program have been discontinued. A comprehensive statistical analysis of raptor nesting data was performed to test FEIS predictions and presented in the 2018 WMMP Report (ERM 2019). Following comments from ECCC and the GN, a more holistic analysis was conducted, using additional data compiled by the Government of Northwest Territories from 1987 to 2004 and analyzing effects separately for each species. The analysis was submitted as a scientific publication for peer review in 2019 but the peer review process was not properly completed due to reviewer unavailability during the Covid-19 pandemic. The paper is in the process of edits and re-submission. Broadly, the analysis concluded that breeding rate was primarily driven by annual weather variation; influence of specific weather parameters (snow depth, precipitation, temperature) varied by species, connected to differences in nesting site characteristics such as overhang protection. Top AIC ranked breeding rate and productivity models generally did not include mine impact parameters, indicating that mine activity did not influence breeding rates or productivity in any of the raptor species.

Occupancy surveys of raptor territories in Madrid North were not conducted in 2022 because construction did not occur in the area during the raptor breeding period. These surveys are required if construction occurs during the raptor breeding period as part of Term and Condition 27 for NIRB Project Certificate No. 009.

3.11.1 FEIS Predictions

The Madrid-Boston FEIS predictions included a not significant and low magnitude residual effect of disturbance at a geographic extent of the RSA and direct mortality at the extent of the PDA for raptors (TMAC Resources Inc. 2017).

3.11.2 Methods

The potential effects of Project-related activities on raptors are monitored through the wildlife interactions, incidents, and mortalities program and incidental sightings program; these records are qualitatively assessed for trends. General methods for these programs are described in Section 3.2.

3.11.3 Results

3.11.3.1 Interactions, Incidents, and Mortalities

Two incidents involving raptors occurred in 2022 (Appendix 3.2-4). The first incident involved a dead snowy owl found on February 8, 2022 during a weekly inspection of the Doris Camp diversion berm. The snowy owl was believed to have died from predation based on carcass condition. Under the WMMP Plan (Agnico Eagle Mines Ltd. 2021), the incident was reported to the Kitikmeot Inuit Association (KIA), Nunavut Impact Review Board (NIRB) and the Government of Nunavut Department of Environment (GN DoE).

Additionally, a raven's nest was identified on a satellite dish at Boston Camp and was relocated after a license due to the potential fire hazard that it presented (Photo 3.11-1). A permit for removal was provided by the GN. The nest was not occupied (did not have eggs or young) and was moved to the end of the Boston runway, 800m away from the Boston Camp (Photo 3.11-2).

Photo 3.11-1: Common Raven Nest on satellite dish at Boston Camp. August 8, 2022.

Photo 3.11-2: Common Raven nest place at Boston runway. August 30, 2022.

3.11.3.2 Wildlife Sightings Log and Incidental Observations

In 2022, a total of 16 raptors were reported in 15 sightings between April and October (Appendix 3.2-5). Eagles were observed on six occasions and included three unidentified eagles, one unidentified juvenile eagle, one golden eagle and one bald eagle. Peregrine falcon (*n* = 5 sightings) and rough-legged hawks (*n* = 3 sightings) were also noted. Additionally, one snowy owl was recorded east of Boston camp. Sightings were most common in the Doris area, typically noted soaring or flying over camp (Table 3.11-1). Raptors were also recorded occasionally along Windy Road, the TLR, and around Boston (Table 3.11-1).

Table 3.11-1: Raptor Sightings and Incidental Observations (2022)

General Location	Months	Total Sightings	Total Individuals
Doris Area	April to September	9	10
Windy Road/ Madrid	May	2	2
TLR/TIA	September	1	1
Boston	June, October	2	2
Not Specified	June	1	1

3.11.3.3 Species of Conservation Concern

Two raptor species of conservation concern are known to occur in the Study Area: short-eared owls are listed as Vulnerable in Nunavut and by COSEWIC (COSEWIC 2015) and under Schedule 1 of the SARA (Government of Canada 2021a) as Special Concern. Short-eared owls are additionally listed as vulnerable (S3B) territorially within Nunavut suggesting they are at moderate risk of extirpation (CESCC 2020). Peregrine falcons are also listed as Special Concern under Schedule 1 of the SARA (Government of Canada 2021a).

Peregrine falcon were incidentally recorded in the wildlife sightings log on five occasions in 2022. Several peregrine falcon breeding territories occur throughout the Study Area, but territories were not monitored in 2022. Short-eared owl were not recorded in 2022. Short-eared owl are ground nesters which change territories each year, and are therefore only occasionally incidentally recorded.

3.11.4 Discussion

Aerial surveys of raptor nests in the vicinity of Madrid North were not conducted in 2022 because no construction occurred in the area during the raptor breeding period.

During 2022, 15 raptor sightings were recorded in April through October. The majority of individuals were rough-legged hawks and eagles, while the remainder included a snowy owl and peregrine falcons. No raptor nests were identified incidentally in 2022. One snowy owl was found deceased and is presumed to have died from natural causes. An unoccupied common raven's nest was relocated due to potential fire risk, it was moved from existing infrastructure at Boston Camp to Boston runway.

3.12 Marine Mammals

The WMMP Plan includes potential monitoring for noise and marine mammals during construction of the planned dock in Roberts Bay (following condition 33 in Certificate No. 009; NIRB 2018). Noise monitoring activities will be subject to an authorization from DFO, via an application process including information on detailed design and construction methods. The dock at Roberts Bay was not constructed in 2022 and as such, no monitoring for marine mammals related to construction noise was conducted (Agnico Eagle Mines Ltd. 2021).

The Shipping Management Plan was also updated in early 2023 to include monitoring for marine wildlife in Roberts Bay during the shipping season. In 2022, initial monitoring was conducted for marine mammals in Roberts Bay while ships were entering the Bay. Monitoring will begin in full in 2023, with methods and results to be reported in the 2023 WMMP Report.

Mitigations for marine mammals related to shipping activity are described in the Shipping Management Plan (based on conditions 31 and 32 in Certificate No. 009; NIRB 2018). These mitigations include required measures for shipping vessels and reporting of incidental sightings and incidents on shipping routes. All incidental sightings and incident reports are included in the WMMP Report (see Results).

3.12.1 Methods

The potential effects of Project-related activities on marine mammals are monitored through the monitoring of marine mammals in Roberts Bay as well as through the Wildlife Sightings/Reporting program, results of which are presented as wildlife interactions, incidents, and mortalities and incidental sightings (see Section 3.2).

Incidental sightings and incidents along shipping routes are also reported by shipping vessel operators. Additionally, vessel tracks were assessed via data from the Wood Mackenzie vessel tracking database to confirm that setbacks and avoidance areas were followed.

3.12.1.1 Marine Mammal Monitoring

In 2022, marine mammal surveys were completed in September in Roberts Bay, once per day when shipping boats were being unloaded. Surveys were completed from a fixed location for twenty minutes at a time watching for the presence and behaviour of any marine mammal in the Bay. Survey data included the date, start and end time, weather, sea state, wind (Beaufort scale), wind direction, wave height in the bay, glare conditions, and visibility in kilometers. When a marine mammal was sighted the timing of the observation, distance from the observer, whether a mitigation action occurred, and location were recorded. The species, number of individuals, age class, sex, and behaviour of the animal were also recorded.

3.12.2 Results

3.12.2.1 Marine Mammal Monitoring

A total of 16 surveys were completed in 2022 for marine mammals in Roberts Bay once per day between September 3 to September 24, on days when ships were scheduled in the Bay. Two marine mammals were observed (one bearded seal and one unknown seal) both of unknown sex or age. Both animals were observed swimming or sunbathing in Roberts Bay.

3.12.2.2 Shipping Mitigations

No marine wildlife incidents or incidental sightings were reported along shipping routes in 2022. Vessel tracks from 2022 were summarized to confirm that mitigations for setbacks and designated routes were followed (Figure 3.12-1). Some tracks do not reflect precise vessel locations due to gaps in GPS signals (e.g., where tracks appear to cross land; Figure 3.12-1). The only deviation from the designated route in 2022 occurred where both the around the Qamutik and Aujaq vessels routed around the south end of Bylot Island (Figure 3.12-1). This change in route resulted in both vessels avoiding the East Lancaster Sound migratory bird key habitat site and did not interfere with any set mitigations.

3.12.2.3 Interactions, Incidents, and Mortalities

No incidents, interactions, or mortalities with marine mammals were recorded in 2022.

3.12.2.4 Wildlife Sightings Log and Incidental Observations

One unknown seal was incidentally reported in July 2022 (Appendix 3.2-5). The individual was seen swimming around the dock at Roberts Bay. One additional marine sighting of arctic char was recorded in July in Roberts Bay.

3.12.3 Discussion

Monitoring of marine mammals in Roberts Bay was conducted for the first time in 2022. Initial data were collected in September 2022, with surveys occurring on days with shipping activity in the bay. Two seals were recorded and exhibited normal behaviour. Monitoring will continue in 2023, following the experimental design described in the updated 2023 Shipping Management Plan. One seal was also reported incidentally in Roberts Bay in July 2023.

No marine wildlife incidents or incidental sightings were reported along shipping routes in 2022. Vessel operators were provided with Project-specific training and review of marine wildlife mitigations and reporting requirements prior to the shipping season, as is described in the Shipping Management Plan. An assessment of vessel tracks indicated that vessels followed setbacks and sensitive areas for wildlife in the shipping area.

3.13 Plants

A sedge sampling program was implemented in 2018 following a request from the KIA to generate an understanding of the baseline tissue metal concentrations in sedges. These data were included as an appendix of the 2019 WMMP Report as a general summary along with raw data. Additional data collection will be discussed when operations of the Madrid and Boston areas is underway.

Monitoring for invasive plants occurred during baseline work for the FEIS. At that time, no invasive plants were found onsite. Ongoing monitoring for invasive plants is required by condition 17 in Certificate No. 009 (NIRB 2018). The WMMP Plan was updated in early 2023 to include invasive plant monitoring along Project roads at 5-year intervals. This monitoring is planned to begin in 2023.

Figure 3.12-1: Vessel Tracks during Shipping Season, August to September, 2022

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APPENDIX 2.1-1 DETAILED METHODOLOGY FOR THE HOPE BAY PROJECT PROGRAMS, 2022

March 2023

Hope Bay Project

2022 Wildlife Mitigation and Monitoring Program Compliance Report

Appendix 2.1-1: Detailed Methodology for the Hope Bay Project Programs, 2022

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Appendix 2.1-1: Detailed Methodology for the Hope Bay Project Programs, 2022

1. OVERVIEW

Detailed descriptions of the methods for the 2022 monitoring programs are provided below.
These monitoring programs align with those outlined in the 2022 Wildlife Mitigation and Monitoring Plan Compliance Report (the 2022 Report). Table 1-1 outlines the monitoring programs executed in 2022 and for which detailed methods are provided in this appendix; the corresponding results section numbers of the 2022 Report are also provided.

Table 1-1: Monitoring Programs and Corresponding 2022 Report Sections

Monitoring Program	2022 Report Section
Habitat Loss	Section 2.1
Valued Ecosystem Components (VEC) Specific Monitoring and Mitigation	Section 3
Facilities and Wildlife Camera Programs	Included with each VEC in Section 3; Methods in Section 3.2
On-site Monitoring and Mitigation (interactions, incidents and mortalities)	
Incidental wildlife observations by Environment and Onsite Personnel	
Caribou	Section 3.4
Muskox	Section 3.5
Grizzly Bear	Section 3.6
Wolverine	Section 3.7
Nest Predators	Section 3.8
Upland Breeding Birds	Section 3.9
Waterbirds and Shorebirds	Section 3.10
Raptors	Section 3.11

2. HABITAT LOSS

Direct habitat loss attributed to the Hope Bay Project (the Project) footprint was initially assessed in the Madrid-Boston Final Environmental Impact Statement (FEIS) in 2017 (TMAC Resources 2017). The assessment was based on two spatial habitat layers. Habitat suitability modelling at the extent of the Regional Study Area (RSA) used the Northwest Territories Department of Resources, Wildlife, and Economic Development (RWED) Ecological Land Classification (ELC) for the Slave Geological Province (Matthews, Epp, and Smith 2001). The RWED ELC segments the landscape into 21 land cover classes plus an unidentified class; 15 of those classes plus the unidentified class occurred within the RSA. Additional habitat suitability modelling at the extent of the Local Study Area (LSA) was done based on ecosystem units identified from Terrestrial Ecosystem Mapping (TEM). Twenty-one ecosystem units were mapped within the LSA and used to model Valued Ecosystem Components (VEC) species habitat suitability across seasons. The expected area of disturbance due to the Project footprint was calculated as a proportion of the total area of the ecosystem class or unit within the RSA and LSA by overlaying the Project Development Area (PDA) on the RWED ELC and the TEM.

Habitat suitability models utilizing TEM ecosystem units were newly developed using relevant accounts of each species' ecological habitat and its seasonal requirements for food, security, and thermal protection variables (Rescan 2011). Habitat suitability models utilizing the ELC were based on previously published habitat suitability models or observed habitat preferences.

Ratings of suitability were determined in either a four-rating or two-rating system. For caribou, grizzly bear, and muskox, habitat suitability was ranked as high, moderate, low, and nil quality; suitable habitat loss was considered as the areas of high and moderate quality habitat (collectively referred to as 'good' quality). For all other VECs, habitat was categorized as suitable or unsuitable, and habitat loss was the area of suitable habitat in the PDA. An additional criterion for waterbirds was implemented, with any terrain outside of a 50 m buffer around waterbodies considered unsuitable habitat. General descriptions of the habitat suitability ratings are as follows:

- *High:* ecosystem types that are preferred or critical habitat, or have relatively high densities of the species;
- *Moderate:* ecosystem types that are neither preferred nor selected against or have moderate densities of the species;
- *Low:* ecosystem types that are generally selected against or types that have relatively low densities of the species; and
- *Nil:* ecosystem types that are not used by the species or group, have no positive value, or for which no acceptable data exists to model suitability.

For habitat rated using the two class scheme, the ratings were as follows:

- *Suitable*: ecosystem units that are preferred or represent usable habitat; and
- *Not suitable*: ecosystem units that have very little or no positive value for the species

The expected change in the amount of suitable habitat due to the Project footprint was then calculated by overlaying the current Project footprint onto maps of habitat suitability for each VEC species or group. The Project footprint used to assess habitat loss only included as-built infrastructure up until December 2022, not including unbuilt permitted infrastructure.

To quantify the suitable habitat disturbed per VEC species or group, habitat suitability was assessed according to the relevant species-specific scale referred to in the Madrid-Boston FEIS. The spatial scale assessed is larger (the RSA) for species with larger home ranges, and smaller (the LSA) for species with smaller home range sizes; i.e., mammals (caribou, muskox, grizzly bear, and wolverine) were assessed for habitat loss corresponding to the RSA, and birds (upland breeding birds, waterbirds, and raptors) were assessed for habitat loss corresponding to the LSA (see Figure 2.1-1 in the 2022 Report). Suitable habitat loss was calculated per VEC species or group by summing the disturbed vegetation across all ecosystem types identified as good (high and moderate quality) or suitable. The proportion of suitable habitat lost was expressed as a percentage of the amount available within the relevant area of the Madrid-Boston FEIS (LSA or RSA, depending on the VEC).

3. FACILITIES AND WILDLIFE CAMERA PROGRAMS

A wildlife camera monitoring program was implemented in late 2012 to monitor for VEC species on and adjacent to the Project site and at control sites. Wildlife VEC species monitored by wildlife camera include caribou, muskox, grizzly bear, and wolverine. Muskox were added as a VEC after the Madrid-Boston expansion approval as part of Project Certificate No. 009. Muskox are not common in the Study Area and there is not currently sufficient data of muskox occurrence across the camera Study Area and throughout all years of data collection for statistical analysis.

Nest predators are also monitored using cameras. Studies suggest that ground-nesting birds may have lower nesting success near industrial developments if predators are attracted to the development and depredate nests there (Liebezeit et al. 2009). Mammalian nest predators are monitored through the wildlife camera program, including Arctic fox, red fox, and grey wolves, which are an opportunistic nest predator. Avian nest predators, including gulls, jaegers, and the common raven, in addition to weasels, are also considered to be potential nest predators. However, birds are generally underreported in camera data due to their smaller size and aerial mobility, making them difficult to monitor through camera traps. Similarly, weasels are a small-bodied animal and are underreported in camera data. For these reasons, birds and small mammals were not included in the camera data analyses.

This section of the Report presents the results of the ninth year of wildlife camera studies at the Project (September 2021 to September 2022). Results from the first eight years of monitoring were presented in ERM Rescan (2014), ERM (2015), ERM (2016a), ERM (2017), (ERM 2018), ERM (2019), ERM (2020), and ERM (2021).

In February 2016, TMAC met with representatives of the Kitikmeot Inuit Association (KIA) and Government of Nunavut Department of Environment (GN DOE) to redesign the camera program. This redesign was conducted to address a variety of comments from regulators on camera placement and use (ERM 2016b). Cameras were deployed in June 2016 using the new design. Data have been statistically analyzed for differences in caribou, grizzly bear, and wolverine occurrence according to distance from the mine from the new design program starting 2016 and continuing onwards.

In September 2018, an additional camera program was initiated in the Boston area. Wildlife cameras around the Boston area collected baseline data during the September 2018 to September 2022 monitoring period. These data are reported in a short summary in Section 3.3 of the 2022 Report. Analysis of the Boston camera program will not begin until data have been collected for both baseline and construction/operations periods in the Boston area.

3.1 Camera Program Study Design

3.1.1 Doris and Madrid Program Study Design

A total of 57 Reconyx™ PC800 HyperFire Professional cameras were used to monitor caribou, muskox, grizzly bear, wolverine, nest predators, and other wildlife from June 2016 to September 2022. The camera layout is show on Figure 3.2-1 of the 2022 Report. A minimum convex polygon (MCP) was generated in ArcGIS 10.5.1 around all camera locations to generate an estimate of the monitoring area, as suggested by Meek et al. (2014). The resulting MCP area around all cameras was 50,837 ha including all terrestrial and aquatic (freshwater and marine) habitats, and 40,025 ha considering only terrestrial habitats. The total area of the MCP inclusive of aquatic habitats is representative of area that could be used by wildlife that could encounter wildlife cameras during the winter period, as lakes, rivers, and the ocean are frozen at this time. The area of the MCP including only terrestrial habitats is representative of the areas that could be used by wildlife that could encounter wildlife cameras during the spring through the fall.

The placement of wildlife cameras was modified in June 2016 relative to the first three years of the camera program. The new camera layout addressed two monitoring aspects: 1) facilities interaction monitoring: cameras associated with specific infrastructure and gathering site specific data, and 2) wildlife camera monitoring: cameras placed in various distances from the Project and used to look for changes in species relative abundances with proximity to the Project.

Under the current camera study design, cameras are arrayed in three zones:

1. Treatment, with cameras placed at distances within 2 km of the Project site;
2. Zone of Influence (ZOI), with cameras placed at distances between 2 and 10 km of the Project site; and
3. Control, with cameras placed at distances beyond 10 km of the Project site.

One area was designated a “Ladder Area” where two cameras were placed in the area of tundra where the Madrid expansion will be constructed; for the purposes of the 2022 camera program, these cameras functioned as ZOI cameras. Once the Madrid expansion has been constructed, these cameras will become Treatment cameras. These two cameras will allow for a before-after analysis that will have greater sensitivity in determining potential effects related to the Madrid expansion on grizzly bears, and possibly wolverine, and caribou.

Cameras were deployed in relatively equal numbers in each of the three zones, including 21 Treatment cameras, 17 ZOI cameras, and 19 Control cameras (see Figure 3.2-1 in the 2022 Report; Table 3.1-1). The ZOI and Control cameras were located along a predominantly east-west axis such that Control and ZOI cameras were located at relatively similar distances from the ocean shoreline as the Treatment cameras. This was done to account for the relative abundance of predators such as bears and wolverine at the coast versus inland.

Table 3.1-1: Camera Locations and Rationale for Placement under the Current Camera Study Design, September 2016 to September 2022

Camera Zone	Camera No.	Total Cameras	Site Specific Monitoring Objective
Treatment	1, 11, 13, 15, 17, 19, 28, 32, 42, 50, 53, 54, 59, 60	14	-
	2, 35	2	Road Crossing Ramp (caribou only)[1]
	18, 21	2	Waste Management Facility (grizzly bear, wolverine, and nest predators)[2]
	22	1	Roberts Creek Boulder Field/ERM Fish Fence (grizzly bear, wolverine, and nest predators)[2]
	51, 52	2	Tailings Impoundment Area (TIA; all VECs and nest predators)
ZOI	10, 12, 14, 23 - 26, 30, 34, 39, 41, 44, 46 - 48, 55, 57	17	-
Control	3 - 9, 16, 29, 31, 33, 36, 37, 40, 43, 45, 49, 56, 58	19	-

Notes:

[1] *Caribou interactions: Road crossing ramp = cameras installed at crossing ramps along the Doris-Windy AWR.*

[2] *Grizzly bear, wolverine and nest predator interactions: Roberts Bay Waste Management Facility and Roberts Lake Outflow/ERM Fish Fence.*

ZOI and Control cameras were placed in habitats comparable to habitat where Treatment cameras were placed. The habitat considerations included microhabitat (i.e., similar habitat within the 'trigger zone' field of view between Treatment, ZOI, and Control cameras) and broader habitat considerations including distance to ocean, distance to large and medium lakes, and distance to streams and rivers. To improve independence, cameras were not in line of sight of each other. Cameras were oriented so that the area within at least 40 m in front of the camera was clear and the cameras were equal in their field of view. The minimum distance between all cameras in any zone was 71.3 m, which was the distance between Treatment cameras 18 and 21 at the Roberts Bay Waste Management Facility (Figure 3.2-1 in the 2022 Report). These two cameras, while not in line of sight of one another, have site specific monitoring objectives (see below). Hence, these two cameras were placed closer to one another for the purposes of facilities monitoring. The next closest distances between cameras was 487.9 m, between Treatment cameras 17 and 18 (Figure 3.2-1 in the 2022 Report). The maximum distance among all cameras was 38.5 km, the distance between Control cameras 37 and 56; camera 37 is in the Control zone on the east side of the Project while camera 56 is in the Control zone on the west side of the Project. Overall, the average distance among all cameras was 12.3 ± 6.7 km (± standard deviation).

There were seven cameras that were placed near Project infrastructure to address the facilities interaction monitoring component of the camera program (Table 3.1-1). These seven cameras included:

- Two cameras located at caribou crossing ramp locations along the Doris-Windy AWR (Cameras 2 and 35; Photos 3.1-1 to 3.1-4);
- One camera facing the in-stream boulder field in Roberts Lake Outflow[1] (Camera 22; Photos 3.1-5 and 3.1-6);
- Two cameras set up at the Roberts Bay Waste Management Facility (Cameras 18 and 21; Photos 4.1-7 to 4.1-9); and
- Two cameras set up at the Tailings Impoundment Area (TIA; Cameras 51 and 52; Photos 3.1-10 to 3.1-13).

The seven cameras that monitor Project facilities are considered to be cameras with site specific monitoring objectives for wildlife VECs (Table 3.1-1). The cameras located at the caribou crossing ramps are specifically monitoring for caribou usage, while the two cameras located at the Roberts Bay Waste Management Facility and one camera at Roberts Lake Outflow are monitoring for grizzly bear and other predators/scavengers (wolverine, wolves, and foxes) interactions. Cameras 51 and 52 monitor for interactions of all wildlife VECs as well as nest predators.

As per the revised Study Design, the Doris Landfill will be monitored by remote camera (ERM 2016b). The landfill has not been constructed and will be located on the east side of the TIA. A remote camera will be placed at this location when it has been constructed and a suitable location for long-term monitoring has been assessed.

It should be noted that there is a camera that is located at the Doris Lake outflow waterfall (Camera 15; see Figure 3.2-1 in the 2022 Report). A camera was placed in this location in 2015 to address a condition of Project Certificate No. 003 that wildlife activity at the waterfall shall be monitored (Revised Term and Condition 25). However, under the amendment to the Water License, mine water will be discharged via a submarine process into Roberts Bay instead of being discharged into the freshwater environment in Doris Creek. Camera 15 will continue to monitor wildlife activity at the Doris Lake outflow waterfall to address Revised Term and Condition 25; however, considering the change in the Project design with no mine water discharge into Doris Creek, Camera 15 is not being considered as a camera with a site specific monitoring objective under the revised study design as no effects to water quality are anticipated at this location.

[1] This camera also faces the site where the ERM Fish Fence has been installed in previous years; the ERM Fish Fence was not installed in 2020.

Photo 3.1-1: Example of the winter monitoring view of Camera 2 at one of the two caribou crossing ramps along the Doris-Windy AWR (ramp indicated in mid-left).

Photo 3.1-2: Example of the summer monitoring view of Camera 2 at one of the two caribou crossing ramps along the Doris-Windy AWR (ramp indicated in mid-left).

Photo 3.1-3: Example of the winter monitoring view of Camera 35 at one of the two caribou crossing ramps along the Doris-Windy AWR.

Photo 3.1-4: Example of the summer monitoring view of Camera 35 at one of the two caribou crossing ramps along the Doris-Windy AWR.

Photo 3.1-5: Example of the winter monitoring view of Camera 22 at Roberts Creek.

Photo 3.1-6: Example of the summer monitoring view of Camera 22 at Roberts Creek.

Photo 3.1-7: Example of the monitoring view of Camera 21 at the Roberts Bay Waste Management Facility.

Photo 3.1-8: Example of the winter monitoring view of Camera 18 at the Roberts Bay Waste Management Facility.

Photo 3.1-9: Example of the summer monitoring view of Camera 18 at the Roberts Bay Waste Management Facility.

Photo 3.1-10: Example of the monitoring view of Camera 52 at the North Dam of the TIA, September 2016.

Photo 3.1-11: Example of the monitoring view of Camera 52 at the North Dam of the TIA, September 2017.

Photo 3.1-12: Example of the monitoring view of Camera 51 at the future site of the South Dam of the TIA, September 2016.

Photo 3.1-13: Example of the monitoring view of Camera 51 at the future site of the South Dam of the TIA, September 2017.

In August 2022, two new cameras were deployed on either side of a culvert running under Windy Road (Photo 3.1-14 and Photo 3.4-3 in the 2022 Report). The cameras were set with the specific purpose of detecting caribou activity, after an Inuit Environmental Advisory Committee (IEAC) member noticed possible caribou trails from the culvert. The culvert is roughly 160 m north of one of the caribou crossing ramps (and camera 35). Both cameras are place north of the culvert, facing south in order to record any caribou passing through the culvert (Photo 3.1-14). These cameras will be included in wildlife event summaries starting in 2023.

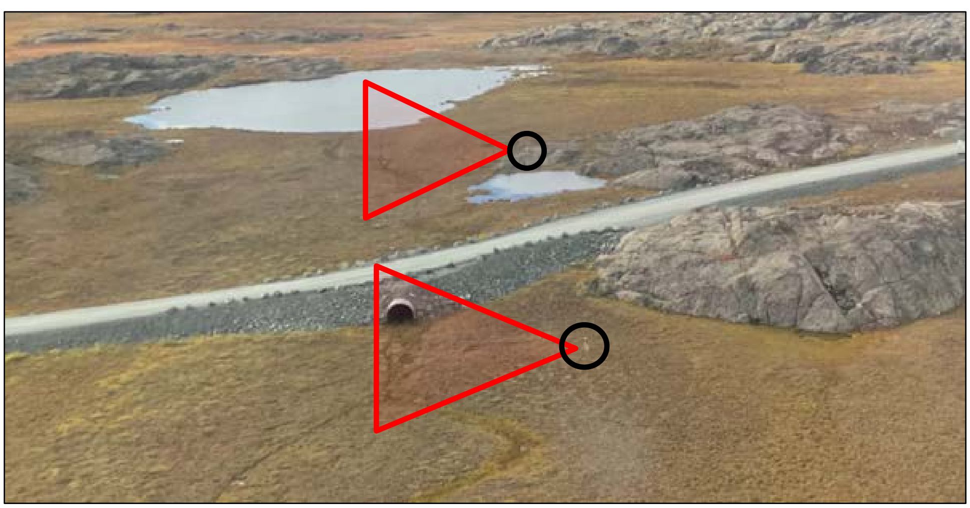

Photo 3.1-14: Culvert wildlife cameras and their approximate field of views, facing south on either side of Windy Road. August 2022.

3.1.2 Boston Program Study Design

In September 2018, 26 remote cameras were deployed in the Boston area. In June 2019, an additional three cameras were deployed (see Figure 3.2-2 in the 2022 Report). Design of the camera placement followed the same process as the program already established in the Doris and Madrid area. The Treatment (within 2 km of planned infrastructure), ZOI (2-10 km from planned infrastructure), and Control (> 10 km from infrastructure) zones each have five cameras, with an additional 14 cameras along the proposed All Weather Road (AWR) between Madrid and Boston (Figure 3.2-2 in the 2022 Report).

Camera placement was balanced with similar considerations as the Doris and Madrid area program. Locations for Treatment, ZOI, and Control cameras were pre-selected using Google Earth and available satellite imagery to verify that each of the five Treatment cameras had a paired camera within similar broad and small scale habitats in ZOI and Control zone. Locations were chosen to balance distance to ecological features such as waterbodies. Sites were scoped in the field before placement to assess the accessibility of the location for wildlife and the camera field of view. For cameras placed along the proposed road route, camera locations were optimized according to existing caribou trails so that cameras are placed near future caribou crossing ramps. Camera positions were oriented towards existing caribou trails, and where possible, also the proposed road route. No camera views are within sight of each other, with the closest cameras 1.05 km apart (cameras 79 and 84; Figure 3.2-2 in the 2022 Report). The furthest distance between two cameras is 69 km (between camera 75 and 83); this marks the southern extent of the Boston camera Study Area and the northern extent of the AWR route (Figure 3.2-2 in the 2022 Report). Other than the cameras placed along the AWR route, no cameras in the area had site specific monitoring objectives.

3.2 Camera Set Up and Operations

The Reconyx™ PC800 HyperFire uses a passive infrared sensor to capture motion-trigged images and has a maximum reported motion detection radius of 30.5 m in daylight and 21.3 m at night (Reconyx 2013, 2017a, 2017b). There was no bait used in the study to lure animals to the camera locations.

Cameras were deployed on wooden tripods where the height of the camera ranged from 1.2 to 1.4 m off the ground. The camera sensor was directed perpendicular to the ground, such that the sensor faced the horizon on the tundra (Photos 3.2-1 and 3.2-2).

Cameras were programmed to take two types of photos: timed and motion-triggered photographs. Timed photos are mainly used to determine the number of active deployment days for cameras (camera effort). As such, cameras were programmed to take a minimum of one timed photo at noon to determine whether cameras were actively recording photos or were obscured (e.g., covered by snow or knocked over; see Camera Effort section below).

Detailed camera settings are presented in Table 3.2-1. Cameras were programmed to take motion-triggered photos automatically 24 h/day whenever there was movement in front of the camera, as detected by the passive infrared sensor. Based on the camera trigger specifications (field of view) and field-testing of the cameras, the motion trigger range of the cameras was approximately 25 to 30 m, depending on the size of the animal. During each motion triggered event, cameras were programmed to take a set of 10 photos at one second intervals (Table 3.2-1). If there was still motion in front of the camera following the initial set of triggered photographs, the cameras were programmed to immediately start a second set of 10 photos. Each image recorded the photo type (i.e., timed [T] or motion triggered [M]), the camera number, date, time, temperature, and, for motion-triggered photos, the number from the series of photos taken (i.e., 1/10 to 10/10).

Photo 3.2-1: Example of camera set up (camera height approximately 1.2 m).

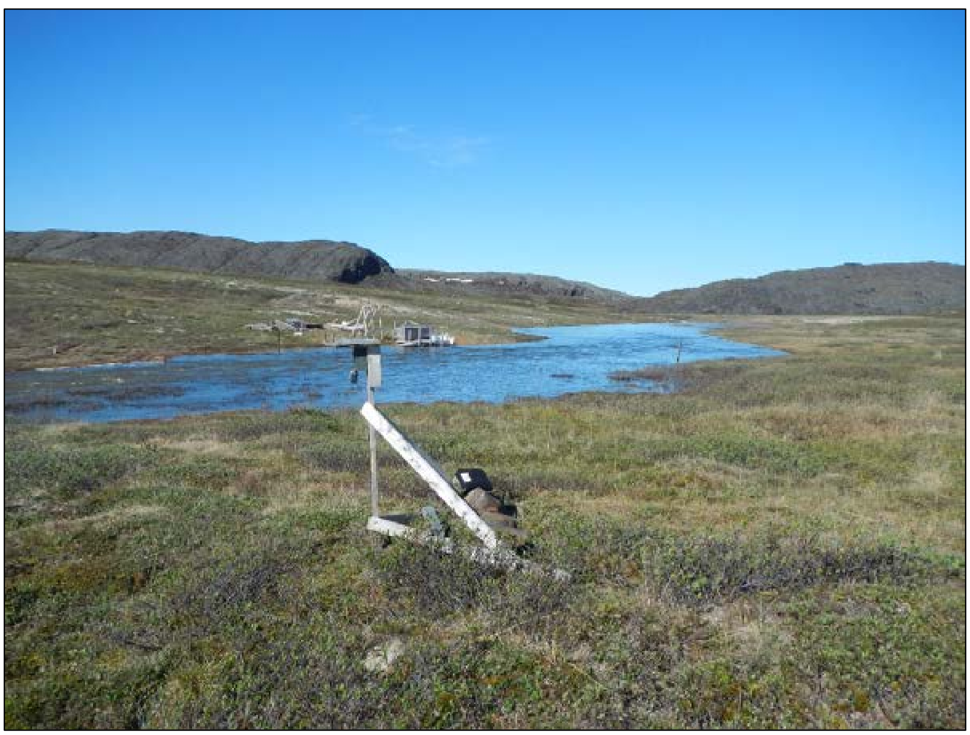

Photo 3.2-2: Example of camera set up (camera height approximately 1.4 m).

Table 3.2-1: Detailed Camera Settings for Motion and Timed Photos, September 2021 to September 2022

Photo Type	Setting	Winter Settings (~September - ~June)*	Summer Settings (~June - ~September)*
Motion-triggered Photos	Trigger Sensitivity (Low, Low/Med, Med, Med/High, High)	High	High
	Trigger Response Time**	1/5 Second	1/5 Second
	No. Photos Taken (per Trigger)	10	10
	Capture Interval (time between successive photos)***	1 second	1 second
	Delay (time between successive triggers)	None	None
	Photo Schedule	On All Day	On All Day
	Nighttime shutter speed**	1/30 Second	1/30 Second
	Nighttime ISO Sensitivity (Low, Medium, High)	Medium	Medium
Timed Photos	No. Photos Taken	1	1
	Photo Frequency	30 min	30 min
	Photo Schedule	On All Day****	Every Day, 11:30 to 12:30 only
General (motion and timed)	Brightness (1 - 9)	Default (Low-Medium; 3)	Default (Low-Medium; 3)
	Contrast (1-9)	Default (Medium-High; 7)	Default (Medium-High; 7)
	Sharpness (1 - 9)	Default (Medium; 5)	Default (Medium; 5)
	Saturation (1-9)	Default (Medium; 5)	Default (Medium; 5)
	White Balance	Default (Auto)	Default (Auto)
	Flash	On	On

Notes:

** Approximate date range between camera checks. Camera checks are performed in June and September, though checks were not completed on the same day at a given camera in each year.*

*** Reported values from Reconyx User Manual (Reconyx 2013) and Instruction Manual (Reconyx 2017a). Trigger response speed is the time between when motion occurs within the sensor range and when the camera is activated and records an image.*

**** Camera capable of taking photos at a speed of 2 frames per second, if rapid fire settings are used.*

***** Cameras were programmed to take timed photos every 30 minutes in the winter but due to an unknown programming problem no timed photos were taken at any cameras during the winter of 2017/2018.*

3.3 Camera Data Analysis

Camera data in 2022 were reviewed for the deployment period from September 2021 to September 2022 to record the presence of caribou, muskox, grizzly bear, wolverine, nest predators, and other wildlife. Camera effort was recorded from timed photos as the number of active deployment days for each camera.

3.3.1 Photo Review Process

All photos, including timed and motion-triggered photos, were manually scanned for wildlife observations using PC photo viewing software. For every wildlife observation, the following information was recorded in an Excel spreadsheet: species, number of animals, and behaviour (e.g., resting, foraging, travelling), date, time (including start and end times for motion-triggered photo sets), photo type, photo number (including start and end photo numbers for motion-triggered photo sets), number of photos, and number of triggers.

A portion of wildlife observations of VEC species were checked by a second person for the purposes of quality control. All observations of caribou and wolverine in the raw data were reviewed, as well as a portion of grizzly bear observations (approximately 75%). A portion of observations of non-VEC species were also checked including nest predator observations (approximately 75%).

3.3.2 Camera Effort

Camera effort was calculated as the total number of active deployment days from September 2021 to September 2022. Cameras occluded by snow (25% or more of the screen occluded) for 24 hours or more were considered to have no effort until the screen cleared (75% visibility or better). Cameras were also considered to have no effort during periods in which they were knocked over.

Overall camera effort (i.e., the total number of days in which the camera was able to record images of wildlife) was then calculated as follows:

- The dates associated with the first and last images recorded at a camera across the deployment period were determined; and
- Periods of inactivity (e.g., when a camera was obscured by snow or knocked over) were tabulated in 24 h increments and subtracted from each camera's total period of operation.

Following the above calculations, camera effort was then summarized by month and reported as "camera days".

From fall 2017 through spring 2018, camera effort (typically recorded via timed photos automatically taken throughout each day) was unavailable due to a camera programming error; therefore, from September 2017 through the next re-programming phase in June 2018, each camera's effort was assumed to be the same as the previous year's effort for a given camera and month. A sensitivity analysis conducted in 2019 filled the no-effort period with the following year's data (i.e., September 2018 to June 2019) and found no difference in caribou modelling data.

The effort information from June 2016 to September 2018 (ERM 2017, 2018, 2019, 2020) was combined with the effort information for the camera deployment periods from September 2021 to September 2022 for the total number of camera effort days monitoring caribou, muskox, grizzly bear, and wolverine.

3.3.3 Summarization of Wildlife Events

Camera data were reviewed to determine total number of wildlife events recorded at a camera as the basis for the quantitative (i.e., the statistical analysis) and qualitative analyses of species detections included in the 2022 Report. An event was defined as the detection of an individual or group of individuals on a timed (T) or motion-triggered (M) photo. Events were considered separate from one another if there was a period of inactivity at the camera between two successive photo observations of wildlife, regardless of photo type. A standard period of 30 minutes of inactivity was used to assess separate events for both photo types, as this was the longest period between successive timed photos during the winter period when cameras were programmed to take timed photos every 30 minutes. This 30-minute period was extended for use during the summer periods, when only one timed photo a day was recorded.

There was one exception to the general rule applied to determining separate wildlife events. A caribou event could be considered to be one event if the same individual, or group of individuals, were recorded at a camera during the same day. Caribou can often be identified to the individual based on behaviour (e.g., bedded down in front of the camera for several hours) or visible characteristics (e.g., size, coat colour, antler shape). This distinction was made to avoid double-counting the same individual(s) across events. For all other species it was not possible to determine unique individuals on images with certainty due to the lack of distinguishing features, and all events separated by 30 minutes or more were considered to be unique detections for the purposes of analysis.

Wildlife events (and the number of individuals recorded on events) were corrected for a monthly darkness factor supplied by the KIA (Table 3.3-1) (Table A-5; KIA 2017). This correction is used to make events and individuals recorded during the months with shorter day length more comparable to events recorded in the summer with long day length, as the reported detection radius of the Reconyx™ PC800 HyperFire camera is smaller in the dark relative to the daylight. This correction factor was used when qualitatively comparing between events and individuals recorded between cameras in the three monitoring zones. The correction factor is not used in the statistical analyses for caribou, grizzly bear, and wolverine, as month of the year was included as covariate term and camera effort per month was included an offset term in the modelling. Considering this, including the darkness factor was not necessary as effect of month was included and controlled for in the statistical modelling.

Table 3.3-1: Monthly Darkness Correction Factor for Camera Event Data

Month	Average Day Length (hh:mm:ss)	Average Day Length (h)	Proportion Daylight	Darkness Factor Correction
January	3:23:50	3	0.13	1.26
February	7:52:52	8	0.33	1.2
March	11:51:19	12	0.5	1.15
April	15:57:32	16	0.67	1.1
May	20:52:32	21	0.88	1.04
June	24:00:00	24	1	1
July	22:29:10	22	0.92	1.03
August	17:11:01	17	0.71	1.09
September	13:05:46	13	0.54	1.14
October	9:09:50	9	0.38	1.19
November	4:54:51	5	0.21	1.24
December	0:30:14	0	0	1.3

3.3.4 Species-specific Analysis

General Camera Monitoring

Caribou, grizzly bear, and wolverine event data recorded on motion-triggered photos in the Doris and Madrid areas for the period from June 2016 to September 2022 were compiled for the purposes of conducting a statistical analyses (see Section 6.1-6.3).

Qualitative summaries of camera data for muskox and mammalian nest predators were generated. Muskox data will be statistically analysed for possible ZOI effects in future years, if there are sufficient detections across the Study Area zones over time.

Boston camera data were processed and summarized but will not be analysed until data have been collected during a construction/operations phase, in addition to the current baseline data.

Site Specific Camera Monitoring

There were seven cameras with site specific monitoring objectives, and each of these cameras were set up to monitor for activity of a specific species or group of species (Table 3.1-1). For the purposes of the report, the cameras with site specific monitoring objectives are those that were placed to satisfy facilities monitoring objectives (see above), and data from these cameras are summarized in a separate report section to evaluate interactions between wildlife and Project facilities. Camera event data from timed and motion-triggered photos from these seven cameras are evaluated qualitatively; behaviour of individuals recorded during events was also discussed where relevant to the discussion of the interaction.

4. ON-SITE MONITORING AND MITIGATION

Wildlife interactions, incidents, and mortalities are recorded as part of the Wildlife Sightings/Reporting process. Reporting procedures at site use Sightings Cards for routine sightings of live animals, nesting, denning activity, and mortalities. A Wildlife Notification System is also used which includes non-emergency traffic awareness notifications plus higher levels of alerts for potentially dangerous wildlife. The site Environmental Department keeps a separate register of potential conflicts that may require deterrence of animals which require a response from the Wildlife Response Team (WRT). These records are labelled as an interaction or incident. An interaction occurs when wildlife interacts with people or Project infrastructure; deterrents may be used, but direct harm, injury, damage, or wildlife mortality does not take place.
An incident is an interaction where there is active deterrence and direct harm, injury, damage, or wildlife mortality occurs. Incidents that result in the mortality of VECs or large fauna, or mortalities resulting from potential interaction with Project activity are reported directly to GN DOE and KIA as necessary and are also reported in this Report annually. A mortality of Arctic ground squirrel is not considered to be an incident and is not reported to the GN DOE and KIA following a change to the incident reporting procedures in 2017; ground squirrel mortalities are now considered interactions. Incidents and mortalities involving migratory birds are reported to Environment and Climate Change Canada (ECCC) as necessary and are also reported in this Report annually.

5. INCIDENTAL WILDLIFE OBSERVATIONS BY ENVIRONMENT PERSONNEL

5.1 Wildlife Sightings Log

Observations from the wildlife sightings log were summarized by VEC species (caribou, muskox, grizzly bear, wolverine, upland birds, raptors, and waterbirds), nest predators, and other mammalian species. Nest predators include fox species, grey wolf, weasels, gulls, jaegers, and the common raven. Prior to 2015, grey wolf was included in the other species category; it is now classified as a nest predator following a request to do so by the KIA (KIA 2015). Species observed that are classified as a conservation concern are summarized in each relevant VEC section. Some records did not indicate the number of individuals observed, stated a group/flock were observed, or gave an approximate number. When an approximate number or range was given, the lowest number was used in calculations. If a number was not recorded, it was assumed that at least one individual was observed.

The wildlife sighting log data have limitations which preclude their use in estimating population size or densities. These include:

- Number of workers on site (the more workers the more potential reports);
- Observers knowledge (not all observers have the same experience or training in the identification of wildlife);
- Observers location of work (indoor versus outdoor);
- Mode of travel (snow machine versus rock truck);
- Eagerness to record species observed (which may vary with point in shift or by individual);
- Likeliness to report animal, e.g., large mammals (grizzly bear or caribou) are more likely to be reported than a waterbird or upland breeding bird;
- Multiple reports of same individual by different staff members;
- Lower likelihood of reporting common species (e.g., ground squirrels);
- Increased likelihood of reporting species on first emergence (e.g., end of hibernation or during migration); and
- Seasonal daylight differences (i.e., there is only a few hour period each day in winter that wildlife can be seen, whereas wildlife can be seen 24 hours a day in summer).

These limitations demonstrate why wildlife sightings log data are not useful to infer population sizes or densities. However, data from the wildlife sightings log provide a variety of natural history data that are useful for answering certain questions, including: 1) identifying anomalous species not encountered during other wildlife surveys, and 2) providing information on the timing of a species using an area (migrations, hibernation, calving).

Observations of the VEC species (caribou, muskox, grizzly bear, and wolverine), have been corrected by the average number of employees and contractors at site following a request from the KIA to do so for caribou (KIA 2015). The daily number of personnel at site was calculated and averaged for each month; the number of wildlife individuals recorded per month and number of records per month for each of the four species was divided by this number. Although sightings are standardized for number of personnel on site, for the other reasons outlined in the list above, these data are still not an appropriate information source for wildlife densities in the area.

5.2 Incidental Wildlife Observations by Environment and On Site Personnel

Incidental wildlife are detected spatially or temporally outside of VEC-specific monitoring surveys or are not the intended target group of VEC-specific monitoring surveys. Incidental data are most useful for documenting species that inhabit an area, and can identify species that might not be encountered during formal wildlife surveys. These observations can also provide information on the timing of migrations (caribou, various bird species), emergence from hibernation (ground squirrels, grizzly bears), and calving (muskox, caribou).

Incidental wildlife observations were collected opportunistically by environment personnel including wildlife biologists at the Project through all phases, including during Baseline/Pre-development surveys for the Project in 1996 through 2006, Construction (2007 to 2012, and 2015 to 2016), Care and Maintenance (2013 to 2014 and 2022), and Operations (2017 to 2021). These observations may help provide a more robust understanding of species richness on site.

6. VEC AND OTHER SPECIES MONITORING AND MITIGATION

6.1 Caribou

Analysis for caribou is conducted using two approaches: analysis of satellite collar data and analysis of data collected through the wildlife camera monitoring program.

6.1.1 Analysis of Satellite Collar Data

Collar data for the Beverly and Ahiak sub-populations were obtained for the period of 2001 to 2022 from the Government of Northwest Territories (GNWT) Department of Environment and Natural Resources (ENR). Collar data for the Dolphin and Union caribou herd have not been provided from the GN DOE since 2019.

6.1.1.1 Beverly/Ahiak Caribou Kernel Density Analysis

Data from the calving period were analyzed. The calving period for the Beverly and Ahiak caribou herds was estimated to be between June 5 and 20 (Gunn, Fournier, and Nishi 2000). Based on these findings, data outside of this date range were excluded from the analysis.

Duplicate data (same animal, date, and time) were removed, as were any obvious spatial outliers (single locations set well apart from the remaining locations for that animal). Data for each female caribou were retained for the period from June 5 to June 20 inclusive; then further reduced to the first location on each day for each animal. The Beverly and Ahiak data received from GNWT ENR were not specific to which herd the collared caribou belonged to, i.e. Beverely or Ahiak, this is a determination made by the calving ground each animal uses and which can vary annually. The sets of single-locations-per-day for each animal for the calving season were plotted against a reference longitude of 100.77° West and a north-south axis in line with the mouth of the Simpson River, which is consistent with the division between these sub-populations as reported by others (Nagy, Campbell, and Kelly 2012; Campbell et al. 2014). Animals with the majority of their locations to the West of the reference point were assigned to the Beverly herd, those with the majority of locations to the East were assigned to the Ahiak herd.

During some years with late springs, females may arrive on the calving grounds late, after June 5. All movement tracks of individual caribou were examined for each year. A set of locations for an animal trailing northward at the start of the calving period was considered part of its spring migratory movement; these series of locations were removed until the point at which the animal slowed and remained for the duration of the calving period near the body of the herd. The remaining data set, stripped of migratory movement data, with each animal assigned to either the Beverly or Ahiak herd was used for seasonal range analyses.

Utilization distribution (UD) surfaces were then created for each of the Ahiak and Beverly groups using the R package 'adehabitat'. The output is defined as a joint probability distribution (bivariate (X, Y)), "the probability that each of X, Y falls in any particular range specified for that variable" (R Core Team 2015). Vector contours of the raster surfaces were created within the same script using specified confidence intervals (95%, 50%). This analysis was done for a compilation of collar data from 2001 to 2021 as well as the 2022 data on its own. The current year was separated from the historical data for the purposes of monitoring for a potential shift in calving ground distribution relative to the Project, as outlined in ERM (2016). A shift may be evident if the current calving grounds are outside of areas used in previous years, and a range shift towards the Project Study Area that overlaps with Project activities may trigger additional mitigation measures in the following year (ERM 2016b).

6.1.1.2 Dolphin and Union Caribou Kernel Density Analysis

At the time of the initial report draft in March 2022, collar data from the Dolphin Union herd were not yet available from the GN. Collar data were never provided for 2020, so the analysis has not been conducted for the past two years. General methods for this analysis are described below. Upon receipt of additional data, methods and results will be updated to incorporate these missing analyses. See Section 3.4 in the 2022 Report for available analysis results.

Data from a period from December 8 to April 16 are analyzed as representative data for the winter range for the herd. The date range was selected based on the period of time when caribou from the herd are present on the mainland outside of the spring and fall migratory period. The beginning of the spring migration (April 17) was based on the earliest date that a collared Dolphin and Union caribou was observed on the sea ice within the Coronation Gulf, Dease Strait, and the Queen Maud Gulf. The end of fall migration (December 7) was the last date when a collared caribou was still present on the sea ice. The spring and fall migration dates were defined using collar data from 1999 to 2004. These date ranges were also applied to the collar data from 2015 onward. Two individuals remained north of 71° latitude for the winter of 2016/2017 and were excluded from calculations of winter UDs. Considering the above, no adjustments to the date ranges were deemed necessary.

Utilization Distributions surfaces are created using the winter data in ArcGIS. Kernel UDs are produced for (i) the current winter of study (December 8 to April 16) and (ii) combining available data from all years, including the current winter of study. The winter kernel is created using the same methodology used to map caribou habitat in the 2016 Draft Nunavut Land Use Plan (Nunavut Planning Commission 2016). Both the individual year and compilation of existing data are mapped using various features in ArcGIS 10.5.1. The data are compiled to provide a perspective on the overlap between the winter range and the Project Study Area in the most recent winter as well as the degree of overlap relative to the larger extent of the winter range by combining all available data. This analysis was guided by requests made by the KIA in 2017 (KIA 2017). Overlap in the winter grounds of the Dolphin and Union caribou herd with the Project Study Area/Project activities does not trigger any additional mitigation for caribou, as there are mitigation measures for caribou employed year round (ERM 2016b).

6.1.2 Statistical Analysis of Camera Data

Caribou occupancy data from motion-triggered photos from June 2016 to September 2022 were analyzed in R.4.3.1. First, a focused hypothesis test was used to assess whether or not cameras in the Treatment locations (< 2 km from existing infrastructure) had a different probability of caribou occupancy than the cameras in the Control locations (> 10 km from existing infrastructure). Caribou occupancy at a camera was defined as one or more caribou events at a camera in a month. A secondary analysis was conducted to evaluate the breadth of the potential ZOI (between 2 and 10 km from existing infrastructure); i.e., to evaluate at what distance an effect on caribou occupancy may be occurring.

Analyses were conducted using data from all cameras except cameras 2 and 35. Cameras 2 and 35 monitor caribou crossing ramps installed on the Doris-Windy AWR. Given the potential for caribou usage to differ at the crossing ramps relative to other areas near the Project and beyond, these cameras were removed from the analyses so that they would not influence the hypothesis test or secondary analysis for a ZOI. The two TIA cameras were included in the statistical analyses given that these two cameras are similar to other Treatment cameras located in close proximity to the Project site.

Camera effort was reviewed prior to the analyses to determine whether adjustments to the data were necessary. Variation in the number of camera days per month has the potential to influence modelling outcomes. A review of the camera data indicated that most cameras had a week or more of monitoring effort throughout most of the monitoring period except for the period from November through February, when most cameras had a week or less effort. December and January were removed from analyses due to low effort across cameras, following recommendations by the KIA (ERM 2018). Given the variation across cameras, all other months only included cameras with an effort cut point of ≥ 7 days per month; sensitivity analyses conducted in 2017 indicated that using lower effort cut points of ≥ 1 days per month and effort ≥ 4 days per month did not affect results.

Generalized additive mixed models were used to test whether there were differences in caribou occupancy recorded by cameras set up in Treatment locations and Control locations. A binomial distribution was used to model the probability of occupancy in a month at each camera. Smoothed covariate terms were included for month and northing, and effort was included as an offset term to adjust for varying number of days of effort per camera in each month. Camera number and year were included as categorical random effects to account for repeated measurements across cameras and interannual variation. The null hypothesis (Ho) was that there was no difference between the probability of at least one event occurring at the Treatment and Control cameras. The alternate hypothesis (Ha) was that the probability of an event differed between Treatment and Control cameras.

Samples sizes for the regression analyses were the total number of cameras by month, referred to as Camera*Months. Effort data were unavailable for September 2017 to May 2018 due to a camera programming error, thus the effort during these months was assumed to be the same as that month in the previous year. The Camera*Months represent the total number of cameras with a certain effort level by month across the 52-month monitoring period from June 2016 to September 2022 (omitting December and January in all years). For example, if all 21 cameras deployed in the Treatment Zone had seven or more days of effort in every month between June 2016 to September 2022, the number of Camera*Months in the Treatment zone would be 21 x 52 = 1,092 Camera*Months at the effort level of ≥ 7 camera days per month. The number of Camera*Months were further split for caribou by cameras that had caribou occupancy or did not (i.e., recorded at least one event or did not record any events). For example, for a single camera that had over a week of camera effort for every month of the monitoring period and did not record a caribou event, this camera would have a total of 52 unoccupied Camera*Months at the effort level of ≥ 7 days per month. If the same camera were to have recorded caribou events in two months, the camera would have a total of two Camera*Months with caribou occupancy and 50 unoccupied Camera*Months.

The secondary analysis for a ZOI also used a generalized additive mixed modelling approach, using similar approaches as the hypothesis test between Treatment and Control. An additional smoothed covariate term was included for distance to infrastructure. The distance to infrastructure was measured using the 2019 Project footprint, because footprint additions have been negligible since that time.

The Treatment vs. Control model (i.e., hypothesis test) and the secondary model testing for a potential ZOI were run using the *gamm()* function from the *mgcv* library. The *gamm()* function allows covariates to be modelled using smooth spline functions that accommodate non-linear trends which are expected for covariates such as month.

6.2 Muskox

Muskox monitoring was conducted through the wildlife camera program. Muskox camera records were summarized across the entire June 2016 – September 2022 period, though muskox were not a formally monitored VEC until 2018 (when Project Certificate No. 009 was adopted for the Phase 2 Project). Muskox events were too rare over the monitoring period and among the camera study area zones to perform a statistical analysis testing whether there is an effect of the Project.

6.3 Grizzly Bear

Grizzly bear monitoring is conducted through the wildlife camera program. The program was focused on whether there is an effect of the Project by analysing whether the number of grizzly bear events differ between cameras in the Treatment and Control zones. Data from cameras in the ZOI zone are further analyzed if a difference is detected between the Control and Treatment zones to determine the distance at which an effect may be occurring.

Grizzly bear event data recorded on motion-triggered photos were analyzed in a similar fashion to caribou occurrence data. Since more grizzly bears were observed, it was possible to explore models for the number of bear events in a month, rather than the occupancy analysis used for caribou. Due to the large number of zero counts in the grizzly bear event data, a Poisson distribution did not provide a good fit to the data. Thus, grizzly bear regression models were fit using a negative bionomial distribution on the error term. This is a flexible alterative to the standard Poisson distribution. The analyses were conducted using data from all cameras except for cameras 18, 21, and 22. Cameras 18 and 21 monitor the area of the Roberts Bay Waste Management Facility and camera 22 monitors an area along the Roberts Lake Outflow. Both of these areas may attract grizzly bears, e.g., from scents from the Waste Management Facility or as a fishing area along Roberts Creek. Given the potential for grizzly bear usage to be different at these two areas relative to other areas near the Project and beyond, these cameras were removed so that they would not influence the hypothesis tests or secondary analysis. The two TIA cameras were included in the statistical analyses given that these two cameras are similar to other Treatment cameras located in close proximity to the Project site.

Hibernation months (November to February) were removed from the grizzly bear analyses. Therefore, the number of months included was 43 total between June 2016 and September 2022. The calculation of sample sizes for the regression analyses, as the number of Camera*Months, was conducted the same way as described for caribou. These were further split by cameras that did not record any grizzly bear events and those that recorded at least one, and the total number of events recorded was also calculated.

6.4 Wolverine

Wolverine monitoring is conducted through the wildlife camera program. The program was focused on whether there is an effect of the Project on wolverine occurrences. Differences between Treatment and Control zones were tested. Data from the ZOI zone were also assessed to determine the effect of distance to infrastructure, if a significant difference between occupancy in the Treatment and Control zones was detected. Regression models, as outlined for the caribou analysis (see Section 6.1.2), were fit to the wolverine occupancy data recorded on motion-triggered photos.

6.5 Nest Predators

Nest predator monitoring is conducted through the wildlife camera program. Nest predator attraction to the Project could result in indirect mortality of breeding birds, so nest predators are monitored during the reproductive period for birds in the Arctic, mid-May to mid-August. The monitoring program aims to qualitatively compares nest predator occurrence in the Treatment zone with the ZOI and Control zone.

Nest predators monitored through the camera program do not include small bodied mammals, such as weasels, because they are often not recorded in the camera data. Avian nest predators (i.e., gulls and common raven) are also generally under-reported in camera data, but are included in summaries when they are recorded.

6.6 Upland Breeding Birds

Pre-clearing surveys were not required in 2022 as no new area was cleared during the bird breeding season. Pre-clearing surveys are done if clearing is scheduled to occur between mid-May and mid-August, which is the reproductive period for birds in the Arctic (ECCC 2016).

6.6.1 PRISM Plot Surveys

Ground-based surveys following the Program for Regional and International Shorebird Monitoring (PRISM) protocol were completed in 2022. PRISM surveys were completed at regional sites to contribute to Canadian Wildlife Service (CWS) data. Field surveys were conducted in late June to correspond to the upland bird and shorebird nesting season. The surveys were particularly targeting documentation of shorebird habitat use.

All PRISM plot locations were provided by CWS. Plots are 300 m × 400 m in size (12 ha). PRISM plots were surveyed following protocols developed by the Canadian Wildlife Service (CWS 2017), except surveys were conducted with three observers instead of two. Sites were accessed by helicopter, with landing locations spaced at least 200 m from plots to minimize disturbance to birds. Habitat, weather, and noise variables were recorded at the beginning of each survey to North American Breeding Bird Survey standards (Environment Canada 2017), and plot photos were taken from at least one corner of the plot. Observers systematically surveyed the plot area starting from one corner and walking in tandem along north south transects at a distance of approximately 15-20 m from one another. At the end of each 400 m long transect, each observer walked 40 m to their next transect line (either directly east or west, depending on the starting location) and passed through the plot again (Figure 6.6-1). This was repeated until each observer had walked six transect lines, for a total of 12 transect lines per plot.

During each PRISM plot survey, the team mapped all bird species within the plot area according to species and, when possible, to sex. Surveys were carried out with a focus on shorebirds, but other species of birds including songbirds, ptarmigan, and waterbirds were also recorded. As surveys proceeded, one observer characterized and mapped the specific vegetation types within each plot area and each territory was judged to be located within one mapped habitat type. Breeding territories within a plot were determined based on behavioural cues of breeding (carrying food or nest materials, observed in courtship or copulation, being paired, alarm calling, distraction displays, tending to a nest, or flushing), and any active nests found during surveys. Shorebird and songbird nests are normally well hidden or camouflaged, making them difficult to find. However, observations of bird behaviour (e.g., rapid flushing from nest sites when incubating individuals are disturbed, broken wing displays often given by shorebirds to lead predators away from nest sites) can be used to find nests or to pinpoint the approximate location of nest sites. All nests located during PRISM surveys were geo-referenced and photographed at the time of detection. Nest productivity was also recorded (i.e., number of eggs or nestlings). The breeding status was unknown for individuals that were not singing or displaying definitive breeding cues.

Observations of territorial behaviour cues and nests were combined for each species to generate counts of the number of breeding territories per PRISM plot.

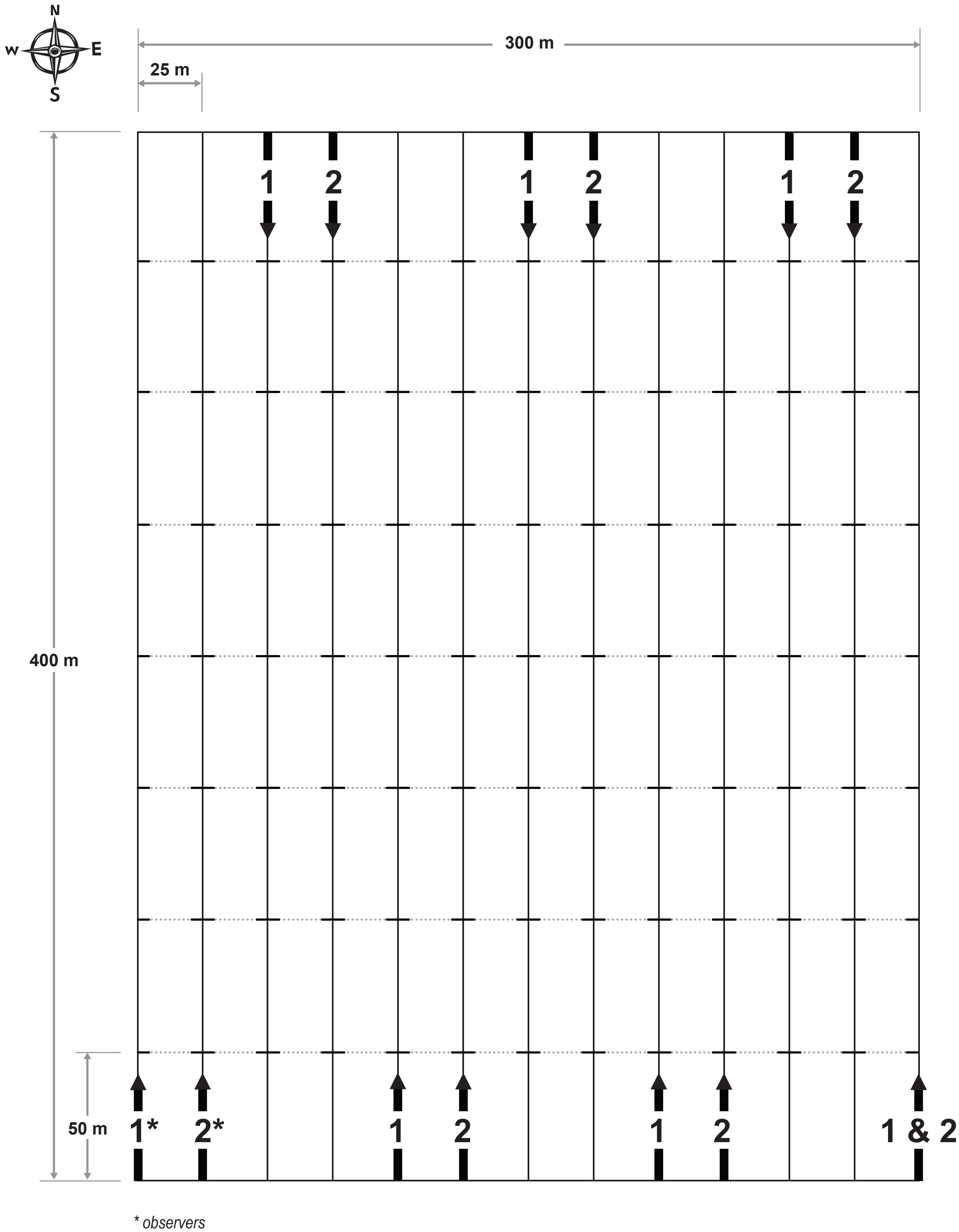

Figure 6.6-1: Schematic of PRISM Plot Survey Methodology

6.7 Waterbirds

6.7.1 Ground Surveys

Ground-based counts were completed for waterbirds at 15 sites with varying distance from Project infrastructure (Figure 3.10-1 in the 2022 Report). Sampling was targeted during the spring pairing season (late June) to coincide with the establishment of nesting territories. Surveys were completed by a team of one ERM biologist and two additional observers/recorders. The team approached survey locations on foot from 200+ meters away (i.e., left trucks or landed in helicopter from a distance to avoid flushing birds). Ground surveys were conducted within a fixed radius (200 m from the observer) for a set time of 20 minutes. At each survey location, all bird observations were recorded according to species, number of individuals, sex, age (adult/young), and behaviour. Site specific information was recorded as well (e.g., weather, time, date, location, habitat information). Bird observations were marked as incidental if they were observed more than 200 m from the observer or flying over, or if they were seen or heard before or after the survey was completed. All mammal observations were recorded as incidentals as well.

The total number of species (i.e., species richness), the number of individuals, the total count of nests, species of concern, and behavior were summarized.

6.7.2 Water Quality Monitoring

Water quality at the TIA was monitored in 2022 in accordance with Commitment 31 and Condition 26 (NIRB 2018). Should water quality exceed guidelines for waterbirds, Agnico Eagle will conduct a toxicological risk assessment to determine if birds are safe using or nesting on the TIA. If that risk assessment determines that there is a risk to waterbird health, then waterbirds will be deterred from the TIA.

Water quality in the TIA at location TL-1 was measured approximately weekly in 2022 by on site staff as part of the existing water license requirements. Water quality data for parameters with guidelines relevant to wildlife (i.e., arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc) were provided to ERM and are presented in Appendix 3.10-1. Maximum concentrations were compared to the CCME *Water quality guidelines for the Protection of Agriculture – Livestock* as those are the guidelines that are available and most relevant for wildlife. If the maximum concentration exceeded the guideline, the parameter was considered for an ecological risk assessment for waterbirds at the TIA.

Water quality did not exceed guidelines for wildlife in 2022, so no risk assessment was therefore warranted.

6.8 Raptors

Surveys were not necessary for raptor nests in 2022 because there was no active construction of Madrid North during the raptor breeding season.

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APPENDIX 2.4-1 HOPE BAY ROADSIDE SNOWBANK MONITORING DATA, 2022

Appendix 2.4-1: Hope Bay Roadside Snowbank Monitoring Data, 2022

Date	Survey Details	Site	East Measure (cm)	West Measure (cm)	Photos	Snowbank Condition	Comments
Jan	Start Time: 10:05 End Time: 12:00 Observers: GDV, WN Days since last snow: 3 Temp (°C): -30 Wind Speed (m/s): 2.8 E Weather: clear skies	SB1	8	13	SB1-E and SB1-W	Clear, maintained 3 days prior	Cell phone used for photos
		SB2	4	24	SB2-E and SB2-W	Clear, maintained 3 days prior	Cell phone used for photos
		SB3	46	16	SB3-E and SB3-W	Clear, maintained 3 days prior	Cell phone used for photos
		SB4	19	40	SB4-E and SB4-W	Clear, maintained 3 days prior	Cell phone used for photos
		SB5	1	0	SB5-E and SB5-W	Clear, maintained 3 days prior	Cell phone used for photos
		SB6	28	12	SB6-E and SB6-W	Clear, maintained 3 days prior	Cell phone used for photos
		SB7	17	16	SB7-E and SB7-W	Clear, maintained 3 days prior	Cell phone used for photos
Feb	Start Time: 11:10 End Time: 12:09 Observers: TL, WN Days since last snow: 6 Temp (°C): -58 Wind Speed (m/s): 8.2 NW Weather: mostly overcast, cold	SB1	2	6	SB1-East and SB1-West	Clear and maintained after last snow 6 days prior	Only snow drift clearance performed after the last snow fall
		SB2	5	12	SB2-East and SB2-West	Clear and maintained after last snow 6 days prior	Only snow drift clearance performed after the last snow fall
		SB3	18	8	SB3-East and SB3-West	Clear and maintained after last snow 6 days prior	Only snow drift clearance performed after the last snow fall
		SB4	8	14	SB4-East and SB4-West	Clear and maintained after last snow 6 days prior	Only snow drift clearance performed after the last snow fall
		SB5	0	0	SB5-East and SB5-West	Clear and maintained after last snow 6 days prior	Only snow drift clearance performed after the last snow fall
		SB6	12	8	SB6-East and SB6-West	Clear and maintained after last snow 6 days prior	Only snow drift clearance performed after the last snow fall
		SB7	9.6	8	SB7-East and SB7-West	Clear and maintained after last snow 6 days prior	Only snow drift clearance performed after the last snow fall
Mar	Start Time: 13:00 End Time: 14:30 Observers: WN, JS Days since last snow: 7 Temp (°C): -37 Wind Speed (m/s): 6.7 E Weather: overcast, cool	SB1	7.2	22	SB1 East and SB1 West	Cleared and maintained	
		SB2	12.6	28.2	SB2 East and SB2 West	Cleared and maintained	
		SB3	23	22.2	SB3 East and SB3 West	Cleared and maintained	
		SB4	16	15.6	SB4 East and SB4 West	Cleared and maintained	
		SB5	8	1.8	SB5 East and SB5 West	Cleared and maintained	
		SB6	20	12	SB6 East and SB6 West	Cleared and maintained	
		SB7	12	14	SB7 East and SB7 West	Cleared and maintained	
Apr	Start Time: 15:20 End Time: 17:10 Observers: WN Days since last snow: unknown Temp (°C): -38 Wind Speed (m/s): 8.2 Weather: mostly sunny, gusty winds	SB1	6.6	21	SB1 East and SB1 West	Roads bare	Some drifting as sign posts from gusty winds
		SB2	4	35.6	SB2 East and SB2 West	Roads bare	Some drifting as sign posts from gusty winds
		SB3	29.4	12	SB3 East and SB3 West	Roads bare	Some drifting as sign posts from gusty winds
		SB4	18	10.8	SB4 East and SB4 West	Roads bare	Some drifting as sign posts from gusty winds
		SB5	5.2	0	SB5 East and SB5 West	Roads bare	Some drifting as sign posts from gusty winds
		SB6	16.6	19.4	SB6 East and SB6 West	Roads bare	Some drifting as sign posts from gusty winds
		SB7	22.8	17	SB7 East and SB7 West	Roads bare	Some drifting as sign posts from gusty winds

Date	Survey Details	Site	East Measure (cm)	West Measure (cm)	Photos	Snowbank Condition	Comments
Oct	Start Time: 14:00 End Time: 15:30 Observers: TL, LPG Days since last snow: 1 Temp (°C): -15 Wind Speed (m/s): 8.7 Weather: clear	SB1	0	9.4	PXL_20221028_212425835; PXL_20221028_212636834; PXL_20221028_212711208; PXL_20221028_212804780; PXL_20221028_212806618; PXL_20221028_212833260	Blown over	
		SB2	0	0	PXL_20221028_211507945; PXL_20221028_211622840; PXL_20221028_211651676; PXL_20221028_211739261; PXL_20221028_211805158	Blown over	
		SB3	2.4	38.4	PXL_20221028_210420326; PXL_20221028_21-459179; PXL_20221028_210548715; PXL_20221028_210757416; PXL_20221028_210827437	Blown over	
		SB4	0	10.6	PXL_20221028_205402650; PXL_20221028_205504592; PXL_20221028_205530855; PXL_20221028_205633177; PXL_20221028_205702293	Blown over	
		SB5	0	0	PXL_20221028_204155128; PXL_20221028_204239463; PXL_20221028_204307035; PXL_20221028_204359771; PXL_20221028_204400756; PXL_20221028_204426333	Blown over	
		SB6	7.4	7.2	PXL_20221028_202951026; PXL_20221028_203025587; PXL_20221028_203055646; PXL_20221028_203255372; PXL_20221028_203256883; PXL_20221028_203322915	Blown over	
		SB7	0	10.2	PXL_20221028_201506024; PXL_20221028_201528480; PXL_20221028_201610096; PXL_20221028_201655444; PXL_20221028_201700069; PXL_20221028_201732008; PXL_20221028_201737410	Blown over	

Date	Survey Details	Site	East Measure (cm)	West Measure (cm)	Photos	Snowbank Condition	Comments
Nov	Start Time: 12:30 End Time: 14:30 Observers: WN Days since last snow: 1 Temp (°C): -32 Wind Speed (m/s): 2.2 Weather: overcast	SB1	16	0	SB1 E and SB1 W	Snowbank compressed of blowing snow	
		SB2	15	0	SB2 E and SB2 W		
		SB3	45.8	0	SB3 E and SB3 W		
		SB4	16.4	15.2	SB4 E and SB4 W		
		SB5	16	0	SB5 E and SB5 W		
		SB6	19	5.8	SB6 E and SB6 W		
		SB7	14.6	13.2	SB7 E and SB7 W		
Dec	Start Time: 13:00 End Time: 14:00 Observers: TL, LPG Days since last snow: unknown Temp (°C): -36 Wind Speed (m/s): 4.6 Weather: overcast	SB1	5.6	0	SB1-1, SB1-2, SB1-3, SB1-4, SB1-5	Recently plowed	
		SB2	0	2.4	SB2-1, SB2-2, SB2-3, SB2-4, SB2-5, SB2-6, SB2-7, SB2-8	Recently plowed	
		SB3	81	2.4	SB3-1, SB3-2, SB3-3, SB3-4, SB3-5, SB3-6	Recently plowed	
		SB4	11	2.4	SB4-1. SB4-2, SB4-3, SB4-4, SB4-5, SB4-6	Recently plowed	
		SB5	13.4	0	SB5-1, SB5-2		
		SB6	9.4	5	SB6-1, SB6-2		
		SB7	20	0	SB7-1, SB7-2, SB7-3		
Dec	Start Time: 13:30 End Time: 15:30 Observers: TLG, DV Days since last snow: 2 Temp (°C): -39 Wind Speed (m/s): 2.1 Weather: clear	SB1	0	22.6	SB1-1 and SB1-2		
		SB2	3	0	SB2-1 and SB2-2		
		SB3	3.6	83	SB3-1 and SB3-2		km 3, bunny tracks and fox tracks
		SB4	5	14.6	SB4		
		SB5	0	4.4	SB5		
		SB6	5	13.6	SB6		km 6, fox tracks
		SB7	4.8	21.2	SB7-1 and SB7-2		km 8, bunny tracks

APPENDIX 2.5-1 HOPE BAY QUARRY BLAST NOISE MONITORING SOP

	Hope Bay Project	
	Quarry Blasting Noise Monitoring	
AGNICO EAGLE	STANDARD OPERATING PROCEDURE	ENVIRO-01
	16 March 2022	Version C.1
Scope of Work:	This SOP provides guidance for personnel conducting noise monitoring at quarry blasts to confirm modeling predictions of noise levels reached at various distances from the blast.	
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BACKGROUND INFORMATION AND OBJECTIVES

Agnico Eagle Mines Ltd. (Agnico Eagle) has committed to stopping blasting when caribou are within 96 dB LPeak (noise level when blasting; ERM 2019). This threshold for blasting was chosen from a review of the available literature, which indicated that ungulates may have a freezing or startle response when exposed to 96 dB LPeak overpressure (Manci et al. 1988; Weisenberger et al. 1996; Reimers and Colman 2006). Previous noise modeling suggested that this noise level is reached at 2.8 km from the blast (ERM 2019), and therefore blasting is stopped when caribou are within 2.8 km. This value was deemed extremely conservative by noise modellers.

The objective of the noise monitoring is to measure noise levels at various distances from the blasts to confirm these previous modeling predictions, as per the Hope Bay Project's Commitment #41 from the Final Hearing, presented in Appendix B of the Nunavut Impact Review Board (NIRB) Project Certificate (009; NIRB 2018). The Commitment states:

- TMAC will conduct noise measurements during quarry blasts at 2.8 km and 4 km to confirm predictions.
- TMAC will confirm that the overpressure value of 96 Lpeak, dBZ will not exceed at 2,800 m from the location of the blast.

This Noise Monitoring Standard Operating Procedure (SOP) has been developed to guide these noise monitoring measurements during quarry blasts. The SOP identifies procedures for TMAC staff to follow to accurately collect the noise data, including:

- requirements for personnel conducting noise monitoring;
- required equipment for noise monitoring;
- the procedure to collect noise measurements in the field;
- metadata to record in the field;
- the procedure for downloading data after monitoring;
- how to proceed based on noise measurement results; and
- reporting requirements.

TMAC will update this SOP as necessary, in response to data collected in the field or scientific advances, or in response to feedback from stakeholders or regulators, including the KIA, GN, or CWS.

1. METHODS

1.1 Personnel Requirements

The noise monitoring site visits during blasts will be conducted by experienced technicians to ensure that the equipment is properly handled and set up, and that proper documentation and field observations are made to identify audible noise sources. Experience with the 2250 sound level meter is required.

1.2 Equipment

Personnel will require the following equipment for taking noise measurements during a blast:

- Bruel & Kjaer (B&K) Model 2250 sound level meter (the instrument) capable of logging the data:
  - Pre-amplifier and microphone cartridge;
  - CF or SD cards for data storage (1 for use, 1 for replacement, and 1 extra);
  - Case and power supply (battery pack or wall supply);
- Outdoor microphone kit:
  - Microphone extension cable;
  - UA 1404 - upper assembly (windscreen, shower cap, bird);
- Calibrator;
- Mounting apparatus – tripod or pole:
  - Zip ties;
  - Wire cutters/knife;
  - Tape;
- Noise Monitoring Field Data Sheet (Attachment B);
- Kestrel weather meter;
- Clipboard and pencil;
- Camera;
- GPS; and
- Communication device (e.g., radio).

1.3 Data Collection Procedures

1.3.1 Preparation for the Field

Prior to leaving the office to conduct noise monitoring, personnel must:

- Check the local weather forecast. Avoid taking measurement in winds > 6 m/s (12 mph) or rain (other than light showers). Excessive wind can introduce low frequency noise due to air movement over the windscreen, and can result in non-typical noise due to wind in trees. Heavy rain can increase background noise levels. Even light rain can increase tire noise when monitoring near roadways.

- Arrange for or confirm access to proposed monitoring sites if necessary. Noise data will be collected at sites 2 km away from the blast for the first time out and the distance will be adjusted in subsequent monitoring occasions based on results (Section 3). Factors to consider in site selection include:
  - Avoid locations that could be affected by nearby construction noise or added noise from nearby personnel, creeks, or anything that could be moved by wind.
  - Sound reflections off buildings or other solid objects can significantly affect measured levels. Try to have microphone at least 3 m away from large reflecting surfaces.
- Ensure batteries are charged for sound level meters, cameras, gps units, radios.

1.3.2 Deployment Setup

<u>Step 1</u>. Properly set up the instrument software by following the procedure on pages 1-7 in Attachment C.

<u>Step 2.</u> Assemble the equipment in the selected monitoring location:

- mount the mic cartridge, preamp, and extension cable in the outdoor kit;
- connect the extension cable to the top socket of the instrument; and
- mount the outdoor kit on the tripod or extension pole using zip ties. If there is any possibility of the microphone extension cable tapping against the tripod should the wind pick up, then tape the cable to the tripod to avoid invalid noise data. In most situations, a microphone height of 1.2 to 1.5 m above the ground is appropriate but this is not governed by any particular standard or regulation.

<u>Step 3.</u> Calibrate the instrument. Sometimes, if a microphone extension cable is not fully inserted, the meter will appear to be working but it will only be registering the noise floor of the meter. Calibration must be completed once a day prior to deployment to ensure that the noise meter and microphone are still properly operating. The instrument calibration procedures can be found on page 8 of Attachment C.

<u>Step 4.</u> Record all necessary field data on the Field Data Collection Sheet (Attachment B):

- time of calibration;
- instrument data and calibration results;
- UTM location of monitoring site;
- description of the monitoring site (type of surface the meter is standing on);
- distance from all obstacles in the area (cannot be closer than 3 m to any surface except the ground surface);
- photos of the deployed monitoring equipment (showing every direction at each monitoring location);
- time of set up and tear down;
- date and time of the blast;
- weather conditions at each site at the time of set up and tear down including;
- temperature (degrees Celsius);
- relative humidity (%);
- wind speed (km/h or m/s);

- wind direction (degrees from true North);
- precipitation (mm); and
- additional noise sources in the area of the instrument (trucks on the road, birds, wind, rain, etc.).

Step 5. Start the noise measurements prior to the blast by pressing the Play button. The flashing yellow occurs every 5 seconds before you start the measurement. Once the Play button is pressed, a steady green light comes on. The green indicates that the instrument is recording data. The sound pressure is continuously plotted on a graph and the play symbol appears. See the screen photos on page 9 of Attachment C.

Step 6. Once the meter has been started, try to minimize any noise. Before leaving the instrument, check that the device is receiving external power (LED and Plug icon) and that the Time Remaining is greater than or equal to the required measurement duration.

- It is recommended to leave the area while monitoring is occurring. Attempt to be as quiet as possible while leaving or, if this is not practical, make a note of the time at which you departed from the site.
- If personnel stay in the area, all engines must be shut off and silence is required.

1.3.3 Equipment Retrieval

Step 1. Return to the monitoring site to retrieve the tripod and instrument after the blast is completed.

Step 2. Open the Pelican case, “wake up” the display by touching it, and confirm that the measurement is still in progress (i.e. green light is still flashing). Stop the measurement by pressing the Play/Pause button. At this point the data is unsaved and the button will flash amber every second.

Step 3. Save the data by pressing the button to the right of the Play/Pause button (page 10 in Attachment C). The amber light will then flash every 5 seconds. If the battery has died or if the meter has run out of memory, valid data should be available up until the point at which the battery died or the memory became full. The * will disappear from the end of the file name and the stop symbol will appear. The screen will also display the amount of time remaining if any.

Step 4. If, for any reason, the measurement was unsuccessful, consider whether measurement repeats will be required immediately or at a later date.

Step 5. If the noise monitor is to be moved immediately to another site, download the data onto a laptop computer (Section 2.3.4) or take out the memory card and put in a new one (there may not be sufficient memory left on the first card).

Step 6. Record any additional data required such as end time of monitoring, any final photos and additional notes, and record any change in weather parameters.

Step 7. Pack up equipment being sure to leave nothing behind.

1.4 Data Download

To transfer the noise monitoring data from an SD card onto a laptop, the BZ5503 Measurement Partner software is used and can be downloaded onto a laptop from here: http://update.bksv.com/BZ5503/Latest/setup.exe.

For all details on data transfer and re-formatting the SD card, see the procedures in Attachment D. QA/QC measures will be conducted on the downloaded data. Weather data will be verified with the recorded weather data from the Kestrel pocket weather meter.

2. RESULTS

Upon receiving the data, ERM, will analyze the results of the noise monitoring and present a noise profile. This will determine where to subsequently monitor:

- If the dB Lpeak is below 96 dB at 2 km, then monitoring will move to 1.5 or 1 km from the blast next.
- If the dB Lpeak is above 96 dB at 2 km, then monitoring will move to 3 km from the blast next.

3. REPORTING

A noise monitoring report will be completed following all data collection. The reports will include a summary of the methods and equipment, summary tables for the weather, noise data, along with graphs of the raw noise data, a map showing the location of monitoring sites, and photos of each site. Any noise sources that cause noise criteria to be exceeded will be identified. The noise monitoring report will confirm the distance from the blast where 96 Lpeak dBZ (noise threshold for caribou disturbance) is recorded, which will provide input and potential further mitigation measures for caribou in the ongoing Wildlife Mitigation and Monitoring Plan.

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ATTACHMENT A: GLOSSARY – ACOUSTICAL CONCEPTS AND TERMINOLOGY

Attachment A: Acoustics Glossary

A.1. ACOUSTICAL CONCEPTS AND TERMINOLOGY

A.1.1 What Is Noise And Vibration?

Noise

Noise is often defined as a sound, especially one that is loud or unpleasant or that causes disturbance[1] or simply as unwanted sound, but technically, noise is the perception of a series of compressions and rarefactions above and below normal atmospheric pressure.

Vibration

Vibration refers to the oscillating movement of any object. In a sense noise is the movement of air particles and is essentially vibration, though in regards to an environmental assessment vibration is typically taken to refer to the oscillation of a solid object(s). The impact of noise on objects can lead to vibration of the object, or vibration can be experienced by direct transmission through the ground, this is known as ground-borne vibration.

Essentially, noise can be described as what a person hears, and vibration as what they feel.

A.1.2 What Factors Contribute To Environmental Noise?

The noise from an activity, like construction works, at any location can be affected by a number of factors, the most significant being:

- How loud the activity is?
- How far away the activity is from the receiver?
- What type of ground is between the activity and the receiver location e.g. concrete, grass, water or sand?
- How the ground topography varies between the activity and the receiver? For example, is it flat, hilly, mountainous? Blocking the line of sight to a noise source will generally reduce the level of noise.
- Any other obstacles that block the line of sight between the source to receiver e.g. buildings or purpose built noise walls.

A.1.3 How to Measure and Describe Noise?

Noise is measured using a specially designed ‘sound level’ meter which must meet internationally recognised performance standards. Audible sound pressure levels vary across a range of 10^7 Pascals (Pa), from the threshold of hearing at 20μPa to the threshold of pain at 200Pa. Scientists have defined a statistically described logarithmic scale called Decibels (dB) to more manageably describe noise.

To demonstrate how this scale works, the following points give an indication of how the noise levels and differences are perceived by an average person:

- 0 dB - represents the threshold of human hearing (for a young person with ears in good condition).
- 50 dB – represents average conversation.

[1] Copyright © 2011 Oxford University Press

- 70 dB – represents average street noise, local traffic etc.
- 90 dB – represents the noise inside an industrial premises or factory.
- 140 dB - represents the threshold of pain – the point at which permanent hearing damage may occur.

A.1.4 Human Response to Changes in Noise Levels

The following concepts offer qualitative guidance in respect of the average response to changes in noise levels:

- Differences in noise levels of less than approximately 2 dB are generally imperceptible in practice, an increase of 2 dB is hardly perceivable.
- Differences in noise levels of around 5 dB are considered to be significant.
- Differences in noise levels of around 10 dB are generally perceived to be a doubling (or halving) of the perceived loudness of the noise. An increase of 10 dB is perceived as twice as loud. Therefore an increase of 20 dB is four times as loud and an increase of 30 dB is eight times as loud etc.
- The addition of two identical noise levels will increase the dB level by about 3 dBA. For example, if one car is idling at 40 dB and then another identical car starts idling next to it, the total dB level will be about 43 dB.
- The addition of a second noise level of similar character which is at least 8 dB lower than the existing noise level will not add significantly to the overall dB level.
- A doubling of the distance between a noise source and a receiver results approximately in a 3 dB decrease for a line source (for example, vehicles travelling on a road) and a 6 dB decrease for a point source (for example, the idling car discussed above).
- A doubling of traffic volume for a line source results approximately in a 3 dB increase in noise, halving the traffic volume for a line source results approximately in a 3 dB decrease in noise.

A.1.5 Terms to Describe the Perception of Noise

The following terms offer quantitative and qualitative guidance in respect of the audibility of a noise source:

- **Inaudible / Not Audible** - the noise source and/or event could not be heard by the operator, masked by extraneous noise sources not associated with the source. If a noise source is ‘inaudible’ its noise level may be quantified as being less than the measured L_{A90} background noise level, potentially by 10 dB or greater.
- **Barely Audible** – the noise source and/or event are difficult to define by the operator, typically masked by extraneous noise sources not associated with the source. If a source is ‘barely audible’ its noise level may be quantified as being 5 - 7 dB below the measured L_{A90} or L_{Aeq} noise level, depending on the nature of the source e.g. constant or intermittent.
- **Just Audible** – the noise source and/or event may be defined by the operator. However there are a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.
- **Audible** - the noise source and/or event may be easily defined by the operator. There may be a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

- **Dominant** – the noise source and/or event are noted by the operator to be significantly 'louder' than all other noise sources. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

The following terms offer qualitative guidance in respect of acoustic terms used to describe the frequency of occurrence of a noise source during an operator attended environmental noise measurements:

- **Constant** – this indicates that the operator has noted the noise source(s) and/or event to be constantly audible for the duration of the noise measurement e.g. an air-conditioner that runs constantly during the measurement.
- **Intermitten**t – this indicates that the operator has noted the noise source(s) and/or event to be audible, stopping and starting intervals for the duration of the noise measurement e.g. car pass-bys.
- **Infrequent** – this indicates that the operator has noted the noise source(s) and/or event to be constantly audible, however; not occurring regularly or at intervals for the duration of the noise measurement e.g. a small number of aircraft are noted during the measurement.

A.1.6 How to Calculate or Model Noise Levels?

There are two recognized methods which are commonly adopted to determine the noise at particular location from a proposed activity. The first is to undertake noise measurements whilst the activity is in progress and measure the noise, the second is to calculate the noise based on known noise emission data for the activity in question.

The second option is preferred as the first option is largely impractical in terms of cost and time constraints, notwithstanding the meteorological factors that may also influence its quantification. Furthermore, it is also generally considered unacceptable to create an environmental impact simply to measure it. In addition, the most effective mitigation measures are determined and implemented during the design phase and often cannot be readily applied during or after the implementation phase of a project.

Because a number of factors can affect how 'loud' a noise is at a certain location, the calculations can be very complex. The influence of other ambient sources and the contribution from a particular source in question can be difficult to ascertain. To avoid these issues, and to quantify the direct noise contribution from a source/site in question, the noise level is often calculated using noise modelling software packages. The noise emission data used in may be obtained from the manufacturer or from ERM's database of measured noise emissions.

A.1.7 Acoustic Terminology & Statistical Noise Descriptors

Environmental noise levels such as noise generated by industry, construction and road traffic are commonly expressed in dBA. The A-weighting scale follows the average human hearing response and enables comparison of the intensity of noise with different frequency characteristics. Time varying noise sources are often described in terms of statistical noise descriptors. The following descriptors are commonly used when assessing noise and are referred to throughout this acoustic assessment:

- **Decibel (dB is the adopted abbreviation for the decibel)** – The unit used to describe sound levels and noise exposure. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.
- **dBA -** unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.

- **dBC** – unit used to measure ‘C-weighted’ sound pressure levels. C-weighting is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans.
- **dBZ or dBL** – unit used to measure ‘Z-weighted’ sound pressure levels with no weighting applied, linear.
- **Hertz (Hz)** - the measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.
- **Octave –** a division of the frequency range into bands, the upper frequency limit.
- **1/3 Octave** – single octave bands divided into three parts.
- **L_{eq} -** this level represents the equivalent or average noise energy during a measurement period. The $L_{eq, 15min}$ noise descriptor simply refers to the L_{eq} noise level calculated over a 15 minute period. Indeed, any of the below noise descriptors may be defined in this way, with an accompanying time period (e.g. $L_{10, 15 minute}$) as required.
- **L_{max}** - the absolute maximum noise level in a noise sample.
- **L_N -** the percentile sound pressure level exceeded for N% of the measurement period calculated by statistical analysis.
- **L_{10} -** the noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels.
- **L_{90}** - the noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L_{90} level is often referred to as the “background” noise level and is commonly used as a basis for determining noise criteria for assessment purposes.
- **Sound Power Level (L_W**) - this is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment.
- **Sound Pressure Level (L_P)** - the level of sound pressure; as measured at a distance by a standard sound level meter with a microphone. This differs from L_W in that this is the received sound as opposed to the sound ‘intensity’ at the source.
- **Background noise** – the underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L_{A90} descriptor.
- **Ambient noise** – the all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the L_{Aeq} descriptor.
- **Cognitive noise** – noise in which the source is recognised as being annoying.
- **Masking** – the phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.

Industrial Noise Policy (INP) Terminology

The following terminology is from the NSW Environment Protection Authority – *NSW Environmental Noise Management – Industrial Noise Policy* (INP), January 2000 and relevant application notes:

- **Assessment Background Level (ABL)** - is defined in the INP as a single figure background level representing each assessment period (day, evening and night). Its determination is by the tenth percentile method (of the measured L_{A90} statistical noise levels) described in Appendix B on the INP.
- **Rating Background Level (RBL)** - is defined in the INP as the overall single figure background level representing each assessment period (day, evening and night) over the whole monitoring period (as opposed to over each 24 hour period used for the ABL). This is the level used for assessment purposes. It is defined as the median value of:
  - All the day assessment background levels over the monitoring period for the day;
  - All the evening assessment background levels over the monitoring period for the evening; or
  - All the night assessment background levels over the monitoring period for the night.
- **Extraneous noise** – noise resulting from activities that are not typical of the area. Atypical INP activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
- **Most affected location(s)** – locations that experience (or will experience) the greatest noise impact from the noise source under consideration. In determining these locations, one needs to consider existing background levels, exact noise source location(s), distance from source (or proposed source) to receiver, and any shielding between source and receiver.
- **Noise criteria** – the general set of non-mandatory noise level targets for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (for example, noise levels for various land uses).
- **Noise limits** – enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
- **Project Specific Noise Levels** – target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility.
- **Compliance** – the process of checking that source noise levels meet with the noise limits in a statutory context.
- **Non-compliance** – development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit by more than 2 dB.
- **Feasible and Reasonable measures** – feasibility relates to engineering considerations and what is practical to build. reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors:
  - Noise mitigation benefits (amount of noise reduction provided, number of people protected);
  - Cost of mitigation (cost of mitigation versus benefit provided);
  - Community views (aesthetic impacts and community wishes); and
  - Noise levels for affected land uses (existing and future levels, and changes in noise levels).

- **Meteorological Conditions** – wind and temperature inversion conditions.
- **Temperature Inversion** – an atmospheric condition in which temperature increases with height above the ground.
- **Adverse Weather** – weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).

A.1.8 Operator Attended Noise Measurements

Table A.1 below presents typical abbreviations that are used to describe common noise sources that may be noted during environmental noise measurements.

Table A.1: General Field Note Abbreviations

Abbreviation	Noise Source
ANML (B-I-D-L)	Animals (birds – insects – domestic - livestock)
ACF T	Aircraft
CPBY	Car pass by
DLCN	Dialogue, conversations e.g. with passers-by
DTRF	Distant traffic
LTRF	Local traffic
OIND	Other industry/industrial sites
OPTR	Operator
RDOC	Residential/occupants
RHUM	Rural harm
SHUM	Suburban harm
UHUM	Urban harm
WBVG	Windblown vegetation

During operator attended noise measurements, the sound level meter will present the instantaneous noise level and record acoustical and statistical parameters. In certain acoustical environments, where a range of noise sources are audible and detectable, the sound level meter cannot measure a direct source noise level and it is often necessary to account for the contribution and duration of the sources.

Noted Percentile Contribution – Table A.2 presents noise level deductions that are typically applied based on the percentage contribution of a noise source(s).

Noted Time Contribution – Table A.3 presents noise level deductions that may be applied based on the percentage of time that a noise source(s) is audible during a 15 minute measurement. Where the noise emission from a source is clearly detectable and the contribution can be measured, these deductions are not necessary.

Table A.2:Noise Level Deductions – Noted Percentile Contribution

Percentage Contribution	Noise Level Adjustment, dBA
5%	-13.0
10%	-10.0
15%	-8.2
20%	-7.0
25%	-6.0
30%	-5.2
35%	-4.6
40%	-4.0
45%	-3.5
50%	-3.0
55%	-2.6
60%	-2.2
65%	-1.9
70%	-1.5
75%	-1.2
80%	-1.0
85%	-0.7
90%	-0.5
95%	-0.2
100%	0.0

***EXAMPLE**: the measured $L_{Aeq,\ 15\ minute}$ noise level is 49 dB and the site contribution was observed to be 10% of this level (extraneous noise sources were noted to dominate the measurement), therefore the $L_{Aeq,\ 15\ minute}$ noise level deduction is 10 dB, with a resultant noise level contribution of approximately 39 dB.*

Table A.3: Noise Level Deductions – Noted Time Contribution

Event Duration (minutes)	Noise Level Adjustment, dBA
1	-11.8
2	-8.8
3	-7.0
4	-5.7
5	-4.8
6	-4.0
7	-3.3
8	-2.7
9	-2.2
10	-1.8
11	-1.3
12	-1.0
13	-0.6
14	-0.3
15	0.0

EXAMPLE: *the measured $L_{Aeq,\ 15\ minute}$ noise level contribution of an excavator was noted to be 56 dB, however it was only audible for 6 minutes during the 15 minute measurement period, therefore the $L_{Aeq,\ 15\ minute}$ noise level deduction is 4 dB, with a resultant noise level contribution of approximately 52 dB.*

A.2. VIBRATION – GLOSSARY OF TERMS, DEFINITIONS AND METHODOLOGY

A.2.1 How to Measure and Control Vibration

Vibration refers to the oscillating movement of any object. In relation to construction projects, ground-borne vibration is the most likely outcome of works and potentially has three (3) effects on vibration sensitive receivers, these are:

- Ground-borne vibration that may cause annoyance.
- Ground-borne vibration that may have adverse effect on a structure e.g. a building.
- Regenerated noise due to ground-borne vibration.

Each of these potential effects can be assessed in accordance with the relevant standard. Perceptible levels of vibration often create concern for the surrounding community at levels well below structural damage guideline values; this issue needs to be managed as part of the vibration monitoring program.

Vibration is typically measured using specific devices that record the velocity or acceleration at a designated receiver location – usually being the closest premises to works. Modern vibration monitoring devices will typically capture amplitude data for the three (3) orthogonal axes being, the transverse, longitudinal and vertical and also the frequency at which the measured vibration event occurs.

Monitoring of this level of detail enables analysis of significant vibration events to determine compliance with relevant guidelines such as the NSW Department of Environment and Conservation – NSW Environmental Noise Management – *Assessing Vibration: a Technical Guideline* (the NSW vibration guideline), February 2006 and the German Institute for Standardization – DIN 4150 (1999-02) Part 3 (DIN4150-3) – *Structural Vibration - Effects of Vibration on Structures*.

Vibration propagates in a different manner to noise and can be difficult to control depending on the frequency of the source in question, although identifying the strategy best suited to controlling vibration follows a similar approach to that of noise. This includes elimination, control at the source, control along the propagation path and control at the receiver and/or a combination of these, such as no work/respite periods.

A.2.2 Vibration Descriptors

The following terms are often used to describe measured vibration levels.

- **Parameter** – an attribute with a value - for example, weighting.
- **Particle Velocity** – the instantaneous value of the distance travelled by a particle per unit time in a medium that is displaced from its equilibrium state by the passage of a sound or vibration wave.
- **Peak Component Particle Velocity (PCPV)** – is the highest (maximum or peak) particle velocity which is recorded during a particular vibration event over the three (3) axes. PCPV is measured in the unit, mm/s.
- **Phase** – the relative position of a sound wave to some reference point, the phase of a wave is given in radians, degrees, or fractions of a wavelength.
- **Acceleration** – the change in velocity over time. Acceleration is dependent on the velocity and the frequency of the vibration event (velocity is a vector), as such acceleration changes in two ways - magnitude and/or direction. Acceleration is measured in the unit, m/s^2.
- **Perceptible** – vibration levels that a receiver of building occupant may ‘feel’. 0.2 mm/s is typically considered to be the human threshold for perception of vibration.

- **Geophone or accelerometer** – the transducer/device typically used to measure vibration.
- **Damage** – is defined in DIN 4150-3 to include minor non-structural effects such as cosmetic damage or superficial cracking in paint or cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls.
- **Vibration Dose Value (VDV)** – a concept outlined in the NSW vibration guideline, which is a calculative approach to assessing the impact of intermittent vibration or extended periods of impulsive vibration. VDV require the measurement of the overall weighted RMS (Root Mean Square) acceleration levels over the frequency range 1Hz to 80Hz. To calculate VDV the following formula (refer Section 2.4.1 of the guideline) is used:

  $$VDV = \left[\int_0^T a^4(t)dt \right]^{0.25}$$

  where VDV is the vibration dose value in m/s$^{1.75}$, *a (t)* is the frequency-weighted RMS of acceleration in m/s^2 and *T* is the total period of the day (in seconds) during which vibration may occur.
- **MIC -** Maximum Instantaneous Charge or explosive charge mass (kg) detonated per delay (any 8ms interval).
- **SD** (m) **-** The scaled distance for air-blast and ground vibration from the charge to the receiver.

ATTACHMENT B: NOISE MONITORING FIELD DATA SHEET

Noise Baseline Study - Field Data Sheet

Sampler Location:

Project Name ______________________ **Project #** __________

ID (*e.g.* S1) __________

UTM Coordinates: __________ **E** __________ **N** **UTM Datum** __________

Ground Cover (*e.g.* soil/vegetation type): ______________________ **Start Date/Time** __________

Terrain (*e.g.* flat, hills, mountains): ______________________ **Finish Date/Time** __________

Weather:

Temperature (°C): ______________________ **Cloud Cover (%):** __________

Precipitation: ☐ **Heavy** ☐ **Moderate** ☐ **Mild** ☐ **None**

☐ **Snow** ☐ **Rain** ☐ **Other** __________

Wind: **Speed** ☐ **Strong** ☐ **Moderate** ☐ **Light** ☐ **None** **Direction** ______

Instrument:

Type __________ **Serial #** __________

Calibration: ☐ **Before** ☐ **After**

Method ______________________

Weighting (*i.e.* A) __________ **Other Settings** ______________________

Response (*i.e.* fast/slow) __________ ______________________

Observations: ***Include directions and estimated distances to the instrument in this section***

Audible noise observed ____

____

Potential noise sources ____

____

Obstacles (*e.g.* trees, buildings) ____

Notes: ____

____

____

____

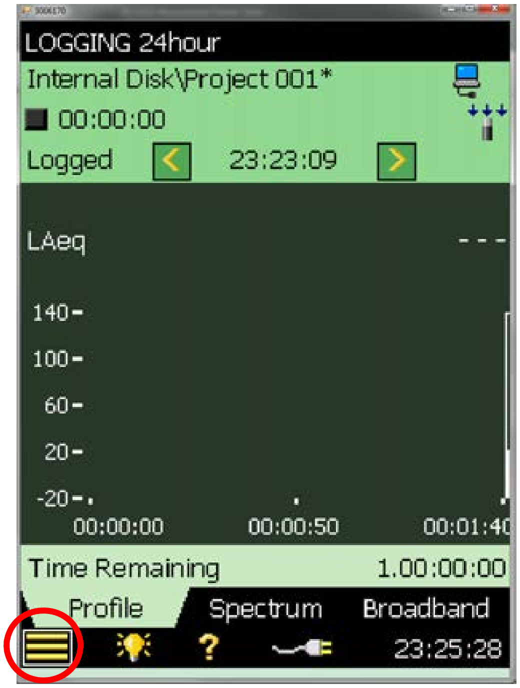
____

____

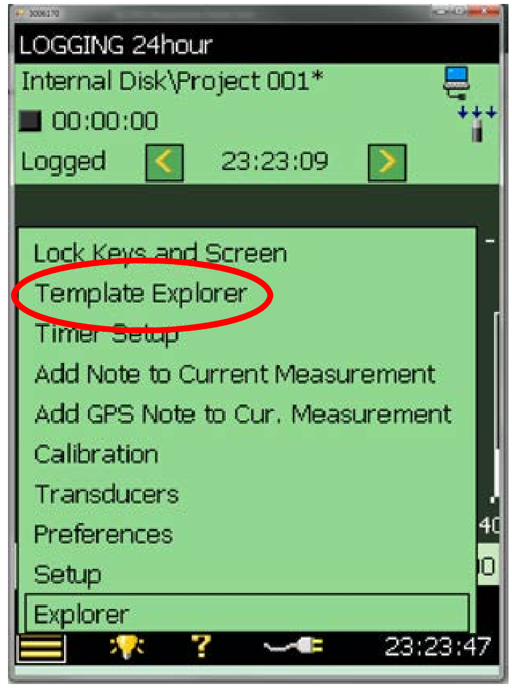
____

****Please be sure to take a few photos of the instrument and the surrounding area (*i.e.* one in each direction) and put them in the project folder with appropriate labels upon return to the office!****

ATTACHMENT C: INSTRUMENT SOFTWARE SETUP

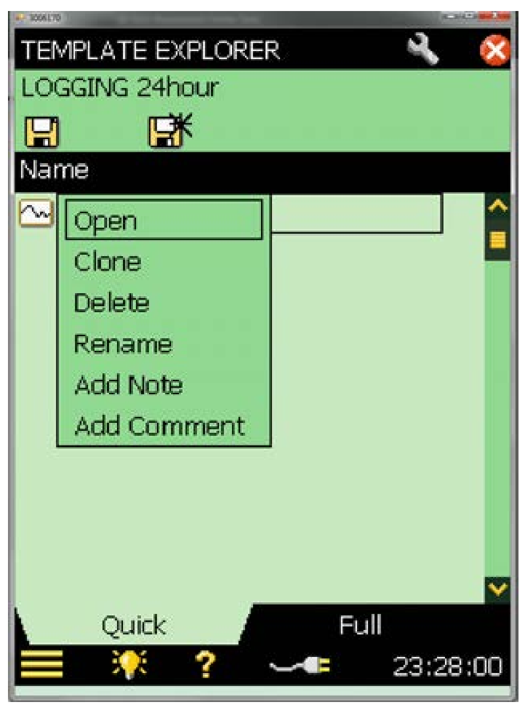


1. It takes about 30 secs to 1 minutes for the unit to initialize. Tap or use the arrow keys to select the Main Menu icon.



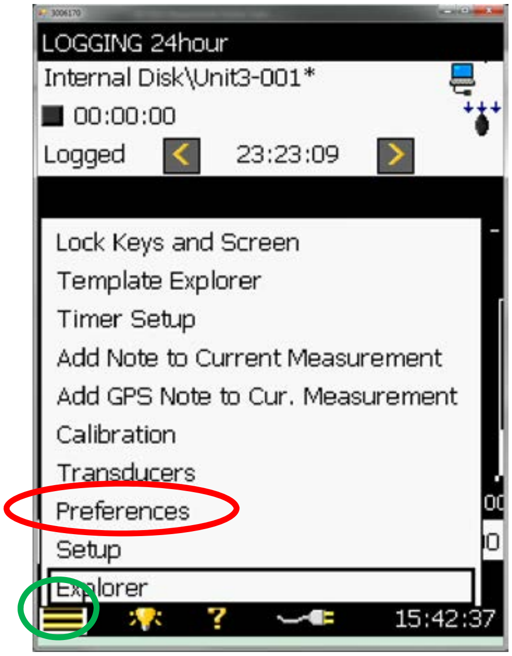
2. Select **Template Explorer.**

3. Select the template "**LOGGING 24hour".**

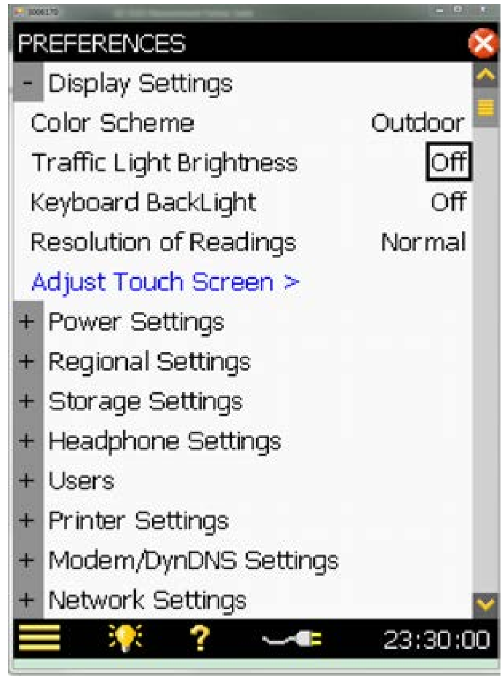


4. A drop down menu will appear and select **Open.** You might need to make minor adjustments later.

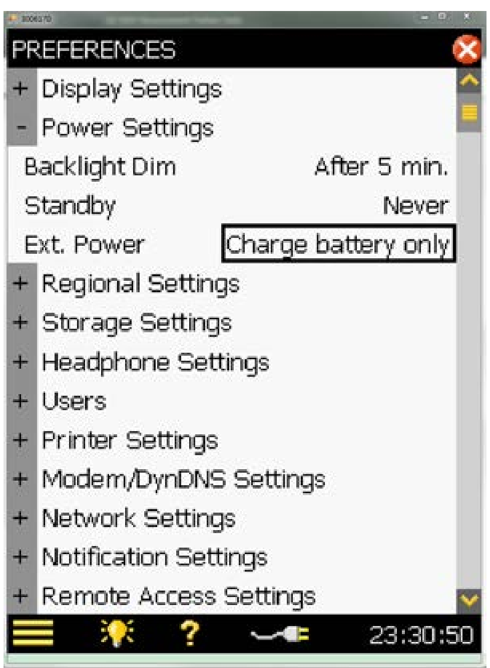
This should be all that you will need to do to start logging, but the next steps will show you how to configure the noise monitor. The Logging 24hour template already has these settings in the template. If you're sure that the Logging 24hour template is correct, skip to step **16.**



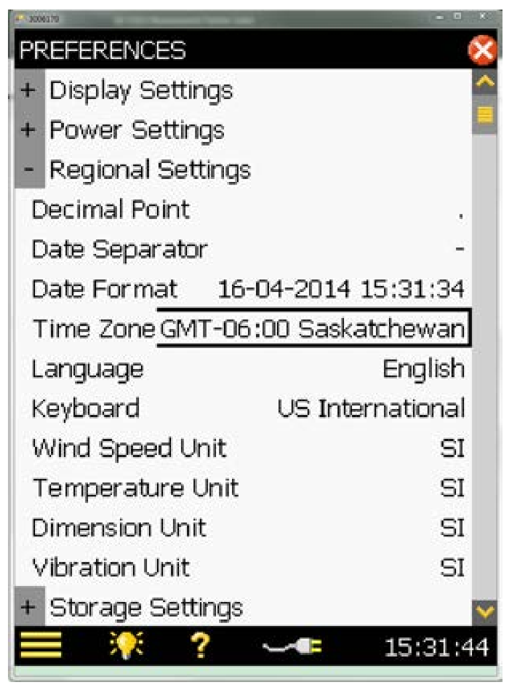
5. Press the Main Menu icon (green circle) The select **preferences**.



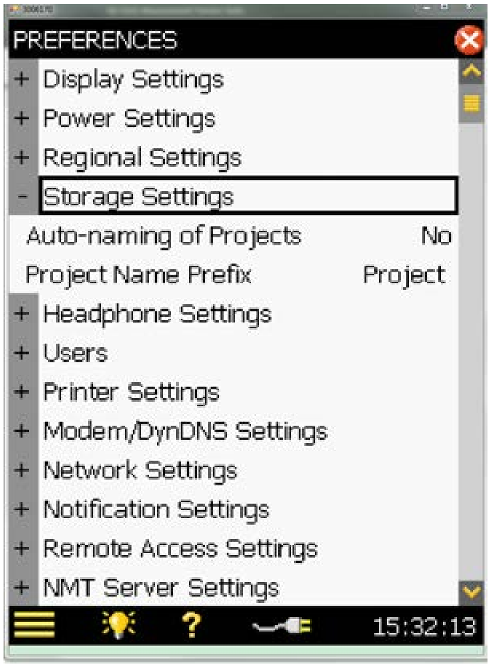
6. These are the settings for **Display Settings**



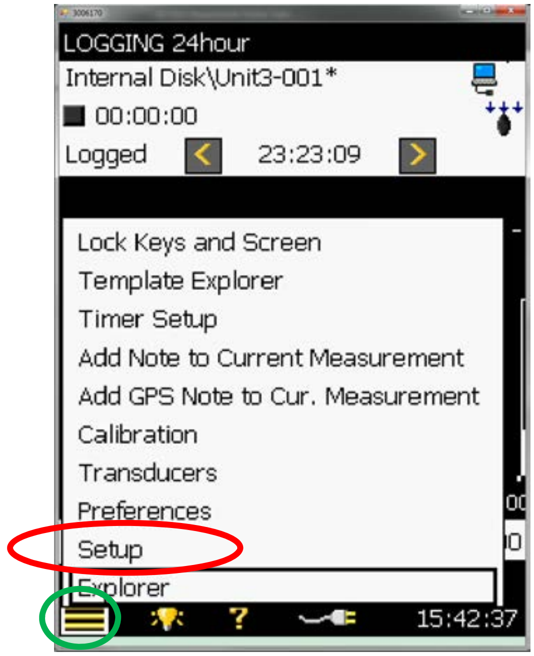
7. These are the settings for **Display Settings.**



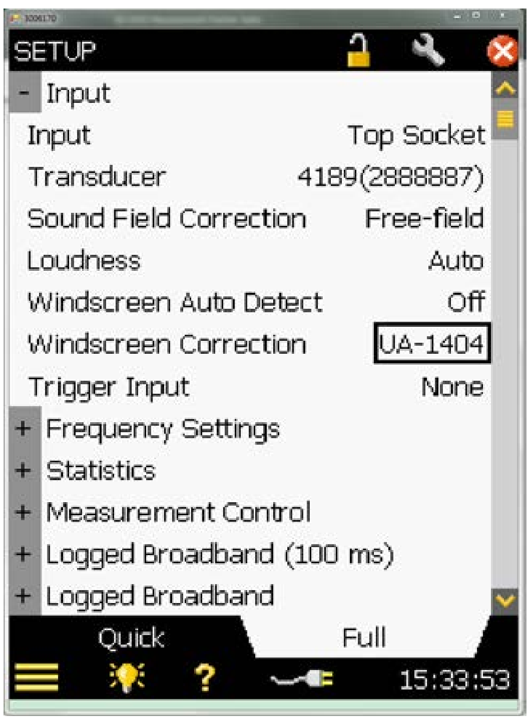
8. **Regional Settings**



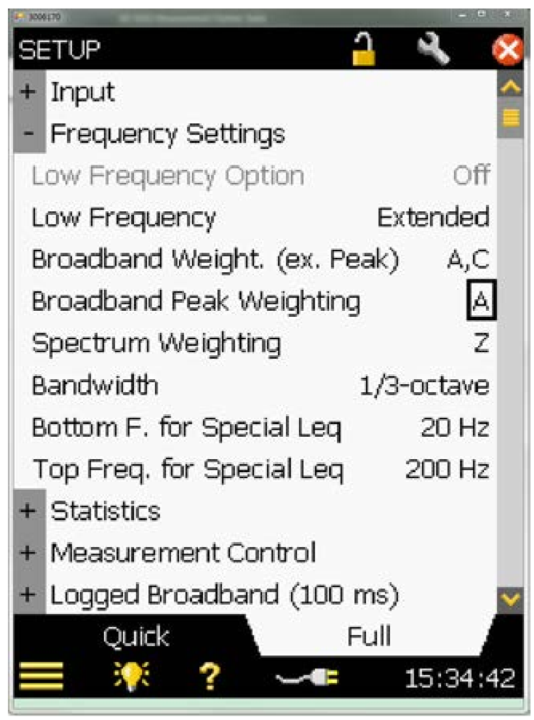
9. **Storage Settings** hit the "x" in the Top right to get back to the home screen



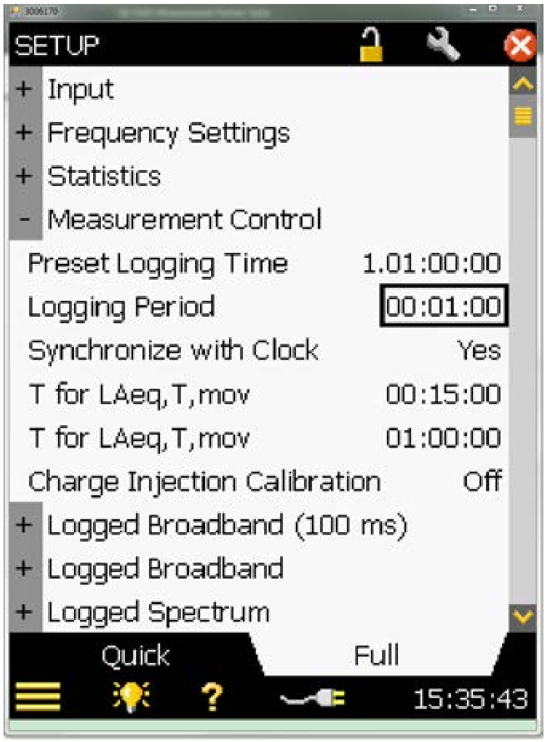
10. Press the Main Menu icon (green circle) Then select "**Setup**".



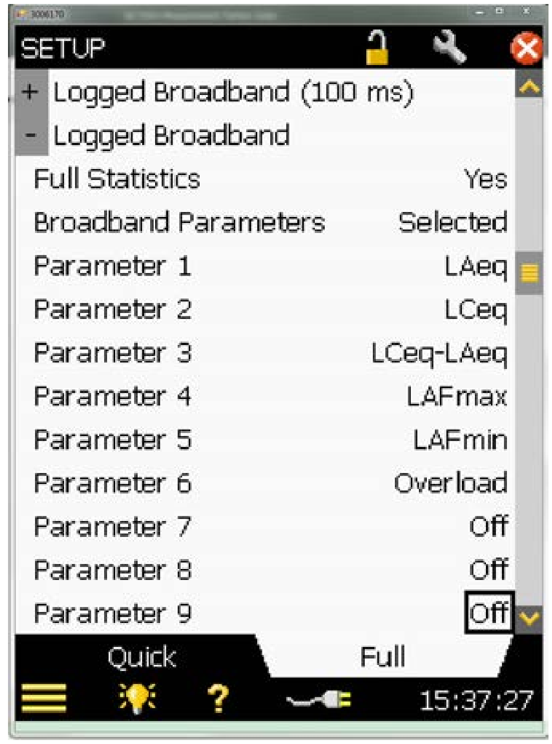
11. **Input Settings**



12. **Frequency Settings.**

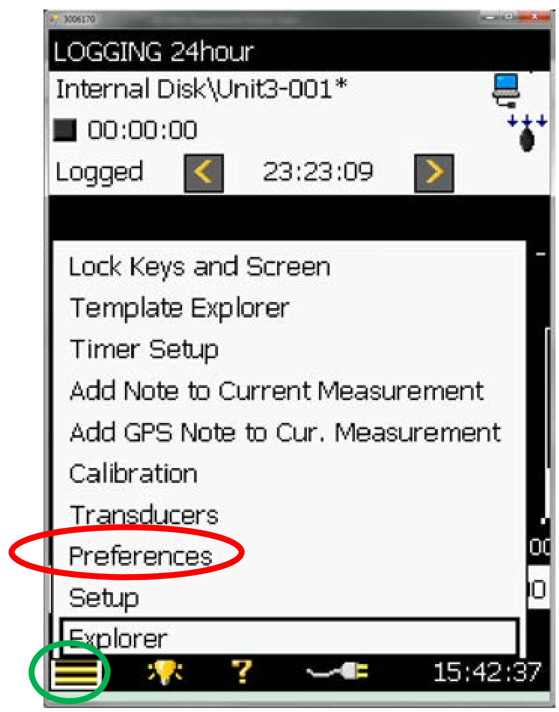


13. **Measurement Contol**

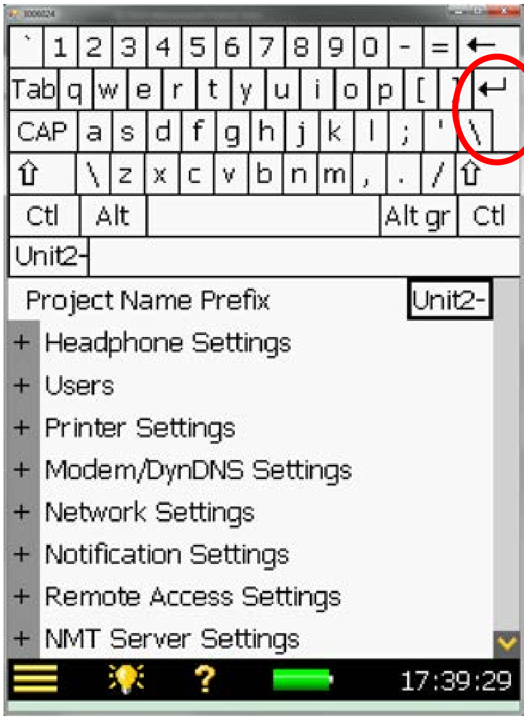


14. **Logged Broadband**

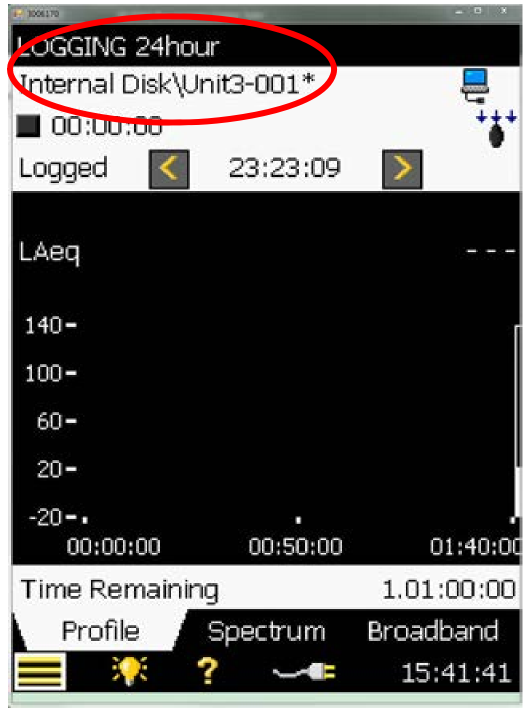
15. **Signal Recording**



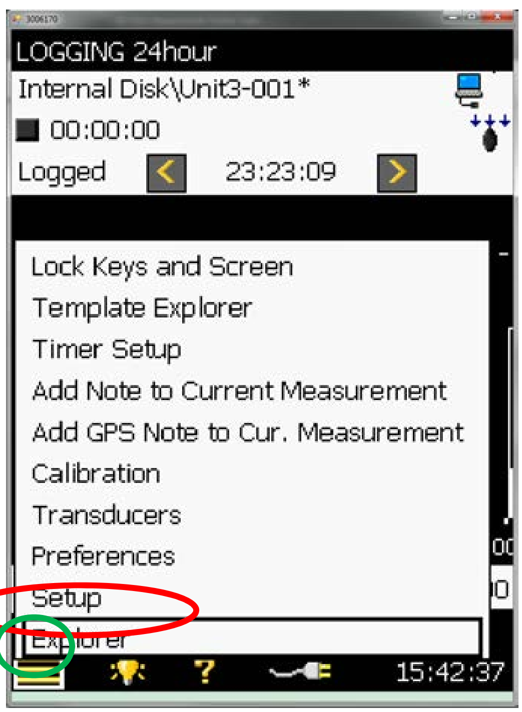
16. You will need to name this project that you'll be creating. Press the Main Menu icon (green circle), select **Preferences.**



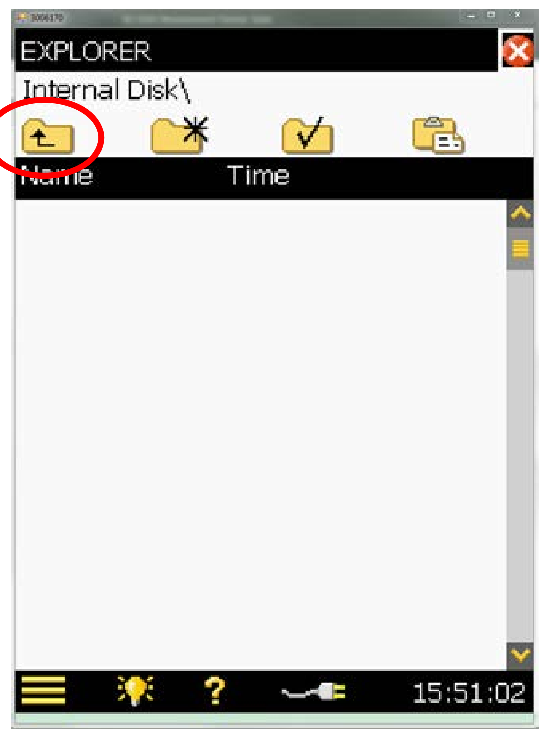
17. Under **Storage Settings,** select the Project name prefix. Name the project Unit(1,2 or 3)-location number (S1, S2…) Hit the enter button (circled in red) when complete



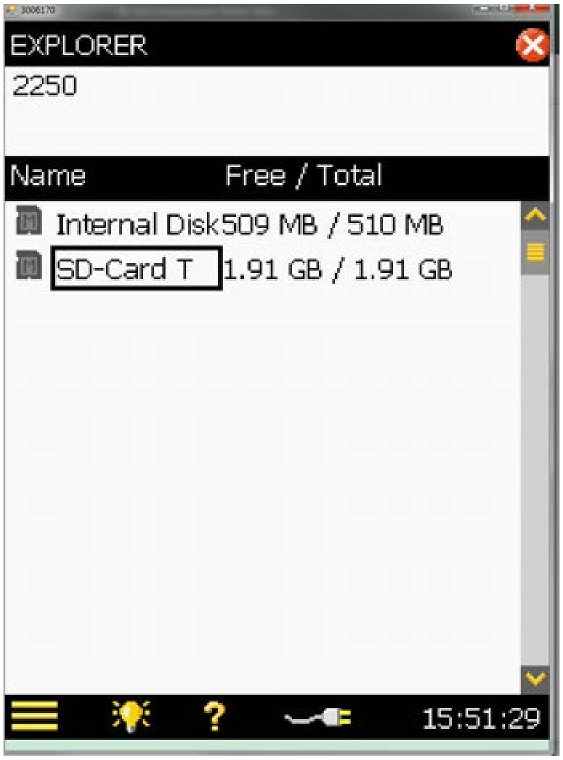
18. You are close to starting to record You'll need to change from **Internal Disk** to **SD card.** Insert an SD card into the bottom of the analyzer.



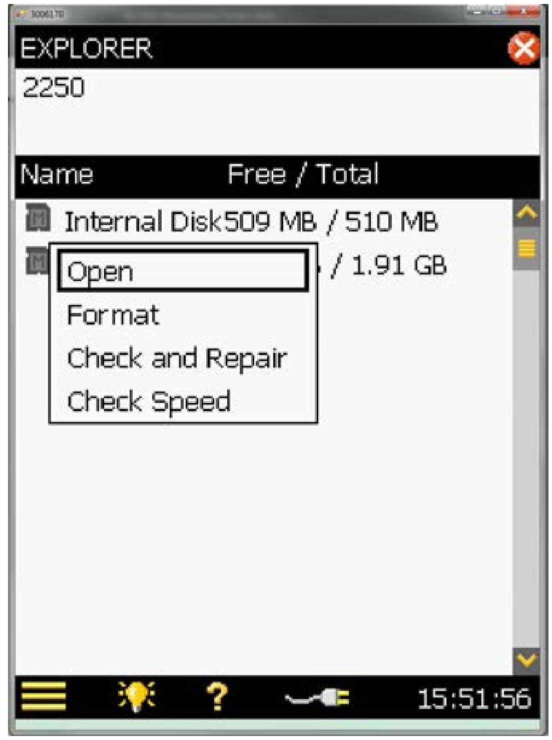
19. Select the main menu and select **Explorer.**



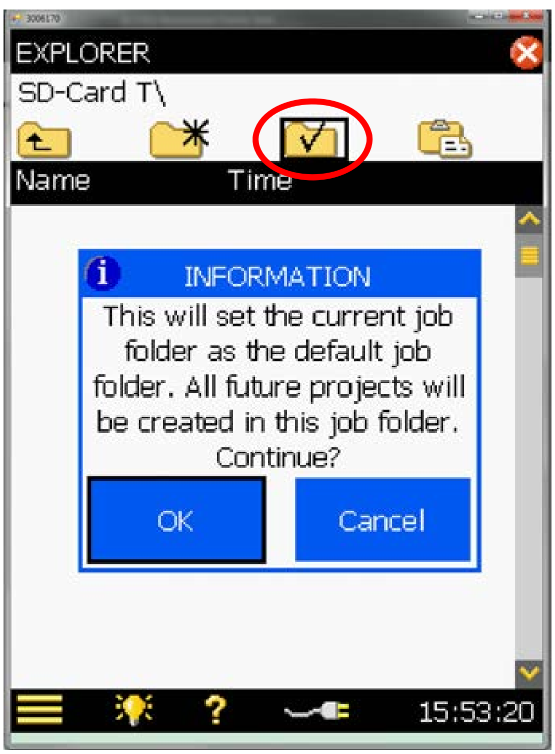
20. Select the folder with the **UP** arrow.



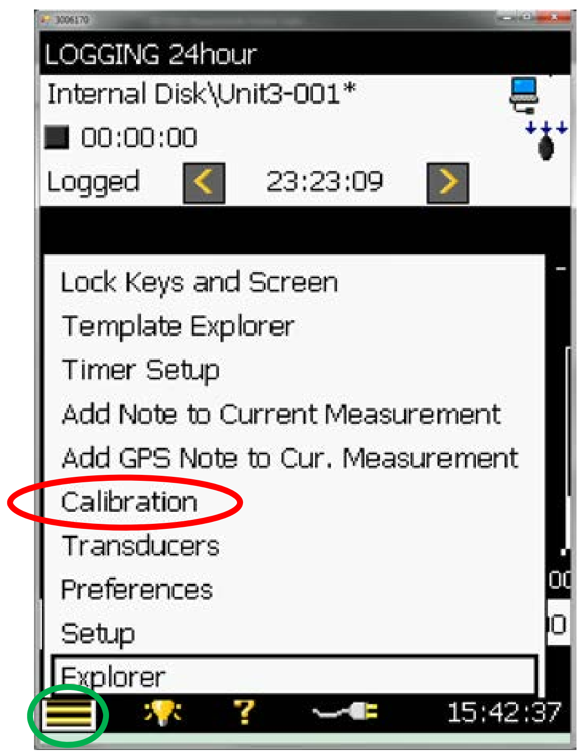
21. Select **SD-card.** Your SD card should be at least 8 GB.



22. Select **Open.**

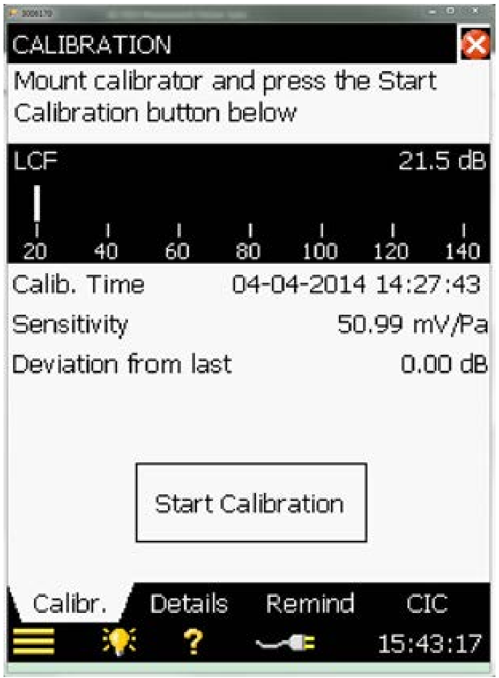


23. You'll be back in the folder screen. Select The icon with a check mark. The information screen will pop up, select **OK.** Hit the **X**.

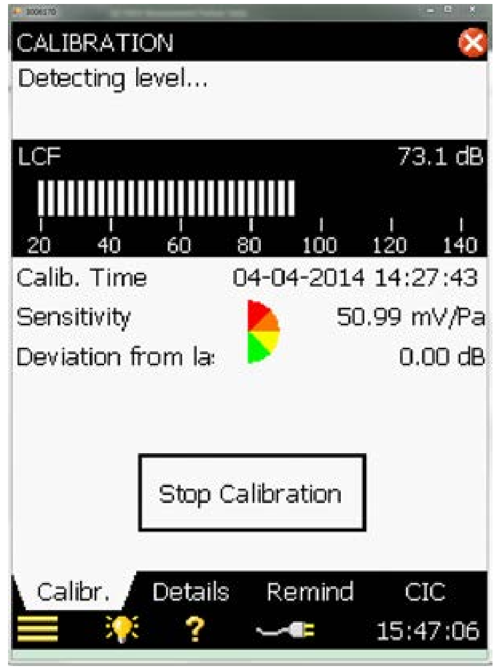


24. Now to calibrate!.Select main menu and then **calibration**.

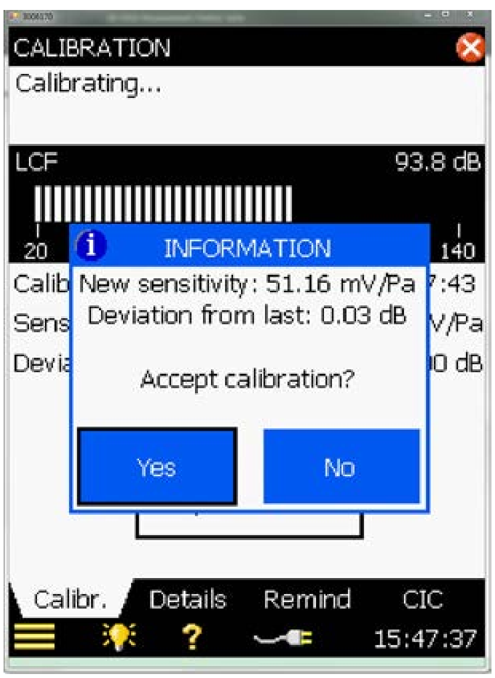
CALIBRATING B&K TYPE 2250 SOUND METER



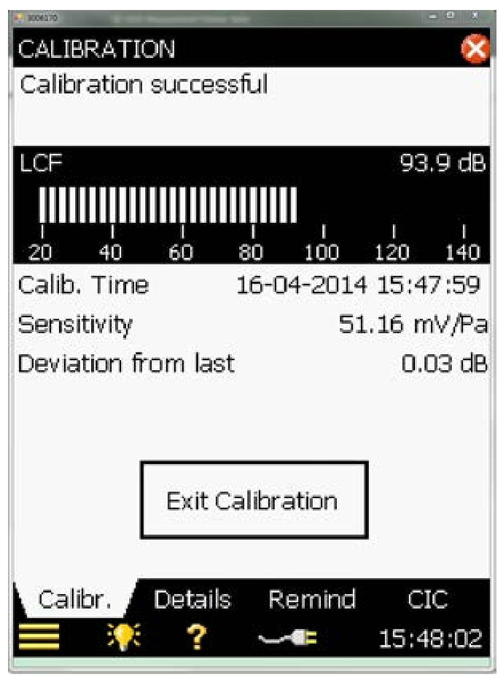
1. Turn on 4231 Calibrator, mount calibrator and press the **Start Calibration** button.



2. The noise meter is detecting the Calibrator level and should read about 94 dBA.

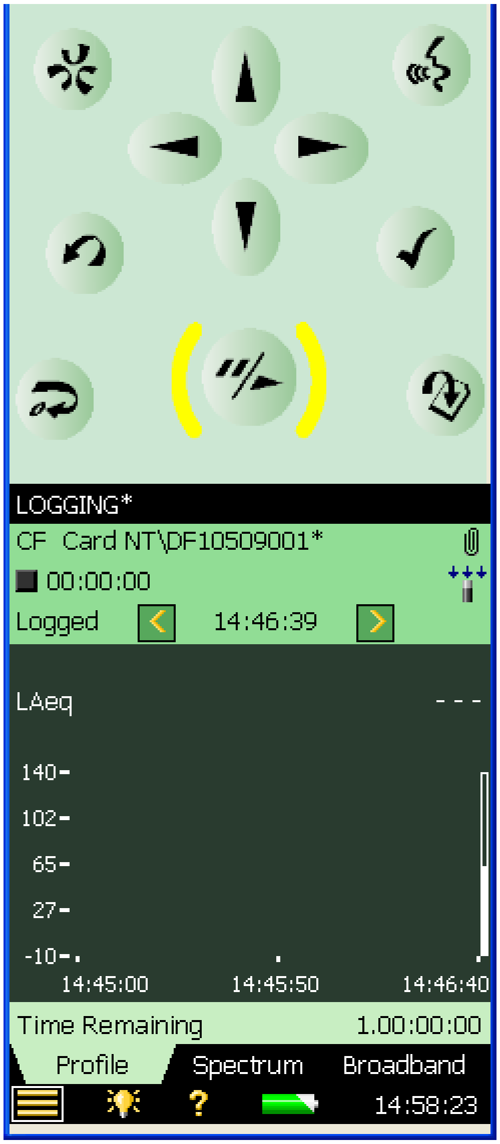


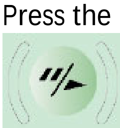
3. The noise meter will let you know if it Doesn't pass the test. Select yes.

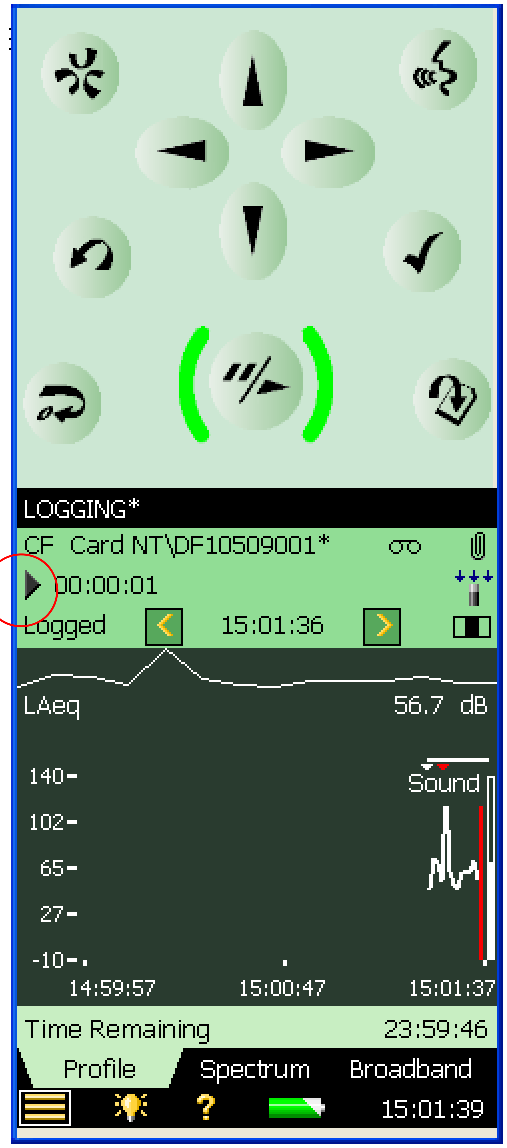


4. Select **exit calibration.**

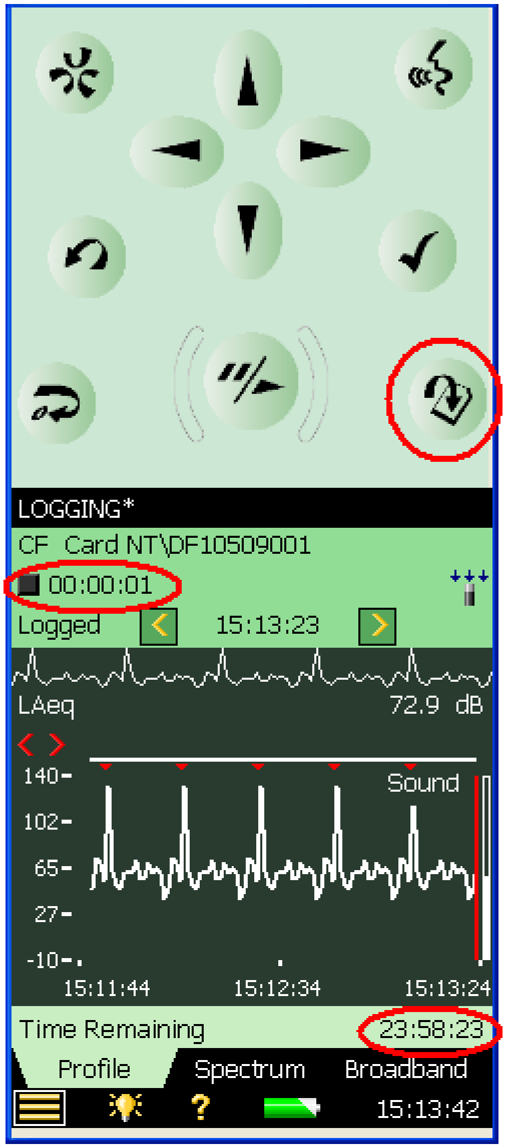
START DEPLOYMENT OF B&K TYPE 2250

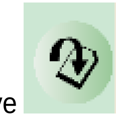


1. The flashing yellow occurs every 5 seconds before you start the measurement.
Press the  button to start deployment.



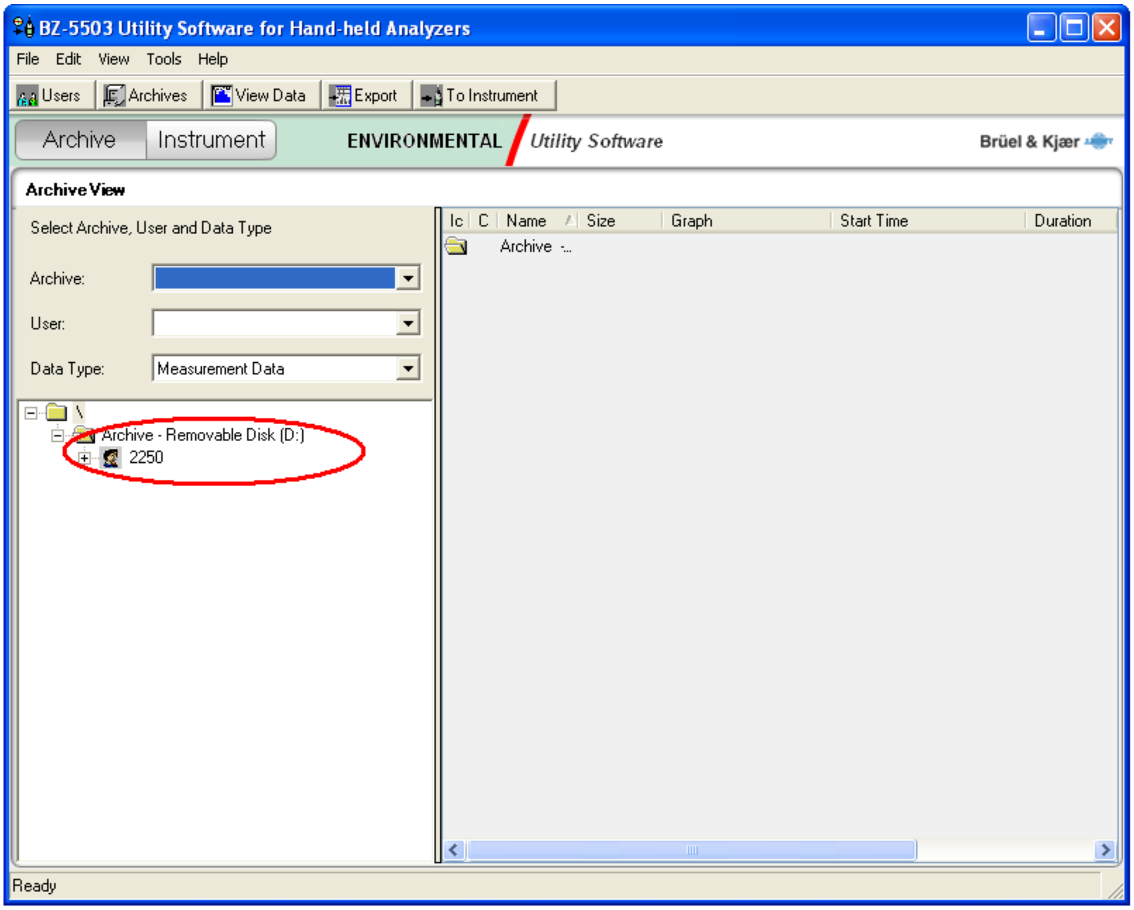
2. A steady green light comes on. The sound pressure is continuously plotted on a graph and the play symbol appears.



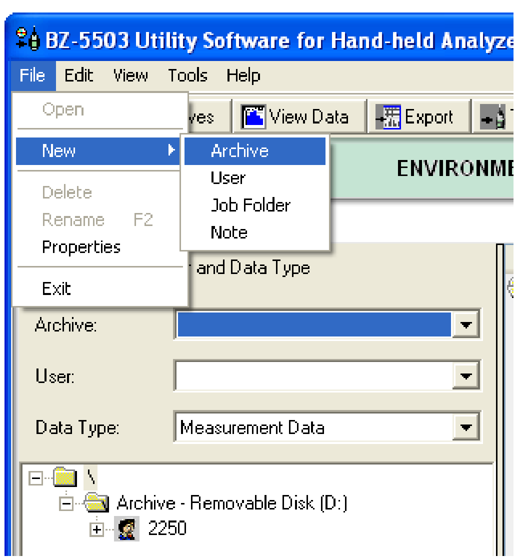
3. Press the Save  button once 24 hours has passed by. You can still press the save button if the unit is still logging. The * will disappear from the end of the file name and the stop symbol will appear. The screen will also display the amount of time remaining if any.

4. Remove the SD Card from the bottom of the meter and replace with a new one.

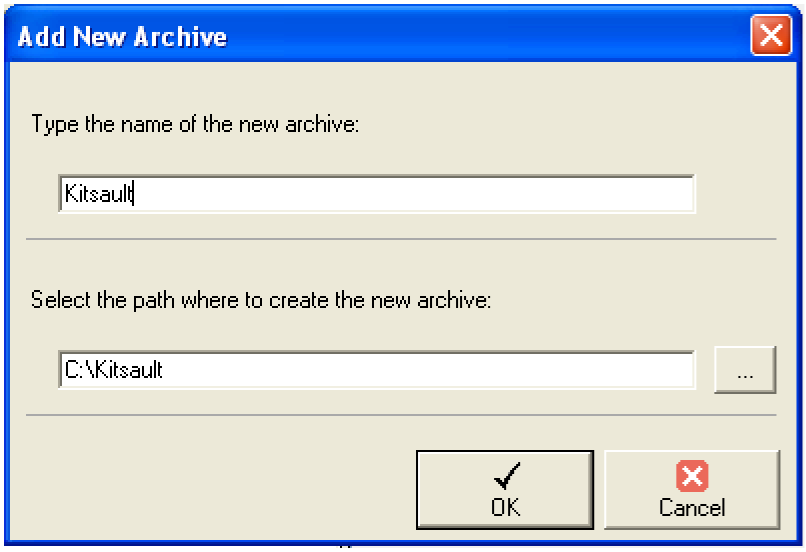
DOWNLOADING DATA FROM B&K TYPE 2250



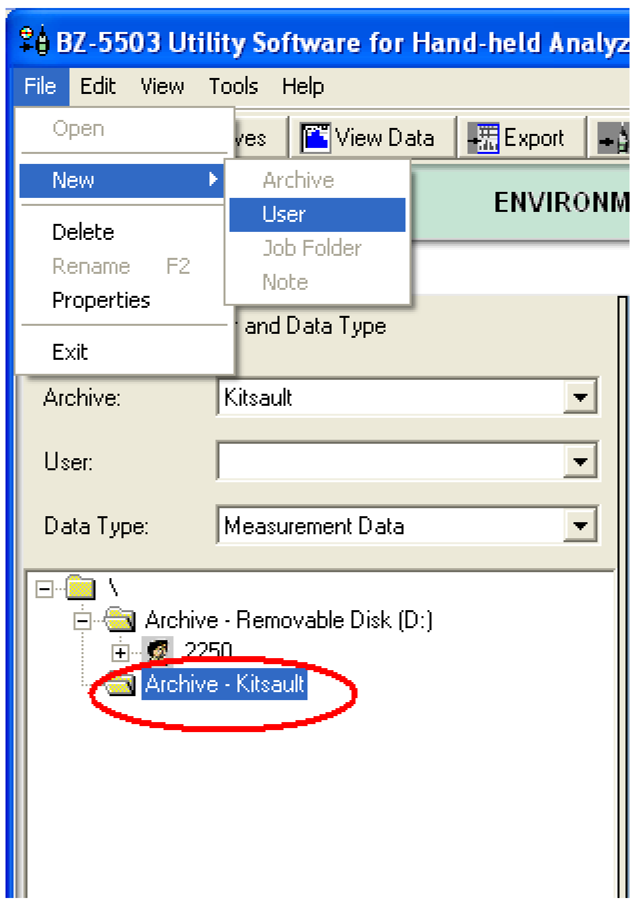
1. Run BZ-5503 Utility Software. Insert 8GB Compact Flash Card into card reader and plug it into USB port. The software should be able to recognize the CF card as a removable disk.



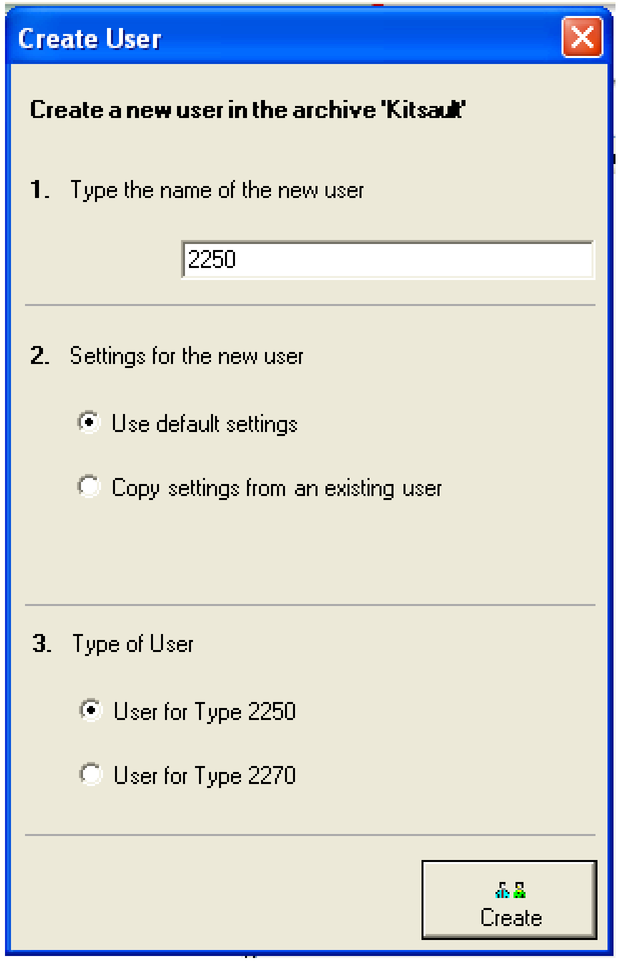
2. Go to **File → New → Archive.**



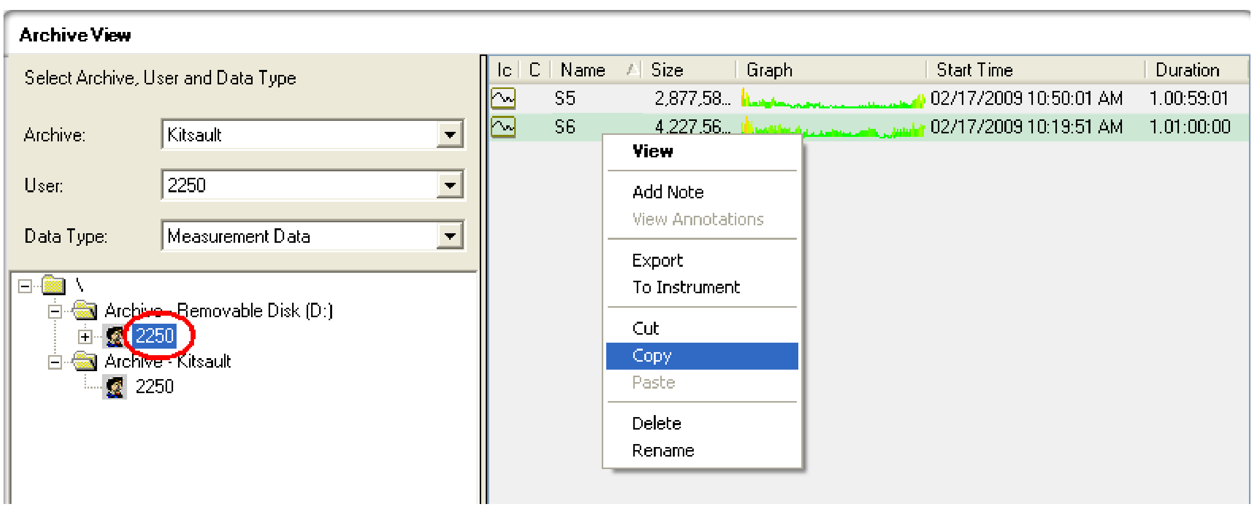
3. Give it an archive name (ie Kitsault) and the location where you want the data files stored.



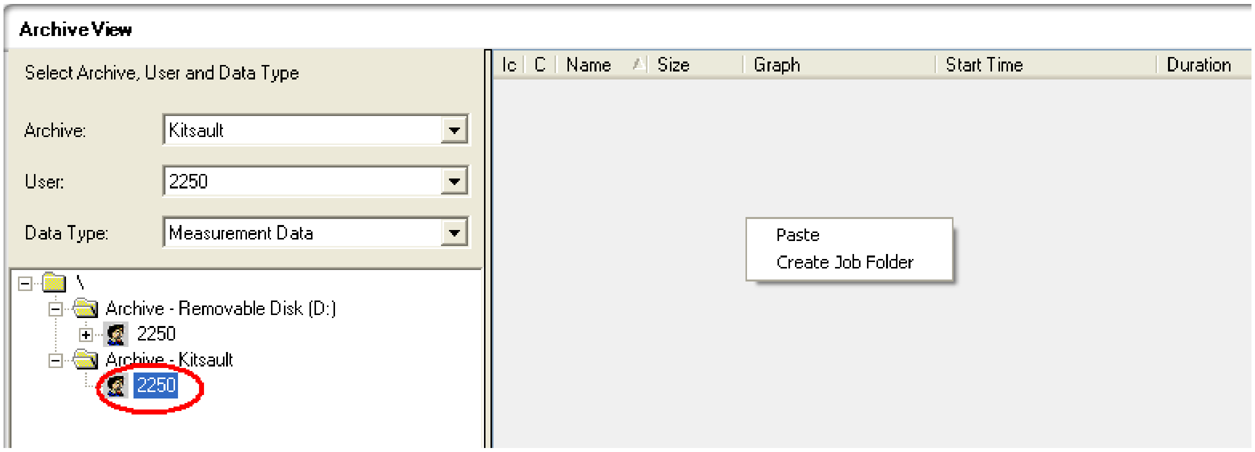
4. The folder **Archive – Kitsault** appears. Go to **File → New → User.**



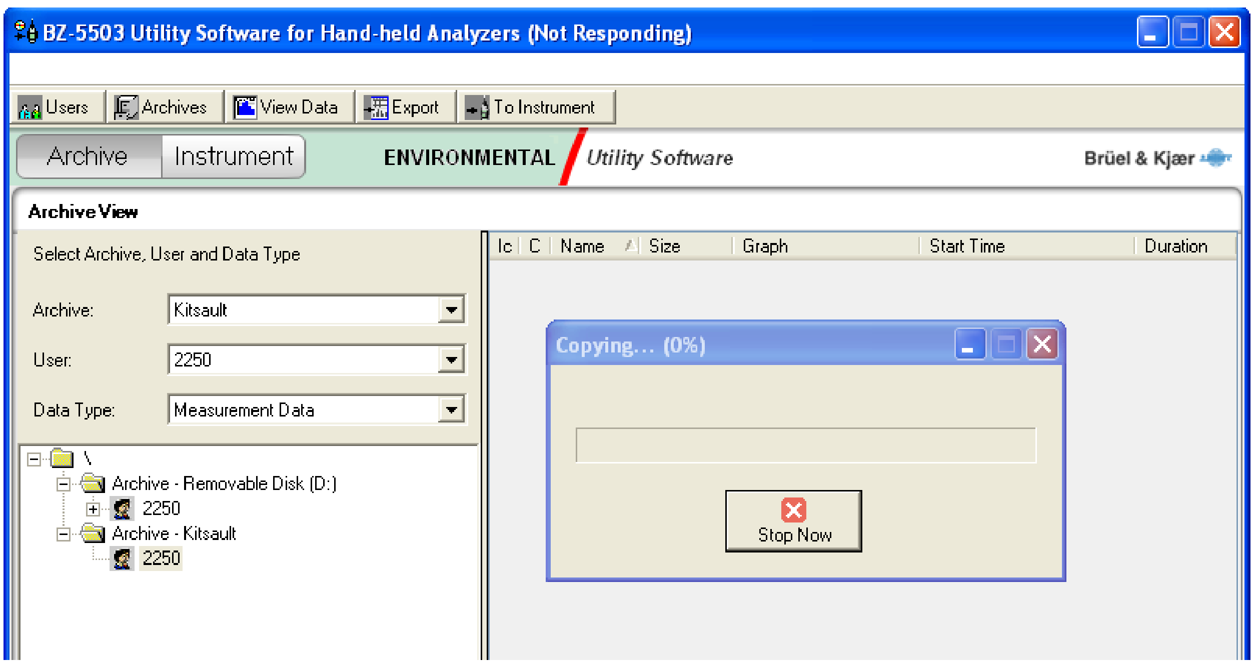
5. The new user name has to be **2250** to avoid confusion. Press the **Create** button.



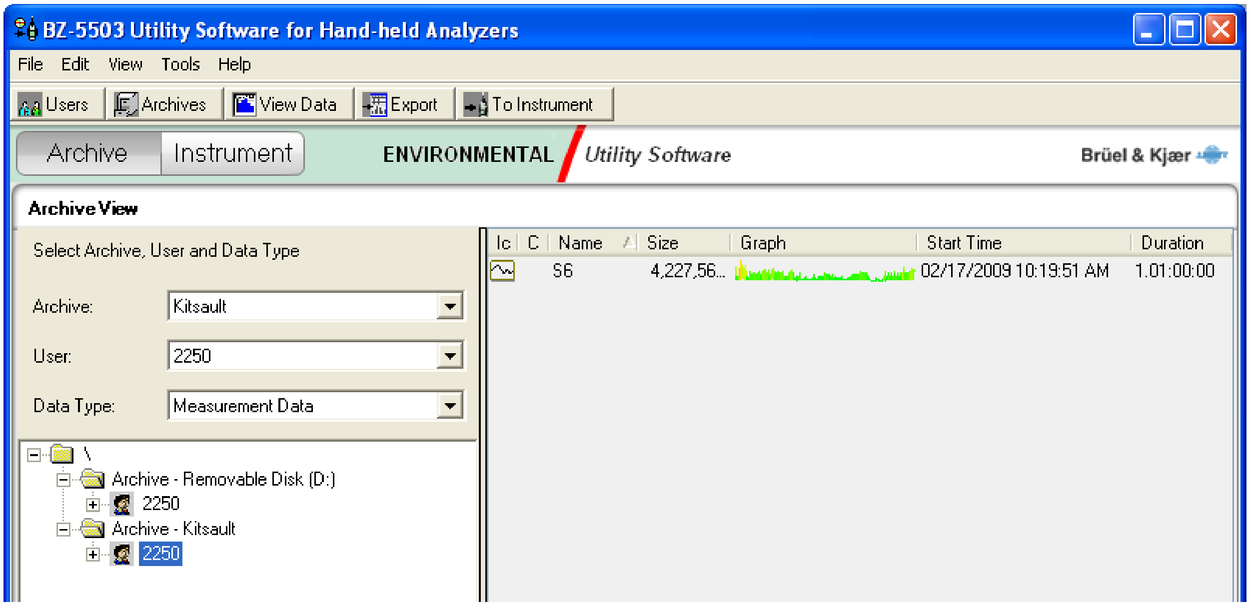
6. Click on **2250** under the removable disk folder. There should only be one sound file, but right click on the sound file. A menu appears, select **Copy.**



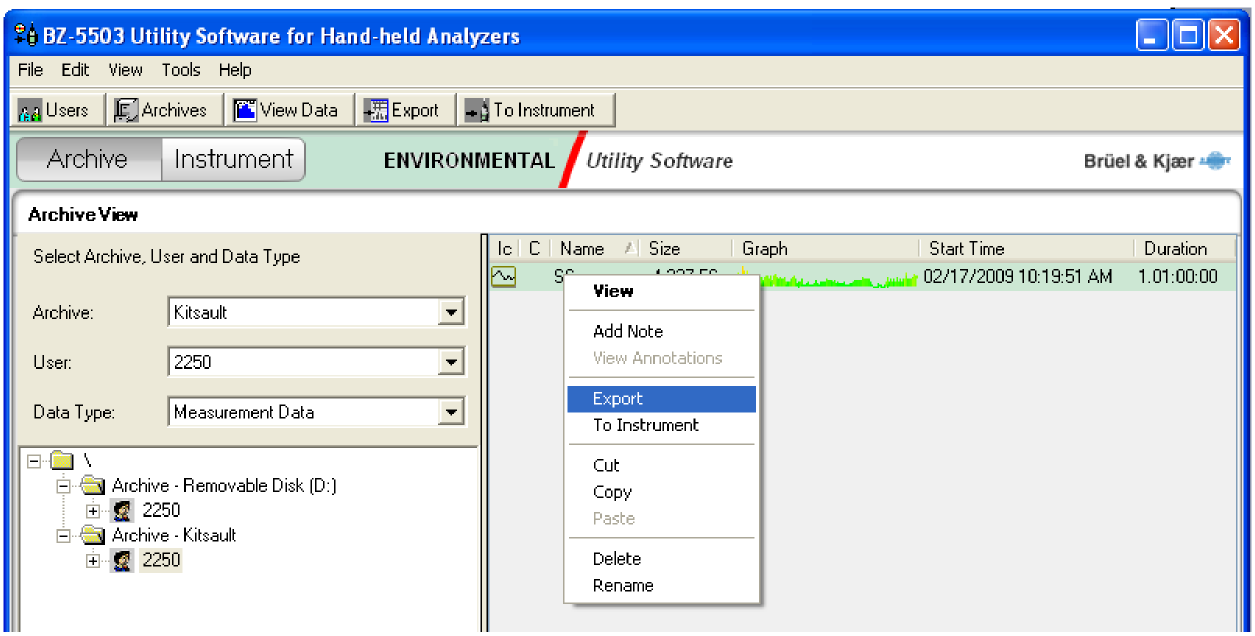
7. Click on the **2250** under the folder you just created on your hard drive. Right click anywhere on the right hand side of the window screen. A menu appears, select **Paste.**



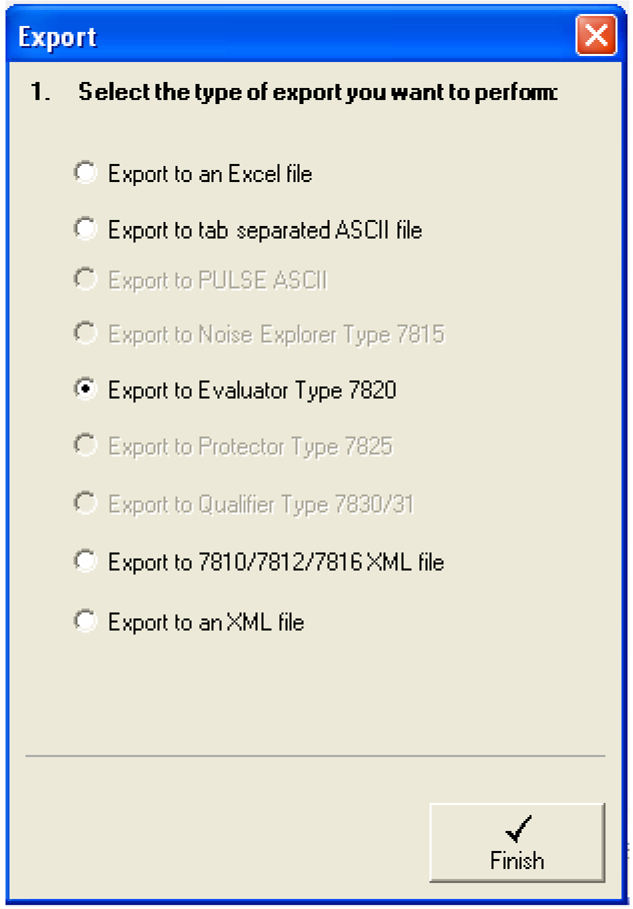
8. It takes around 30 to 40 minutes to copy the data. The progress bar will always stay at 0% and it might seem that your system froze. Just leave it alone and come back later. As you can see in the above screen shot, the title bar displays “not responding”.



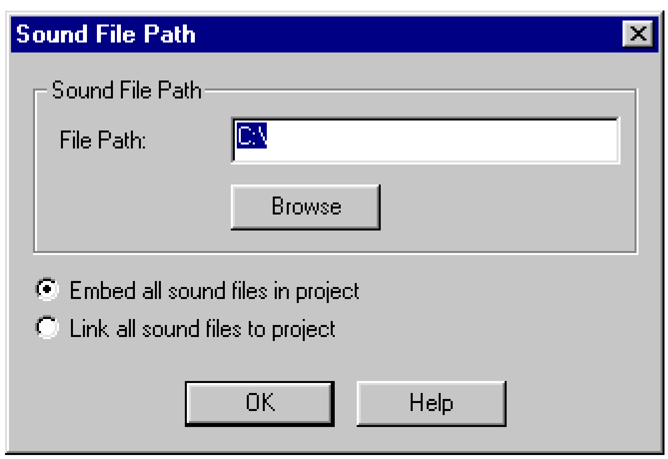
9. Once the status bar disappears and the sound data file appears the transfer is successful.



10. Right click on the sound file and select **Export.**



11. Export to Evaluator Type 7820 which is used for post processing. Insert the USB dongle key into the USB port for the Evaluator program to work. Once the file has been saved in Evaluator, the USB dongle key is not required.

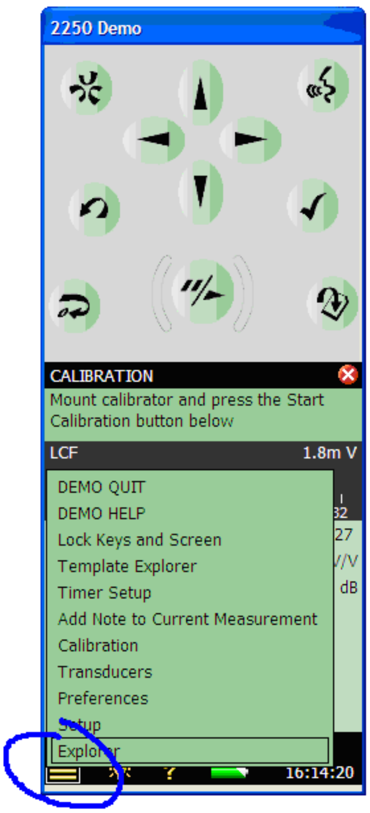


12. The program will ask if you want to Embed or Link the sound files. These are the sound wave files recorded so you might want to choose Link since it will take a long time to Embed the sound files.

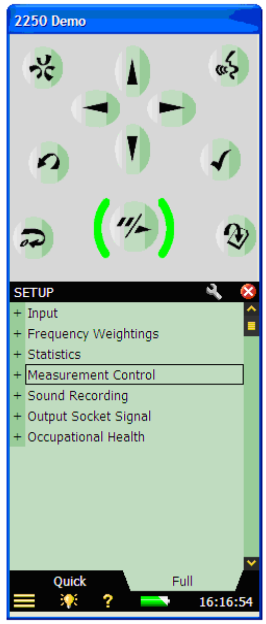
SETTING UP THE AVERAGING TIME

1. Averaging time provides Leq, L90 and Lmax and Lmin for the time period that user indicates. Typically 1-min average is used for baseline measurements please consult discipline manager for the averaging and check the work plan.

2. To set-up the averaging period, press the menu button on the lower left side of the screen. And Choose <**SETUP>** in this menu.



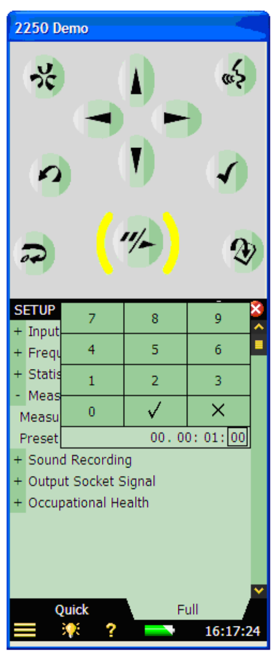
3. Choose <**MEASUREMENT CONTROL>** in this menu.



4. The Screen will show eight digits such as 00.00:00:00
The digits shows DD.HH:MM:SS therefore in order to get 1-minute average you need to enter 00.00:01:00

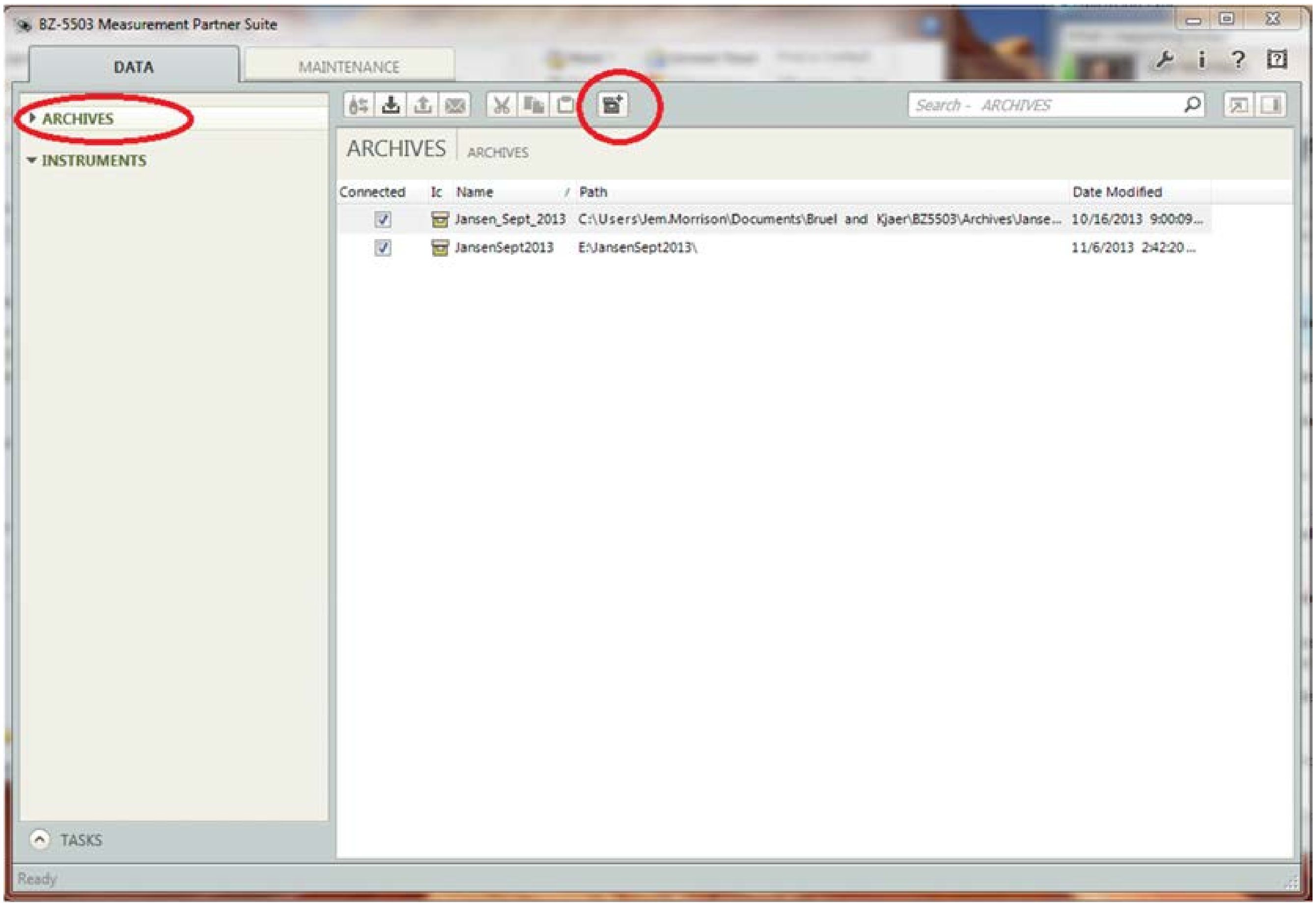
For short term monitoring, please enter shorter time such as train measurements could be done at 1-second averaging.

Validate the time averaging period by pressing "√" on the screen.

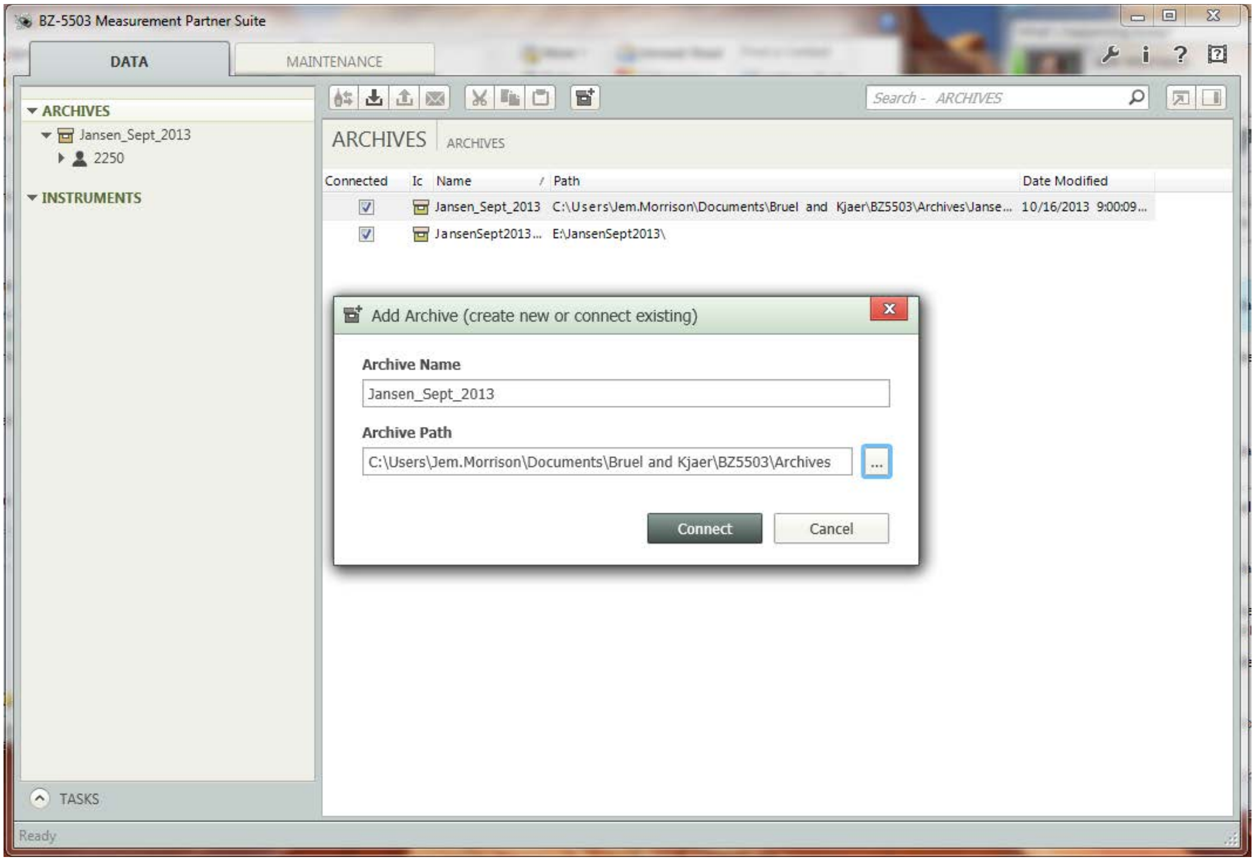


ATTACHMENT D: DATA TRANSFER FROM SD CARD TO LAPTOP

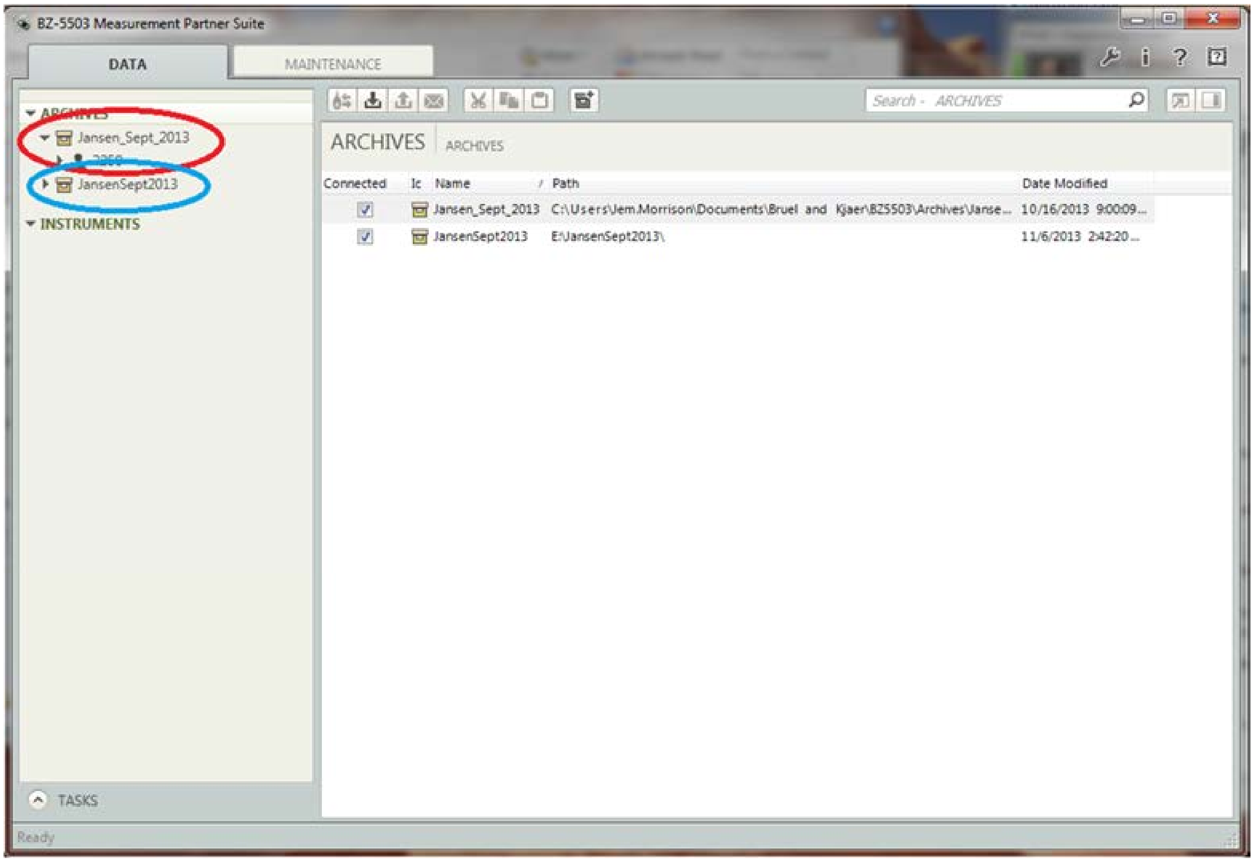
Data Transfer: From SD Card to Laptop, and Re-Formatting the SD Card



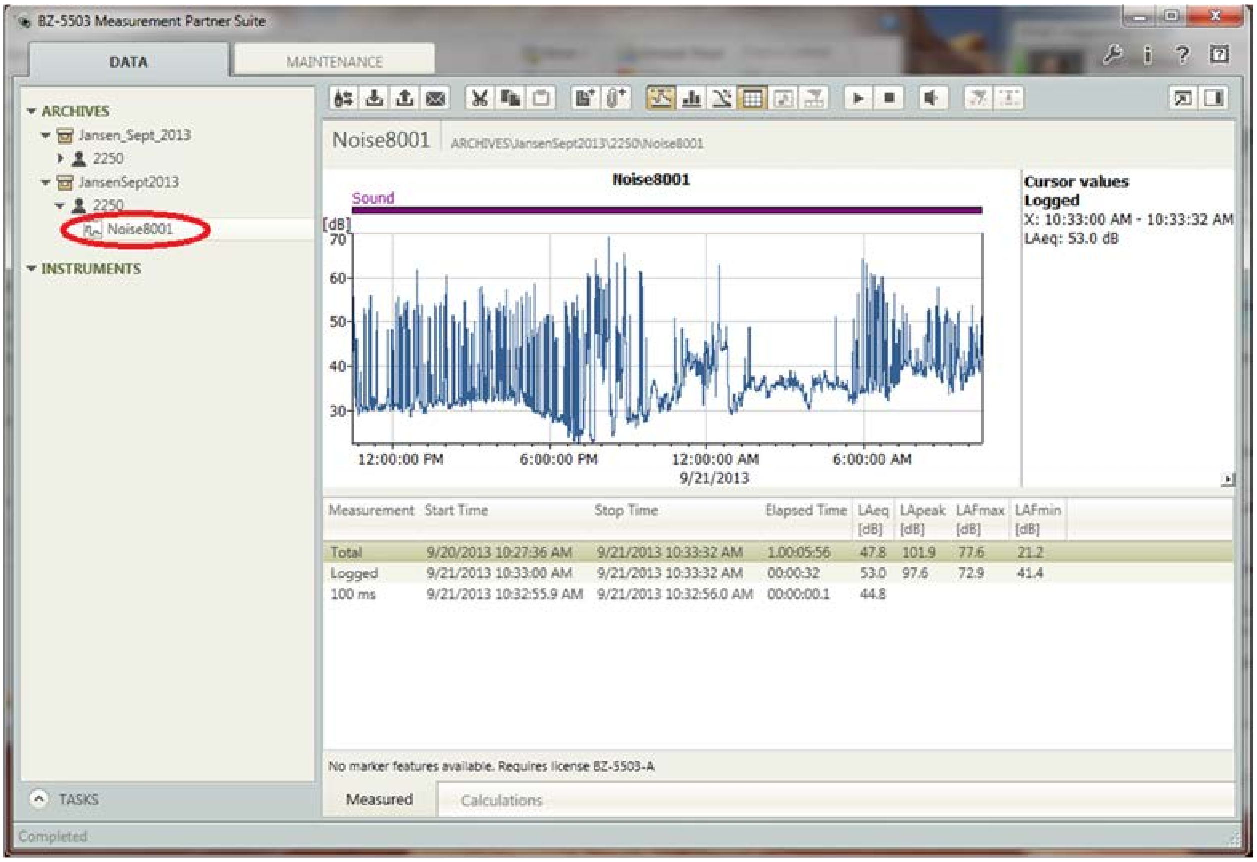
1. Launch BZ5503 Measurement Partner suite. Select Archives, and select new archive circled in red in the top middle.



2. Name the archive something meaningful and select an archive path similar to the one above. Select Connect.

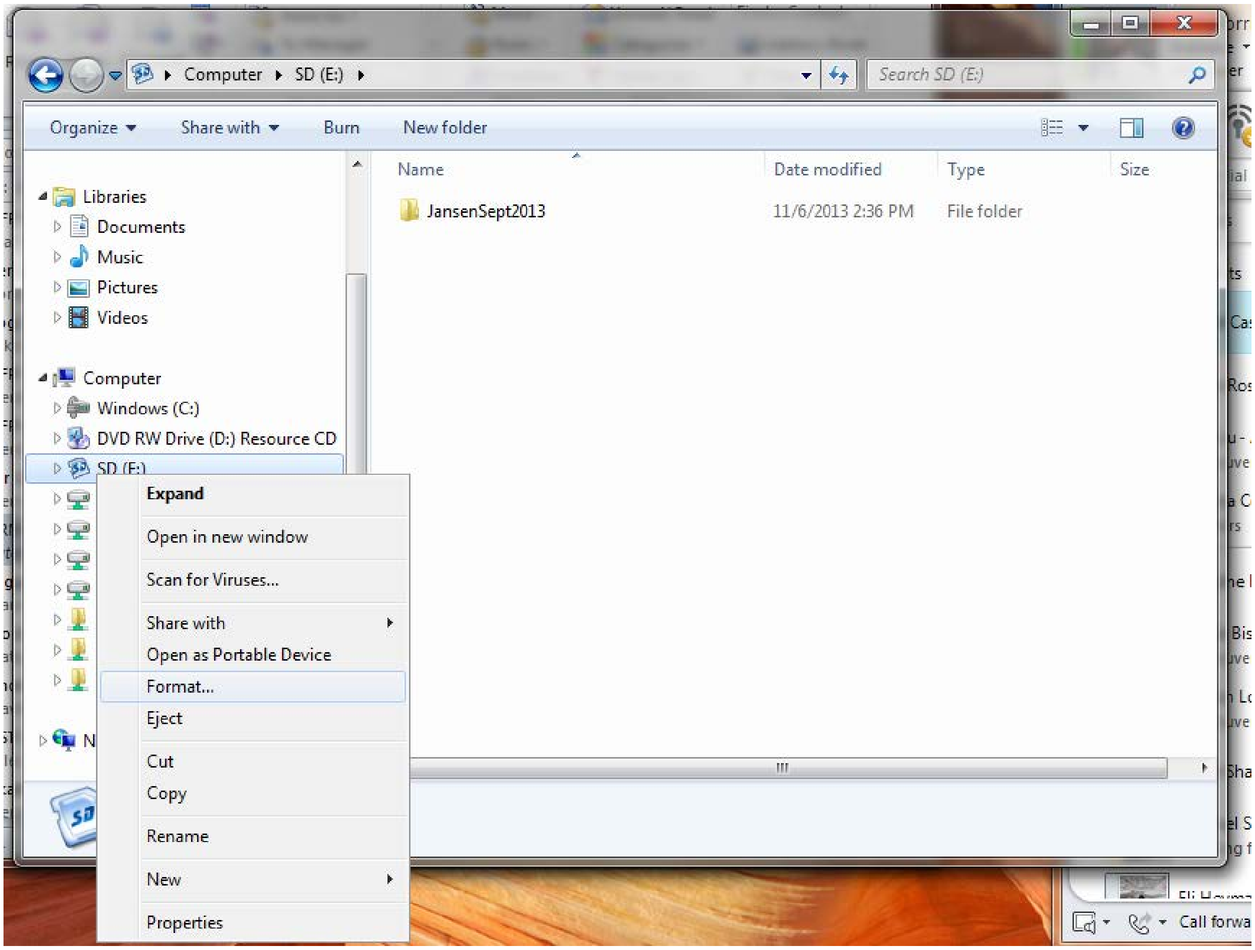


3. Your new archive will appear in the top left (circled in Red). Insert the SD card from the noise meter and your card will pop up (circled in blue). Note: it may not appear in the same spot as above.

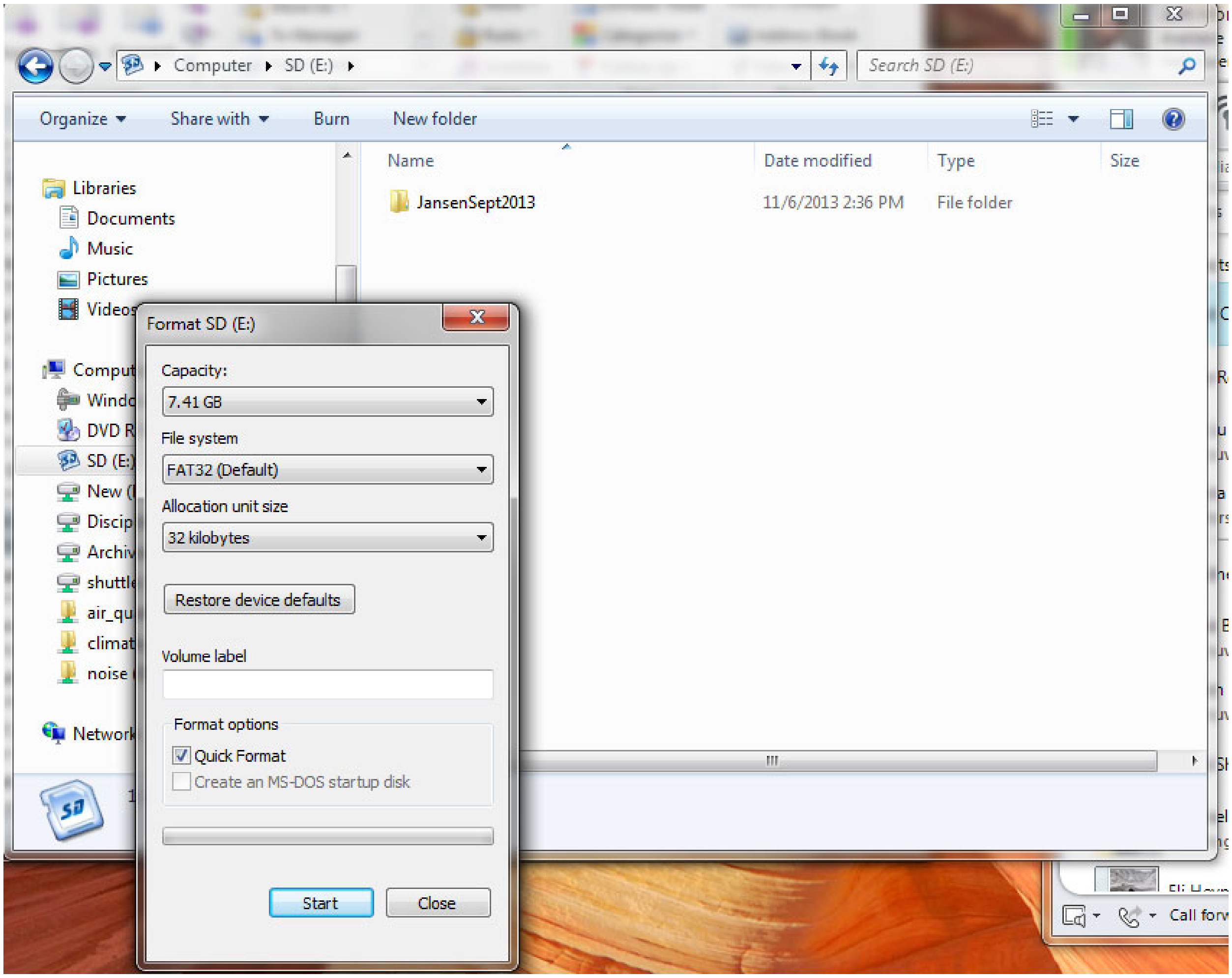


4. Select the noise file from the SD card, your screen should look something like above. You will be able to see the recording time, and listen to the data.

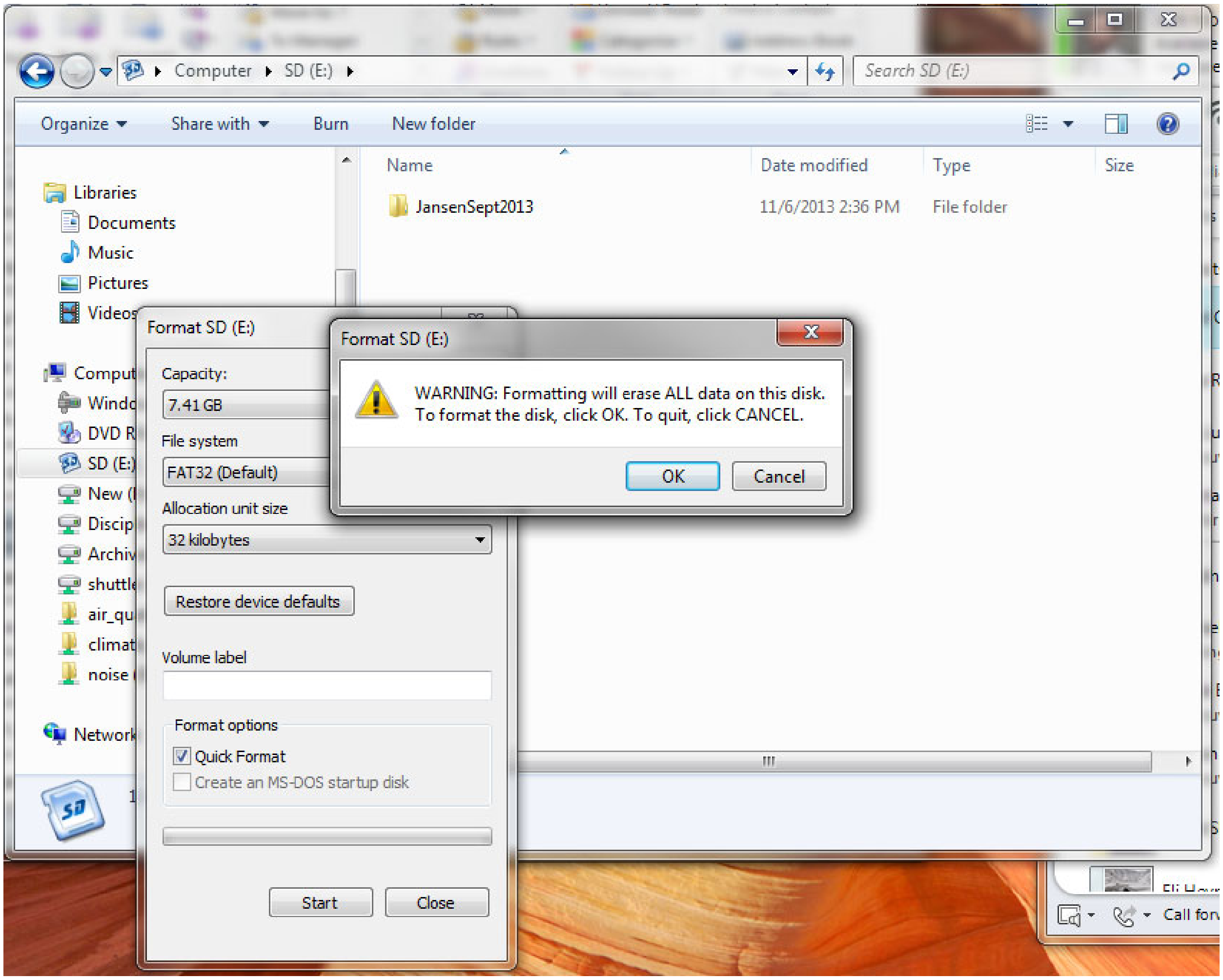
5. To move the data from the SD card to the Archive, simply click and drag the Noise file into the archive you created. This is about a 4 Gig file and this will take a few minutes to happen. You will see a progress screen, but it won't be doing anything until its over.



6. Once the data has been transferred to the archive you've created on your computer, you will need to re-format the SD card so that you'll be able to record a new 24 hour monitoring period. Start up menu, and right click on the SD card, and select format.



7. the screen should look something like this and select start to re-format.



8. This warning will pop up and select ok. You're SD card is now ready for another round of sampling.

APPENDIX 3.2-1 WILDLIFE CAMERA LOCATIONS AND CAMERA EFFORT BY MONTH, DORIS AND MADRID AREAS, JUNE 2016 TO SEPTEMBER 2022

Appendix 3.2-1: Wildlife Camera Locations and Camera Effort by Month, Doris and Madrid Areas, June 2016 to September 2022

Camera No.	Position			Distance to Infrastructure (m)			Camera Bearing	Camera Type	ZOI and Control Location Relative to Project	Species Specific Monitoring Objective	Summary Camera Effort June 2016 - December 2018	Summary Camera Effort January 2019 - May 2021	2021							2022									Summary Camera Effort September 2021 - September 2022		
	Zone	Easting	Northing	2017	2018	2019-Current					Total	Total	June	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total	Average	Standard Deviation
1	13 W	432949	7558756	0	0	0	SE	Treatment	-	-	551	479	30	31	31	30	29	22	0	0	0	14	30	31	30	31	31	25	365	20.3	13.6
2	13 W	432387	7553947	28	28	28	N	Treatment	-	Road Crossing Ramp	574	576	30	31	31	30	26	11	10	0	3	30	30	31	30	31	31	22	377	20.9	12.8
3	13 W	444031	7566975	11505	11505	11505	NW	Control	East	-	393	397	30	31	31	6	12	0	0	0	0	0	0	5	0	0	0	0	115	6.4	11.6
4	13 W	444861	7564091	10991	10991	10991	W	Control	East	-	468	360	27	31	31	12	4	0	0	0	0	0	0	11	30	31	31	3	211	11.7	13.9
5	13 W	450151	7565854	16481	16481	16481	E	Control	East	-	221	252	30	31	7	6	4	0	0	0	0	0	0	9	30	31	16	0	164	9.1	12.5
6	13 W	448290	7567418	15679	15679	15679	E	Control	East	-	458	402	17	31	31	25	7	0	0	0	0	0	0	10	30	31	10	0	192	10.7	13.1
7	13 W	446995	7560826	11697	11697	11697	N	Control	East	-	498	321	27	31	31	30	21	9	0	0	0	0	26	31	30	31	31	23	321	17.8	14.0
8	13 W	446453	7567249	13905	13905	13905	W	Control	East	-	292	145	27	29	0	2	28	14	0	0	0	0	5	31	30	31	31	22	250	13.9	14.1
9	13 W	421674	7551536	10998	10998	10998	S	Control	West	-	278	23	18	4	0	2	29	0	0	0	0	0	0	9	13	0	0	0	75	4.2	8.1
10	13 W	429000	7563795	2581	2581	2581	SW	ZOI	West	-	685	454	18	31	31	30	31	20	2	0	1	31	30	26	30	31	31	25	368	20.4	13.2
11	13 W	434312	7561671	1313	1313	1313	SE	Treatment	-	-	572	656	30	31	31	30	31	22	0	0	0	22	30	31	30	31	31	22	372	20.7	13.6
12	13 W	428170	7550169	4507	4507	4507	S	ZOI	West	-	285	291	18	0	0	2	5	0	0	0	0	0	0	9	30	31	31	14	140	7.8	11.8
13	13 W	431162	7549789	1655	1655	1655	S	Treatment	-	-	484	640	29	28	29	29	31	18	11	0	6	31	30	31	30	31	31	24	389	21.6	12.3
14	13 W	441096	7559506	5660	5660	5660	W	ZOI	East	-	430	234	26	31	10	2	6	0	0	0	0	0	0	11	30	31	31	22	200	11.1	13.2
15	13 W	434048	7559949	439	439	439	S	Treatment	-	-	696	554	12	0	0	0	0	0	0	0	0	0	0	0	0	0	31	22	65	3.6	8.9
16	13 W	445286	7563652	11147	11147	11147	NW	Control	East	-	456	205	27	31	31	30	20	8	0	0	0	0	18	31	30	31	31	24	312	17.3	13.9
17	13 W	432414	7563015	132	67	67	NW	Treatment	-	-	606	564	30	31	31	30	26	14	0	5	5	8	30	31	30	31	31	23	356	19.8	13.0
18	13 W	432884	7563146	0	0	0	E	Treatment	-	Waste Management Facility	522	544	30	31	31	30	31	19	0	0	4	10	30	31	30	31	31	23	362	20.1	13.5
19	13 W	433432	7562946	295	295	295	W	Treatment	-	-	455	533	0	0	0	7	28	9	0	0	6	13	28	31	30	31	31	25	239	13.3	13.6
21	13 W	432902	7563215	0	0	0	S	Treatment	-	Waste Management Facility	131	409	30	31	31	30	31	23	7	5	3	22	30	31	30	31	31	21	387	21.5	12.3
22	13 W	435190	7562859	2040	2040	2040	SE	Treatment	-	ERM Fish Fence	356	632	30	31	31	30	31	14	0	0	0	22	25	31	8	0	0	0	253	14.1	14.3
23	13 W	440934	7562091	6601	6601	6601	E	ZOI	-	-	232	160	30	31	31	13	31	30	19	0	2	28	30	31	30	5	0	0	311	17.3	14.2
24	13 W	432915	7546879	3540	3540	2827	SE	ZOI/Ladder	South	-	346	190	0	20	31	30	31	12	0	0	0	0	0	19	30	31	31	24	259	14.4	14.1
25	13 W	439189	7561613	4911	4911	4911	SW	ZOI	East	-	527	341	1	0	0	3	31	22	0	0	0	0	29	31	30	31	31	7	216	12.0	14.4
26	13 W	439511	7559524	4174	4174	4174	E	ZOI	East	-	514	185	0	0	0	0															
28	13 W	437525	7555177	1860	1758	1758	SE	Treatment	-	-	544	584	30	31	31	30	5	0	0	0	0	0	0	9	30	31	31	24	252	14.0	14.7
29	13 W	447664	7555608	11763	11701	11700	E	Control	East	-	518	589	30	31	31	30	31	19	0	0	0	0	5	31	30	31	31	24	324	18.0	14.5
30	13 W	436434	7551376	3216	3216	2794	NE	ZOI	East	-	526	171	18	31	31	30	31	8	0	0	0	0	0	9	30	31	31	24	274	15.2	14.3
31	13 W	447294	7558194	11554	11554	11532	SE	Control	East	-	690	180	26	31	31	30	31	13	0	0	0	0	19	22	0	0	0	0	203	11.3	13.7
32	13 W	431386	7554959	982	982	982	E	Treatment	-	-	526	414	14	31	31	30	25	17	0	0	0	0	5	23	1	0	2	18	197	10.9	12.5
33	13 W	446370	7566101	13351	13351	13349	S	Control	East	-	291	303	27	31	31	30	31	30	11	0	0	27	30	31	30	31	19	0	359	19.9	13.7
34	13 W	435945	7545070	6037	6037	5333	NE	ZOI/Ladder	South	-	568	475	18	31	31	30	22	10	4	0	0	24	30	31	8	0	0	0	239	13.3	13.4
35	13 W	432743	7556706	57	57	57	E	Treatment	-	Road Crossing Ramp	532	487	30	31	31	30	16	0	0	0	0	0	0	11	30	31	31	25	266	14.8	14.6
36	13 W	447689	7563809	13382	13382	13382	N	Control	East	-	342	111	14	0	0	0	0	0	0	0	0	0	0	0	0	5	18	24	61	3.4	7.3
37	13 W	447868	7573293	17736	17736	17736	NE	Control	East	-	266	294	6	0	0	6	26	6	0	0	0	2	30	28	30	31	31	6	202	11.2	13.4
39	13 W	439855	7553886	4524	4421	4421	NE	ZOI	East	-	539	99	0	0	0	2	30	10	0	0	0	3	30	31	30	31	31	24	222	12.3	14.4
40	13 W	449306	7559369	13712	13712	13712	NW	Control	East	-	469	403	30	31	31	30	21	0	0	0	0	8	27	31	30	31	31	23	324	18.0	14.2
41	13 W	436856	7564792	4006	4006	4006	SE	ZOI	East	-	234	437	18	31	31	30	31	17	0	0	0	0	6	31	30	31	28	0	284	15.8	14.5
42	13 W	432858	7561589	0	0	0	S	Treatment	-	-	663	614	30	31	31	27	30	17	9	0	0	29	30	22	30	31	31	23	371	20.6	12.7
43	13 W	447488	7561980	12505	12505	12505	W	Control	East	-	538	339	30	31	31	30	26	15	0	0	0	6	30	31	30	31	31	24	346	19.2	13.9

Appendix 3.2-1: Wildlife Camera Locations and Camera Effort by Month, Doris and Madrid Areas, June 2016 to September 2022

Camera No.	Position			Distance to Infrastructure (m)			Camera Bearing	Camera Type	ZOI and Control Location Relative to Project	Species Specific Monitoring Objective	Summary Camera Effort June 2016 - December 2018	Summary Camera Effort January 2019 - May 2021	2021							2022									Summary Camera Effort September 2021 - September 2022		
	Zone	Easting	Northing	2017	2018	2019-Current					Total	Total	June	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total	Average	Standard Deviation
44	13 W	441011	7563691	7648	7648	7648	S	ZOI	East	-	615	610	30	31	31	30	31	17	0	0	6	31	28	22	30	31	31	24	373	20.7	13.1
45	13 W	443663	7571970	13546	13546	13546	N	Control	East	-	289	36	30	7	0	1	0	0	0	0	0	0	0	11	2	0	0	0	51	2.8	7.4
46	13 W	442904	7560551	7707	7707	7707	N	ZOI	East	-	249	372	30	31	31	30	21	0	0	0	0	0	28	31	30	31	31	24	318	17.7	14.7
47	13 W	442470	7550873	8383	8275	8275	E	ZOI	East	-	338	397	30	31	31	30	30	14	0	0	0	2	26	31	30	31	31	24	341	18.9	14.1
48	13 W	443980	7554761	8182	8106	8106	NW	ZOI	East	-	211	343	30	31	31	30	12	0	0	0	0	0	12	31	30	31	31	24	293	16.3	14.6
49	13 W	445024	7565168	11713	11713	11713	S	Control	East	-	462	47	7	0	0	2	31	10	0	0	0	0	0	5	0	0	0	0	55	3.1	7.6
50	13 W	434645	7553626	1998	1998	1998	NE	Treatment	-	-	408	253	0	22	31	30	31	22	0	0	0	0	0	13	30	31	31	25	266	14.8	14.3
51	13 W	435488	7555990	16	16	0	E	Treatment	-	TIA	304	377	30	31	31	30	25	7	0	0	3	6	30	31	30	31	31	23	339	18.8	13.9
52	13 W	434501	7559084	77	77	77	NW	Treatment	-	TIA	452	526	30	31	31	30	31	18	14	31	28	31	30	21	0	0	0	0	326	18.1	14.0
53	13 W	431215	7559161	1096	1096	1096	W	Treatment	-	-	657	739	30	31	31	30	30	16	9	0	18	31	30	31	30	31	31	25	404	22.4	12.1
54	13 W	430564	7558687	1757	1757	1757	SE	Treatment	-	-	561	581	17	0	0	4	31	14	0	0	0	12	26	31	18	0	0	0	153	8.5	11.5
55	13 W	428287	7554559	4039	4039	4039	N	ZOI	West	-	385	254	18	18	0	1	7	0	0	0	0	0	0	9	30	31	31	25	170	9.4	12.4
56	13 W	419347	7547495	13650	13650	13650	N	Control	West	-	513	336	18	31	31	30	16	0	0	0	0	19	30	31	30	31	31	25	323	17.9	13.9
57	13 W	427342	7552318	5324	5324	5324	SW	ZOI	West	-	317	402	18	31	2	2	30	7	0	0	6	27	30	31	30	31	31	25	301	16.7	13.9
58	13 W	421708	7545207	12160	12160	12160	N	Control	West	-	212	435	30	31	31	30	22	0	0	0	0	23	22	9	30	31	31	25	315	17.5	13.8
59	13 W	431411	7564176	265	265	265	E	Treatment	-	-	415	494	30	31	31	30	28	15	0	0	0	15	30	31	30	31	31	25	358	19.9	13.6
60	13 W	433982	7564662	1441	1441	1441	S	Treatment	-	-	590	437	18	31	31	27	0	0	0	0	0	0	0	0	0	0	0	0	107	5.9	11.7
										Total			1264	1368	1257	1171	1256	569	96	41	91	527	965	1253	1340	1312	1302	904			
										Average			22.2	24.0	22.1	20.5	22.4	10.2	1.7	0.7	1.6	9.4	17.2	22.4	23.9	23.4	23.3	16.1			
										Standard Deviation			10.0	12.3	13.9	12.7	10.7	8.8	4.2	4.2	4.6	11.9	13.7	10.8	11.5	13.3	12.8	10.8			

Notes:
Cells with dashes (-) indicate camera was not active for that month.

APPENDIX 3.2-2 CAMERA SUMMARY OF WILDLIFE IMAGES AND EVENTS, DORIS AND MADRID AREAS, SEPTEMBER 2021 TO SEPTEMBER 2022

Appendix 3.2-2: Camera Summary of Wildlife Images and Events, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Number of Images and Events Recorded of Wildlife Species																					
		Caribou				Grizzly Bear				Wolverine				Muskox				Nest Predators				Other Wildlife	
		Motion		Timed		Motion		Timed		Motion		Timed		Motion		Timed		Motion		Timed		Motion Images	Timed Images
		Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events		
1	Treatment	450	36	1	1																	430	11
2	Treatment	120	11																			81	5
3	Control	550	33			138	5			20	1											90	
4	Control	70	7			280	8															110	
5	Control	230	9			260	5			10	1												
6	Control	420	8	1	1	300	4															11	
7	Control	90	5			30	1															10	1
8	Control	130	6			100	3															81	1
9	Control	80	1			70	3															10	
10	ZOI	287	15			90	4			10	1											130	
11	Treatment	13	2			250	7															180	
12	ZOI	90	9			90	5															120	
13	Treatment	210	7			350	7			30	2												
14	ZOI	210	7			90	2															102	
15	Treatment	30	3			80	4															10	
16	Control	150	13	1	1	130	5															30	
17	Treatment	32	4			170	7															126	12
18	Treatment	240	23																			80	
19	Treatment	100	10			50	3															50	1
21	Treatment	904	57			60	4															590	5
22	Treatment	30	3			740	30			40	2											117	
23	ZOI	190	6	1	1	280	8															130	
24	ZOI/Ladder	680	43	1	1	30	1			10	1											90	0
25	ZOI	50	3			512	9			10	1											10	
26	ZOI					30	1															20	
28	Treatment	380	9			500	10							240	1							230	
29	Control	510	8			30	2															31	3
30	ZOI	220	9			200	3			140	2											70	1
31	Control	40	1			10	1															20	1
32	Treatment	340	18			250	7															331	
33	Control	680	32			3290	13			60	4											20	
34	ZOI/Ladder	20	2			50	1															340	
35	Treatment	60	6	0	0																	409	8
36	Control	20	2			50	2			30	3											20	
37	Control	197	11			618	6							100	1							20	
39	ZOI																					2	
40	Control	110	2																			80	3
41	ZOI	16	3			110	3			2	1											69	
42	Treatment	300	26																			30	13
43	Control	390	4			441	7			2	1											116	2
44	ZOI	20	2			70	3															160	
45	Control					240	5																
46	ZOI	160	5			200	4															60	

Appendix 3.2-2: Camera Summary of Wildlife Images and Events, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Number of Images and Events Recorded of Wildlife Species																					
		Caribou				Grizzly Bear				Wolverine				Muskox				Nest Predators				Other Wildlife	
		Motion		Timed		Motion		Timed		Motion		Timed		Motion		Timed		Motion		Timed		Motion Images	Timed Images
		Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events	Images	Events		
47	ZOI	230	11							11	2											16	
48	ZOI	330	19			50	2															30	5
49	Control					191	2																
50	Treatment	30	4			10	1															60	
51	Treatment	217	29			30	2															200	8
52	Treatment	90	6	2	0	157	7															187	3
53	Treatment	100	4			60	2							110	2							110	
54	Treatment	178	10			319	12															234	1
55	ZOI	142	7																			50	
56	Control	130	2			530	5			12	2											20	
57	ZOI	260	12			30	2			40	3											70	
58	Control	10	1			608	23															73	
59	Treatment	530	3			270	7															40	
60	Treatment																						
	TOTAL	**11066**	**569**	**7**	**5**	**12444**	**258**			**427**	**27**			**450**	**4**							**5706**	**84**

APPENDIX 3.2-3 WILDLIFE EVENTS RECORDED BY WILDLIFE CAMERAS, DORIS AND MADRID AREAS, SEPTEMBER 2021 TO SEPTEMBER 2022

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
Part 1. Camera Data for Caribou, Grizzly Bear, Wolverine, Muskox, and Nest Predators Recorded on Motion-triggered Photos																	
1	Treatment	4/24/2022	1	16:02	16:05	M	1060	1079	20	2	Red Fox	2	NA	2	Walking	Tundra	
1	Treatment	7/4/2022	1	20:32	20:32	M	363	364	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/6/2022	2	7:47	7:47	M	386	393	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/6/2022	3	9:30	9:30	M	396	399	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/6/2022	4	17:25	17:25	M	409	411	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/8/2022	1	21:17	21:17	M	435	437	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/9/2022	1	3:45	3:45	M	445	454	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/10/2022	1	5:19	5:19	M	458	478	30	3	Caribou	3	NA	3	Walking	Tundra	
1	Treatment	7/10/2022	2	17:59	17:07	M	491	496	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/11/2022	2	21:09	21:09	M	534	538	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/11/2022	3	22:43	22:43	M	544	545	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/12/2022	1	0:47	0:47	M	554	562	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/12/2022	2	19:10	19:10	M	567	568	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/12/2022	3	21:03	21:03	M	577	577	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/13/2022	1	1:49	1:49	M	587	597	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/13/2022	2	7:34	7:34	M	607	616	20	2	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/14/2022	1	1:03	1:03	M	620	621	10	1	Caribou	1	NA	1	Walking	Tundra	
1	Treatment	7/17/2022	1	11:53	11:53	M	659	661	10	1	Caribou	1	NA	1	Walking	Tundra	
2	Treatment	7/3/2022	1	0:09	0:09	M	4897	4906	10	1	Caribou	3	NA	3	Grazing	Tundra	Truck triggered photo while driving.
2	Treatment	7/4/2022	1	20:12	20:12	M	5723	5732	10	1	Caribou	1	NA	1	Walking	Road	Truck triggered photo while driving.
2	Treatment	7/20/2022	1	3:58	3:59	M	9898	9907	10	1	Caribou	1	NA	1	Grazing	Tundra	
2	Treatment	7/21/2022	1	20:36	20:36	M	9954	9957	10	1	Caribou	1	NA	1	Walking	Tundra	
2	Treatment	8/2/2022	1	9:33	9:33	M	1908	1914	10	1	Caribou	1	NA	1	Walking	Tundra	
2	Treatment	8/3/2022	1	21:55	21:55	M	2584	2593	10	1	Caribou	1	NA	1	Walking	Tundra	
3	Control	5/26/2022	1	4:41	4:42	M	83	110	28	3	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
4	Control	10/4/2021	1	17:12	17:17	M	79	139	60	6	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
4	Control	7/3/2022	1	3:58	3:58	M	240	249	10	1	Caribou	2	1	3	Grazing	Tundra	Bear knocked the camera down.
4	Control	7/8/2022	1	5:07	5:07	M	275	275	10	1	Caribou	1	NA	1	Walking	Tundra	
4	Control	7/23/2022	1	16:31	16:31	M	333	339	10	1	Caribou	1	NA	1	Investigating camera	Tundra	
4	Control	7/24/2022	1	10:20	10:20	M	349	355	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
4	Control	9/3/2022	1	8:36	8:38	M	516	559	60	6	Grizzly Bear	2	NA	2	Walking	Tundra	
5	Control	6/9/2022	1	18:45	18:45	M	165	174	10	1	Caribou	1	NA	1	Walking	Tundra	
5	Control	6/23/2022	1	15:02	15:02	M	247	253	10	1	Caribou	1	NA	1	Walking	Tundra	
5	Control	6/30/2022	1	23:28	23:29	M	328	431	50	5	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
5	Control	8/4/2022	1	20:09	20:10	M	593	612	20	2	Caribou	NA	1	1	Walking	Tundra	
6	Control	9/8/2021	1	9:57	10:00	M	2048	2117	70	7	Caribou	1	0	1	Investigating camera	Tundra	
6	Control	9/12/2021	1	18:46	18:53	M	2133	2232	100	10	Caribou	1	0	1	Investigating camera	Tundra	
6	Control	9/12/2021	1	19:43	19:48	M	2233	2332	100	10	Caribou	1	0	1	Investigating camera	Tundra	
6	Control	7/10/2022	1	20:00	20:00	M	559	563	10	1	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
6	Control	7/18/2022	1	9:20	9:20	M	609	612	10	1	Caribou	1	NA	1	Walking	Tundra	
7	Control	4/28/2022	1	15:35	15:36	M	677	686	10	1	Fox	1	NA	1	Walking	Tundra	
7	Control	5/31/2022	1	9:21	9:21	M	65	89	30	3	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
7	Control	6/22/2022	1	13:39	13:39	M	164	173	10	1	Caribou	1	NA	1	Walking	Tundra	
7	Control	8/19/2022	1	9:58	9:58	M	395	398	10	1	Caribou	1	NA	1	Walking	Tundra	
7	Control	8/19/2022	2	12:35	12:35	M	408	415	10	1	Caribou	1	NA	1	Grazing	Tundra	
7	Control	9/1/2022	1	6:02	6:02	M	464	483	20	2	Caribou	1	NA	1	Investigating camera	Tundra	
8	Control	4/30/2022	1	1:53	1:53	M	730	739	10	1	Arctic Fox	1	NA	1	Standing	Tundra	
8	Control	5/25/2022	1	12:34	12:34	M	40	61	30	3	Caribou	1	NA	1	Grazing	Tundra	
8	Control	5/31/2022	1	15:59	15:59	M	98	115	20	2	Caribou	1	NA	1	Investigating camera	Tundra	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
8	Control	6/7/2022	1	21:59	21:59	M	139	151	20	2	Caribou	1	NA	1	Investigating camera	Tundra	
8	Control	6/7/2022	2	22:05	22:08	M	159	191	40	4	Caribou	1	NA	1	Investigating camera	Tundra	
9	Control	6/13/2022	1	10:46	10:48	M	121	138	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
10	ZOI	9/2/2021	1	19:10	19:10	M	487	496	10	1	Grizzly Bear	1	0	1	Investigating camera	Tundra	
10	ZOI	5/1/2022	1	0:39	0:40	M	581	600	20	2	Fox	1	NA	1	Investigating camera	Tundra	
10	ZOI	6/17/2022	1	7:00	7:00	M	123	142	20	2	Caribou	2	NA	2	Grazing	Tundra	
10	ZOI	6/17/2022	2	18:29	18:29	M	146	167	22	3	Caribou	1	NA	1	Grazing	Tundra	
10	ZOI	6/25/2022	1	23:02	23:06	M	200	323	88	9	Caribou	1	1	2	Investigating camera	Tundra	
10	ZOI	7/5/2022	1	5:38	5:38	M	357	360	4	1	Caribou	1	NA	1	Walking	Tundra	
10	ZOI	7/8/2022	1	3:21	3:21	M	376	377	2	1	Caribou	1	NA	1	Walking	Tundra	
10	ZOI	7/18/2022	1	14:41	14:41	M	419	423	5	1	Caribou	1	NA	1	Walking	Tundra	
10	ZOI	8/14/2022	1	6:05	6:06	M	507	526	20	2	Caribou	1	NA	1	Standing	Tundra	
10	ZOI	8/14/2022	1	6:06	6:06	M	527	536	10	1	Caribou	2	NA	2	Standing	Tundra	
10	ZOI	8/27/2022	1	16:34	16:37	M	609	644	36	4	Caribou	NA	1	1	Grazing	Tundra	
11	Treatment	6/16/2022	1	20:26	20:26	M	114	116	3	1	Caribou	1	NA	1	Walking	Tundra	
11	Treatment	7/26/2022	2	10:35	10:40	M	381	410	30	3	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
12	ZOI	6/29/2022	1	12:52	12:55	M	185	202	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
12	ZOI	7/3/2022	1	1:34	1:35	M	222	229	10	1	Caribou	1	NA	1	Investigating camera	Tundra	
12	ZOI	7/3/2022	1	5:15	5:15	M	232	234	10	1	Caribou	1	NA	1	Walking	Tundra	
12	ZOI	7/5/2022	1	1:38	1:38	M	248	253	10	1	Caribou	1	NA	1	Walking	Tundra	
12	ZOI	7/11/2022	1	5:35	5:35	M	276	280	10	1	Caribou	1	NA	1	Walking	Tundra	
12	ZOI	7/15/2022	1	0:02	0:02	M	308	311	10	1	Caribou	1	NA	1	Walking	Tundra	
12	ZOI	9/9/2022	1	23:56	23:56	M	529	538	10	1	Caribou	1	NA	1	Grazing	Tundra	
12	ZOI	9/10/2022	1	4:18	4:18	M	539	548	10	1	Caribou	1	NA	1	Walking	Tundra	
13	Treatment	9/8/2021	1	10:09	10:10	M	53	92	40	4	Grizzly Bear	1	0	1	Investigating camera	Tundra	
13	Treatment	3/24/2022	1	8:27	8:27	M	586	577	10	1	Wolverine	1	NA	1	Other	Tundra	
13	Treatment	3/28/2022	1	16:33	16:33	M	593	602	10	1	Red Fox	1	NA	1	Walking	Tundra	
13	Treatment	6/13/2022	1	12:50	15:54	M	97	136	30	3	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
13	Treatment	6/21/2022	1	15:25	15:25	M	179	182	10	1	Caribou	1	NA	1	Walking	Tundra	
13	Treatment	6/21/2022	2	16:45	16:45	M	189	198	10	1	Caribou	1	NA	1	Walking	Tundra	
13	Treatment	6/28/2022	3	7:55	7:55	M	217	219	10	1	Caribou	1	NA	1	Investigating camera	Tundra	
13	Treatment	9/14/2022	1	13:37	13:38	M	465	503	40	4	Grizzly Bear	1	1	2	Grazing	Tundra	
14	ZOI	6/16/2022	1	11:30	11:45	M	209	225	20	2	Caribou	4	NA	4	Walking	Tundra	
14	ZOI	6/26/2022	1	13:47	13:47	M	462	471	10	1	Caribou	1	NA	1	Walking	Tundra	
14	ZOI	7/16/2022	1	22:14	22:14	M	662	663	10	1	Caribou	1	NA	1	Walking	Tundra	
14	ZOI	7/27/2022	1	3:10	3:10	M	702	707	10	1	Caribou	1	NA	1	Walking	Tundra	
14	ZOI	8/28/2022	1	21:38	21:38	M	811	818	10	1	Caribou	1	NA	1	Walking	Tundra	
14	ZOI	8/28/2022	2	21:39	21:43	M	821	952	120	12	Caribou	1	NA	1	Investigating camera	Tundra	
14	ZOI	9/8/2022	1	5:24	17:24	M	1011	1025	20	2	Caribou	1	NA	1	Investigating camera	Tundra	
16	Control	6/14/2022	1	18:03	18:03	M	116	127	20	2	Caribou	1	NA	1	Investigating camera	Tundra	
16	Control	7/21/2022	1	1:11	1:11	M	264	267	10	1	Caribou	1	NA	1	Walking	Tundra	
16	Control	8/3/2022	1	6:22	6:22	M	313	322	10	1	Caribou	1	NA	1	Walking	Tundra	
16	Control	9/9/2022	1	20:06	20:06	M	437	446	10	1	Caribou	1	NA	1	Grazing	Tundra	
17	Treatment	6/25/2022	1	11:01	11:01	M	640	649	10	1	Caribou	3	3	6	Grazing	Tundra	
17	Treatment	6/25/2022	2	11:02	11:02	M	650	651	2	1	Caribou	1	NA	1	Walking	Tundra	
18	Treatment	7/5/2022	1	13:11	13:11	M	8792	8792	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/7/2022	1	5:17	5:17	M	9635	9644	10	1	Caribou	2	NA	2	Walking	Road	
18	Treatment	7/8/2022	1	17:31	17:31	M	612	621	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/16/2022	1	19:37	19:37	M	2876	2882	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/16/2022	2	20:01	20:01	M	2886	2895	10	1	Caribou	1	NA	1	Walking	Road	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
18	Treatment	7/19/2022	1	22:25	22:25	M	4045	4053	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/20/2022	2	8:20	8:21	M	4055	4064	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/20/2022	3	19:03	19:03	M	4278	4287	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/21/2022	1	1:41	1:41	M	4298	4301	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/21/2022	2	5:36	5:36	M	4308	4317	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/21/2022	3	11:27	11:28	M	4438	4446	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/21/2022	4	13:45	13:45	M	4581	4588	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/21/2022	5	20:10	20:11	M	4931	4937	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/21/2022	6	20:21	20:21	M	4941	4944	10	1	Caribou	1	NA	1	Walking	Road	
18	Treatment	7/21/2022	7	22:46	22:46	M	4951	4960	10	1	Caribou	1	NA	1	Walking	Road	
19	Treatment	7/9/2022	1	1:04	1:04	M	189	198	10	1	Caribou	1	NA	1	Walking	Tundra	
19	Treatment	7/9/2022	2	2:50	2:50	M	199	201	10	1	Caribou	1	NA	1	Walking	Tundra	
19	Treatment	7/19/2022	1	23:37	23:37	M	242	251	10	1	Caribou	1	NA	1	Walking	Tundra	
19	Treatment	7/25/2022	1	5:11	5:11	M	267	276	10	1	Caribou	1	NA	1	Grazing	Tundra	
19	Treatment	7/31/2022	1	11:29	11:29	M	315	316	10	1	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
19	Treatment	8/2/2022	1	3:51	3:51	M	341	347	10	1	Caribou	1	NA	1	Walking	Tundra	
19	Treatment	8/2/2022	2	10:27	10:27	M	351	355	10	1	Caribou	1	NA	1	Walking	Tundra	
19	Treatment	8/22/2022	1	20:12	20:12	M	434	464	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
21	Treatment	6/19/2022	1	21:53	21:53	M	4434	4443	10	1	Red Fox	1	NA	1	Walking	Road	
21	Treatment	7/4/2022	1	12:15	12:15	M	6068	6072	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/5/2022	1	8:22	8:22	M	6319	6321	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/5/2022	2	13:16	13:16	M	6382	6389	10	1	Caribou	2	NA	2	Walking	Road	
21	Treatment	7/5/2022	3	14:09	14:09	M	6452	6472	30	3	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/5/2022	4	17:59	17:59	M	6562	6564	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/5/2022	5	19:28	19:28	M	6572	6581	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/6/2022	1	20:53	20:53	M	6735	6738	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/7/2022	1	1:08	1:08	M	6745	6748	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/7/2022	2	4:11	4:11	M	6755	6771	20	2	Caribou	2	NA	2	Walking	Road	
21	Treatment	7/7/2022	3	8:31	8:31	M	6795	6804	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/7/2022	4	23:48	23:49	M	7168	7177	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/8/2022	1	4:59	5:00	M	7178	7187	10	1	Caribou	2	NA	2	Walking	Road	
21	Treatment	7/8/2022	2	19:39	19:39	M	7551	7560	10	1	Caribou	2	NA	2	Walking	Road	
21	Treatment	7/8/2022	3	21:03	21:03	M	7561	7572	20	2	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/8/2022	4	21:14	21:15	M	7581	7590	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/8/2022	5	21:36	21:36	M	7591	7592	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/8/2022	6	22:26	22:26	M	7601	7607	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/9/2022	1	1:06	1:06	M	7611	7620	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/9/2022	2	1:55	1:55	M	7621	7630	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/9/2022	3	2:57	2:58	M	7641	7680	40	4	Caribou	3	NA	3	Walking	Road	
21	Treatment	7/9/2022	4	4:03	4:03	M	7681	7684	4	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/9/2022	5	4:28	4:28	M	7691	7710	20	2	Caribou	2	NA	2	Walking	Road	
21	Treatment	7/9/2022	6	5:19	5:19	M	7711	7712	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/9/2022	7	17:33	17:33	M	7894	7895	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/9/2022	8	19:22	19:22	M	7914	7920	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/9/2022	9	21:24	21:24	M	7924	7933	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/10/2022	1	8:10	8:10	M	7974	7981	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/10/2022	2	16:12	16:12	M	8107	8116	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/10/2022	3	20:25	20:25	M	8147	8156	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/11/2022	4	0:48	0:48	M	8157	8166	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/11/2022	5	1:38	1:38	M	8177	8190	20	2	Caribou	1	NA	1	Walking	Road	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
21	Treatment	7/11/2022	6	23:36	23:36	M	8480	8483	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/12/2022	1	0:00	0:00	M	8490	8492	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/12/2022	2	1:29	1:29	M	8500	8509	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/12/2022	3	2:56	2:56	M	8510	8512	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/14/2022	1	1:54	1:54	M	8836	8845	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/14/2022	2	20:35	20:35	M	8869	8874	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/14/2022	3	21:47	21:47	M	8879	8880	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/14/2022	4	22:11	22:11	M	8889	8898	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/16/2022	1	14:45	14:46	M	9115	9124	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/16/2022	2	19:04	19:04	M	9175	9194	20	2	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/16/2022	3	19:41	19:41	M	9205	9213	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/16/2022	4	20:05	20:05	M	9215	9224	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/16/2022	5	20:49	20:49	M	9225	9229	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/17/2022	1	12:47	12:47	M	9278	9290	20	2	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/19/2022	1	15:26	15:26	M	9534	9553	20	2	Caribou	1	NA	1	Standing	Esker	
21	Treatment	7/20/2022	1	8:24	8:24	M	9605	9623	20	2	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/20/2022	2	13:12	13:12	M	9677	9682	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/20/2022	3	14:18	14:18	M	9697	9706	10	1	Caribou	2	NA	2	Walking	Road	
21	Treatment	7/21/2022	1	11:03	11:04	M	9867	9878	20	2	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/21/2022	2	17:04	17:04	M	9980	9983	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/21/2022	1	21:05	21:05	M	1	10	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/21/2022	2	21:29	21:29	M	11	26	20	2	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/21/2022	3	22:50	22:50	M	31	37	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/21/2022	4	22:50	22:50	M	41	50	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/22/2022	9	21:20	21:20	M	324	329	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/23/2022	1	3:53	3:53	M	344	353	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/26/2022	1	14:38	14:38	M	736	739	10	1	Caribou	1	NA	1	Walking	Road	
21	Treatment	7/26/2022	2	20:15	20:15	M	776	785	10	1	Caribou	2	NA	2	Walking	Road	
21	Treatment	8/3/2022	1	22:32	22:32	M	1970	1972	10	1	Grizzly Bear	1	NA	1	Walking	Road	
21	Treatment	8/5/2022	1	18:53	18:53	M	2266	2275	10	1	Caribou	1	NA	1	Walking	Road	
22	Treatment	9/14/2021	1	15:27	15:27	M	713	722	10	1	Wolverine	1	0	1	Running	Tundra	
22	Treatment	9/14/2021	1	15:28	15:29	M	723	742	20	2	Wolverine	1	0	1	Investigating camera	Tundra	Likely the same wolverine as above
22	Treatment	5/10/2022	1	7:21	7:21	M	799	801	10	1	Fox	1	NA	1	Investigating camera	Tundra	
22	Treatment	7/26/2022	1	6:41	6:41	M	580	584	10	1	Grizzly Bear	1	NA	1	Walking	Tundra	
22	Treatment	7/26/2022	2	7:29	7:29	M	590	599	10	1	Caribou	1	NA	1	Investigating camera	Tundra	
22	Treatment	8/14/2022	1	7:47	7:50	M	717	747	40	4	Grizzly Bear	1	NA	1	Walking	Tundra	Throughout series, bear moves camera trigging photo bursts.
22	Treatment	8/21/2022	2	1:59	1:59	M	778	784	10	1	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
22	Treatment	8/24/2022	3	11:18	11:19	M	797	806	10	1	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
22	Treatment	8/25/2022	4	17:56	17:58	M	813	852	60	6	Grizzly Bear	1	NA	1	Investigating camera	Tundra	Possible this bear has frequented the area.
22	Treatment	8/28/2022	5	16:14	16:14	M	862	871	10	1	Grizzly Bear	1	1	2	Investigating camera	Tundra	
22	Treatment	8/28/2022	6	17:58	17:58	M	872	881	10	1	Grizzly Bear	NA	1	1	Walking	Tundra	
22	Treatment	8/29/2022	7	15:59	16:01	M	895	914	20	2	Grizzly Bear	NA	1	1	Walking	Tundra	
22	Treatment	8/29/2022	8	16:02	16:02	M	915	924	10	1	Grizzly Bear	1	1	2	Walking	Tundra	
22	Treatment	9/3/2022	9	22:12	22:12	M	940	949	10	1	Grizzly Bear	1	NA	1	Walking	Tundra	
23	ZOI	9/10/2021	1	12:32	12:32	M	1441	1442	10	1	Grizzly Bear	1	0	1	Investigating camera	Tundra	Knocks camera over.
23	ZOI	10/7/2021	1	10:34	10:35	M	45	72	30	3	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
23	ZOI	11/11/2022	1	13:48	13:48	M	203	205	10	1	Red Fox	1	NA	1	Walking	Tundra	
23	ZOI	3/19/2022	1	12:36	12:36	M	627	633	10	1	Red Fox	1	NA	1	Walking	Tundra	
23	ZOI	3/23/2022	1	12:49	12:49	M	649	651	10	1	Fox	1	NA	1	Walking	Tundra	
23	ZOI	5/2/2022	1	2:55	2:55	M	786	795	10	1	Fox	1	NA	1	Running	Tundra	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
23	ZOI	5/16/2022	1	0:14	0:14	M	868	869	10	1	Fox	1	NA	1	Walking	Tundra	
23	ZOI	6/7/2022	1	4:23	4:23	M	92	111	20	2	Caribou	1	NA	1	Walking	Tundra	Investigating camera as well.
23	ZOI	6/23/2022	1	11:40	11:40	M	210	219	10	1	Caribou	1	NA	1	Feeding	Tundra	
23	ZOI	6/27/2022	5	21:28	21:28	M	235	244	10	1	Caribou	4	NA	4	Feeding	Tundra	
23	ZOI	7/5/2022	6	18:43	18:44	M	279	302	30	3	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
23	ZOI	9/4/2022	1	13:22	13:23	M	1022	1071	50	5	Grizzly Bear	1	NA	1	Investigating camera	Tundra	Appears a bear righted the camera from a fallen state.
23	ZOI	9/10/2022	1	17:20	17:20	M	1090	1109	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	Possible to be same bear as seen previously.
24	ZOI/Ladder	9/11/2021	1	12:24	12:24	M	556	575	20	2	Caribou	1	0	1	Walking	Tundra	Small horns, not sure if young, or female.
24	ZOI/Ladder	9/11/2021	1	13:02	13:02	M	577	586	10	1	Caribou	1	0	1	Walking	Tundra	Caribou butt and back leg visible in image 577.
24	ZOI/Ladder	9/23/2021	1	13:08	13:09	M	633	662	30	3	Grizzly Bear	1	0	1	Investigating camera	Tundra	
24	ZOI/Ladder	5/15/2022	1	0:45	0:45	M	704	704	1	1	Fox	1	NA	1	Standing	Tundra	
24	ZOI/Ladder	5/15/2022	1	6:09	6:09	M	714	714	1	1	Fox	1	NA	1	Standing	Tundra	
24	ZOI/Ladder	6/4/2022	1	1:54	1:54	M	118	125	10	1	Fox	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	6/7/2022	2	15:48	15:48	M	158	167	10	1	Caribou	NA	1	1	Walking	Tundra	Wolvering sitting, then rolling, and walking off.
24	ZOI/Ladder	6/7/2022	3	15:57	15:57	M	178	187	10	1	Wolverine	1	NA	1	Other	Tundra	
24	ZOI/Ladder	6/10/2022	1	11:06		M	194	203	10	1	Fox	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	6/30/2022	1	6:49	6:49	M	274	283	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	6/30/2022	2	23:24	23:24	M	287	296	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/5/2022	1	5:37	5:38	M	309	318	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/10/2022	1	3:52	3:52	M	344	353	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/10/2022	1	20:49	17:49	M	367	376	10	1	Caribou	NA	1	1	Walking	Tundra	
24	ZOI/Ladder	7/10/2022	2	20:56	20:56	M	377	386	10	1	Caribou	NA	1	1	Walking	Tundra	
24	ZOI/Ladder	7/11/2022	1	21:48	21:48	M	390	399	10	1	Caribou	1	NA	1	Running	Tundra	
24	ZOI/Ladder	7/16/2022	1	3:34	3:34	M	422	431	10	1	Caribou	1	NA	1	Running	Tundra	
24	ZOI/Ladder	7/16/2022	2	10:43	10:43	M	432	441	10	1	Caribou	NA	1	1	Running	Tundra	
24	ZOI/Ladder	7/16/2022	3	21:45	21:45	M	445	454	10	1	Caribou	NA	1	1	Walking	Tundra	
24	ZOI/Ladder	7/16/2022	4	23:34	23:34	M	455	474	20	2	Caribou	NA	1	1	Walking	Tundra	Maturity unknown.
24	ZOI/Ladder	7/18/2022	1	16:52	12:45	M	481	490	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/19/2022	1	7:36	7:36	M	491	510	20	2	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/20/2022	1	1:56	1:56	M	514	523	10	1	Caribou	1	1	2	Walking	Tundra	
24	ZOI/Ladder	7/20/2022	2	8:14	8:14	M	524	533	10	1	Caribou	1	NA	1	Running	Tundra	
24	ZOI/Ladder	7/20/2022	3	21:45	21:45	M	538	546	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/24/2022	1	6:21	6:22	M	556	565	10	1	Caribou	1	NA	1	Running	Tundra	
24	ZOI/Ladder	7/25/2022	1	16:13	16:12	M	572	581	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/25/2022	2	17:20	17:20	M	582	591	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/26/2022	1	2:08	2:08	M	592	601	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	7/30/2022	1	12:56	12:48	M	637	656	20	2	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	8/2/2022	1	21:06	21:06	M	666	675	10	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	8/2/2022	2	21:26	21:26	M	676	685	10	1	Caribou	1	NA	1	Walking	Tundra	Appears to be same adult observed August 2, 2022.
24	ZOI/Ladder	8/10/2022	1	3:37	3:37	M	737	756	20	1	Caribou	1	NA	1	Walking	Tundra	
24	ZOI/Ladder	8/22/2022	1	19:49	19:49	M	796	825	30	3	Caribou	2	NA	2	Walking	Tundra	
25	ZOI	5/24/2022	1	11:30	15:16	M	70	312	240	24	Grizzly Bear	1	1	2	Investigating camera	Tundra	
25	ZOI	5/27/2022	1	13:23	13:23	M	322	331	10	1	Fox	1	NA	1	Walking	Tundra	
25	ZOI	6/7/2022	1	8:47	8:47	M	362	391	30	3	Caribou	1	NA	1	Investigating camera	Tundra	
25	ZOI	6/8/2022	1	22:26	22:26	M	398	407	10	1	Caribou	1	NA	1	Walking	Tundra	
25	ZOI	7/4/2022	1	6:22	6:22	M	583	592	10	1	Caribou	12	NA	12	Feeding	Tundra	Caribou interested in camera while other feed. Appears to have licked the camera before leaving.
25	ZOI	8/14/2022	1	14:46	14:47	M	779	788	2	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
25	ZOI	9/3/2022	1	7:10	7:11	M	856	905	50	5	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
28	Treatment	9/5/2021	1	8:53	20:55	M	846	895	50	5	Caribou	1	0	1	Investigating camera	Tundra	
28	Treatment	9/9/2021	1	7:51	7:52	M	915	944	30	3	Fox	1	0	1	Running	Tundra	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
28	Treatment	5/26/2022	1	7:42	7:42	M	60	69	10	1	Fox	1	NA	1	Investigating camera	Tundra	
28	Treatment	6/14/2022	1	8:13	8:14	M	127	146	20	2	Caribou	1	NA	1	Investigating camera	Tundra	
28	Treatment	6/24/2022	1	22:02	22:02	M	190	219	30	3	Caribou	1	NA	1	Investigating camera	Tundra	
28	Treatment	7/15/2022	1	17:41	17:43	M	303	362	60	6	Caribou	1	NA	1	Feeding	Tundra	
28	Treatment	7/20/2022	1	0:06	0:07	M	375	394	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
28	Treatment	7/24/2022	1	22:33	22:33	M	410	419	10	1	Caribou	NA	1	1	Running	Tundra	
28	Treatment	7/27/2022	1	0:02	0:04	M	426	455	20	2	Caribou	NA	1	1	Feeding	Tundra	
28	Treatment	7/28/2022	1	16:19	16:20	M	562	471	10	1	Caribou	NA	1	1	Walking	Tundra	
28	Treatment	8/21/2022	1	17:27	17:35	M	544	783	240	24	Muskox	8	3	11	Grazing	Tundra	This herd is likely same group that was observed along Windly road Km 4, and observed from helicopter mid summer.
29	Control	5/8/2022	1	1:21	1:21	M	694	701	10	1	Fox	1	NA	1	Walking	Tundra	
29	Control	6/22/2022	1	5:09	5:10	M	151	180	30	3	Caribou	1	NA	1	Feeding	Tundra	
29	Control	8/19/2022	1	22:25	22:25	M	348	357	10	1	Red Fox	1	NA	1	Walking	Tundra	
29	Control	9/6/2022	1	21:03	21:05	M	442	491	50	5	Caribou	2	NA	2	Investigating camera	Tundra	
29	Control	9/17/2022	1	18:41	18:41	M	525	544	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
30	ZOI	9/28/2021	1	3:22	3:23	M	1152	1161	10	1	Fox	1	0	1	Walking	Tundra	Arctic or red.
30	ZOI	10/1/2021	1	7:27	7:27	M	97	106	10	1	Fox	1	NA	1	Running	Tundra	
30	ZOI	6/10/2022	1	11:59	11:59	M	106	115	10	1	Fox	1	NA	1	Walking	Tundra	
30	ZOI	7/11/2022	1	20:15	20:15	M	311	320	10	1	Fox	1	NA	1	Walking	Tundra	
30	ZOI	7/14/2022	1	23:36	23:36	M	330	339	10	1	Caribou	1	NA	1	Investigating camera	Tundra	Appears to see the camera and bolts.
30	ZOI	7/16/2022	1	11:11	11:13	M	343	402	60	6	Grizzly Bear	1	1	2	Investigating camera	Tundra	Presumed mother and cub.
30	ZOI	8/4/2022	1	7:57	20:22	M	460	469	10	1	Caribou	1	NA	1	Walking	Tundra	
30	ZOI	8/6/2022	1	21:19	21:19	M	479	488	10	1	Red Fox	1	NA	1	Walking	Tundra	
30	ZOI	8/11/2022	1	14:27	14:27	M	504	513	10	1	Caribou	1	NA	1	Walking	Tundra	
30	ZOI	8/16/2022	1	12:55	12:56	M	530	549	20	2	Common Raven	2	NA	2	Sitting	Tundra	
30	ZOI	8/13/2022	1	13:19	13:19	M	560	569	10	1	Common Raven	1	NA	1	Sitting	Tripod	
30	ZOI	8/13/2022	2	13:20	13:21	M	570	589	20	2	Common Raven	2	NA	2	Feeding	Tundra	
30	ZOI	9/3/2022	1	1:11	1:11	M	650	669	30	10	Caribou	11	NA	11	Walking	Tundra	
30	ZOI	9/15/2022	1	13:04		M	709	NA	70	7	Caribou	4	NA	4	Investigating camera	Tundra	Two caribou appears to have recently shed antler velvet.
31	Control	4/23/2022	1	17:24	17:24	M	642	651	10	1	Fox	1	NA	1	Walking	Tundra	
31	Control	5/1/2022	1	22:59	23:00	M	676	685	10	1	Fox	1	NA	1	Running	Tundra	
32	Treatment	9/9/2022	1	20:45	20:47	M	10	59	50	5	Caribou	1	NA	1	Investigating camera	Tundra	
33	Control	9/13/2021	1	12:00	12:01	M	3297	3339	50	5	Grizzly Bear	1	0	1	Investigating camera	Tundra	
33	Control	10/14/2021	1	17:46	17:53	M	69	198	130	13	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
33	Control	12/6/2021	1	11:52	11:53	M	366	395	40	4	Caribou	5	1	6	Feeding	Tundra	
33	Control	3/5/2022	1	9:16	9:21	M	672	750	80	8	Wolverine	1	NA	1	Investigating camera	Tundra	
33	Control	3/22/2022	1	18:01	18:01	M	816	820	10	1	Red Fox	1	NA	1	Walking	Tundra	
33	Control	4/1/2022	1	0:13	0:14	M	883	898	20	2	Fox	1	NA	1	Feeding	Tundra	
33	Control	4/7/2022	1	1:28	1:28	M	921	923	10	1	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
33	Control	4/19/2022	1	22:30	22:30	M	1000	1008	10	1	Fox	1	NA	1	Walking	Tundra	
33	Control	4/19/2022	2	22:30	22:30	M	1018	1029	20	2	Fox	1	NA	1	Running	Tundra	
33	Control	4/24/2022	1	19:27	19:27	M	1045	1054	10	1	Red Fox	1	NA	1	Walking	Tundra	
33	Control	4/29/2022	1	14:27	14:27	M	1090	1097	10	1	Fox	1	NA	1	Walking	Tundra	
33	Control	5/1/2022	1	11:18	11:18	M	1103	1110	10	1	Fox	1	NA	1	Walking	Tundra	
33	Control	5/1/2022	1	11:01	23:01	M	1116	1122	10	1	Red Fox	1	NA	1	Walking	Tundra	
33	Control	5/4/2022	1	1:50	1:50	M	1172	1188	20	2	Arctic Fox	1	NA	1	Walking	Tundra	
33	Control	5/4/2022	1	10:11	10:11	M	1192	1197	10	1	Wolverine	1	NA	1	Walking	Tundra	
33	Control	5/17/2022	1	9:53	9:54	M	1242	1272	30	3	Caribou	NA	1	1	Walking	Tundra	
33	Control	5/26/2022	1	9:05	9:06	M	40	59	20	2	Fox	1	NA	1	Walking	Tundra	
33	Control	5/27/2022	1	6:30	6:31	M	63	72	10	1	Fox	1	NA	1	Walking	Tundra	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
33	Control	6/6/2022	1	15:26	15:27	M	106	115	10	1	Caribou	1	NA	1	Feeding	Tundra	
33	Control	6/8/2022	1	1:55	2:04	M	119	388	270	27	Caribou	1	NA	1	Investigating camera	Tundra	Feeding and investigation camera.
34	ZOI/Ladder	9/7/2021	1	21:57	21:57	M	472	481	10	1	Fox	1	0	1	Walking	Tundra	
34	ZOI/Ladder	3/22/2022	1	14:40	14:41	M	616	625	10	1	Red Fox	1	NA	1	Running	Tundra	
34	ZOI/Ladder	3/26/2022	1	19:57	19:57	M	638	638	10	1	Fox	1	NA	1	Walking	Tundra	
34	ZOI/Ladder	3/21/2022	1	16:25	16:26	M	663	672	10	1	Red Fox	1	NA	1	Hunting	Tundra	
34	ZOI/Ladder	4/7/2022	2	22:25	22:25	M	714	720	10	1	Fox	1	NA	1	Walking	Tundra	
34	ZOI/Ladder	4/12/2022	1	13:31	13:31	M	739	740	10	1	Red Fox	1	NA	1	Walking	Tundra	
34	ZOI/Ladder	4/28/2022	1	9:21	9:22	M	794	803	10	1	Fox	1	NA	1	Walking	Tundra	
34	ZOI/Ladder	6/7/2022	1	23:11	23:54	M	108	157	50	5	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
35	Treatment	7/20/2022	1	13:05	13:05	M	243	252	10	1	Caribou	1	NA	1	Walking	Tundra	Shows caribou using ramp allowing wildlife passage.
35	Treatment	7/24/2022	1	0:49	0:49	M	532	541	10	1	Caribou	1	NA	1	Walking	Tundra	
35	Treatment	8/24/2022	1	13:52	13:52	M	9969	9987	10	1	Caribou	1	NA	1	Standing	Tundra	
35	Treatment	8/25/2022	1	11:07	11:08	M	150	159	10	1	Caribou	2	NA	2	Walking	Tundra	One of two animals use wildlife ramp to access Windy Road.
36	Control	7/21/2022	1	19:19	19:19	M	24	33	10	1	Caribou	1	NA	1	Walking	Tundra	
36	Control	7/25/2022	1	0:21	0:22	M	43	52	10	1	Caribou	1	NA	1	Walking	Tundra	Two grizzly bears noted in images captured while camera was knocked down.
37	Control	10/12/2021	1	21:15	21:19	M	122	201	80	8	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
37	Control	5/18/2022	1	13:55	13:56	M	896	1231	350	35	Grizzly Bear	1	NA	1	Walking	Tundra	
37	Control	6/18/2022	1	3:41	3:46	M	162	261	100	10	Muskox	3	NA	3	Grazing	Tundra	Investigating camera as well.
37	Control	6/29/2022	1	21:18	21:18	M	348	367	20	2	Caribou	2	NA	2	Investigating camera	Tundra	
37	Control	7/19/2022	1	2:50	2:50	M	455	464	10	1	Caribou	1	NA	1	Walking	Tundra	
37	Control	8/11/2022	1	8:35	8:37	M	1004	1043	50	5	Grizzly Bear	1	NA	1	Investigating camera	Tripod	
37	Control	8/12/2022	1	4:30	4:30	M	1047	1056	10	1	Caribou	1	NA	1	Walking	Tundra	
37	Control	8/12/2022	2	12:20	12:21	M	1059	1108	40	4	Caribou	2	NA	2	Feeding	Tripod	
37	Control	8/17/2022	1	17:26	17:26	M	1125	1134	10	1	Caribou	1	NA	1	Feeding	Tundra	
37	Control	8/23/2022	1	21:58	22:02	M	1153	1172	20	2	Caribou	1	NA	1	Investigating camera	Tripod	
37	Control	8/26/2022	1	10:29	10:29	M	1229	1238	10	1	Caribou	NA	NA	NA	Investigating camera	Tundra	
37	Control	8/28/2022	1	8:22	8:24	M	1245	1284	40	4	Caribou	1	NA	1	Grazing	Tundra	
37	Control	9/5/2022	1	13:55	13:55	M	1322	1331	10	1	Caribou	1	NA	1	Walking	Tundra	Appears to be same adult caribou noted early.
39	ZOI	5/10/2022	1	11:22	11:22	M	730	739	10	1	Red Fox	1	NA	1	Running	Tundra	
39	ZOI	10/20/2021	1	3:32	3:32	M	104	113	10	1	Red Fox	1	NA	1	Walking	Tundra	
40	Control	4/7/2022	1	16:20	16:20	M	624	633	10	1	Fox	1	NA	1	Walking	Tundra	
40	Control	4/26/2022	1	8:10	8:10	M	688	697	10	1	Red Fox	1	NA	1	Walking	Tundra	
40	Control	5/28/2022	1	13:55	13:57	M	100	182	90	9	Caribou	2	NA	2	Investigating camera	Tundra	
41	ZOI	5/23/2022	1	8:36	8:36	M	47	48	2	1	Wolverine	1	NA	1	Walking	Tundra	
41	ZOI	7/14/2022	1	22:00	22:00	M	276	277	2	1	Caribou	1	NA	1	Walking	Tundra	
41	ZOI	7/27/2022	1	11:03	11:03	M	322	325	4	1	Caribou	1	NA	1	Investigating camera	Tundra	
41	ZOI	7/30/2022	1	19:01	19:01	M	344	353	10	1	Caribou	1	NA	1	Walking	Tundra	
41	ZOI	8/28/2022	1	9:27	9:28	M	438	459	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
42	Treatment	9/2/2021	1	9:10	9:10	M	496	515	20	2	Caribou	1	0	1	Investigating camera	Tundra	
42	Treatment	7/4/2022	1	5:35	5:35	M	176	178	10	1	Caribou	1	NA	1	Walking	Tundra	
42	Treatment	7/4/2022	2	14:37	14:37	M	189	191	10	1	Caribou	1	NA	1	Walking	Tundra	
42	Treatment	7/5/2022	1	1:53	1:54	M	199	208	10	1	Caribou	1	NA	1	Walking	Tundra	
42	Treatment	7/6/2022	1	21:45	21:45	M	215	222	10	1	Caribou	1	NA	1	Walking	Tundra	
42	Treatment	7/14/2022	1	3:39	3:39	M	246	249	10	1	Caribou	1	NA	1	Walking	Tundra	
42	Treatment	7/21/2022	1	6:39	6:39	M	277	279	10	1	Caribou	1	NA	1	Walking	Tundra	
42	Treatment	7/27/2022	1	0:10	0:10	M	305	309	10	1	Caribou	1	NA	1	Running	Tundra	
42	Treatment	8/6/2022	1	10:22	10:22	M	345	352	10	1	Caribou	1	NA	1	Walking	Tundra	
42	Treatment	8/9/2022	1	10:14	10:14	M	364	373	10	1	Caribou	1	NA	1	Walking	Tundra	
42	Treatment	8/9/2022	2	10:54	10:54	M	384	384	10	1	Caribou	1	NA	1	Walking	Tundra	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
43	Control	10/13/2021	1	19:09	19:09	M	76	85	10	1	Fox	1	NA	1	Walking	Tundra	
43	Control	10/15/2021	1	13:51	13:51	M	92	101	10	1	Red Fox	1	NA	1	Walking	Tundra	
43	Control	10/15/2021	2	14:09	14:09	M	102	111	10	1	Fox	1	NA	1	Running	Tundra	
43	Control	5/1/2022	1	4:43	4:53	M	703	832	130	13	Caribou	3	1	3	Investigating camera	Tundra	An adult and a calf up in the face of the camera, while two other adults were feeding farther away.
43	Control	5/9/2022	1	20:18	20:19		930	1126	197	20	Grizzly Bear	1	NA	1	Investigating camera	Tundra	Grizzly Bear seems to be playing.
43	Control	9/16/2022	1	8:06	8:09	M	549	628	80	8	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
43	Control	7/3/2022	1	20:27	20:27	M	207	210	10	1	Caribou	2	NA	2	Walking	Tundra	
43	Control	7/9/2022	1	1:45	1:45	M	242	243	10	1	Fox	1	NA	1	Walking	Tundra	
43	Control	7/19/2022	1	5:27	5:28	M	282	311	30	3	Caribou	1	NA	1	Walking	Tundra	
44	ZOI	7/7/2022	1	1:28	1:28	M	682	691	10	1	Caribou	1	NA	1	Grazing	Tundra	
44	ZOI	7/9/2022	1	21:55	21:55	M	721	722	10	1	Caribou	1	NA	1	Investigating camera	Tundra	
45	Control	6/2/2022	1	16:45	16:49	M	87	125	40	4	Grizzly Bear	1	1	2	Investigating camera	Tundra	
46	ZOI	8/29/2022	1	11:42	11:43	M	462	530	60	6	Caribou	1	NA	1	Investigating camera	Tundra	
46	ZOI	9/3/2022	1	9:55	9:55	M	546	578	40	4	Caribou	2	NA	2	Walking	Tundra	
46	ZOI	9/13/2022	1	10:28	10:29	M	616	637	40	4	Caribou	1	NA	1	Investigating camera	Tundra	
47	ZOI	9/9/2021	1	4:14	4:14	M	459	478	20	2	Caribou	2	0	2	Investigating camera	Tundra	
47	ZOI	3/30/2022	1	16:47	16:47	M	580	589	10	1	Fox	1	NA	1	Walking	Tundra	
47	ZOI	4/3/2022	1	13:58	13:58	M	602	611	10	1	Red Fox	1	NA	1	Walking	Tundra	
47	ZOI	5/2/2022	1	20:15	20:20	M	709	738	30	3	Red Fox	1	NA	1	Investigating camera	Tundra	
47	ZOI	7/7/2022	1	1:40	1:40	M	196	205	10	1	Caribou	2	NA	2	Walking	Tundra	
47	ZOI	7/12/2022	1	23:48	23:48	M	224	233	10	1	Caribou	1	NA	1	Walking	Tundra	
47	ZOI	7/31/2022	1	17:22	17:23	M	291	328	40	4	Caribou	2	NA	2	Grazing	Tundra	
47	ZOI	8/9/2022	1	22:58	22:58	M	358	367	10	1	Wolverine	1	NA	1	Walking	Tundra	
47	ZOI	8/25/2022	1	10:25	10:25	M	413	422	10	1	Caribou	1	NA	1	Walking	Tundra	
47	ZOI	9/1/2022	1	12:56	12:59	M	447	467	30	3	Caribou	1	NA	1	Bedded	Tundra	
47	ZOI	9/1/2022	2	13:05	13:05	M	477	486	10	1	Caribou	1	NA	1	Walking	Tundra	
47	ZOI	9/1/2022	3	14:13	14:13	M	489	496	10	1	Caribou	1	NA	1	Grazing	Tundra	
47	ZOI	9/2/2022	1	17:05	17:05	M	500	519	20	2	Caribou	1	NA	1	Walking	Tundra	
48	ZOI	6/14/2022	1	17:03	17:08	M	140	159	20	2	Caribou	3	NA	3	Investigating camera	Tundra	
48	ZOI	6/17/2022	1	19:47	19:47	M	169	180	20	2	Caribou	1	NA	1	Investigating camera	Tundra	
48	ZOI	7/5/2022	1	14:52	14:52	M	283	285	10	1	Caribou	1	NA	1	Walking	Tundra	
48	ZOI	7/7/2022	1	4:59	4:59	M	316	323	10	1	Caribou	1	NA	1	Walking	Tundra	
48	ZOI	8/21/2022	1	21:03	21:04	M	464	494	40	4	Caribou	4	NA	4	Walking	Tundra	
48	ZOI	8/30/2022	1	14:53	14:53	M	535	550	20	2	Caribou	1	NA	1	Investigating camera	Tundra	
48	ZOI	9/2/2022	1	18:42	18:43	M	560	579	20	2	Caribou	1	NA	1	Walking	Tundra	
48	ZOI	9/4/2022	1	13:29	13:29	M	586	595	10	1	Caribou	1	NA	1	Walking	Tundra	
48	ZOI	9/4/2022	2	13:51	13:51	M	606	619	20	2	Caribou	1	NA	1	Walking	Tundra	
48	ZOI	9/4/2022	11	14:16	14:17	M	626	648	30	3	Caribou	1	NA	1	Walking	Tundra	
49	Control	5/26/2022	1	3:50	3:58	M	63	242	180	18	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
50	Treatment	5/22/2022	1	14:37	14:37	M	1320	1329	10	1	Red Fox	1	NA	1	Walking	Tundra	
50	Treatment	5/25/2022	1	22:09	22:10	M	159	179	21	3	Fox	1	NA	1	Investigating camera	Tundra	
50	Treatment	6/22/2022	2	16:43	16:43	M	1522	1530	9	1	Caribou	1	NA	1	Walking	Tundra	
50	Treatment	7/1/2022	3	2:43	2:43	M	1976	1980	5	1	Caribou	1	NA	1	Walking	Tundra	
50	Treatment	8/21/2022	4	19:12	19:12	M	4597	4603	7	1	Caribou	1	NA	1	Investigating camera	Tundra	
50	Treatment	8/21/2022	5	19:16	19:17	M	4607	4629	9	2	Caribou	1	NA	1	Walking	Tundra	
51	Treatment	7/5/2022	1	7:22	7:22	M	210	222	12	2	Caribou	1	NA	1	Investigating camera	Other	
51	Treatment	7/5/2022	2	18:32	18:32	M	226	229	4	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/6/2022	1	12:20	12:20	M	238	242	5	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/9/2022	NA	10:16	10:16	M	255	164	10	1	Grizzly Bear	1	1	2	Walking	Other	
51	Treatment	7/10/2022	1	1:04	1:04	M	268	277	10	1	Caribou	1	NA	1	Walking	Other	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
51	Treatment	7/10/2022	2	3:18	3:18	M	278	286	9	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/11/2022	1	3:58	3:58	M	291	293	3	1	Caribou	1	NA	1	Running	Other	
51	Treatment	7/11/2022	2	10:07	10:07	M	301	301	1	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/11/2022	3	23:49	23:49	M	314	317	5	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/12/2022	1	2:40	2:40	M	324	326	3	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/13/2022	1	3:46	3:46	M	337	346	10	1	Caribou	2	NA	2	Walking	Other	
51	Treatment	7/14/2022	1	1:44	1:44	M	350	354	5	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/14/2022	2	2:41	2:43	M	360	383	24	3	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/22/2022	1	23:44	23:44	M	467	472	6	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/23/2022	1	3:55	3:55	M	477	483	7	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/24/2022	1	0:39	0:39	M	530	533	4	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/24/2022	2	1:01	1:01	M	540	543	4	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/24/2022	3	1:50	1:50	M	550	554	5	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	7/24/2022	4	15:45	15:45	M	583	585	3	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	8/5/2022	1	17:21	17:21	M	969	971	3	1	Caribou	1	NA	1	Walking	Other	
51	Treatment	9/3/2022	1	20:18	20:19	M	3826	2829	4	1	Caribou	1	NA	1	Walking	Other	
53	Treatment	4/15/2022	1	22:05	22:05	M	1201	1210	10	1	Fox	1	NA	1	Walking	Tundra	
53	Treatment	6/17/2022	1	6:08	6:08	M	153	162	10	1	Caribou	6	NA	6	Bedded	Tundra	
53	Treatment	6/24/2022	1	10:45	10:46	M	204	213	10	1	Caribou	3	NA	3	Grazing	Tundra	
53	Treatment	8/19/2022	1	16:08	16:11	M	445	466	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
54	Treatment	6/17/2022	1	3:33	3:40	M	413	462	50	5	Caribou	6	NA	6	Grazing	Tundra	
55	ZOI	10/7/2021	1	15:01	15:02	M	95	114	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
55	ZOI	6/16/2022	1	15:42	15:43	M	103	142	40	4	Caribou	2	NA	2	Grazing	Tundra	
55	ZOI	6/18/2022	1	14:17	14:18	M	171	193	30	3	Caribou	1	NA	1	Investigating camera	Tundra	
55	ZOI	6/29/2022	1	22:09	22:10	M	252	291	40	4	Caribou	3	NA	3	Grazing	Tundra	
55	ZOI	7/3/2022	1	17:41	17:41	M	304	305	10	1	Caribou	1	NA	1	Investigating camera	Tundra	
55	ZOI	7/4/2022	1	1:09	1:09	M	314	333	20	2	Caribou	2	NA	2	Grazing	Tundra	
55	ZOI	7/9/2022	1	0:39	0:39	M	349	358	10	1	Caribou	1	NA	1	Walking	Tundra	
55	ZOI	7/10/2022	1	10:54	10:54	M	362	363	10	1	Caribou	1	NA	1	Walking	Tundra	
55	ZOI	7/24/2022	1	20:54	20:55	M	427	436	10	1	Grizzly Bear	1	1	2	Investigating camera	Tundra	
55	ZOI	8/11/2022	1	0:56	0:56	M	498	512	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
55	ZOI	8/11/2022	2	3:56	15:58	M	518	577	60	6	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
55	ZOI	8/25/2022	1	7:18	7:18	M	621	622	10	1	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
56	Control	9/10/2021	1	11:30	12:00	M	768	769	2	2	Caribou	3	0	3	Grazing	Tundra	
56	Control	6/5/2022	1	6:38	6:38	M	407	416	10	1	Caribou	2	NA	2	Grazing	Tundra	
56	Control	8/18/2022	4	6:33	6:33	M	1179	1184	10	1	Caribou	1	NA	1	Walking	Tundra	
56	Control	8/20/2022	5	5:54	5:54	M	1195	1199	10	1	Caribou	1	NA	1	Walking	Tundra	
56	Control	8/31/2022	6	19:10	19:10	M	1241	1242	10	1	Caribou	1	NA	1	Investigating camera	Tundra	
56	Control	9/8/2022	7	7:12	7:13	M	1272	1321	50	5	Caribou	3	NA	3	Grazing	Tundra	
56	Control	9/15/2022	8	21:18	21:19	M	1346	1386	50	5	Caribou	1	NA	1	Investigating camera	Tundra	
57	ZOI	4/21/2022	1	8:43	8:43	M	700	709	10	1	Wolverine	1	NA	1	Running	Tundra	
57	ZOI	7/2/2022	1	23:37	23:37	M	201	207	10	1	Caribou	1	NA	1	Walking	Tundra	
58	Control	10/24/2021	1	12:53	12:53	M	106	115	10	1	Wolverine	1	NA	1	Walking	Tundra	
58	Control	3/9/2022	1	9:53	9:57	M	521	540	20	2	Wolverine	1	NA	1	Walking	Tundra	
58	Control	3/12/2022	1	14:38	14:38	M	553	562	10	1	Fox	1	NA	1	Walking	Tundra	
58	Control	4/2/2022	1	16:47	16:59	M	626	665	40	4	Red Fox	1	NA	1	Investigating camera	Tundra	
58	Control	4/7/2022	1	21:08	21:08	M	681	690	10	1	Fox	1	NA	1	Walking	Tundra	
58	Control	4/11/2022	1	2:02	2:05	M	710	728	30	3	Fox	1	NA	1	Investigating camera	Tundra	
58	Control	7/4/2022	1	4:35	4:35	M	185	194	10	1	Caribou	3	0	3	Walking	Tundra	
58	Control	7/7/2022	1	2:00	2:00	M	204	205	10	1	Wolverine	1	0	1	Running	Tundra	

Appendix 3.2-3: Wildlife Events Recorded by Wildlife Cameras, Doris and Madrid Areas, September 2021 to September 2022

Camera No.	Camera Type	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
58	Control	7/17/2022	1	11:13	11:13	M	264	267	10	1	Grizzly Bear	NA	1	1	Walking	Tundra	
58	Control	8/21/2022	1	12:14	12:14	M	381	385	10	1	Caribou	1	NA	1	Investigating camera	Tundra	
58	Control	9/3/2022	1	14:54	14:54	M	431	480	50	5	Caribou	1	NA	1	Walking	Tundra	
58	Control	9/6/2022	1	12:22	12:23	M	491	521	40	4	Caribou	2	NA	2	Investigating camera	Tundra	
58	Control	9/20/2022	1	12:26	12:26	M	571	577	10	1	Caribou	1	NA	1	Walking	Tundra	
59	Treatment	9/4/2021	1	1:09	1:36	M	860	889	30	3	Grizzly Bear	1	0	1	Investigating camera	Tundra	
59	Treatment	9/18/2021	1	2:14	2:15	M	952	981	30	3	Grizzly Bear	1	0	1	Investigating camera	Tundra	
59	Treatment	3/31/2022	1	17:02	17:02	M	606	615	10	1	Red Fox	1	NA	1	Other	Tundra	
59	Treatment	9/4/2022	2	7:17	7:21	M	730	770	50	5	Grizzly Bear	1	NA	1	Hunting	Tundra	
59	Treatment	6/9/2022	1	23:07	23:07	M	152	157	10	1	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
59	Treatment	6/13/2022	1	0:17	0:24	M	171	240	60	6	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
59	Treatment	9/4/2022	1	7:07	7:07	M	700	719	20	2	Grizzly Bear	1	NA	1	Investigating camera	Tundra	
1	Treatment	11/1/2021	1	18:18	18:18	T											
6	Control	6/17/2022	NA	12:00	12:00	T	167	167	1	1	Caribou	1	NA	1	Walking	Tundra	
16	Control	8/2/2022	1	11:30	11:30	T	310	310	1	0	Caribou	1	NA	1	Grazing	Tundra	
23	ZOI	6/26/2022	3	11:30		T	209	NA	1	NA	Caribou	1	NA	1	Feeding	Tundra	
23	ZOI	6/26/2022	1	12:30		T	221	NA	NA	NA	Caribou	1	NA	1	Feeding	Tundra	
30	ZOI	6/21/2022	NA	11:30		T	148	NA	NA	NA	Muskox	8	NA	8	Walking	Tundra	
30	ZOI	6/21/2022	NA	12:00		T	149	NA	NA	NA	Muskox	8	NA	8	Walking	Tundra	
30	ZOI	8/4/2022	NA	11:30		T	470	NA	NA	NA	Grizzly Bear	1	1	2	Walking	Tundra	Presumed to have been observed 2022-07-16.
30	ZOI	8/4/2022	NA	12:00		T	471	NA	NA	NA	Grizzly Bear	1	1	2	Walking	Tundra	Presumed to have been observed 2022-07-16.
35	Treatment	8/25/2022	NA	11:30		T	160	NA	NA	NA	Caribou	1	NA	1	Walking	Road	
53	Treatment	6/17/2022	NA	11:30	11:30	T	163	NA	1	NA	Caribou	4	NA	4	Grazing	Tundra	
53	Treatment	6/17/2022	NA	12:00	12:00	T	164	NA	1	NA	Caribou	9	NA	9	Grazing	Tundra	

APPENDIX 3.2-4 WILDLIFE INTERACTIONS, INCIDENTS, AND MORTALITIES RECORDED AT THE PROJECT IN 2022

Appendix 3.2-4: Wildlife Interactions, Incidents, and Mortalities Recorded at the Project in 2022

Incident Date (DD/MM/YY)	Incident Type	Species	Event Description	Immediate Response Actions	Corrective/Preventative Actions Generated	External Regulatory Bodies Notified
07/02/22	Wildlife Incident	Red Fox	While driving near the landfarm, an operator noticed the dead fox on the tundra near the pull-out. (13W 432629 7559514) It is believe that the fox died of natural causes due to the absence of heavy impacts and/or crush injuries.	Photos of the area and the fox were taken. The carcass was placed in the freezer until further instructions from the GN DoE. Under the Wildlife Mitigation and Monitoring plan (2021), this incident is reportable to the Kitikmeot Inuit Association (KIA), Nunavut Impact Review Board (NIRB) and the Government of Nunavut Department of Environment. (GN DoE).	NA	KIA, NIRB, and GN DoE
08/02/22	Wildlife Incident	Snowy Owl	During a weekly inspection of the Doris Camp diversion berm on February 8, 2022, environment staff discovered the remains of a snowy owl. The animal was not found intact indicating the likelihood of predation.	Photos were taken and the wings that were remaining were collected in a labelled plastic bag and placed in the Environment Lab freezer. Under the Wildlife Mitigation and Monitoring Plan (2021), this incident is reportable to the Kitikmeot Inuit Association (KIA), Nunavut Impact Review Board (NIRB) and the Government of Nunavut Department of Environment (GN DoE).	NA	KIA, NIRB, and GN DoE
11/02/22	Wildlife Incident	Ptarmigan species	Mill employee was travelling the TLR at night, near the Powder Mag when a flock of ptarmigan took flight in front of his Kubota. One ptarmigan made contact with the windshield, but was displaced off the road. Remains were not found.	Environment staff were alerted February 12 regarding the incident. Staff responded to the area to recover the deceased animal, but no carcass was found. It is assumed the carcass was taken by a predator. Under the Wildlife Mitigation and Monitoring Plan (2021), this incident is reportable to the Kitikmeot Inuit Association (KIA), Nunavut Impact Review Board (NIRB) and the Government of Nunavut Department of Environment (GN DoE).	NA	KIA, NIRB, and GN DoE
08/08/22	Wildlife Incident	Common Raven	A non-occupied Common Raven nest was found on a satellite dish at Boston Exploration camp.	The Government of Nunavut Department of Environment (GN DoE) was contacted and an Exemption Permit was received for the removal of the nest on Aug. 15, 2022. The nest was removed on Aug. 30, 2022 and placed at the end of the Boston runway, 800m away from the camp. Photos of the removed nest were provided. A follow up letter was sent notifying GN DoE of the removal on Sep. 7, 2022.	NA	GN DOE
25/05/2022	Wildlife Interaction	Grizzly Bear	Two bears on the south face of Doris Mountain, near site.	Pushed from site with helicopter.	NA	NA
06/07/2022	Wildlife Interaction	Caribou	Caribou on airstrip prior to plane arrival.	Pushed from area with pickup.	NA	NA
07/07/2022	Wildlife Interaction	Caribou	Caribou on airstrip prior to plane arrival.	Pushed from area with pickup.	NA	NA
19/07/2022	Wildlife Interaction	Caribou	Caribou on airstrip prior to plane arrival.	Pushed from area with pickup.	NA	NA
27/07/2022	Wildlife Interaction	Caribou	Caribou on airstrip prior to plane arrival.	Pushed from area with pickup.	NA	NA
20/08/2022	Wildlife Interaction	Grizzly Bear	Two bears foraging up Doris Creek/TLR, then came to site. Cut across the UG laydown and walked up, back behind the mill across to the tundra patch between site and Doris mountain.	Pushed by helicopter for 4 minutes, approx. 1 NM.	NA	NA

APPENDIX 3.2-5 HOPE BAY INCIDENTAL WILDLIFE OBSERVATIONS, 2022

Appendix 3.2-5: Hope Bay Incidental Wildlife Observations, 2022

No.	Date (DD-MM-YYYY)	Sited From (ground, air)	Species Name (e.g. caribou)	Species Description	Total # Inds.	# A	# M	# F	# Y	# U	Activity	Location Description (e.g. east shore of Patch Lake)	Habitat Type	Comments (behavior: e.g., observed nest, chicks, den etc.)
1	23-01-2022	Ground	Muskox		10	10					Walking	west of Windy Road, by km #2.	Tundra	No evidence of muskox using large culvert passing, nor evidence of passing over road.
2	23-01-2022	Ground	Ptarmigan		12					12	Walking, roosting	Vent Raise fuel tank	Site	
3	23-01-2022	Ground	Arctic Hare		1					1	Resting	Reagent Berm	TLR area	
4	25/01/2022	Ground	Muskox		10	10					Walking	West of Windy Road between km2 and 3	Tundra	Not looking to cross the road
5	27/01/2022	Ground	Red Fox		1					1	Walking	West of Doris Camp, across from core shack	Tundra	walking away from site, traversing tundra
6	27/01/2022	Ground	Ptarmigan		1	1					Walking	North side berm, at burn pan	Site	
7	07/02/2022	Ground	Ptarmigan		25	25					Walking, feeding	across camp road from Env Lab	Site	
8	09/02/2022	Ground	Ptarmigan		15	15					Walking, flying	Upper underground laydown	Site	
9	09/02/2022	Ground	Muskox		8	8					Walking, feeding	Kilometer 2, on Windy Road, west side	Tundra	
10	12/02/2022	Ground	Muskox		8	8					Resting	Kilometer 4 on Windy road, west side	Tundra	Resting out on the Tundra
11	13/02/2022	Ground	Muskox		8	8					Feeding	Kilometer 3 on Windy Road West side	Tundra	Grazing on Tundra
12	18-02-2022	Ground	Ptarmigan	Willow Ptarmigan	2					2	Walking	Environment Lab parking lot	Site	
13	18-02-2022	Ground	Cross Fox	(Vulpes, Vulpes) W/ Melanistic colour Morph	1	1					Hunting	Roberts Bay by Single Tank Farm	Site	Hunting around some partially buried pipes
14	19-02-2022	Ground	Ptarmigan	Willow Ptarmigan	4	4					Resting	Quarry 2	Site	
15	19-02-2022	Ground	Muskox	Ovibos moschatus	8					8	Resting	West of Windy Road between km2 and 3	Tundra	Resting on the Tundra
16	20-02-2022	Ground	Ptarmigan	Willow Ptarmigan	8	8					Resting	TLR	Tundra	Resting on Snowbanks
17	21-02-2022	Ground	Ptarmigan	Willow Ptarmigan	6	6					Walking	Quarry 2	Site	Walking
18	21-02-2022	Ground	Ptarmigan	Willow Ptarmigan	8	8					Resting	Roberts Bay Entrance	Site	Resting on Snowbanks
19	21-02-2022	Ground	Arctic Hare	Lepus arcticus	1	1					Running	Outside Environment office	Site	Lepus Arcticus on the run
20	22-02-2022	Ground	Ptarmigan	Willow Ptarmigan	21	21					resting	Reclaim Pump House	Site	Resting on Snowbanks
21	6-Mar-22	Ground	Cross Fox	(Vulpes, Vulpes) W/ Melanistic colour Morph	1	1					Walking	TLR past the reclaim jetty, before million dollar beach	Tundra	Crossed the road without any difficulty and walked off into the tundra
22	13-Mar-22	Ground	Muskox		4					4	Walking/grazing	KM 1/2 on Windy Rd, West side	Tundra	
23	17-Mar-22	Ground	Muskox		12						Walking/grazing	KM 1/2 on Windy Rd, West side	Tundra	
24	23-Mar-22	Ground	Ptarmigan	Willow Ptarmigan	6	6					Resting	Snowbank beside Heli-shack	Site	Resting in the Snowbank
25	23-Mar-22	Ground	Arctic Hare	Lepus arcticus	1	1					Resting	Upper underground laydown	Site	Resting
26	23-Mar-22	Ground	Red Fox		1					1	Hunting	Windy Road #4 area.	Tundra	
27	23-Mar-22	Ground	Ptarmigan	Willow Ptarmigan	5					5	Resting	Atop seacan beside Enviro Lab	Site	Resting
28	27-Mar-22	Ground	Ptarmigan	Willow Ptarmigan	7	7					Grazing	Windy Road Km 0	Tundra/Road	Grazing
29	27-Mar-22	Ground	Ptarmigan	Willow Ptarmigan	36	36					Resting	Naartok Crown Pillar Trench around drill rig that is not in use	Site	Resting
30	27-Mar-22	Ground	Ptarmigan	Willow Ptarmigan	12	12					Resting	Environmental Lab	Site	Resting
31	28-Mar-22	Ground	Red fox	Vulpes, Vulpes	1	1					Hunting	North Dam	Tundra	Hunting

No.	Date (DD-MM-YYYY)	Sited From (ground, air)	Species Name (e.g. caribou)	Species Description	Total # Inds.	# A	# M	# F	# Y	# U	Activity	Location Description (e.g. east shore of Patch Lake)	Habitat Type	Comments (behavior: e.g., observed nest, chicks, den etc.)
32	29-Mar-22	Ground	Red fox	Vulpes, Vulpes	1	1					Hunting	Along TIA road	Tundra	Hunting
33	1-Apr-22	Ground	Arctic Fox	Vulpes lagopus	1	1					Walking	KM7 Windy Road	Tundra	Walking
34	2-Apr-22	Ground	Caribou		2					2	Grazing	Doris Air Strip E side on top of rock cut	Tundra	Grazing
35	3-Apr-22	Ground	Red Fox	Vulpes, Vulpes	1	1					Hunting	Kilometer 3 Windy Road	Tundra	Hunting
36	4-Apr-22	Ground	Ptarmigan	Willow Ptarmigan	40	40					Walking	On road behind kitchen	Road/Site	Walking
37	6-Apr-22	Ground	Caribou		2					2	Grazing	North end of the airstrip on the East side	Tundra	Grazing
38	7-Apr-22	Ground	Ptarmigan	Willow Ptarmigan	40	40					Grazing	Pecking on road at GeoTech shop	Road/Site	Grazing
39	7-Apr-22	Ground	Cross Fox	(Vulpes, Vulpes) W/ Melanistic colour Morph	1					1	Walking	KM 3 on Windy	Tundra	Walking
40	8-Apr-22	Ground	Ptarmigan	Willow Ptarmigan	12	12					Resting	Between Patch and Wolverine lake	Tundra	Resting
41	9-Apr-22	Ground	Ptarmigan	Willow Ptarmigan	24	24					Resting	KM 7 Windy Road	Tundra	Resting
42	10-Apr-22	Ground	Caribou		12					12	Walking	Reference Lake B	Tundra	Walking
43	11-Apr-22	Ground	Arctic Hare	Lepus arcticus	1	1					Eating	Enviro Lab	Site	Eating
44	11-Apr-22	Ground	Ptarmigan	Willow Ptarmigan	12	12					Eating	Heli Shack area/Windy road KM 0	Tundra	Eating
45	11-Apr-22	Ground	Red Fox	Vulpes, Vulpes	2	2					Sleeping	East side of Reagent berm	Site	Sleeping
46	14-Mar-22	Ground	Moose		2					2	Resting	South of Patch Lake	Tundra	Resting
47	22-Apr-22	Ground	Ptarmigan		6					6	Flying	Airstrip South, East side of apron	Site	Flying
48	23-Apr-22	Ground	Caribou		2					2	Resting	East side of Airstrip on bedrock	Site	
49	23-Apr-22	Ground	Ptarmigan		60					60	Feeding	East side of Windy Road south of helipad	Site	Feeding, resting, walking
50	23-Apr-22	Ground	Ptarmigan		15					15	Flying/walking	West side of road across from Enviro Lab	Site	
51	23-Apr-22	Ground	Red Fox		1					1	Walking, hunting	West side of Windy Road near km5	Site	
52	23-Apr-22	Ground	Bald Eagle		1	1					Flying	Over camp, north to Doris mountain	Site	
53	24-Apr-22	Ground	Ground Squirrel		1					1	Standing	North slope, up gradient from North Dam	Site	First noted occurrence of 2022
54	24-Apr-22	Ground	Snow Bunting		1					1	Flying	Single tank farm, Rob's Bay	Site	
55	24-Apr-22	Ground	Caribou		2					2	Feeding	North end of the airstrip on the East side	Site	
56	25-Apr-22	Ground	Snow Bunting		8					8	Flying	Windy Road, km5	Site	
57	27-Apr-22	Ground	Ptarmigan		6					6	Flying	Crossing over airstrip from west to east side	Site	
58	28-Apr-22	Ground	Arctic hare		1	1					Walking	Envirolab stairs	Site	
59	25-Apr-22	Ground	Juvenile eagle		1					1	Soaring, flying	over Doris mountain, and downstream side of north dam	Site	
60	4-May-22	Ground	Red fox		1					1	Walking	Helipad area	Site	
61	5-May-22	Ground	Wolf		2	2					Walking	Offshore Rob's Bay	Tundra	First sighting in 2022. Seen walking on the ice in Rob's Bay
62	6-May-22	Ground	Caribou		3	3					Walking	South side Doris Lake	Tundra	Seen slowly moving north.
63	6-May-22	Ground	Rough legged hawk		1					1	Flying	Windy Road, km8 area	Madrid area	First sighting in spring 2022
64	8-May-22	Ground	Grizzly bear		1	1				1	Walking	TLR	Site	First documented sighting of spring 2022
65	13-May-22	Ground	Red Fox	Vulpes, Vulpes	1	1					Walking	Doris Creek	Tundra	Hunting

No.	Date (DD-MM-YYYY)	Sited From (ground, air)	Species Name (e.g. caribou)	Species Description	Total # Inds.	# A	# M	# F	# Y	# U	Activity	Location Description (e.g. east shore of Patch Lake)	Habitat Type	Comments (behavior: e.g., observed nest, chicks, den etc.)
66	13-May-22	Air	Rough legged hawk		1						Flying	Doris Mountain	Doris Mountain	Flying
67	13-May-22	Ground	Red Fox	Vulpes, Vulpes	1						Walking	Batch Plant	Site	Walking
68	13-May-22	Ground	Red Fox	Vulpes, Vulpes	1						Walking	Roberts Bay access road	Site	Walking
69	13-May-22	Ground	Arctic Hare	Lepus arcticus	2					2	Running	Windy Lake road West side of road	Tundra	Running
70	13-May-22	Ground	Ground Squirrel		3						Foraging	Along the road beside Doris Mountain	Tundra	Eating
71	14-May-22	Ground	Ground Squirrel		4						Foraging	Along the road beside Doris Mountain	Tundra	Foraging
72	14-May-22	Ground/Water	Geese	Look to be Canadian Geese	6					6	Resting	Along the waters edge of Roberts Bay	Tundra/ water	First documented sighting of spring 2022
73	14-May-22	Air	Geese	Snow Geese	12					12	Flying	Over the Upper Reagent pad	Air	Flying
74	14-May-22	Water	Geese	Various types	4					4	Resting	On Tia	Water	Resting
75	14-May-22	Air	Rough legged hawk		1					1	Flying	KM 6 on Windy road	Air	Flying
76	14-May-22	Ground	Sandhill Crane		2					2	Walking	On Tundra by Doris Pump house	Tundra	First Reported sighting of Spring 2022
77	14-May-22	Ground	Arctic Hare	Lepus arcticus	1					1	Sleeping	Behing Kitchen	Site	Sleeping behind the kitchen
78	18-May-22	Ground	Geese	Greater White Fronted	2					2	Walking	Tundra By Doris Lake	Tundra	First Reported sighting for spring 2022 By Doris Lake
79	18-May-22	Ground	Arctic Hare	Lepus arcticus	1					1	Resting	Warehouse Laydown next to the shop	Site	Resting in sun.
80	19/05/2022	Ground	Bear		2			1	1		Walking	KM 6 Windy	Tundra	Walking
81	21-May-22	Ground	Bear		2			1	1		Walking	E of camp road in line with LRP	Tundra	Walking
82	21-May-22	Ground	Red fox		1					1	Resting	E of camp road in line with batch plant	Tundra	Resting
83	22-05-2022	Ground	Musk OX		20	16			4		Grazing	2.5 Km E/NE of camp	Tundra	Grazing
84	22-05-2022	Air	Gaggle of Geese		36						Flying	15KM away from camp towards Boston	Air	Flying
86	25-May-22	Ground	Bear		2				2		Resting	100ft North of Windy Lake pump house	site	Searching for sik siks, and resting
87	25-May-22	Ground	Musk OX		12					12	Grazing	2km W of km3 of windy road	Tundra	Foraging
88	26-May-22	Ground	Bear		2				2		Foraging	west side of Windy Road, KM6	Tundra	Foraging
89	31-May-22	Ground	Fox		2					2	Hunting/playing	East side of Windy road, between km 5 and 6	Tundra	Hunting/playing running after geese.
90	6-Oct-22	Air	Muskox		7					7	Standing	South of Doris Lake	Tundra	
91	11-Jun-22	Ground	Grizzly bear		2	1			1	2	Walking	Km 2 Windy Lake	Tundra	Heading East
92	10-Jun-22	Ground	Pacific loon		2	2				2	Swimming	Patch Lake outflow	Lake	
93	10-Jun-22	Ground	Sandhill Crane		2					2	Flying	Patch Lake outflow	Tundra	
94	10-Jun-22	Ground	White Fronted Goose		2	2	1	1			Resting/Nesting	Patch Lake outflow	Tundra	
95	10-Jun-22	Ground	Common merganser		2	2				2	Flying	Patch Lake	Lake	
96	10-Jun-22	Ground	Tundra swan		5					5	Swimming/Flying	Patch Lake	Lake	
97	10-Jun-22	Ground	Peregrine falcon		2					2	Flying	Doris Lake	Air	
98	11-Jun-22	Ground	Fox		1						Walking	100m north of OMAGA lake	Tundra	

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99	12-Jun-22	Ground	Bear		2	1	1		1		Foraging	100m north of Doris tank farm	Tundra	foraging in the area and heading north.
100	14-Jun-22	Ground	Caribou		1	1				1	Foraging	Km6, Windy Road	Tundra	
101	14-Jun-22	Air	Muskox		12	10			2	12	Foraging	SW of Patch Lake	Tundra	
102	15-Jun-22	Ground	Caribou		3	2				2	Feeding	Km 4 Windy Road	Tundra	
103	18-Jun-22	Ground	Caribou		2					2	Walking	Windy lake pumphouse	Tundra	
104	18-Jun-22	Ground	Sandhill Crane		2					2	Resting	Robert's bay	Ocean	
105	19-Jun-22	Ground	Grizzly bear		2	1		1	1		Feeding/walking	East side of airport access road	Tundra	
106	19-Jun-22	Ground	Arctic hare		2	2				2	Bounding/resting	Core shack area in main camp footprint	Site	
107	17-Jun-22	Air	Canada geese		12	12				12	swimming	Camera 69, Boston Camp area	Tundra	
108	17-Jun-22	Air	Gull		1					1	Flying	Camera 69, Boston Camp area	Tundra	
109	17-Jun-22	Air	Eagle		1	1				1	flying	Camera 67, Boston Camp area	Tundra	departed camera area where it was assumed the eagle (species unknown) was feeding on a goose carcass. Only legs remained.
110	19-Jun-22	Ground	Caribou		3						Grazing	Km 4 Windy Road	Tundra	
111	22-Jun-22	Ground	Caribou		1	1					Grazing	Km 2 West Side of Windy Road	Tundra	
112	22-Jun-22	Ground	Grizzly bear		1						Grazing	Km 4 Windy road heading west	Tundra	
113	22-Jun-22	Ground	Geese		<4						Grazing	Windy Lake Pumphouse area	Shoreline	
114	23-Jun-22	Ground	Wolf		1	1					Circling/Stalking	North East of Doris mountain	Tundra	Field Geo's reported wolf circling while they are prospecting North East of Doris Mountain. Helicopter sent to pick them up.
115	26-Jun-22	Ground	Caribou		14					14	Resting/Grazing	East of Madrid	Tundra	Resting in the Tundra
116	2-Jul-22	Ground	Caribou		12					12	Resting/grazing	West of the Quarry	Tundra	Resting and moving slowly north
117	1-Jul-22	Ground	Red Fox		3				3		Sleeping	KM 8 Towards Naartok	Shrubs & Rock	Sleeping
118	2-Jul-22	Ground	Arctic Hare	Lepus arcticus	1						Eating	AQ Shack by Doris Lake	Tundra	Snacking
119	2-Jul-22	Water	Gaggle of Geese	Canadian Geese	15					15	Swimming	Doris Lake	Water	Swimming and eating
120	2-Jul-22	Ground	Sik Sik		1	1					Collecting Nesting material	Doris Lake	Tundra	Collecting materials to nest
121	29-Jun-22	Ground	Geese	Canadian Geese	7					7	Sleeping		Tundra	Sleeping
122	3-Jul-22	Ground	Sik Sik		1					1	Running		Tundra	Running along outcropping
123	3-Jul-22	Ground	Caribou		8		2	6			Walking/Sleeping	Windy Road	Tundra	Walking/ Sleeping
124	3-Jul-22	Ground	Caribou		1		1				Eating/Walking		Tundra	Walking/Eating
125	3-Jul-22	Ground	Caribou		8		2	6			Eating/Walking		Tundra	Walking/Eating
126	3-Jul-22	Ground	Goose	Canadian Goose	1					1	Resting		Tundra	Resting
127	4-Jul-22	Ground	Caribou		1		1				Eating		Tundra	Grazing
128	4-Jul-22	Ground	Caribou		2		1	1			Running		Tundra	Running
129	4-Jul-22	Ground	Caribou		1			1			Grazing		Tundra	Grazing
130	4-Jul-22	Ground	Caribou		1		1				Running		Camp road	Road Running
131	4-Jul-22	Ground	Caribou		3		2	1			Walking		Camp road	Road Running

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132	2-Jul-22	Ground	Caribou		4		1	3			Sleeping/Eating	KM 8 Windy RD	Tundra	Sleeping/Eating
133	2-Jul-22	Ground	Red Fox	Vulpes, Vulpes	5			1	4		Playing	KM 8 Windy RD	Tundra	Playing
134	2-Jul-22	Ground	Caribou		4		1	3			Eating/Sleeping	KM4/5 Windy Rd	Tundra	Walking/Eating
135	2-Jul-22	Ground	Caribou		5		1	3	1		Walking	Naartok	Camp road	Walking
136	2-Jul-22	Ground	Caribou		1			1			Walking	KM2/3 Windy Rd	Tundra	Road Running
137	30-Jun-22	Ground	Sik Sik		1					1	Eating		Tundra	Eating
138	28-Jun-22	Ground	Sik Sik		3					3	Running		Tundra	Running
139	28-Jun-22	Ground	Sik Sik		1					1	Walking		Tundra	Walking
140	28-Jun-22	Air	Peregrine Falcon		1					1	Hunting		Air	Hunting
141	30-Jun-22	Ground	Caribou		7		2	5			Walking/Eating	KM7 Windy Road	Tundra	Walking/Eating
142	30-Jun-22	Ground	Crane		1					1	Walking	KM4/5 Windy RD	Tundra	Walking
143	1-Jul-22	Ground	Loon		1					1	Nesting	KM4/5 Windy Rd	Tundra	Nesting
144	30-Jun-22	Ground	Goose	Cackling Goose	1					1	Eating	Naartok	Tundra	Eating
145	30-Jun-22	Ground	Caribou		3		1	2			Walking	Naartok	Tundra	Walking
146	11-Jul-22	Ground	Red Fox	Vulpes, Vulpes	1				1		Crossing Road	KM8 Windy RD	Road/Site	Walking
147	30-Jun-22	Ground	Caribou		1			1			Walking	KM7 Windy Road	Tundra	Walking
148	6-Jul-22	Ground	Caribou		8					8	Running	Airstrip	Site	Running
149	7-Jul-22	Ground	Caribou		6					6	Running	Airstrip	Site	Running
150	10-Jul-22	Ground	Caribou		9					9	Walking/Running /Hiding	Mill Pad under crusher	Site	Playing Hide and Seek.
151	12-Jul-22	Ground	Caribou		2					2	Standing, feeding	Windy Road, Km2	Site	
152	12-Jul-22	Ground	Grizzly bear		1					1	Walking	Batch plant on the way to Doris mountain	Site	
153	12-Jul-22	Ground	Caribou		1					1	Walking	inside Quarry 2	Site	
154	13-Jul-22	Ground	Caribou		1					1	Walking	inside Doris camp, near dorms	Site	
155	13-Jul-22	Ground	Caribou		1					1	Walking	Doris fuel farm	Site	
156	15-Jul-22	Ground	Grizzly bear and Cub		2	1		1		1	Walking	SW of North Dam on hill	Tundra	
157	15-Jul-22	Ground	Grizzly bear		1		1				Foraging	Robert's Bay behind muster station, and at road way entrance to Rob's Bay	Tundra/Site	
158	18-Jul-22	Ground	Grizzly bear		1					1	Foraging	Km 6, Windy Road	Tundra	
159	15-Jul-22	Ground	Semipalmated Plover		4					4	Flying, perched	Robert's Bay Outflow, at fish fence	Tundra	
160	17-Jul-22	Ground	Greater white-fronted goose		13	3			10		Swimming	Doris Lake outflow	Tundra	
161	19-Jul-22	Ground	Caribou		3					3	Walking/feeding	south apron, airstrip	Tundra	
162	2-Jul-22	Ground	Grizzly bear		1					1	Eating	Powder mag north	Tundra	
163	2-Jul-22	Ground	Grizzly bear		1					1	Walking	Km1 Windy Road	Tundra	

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164	20-Jul-22	Ground	Arctic hare		1				1		Bounding	Environmental lab	Site	
165	20-Jul-22	Ground	Arctic hare		1				1		Standing	back of kitchen by rear entrance loading dock	Site	
166	21-Jul-22	Ground	Caribou		1					1	Standing	Windy Lake pumphouse	Site	
167	22-Jul-22	Ground	Caribou		1					1	Standing	Base of Doris mountain	Site	
168	21-Jul-22	Ground	Grizzly bear		2	1			1		Foraging	South Dam TIA moving east	Tundra	
169	21-Jul-22	Ground	Caribou		1	1					Standing	Mill Pad inside MW tent	Site	
170	22-Jul-22	Ground	Seal	unknown	1					1	Swimming	Robert's Bay boat launch area	Site	
171	23-Jul-22	Ground	Arctic charr		1	1					Swimming	Robert's Bay boat launch area	Site	
172	24-Jul-22	Ground	Caribou		1					1	Walking/feeding	main camp road heading south	Site	
173	27-Jul-22	Ground	Caribou		6					6	Walking/feeding	East of airport apron and on run way	Site	
174	23-Jul-22	Ground	Eagle	unknown	1					1	Soaring, flying	west of Rob's Bay	Site	
175	28-Jul-22	Ground	Eagle	unknown	1					1	Soaring, flying	Little Robert's Lake area	Tundra	
176	28-Jul-22	Ground	Peregrine Falcon		1					1	Flying	Little Robert's Lake area	Tundra	
177	29-Jul-22	Ground	Red fox		1					1	Walking	Windy Rd km 6-7	Tundra	
178	29-Jul-22	Ground	Sandhill Crane		1	1			1	2	Walking	Windy Rd km 6-7	Tundra	
179	30-Jul-22	Ground	Grizzly bear		1					1	Walking	Windy Rd, km 6 heading west	Tundra	
180	31-Jul-22	Ground	Grizzly bear		2			1	1		Eating, walking	South of air strip	Tundra	
181	20-Jul-22	Ground	Caribou		1		1				Running	Waste rock pile	Tundra	
182	21-Jul-22	Ground	Caribou		1					1	Walking	-	Tundra	
183	23-Jul-22	Ground	Caribou		2		2				Sleeping	Besides tire shop	Tundra	
184	24-Jul-22	Ground	Caribou		1		1				Eating	-	Tundra	
185	24-Jul-22	Ground	Caribou		2		1	1			Walking	Road	Tundra	
186	24-Jul-22	Ground	Arctic Hare		2					2	Eating	-	Tundra	
187	24-Jul-22	Ground	Sik Sik		1					1	Eating	-	Tundra	
188	24-Jul-22	Ground	Red Fox		1					1	Sleeping	Outcrop	Tundra	
189	24-Jul-22	Ground	Caribou		1			1			Running	Windy Road	Tundra	
190	24-Jul-22	Ground	Caribou		1			1			Eating	-	Tundra	
191	24-Jul-22	Ground	Caribou		2		1	1			Eating	-	Tundra	
192	25-Jul-22	Ground	Sandhill Cranes		2		1	1			Eating	-	Wetland	
193	25-Jul-22	Ground	Sik Sik		1					1	Running	-	Tundra	
194	25-Jul-22	Ground	Arctic Hare		1					1	Eating	-	Tundra	
195	26-Jul-22	Ground	Caribou		1			1			Eating	-	Tundra	
196	26-Jul-22	Ground	Caribou		1					1	Running	Road to trench at Madrid	Tundra	
197	26-Jul-22	Ground	Caribou		1			1			Eating	-	Tundra	
198	26-Jul-22	Ground	Sandhill crane		3		1	1	1		Walking	-	Wetland	

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199	31-Jul-22	Ground	Grizzly bear		2	1		1	1	1	Walking, feeding, resting	East side of Robert's Bay access road	Tundra	
200	29-Jul-22	Ground	Lapland longspur		1					1	Deceased	Little Robert's Lake, hydrology station area	Tundra	
201	1-Aug-22	Air	Moose		1					1	Walking	Near wildlife camera 85	Tundra	
202	1-Aug-22	Ground	Red fox		1				1		Running	Near wildlife camera 85	Tundra	
203	2-Aug-22	Ground	Grizzly		1						Walking	Airstrip, west side	Tundra	
204	2-Aug-22	Ground	Caribou		1					1	Walking	Airstrip, area	Tundra	
205	3-Aug-22	Ground	Caribou		1					1	Walking	-	Tundra	
206	4-Aug-22	Ground	Caribou		1		1				Eating	Vent raise east	Tundra	
207	4-Aug-22	Ground	Caribou		1					1	Walking		Tundra	
208	5-Aug-22	Ground	Caribou		1		1				Walking		Tundra	
209	5-Aug-22	Ground	Sik Sik		1					1	Running		Tundra	
210	5-Aug-22	Ground	Sandhill Crane		3		1	1	1		Walking		Tundra	
211	5-Aug-22	Ground	Sandhill Crane		5					5	Eating, Walking		Tundra	
212	6-Aug-22	Ground	Caribou		1			1			Eating, Walking	Km 4 windy road	Tundra	
213	6-Aug-22	Ground	Caribou		1		1				Lying down		Tundra	
214	6-Aug-22	Ground	Caribou		1		1				Walking	Km 2 windy road	Tundra	
215	10-Aug-22	Ground	Arctic Hare	Lepus Arcticus	1					1	Resting	Landfarm	Site	
216	10-Aug-22	Ground	Arctic Hare	Lepus Arcticus	1					1	Resting	A Wing	Site	
217	10-Aug-22	Ground	Caribou		1					1	Sleeping	Windy Road KM 3	Tundra	
218	10-Aug-22	Ground	Caribou		2					2	Walking	Windy Road KM 4	Tundra	
219	10-Aug-22	Ground	Caribou		1		1				Walking	Windy Road KM 7	Site Road	
220	9-Aug-22	Air	Peregrine Falcon		1					1	Flying	Doris Camp	Air	Returning to nest with prey
221	9-Aug-22	Ground	Arctic hare	Lepus Arcticus	1					1	Running	Unknown	Ground	
222	9-Aug-22	Ground	Arctic hare	Lepus Arcticus	1					1	Resting	In Drill shack	Site	
223	11-Aug-22	Ground	Sik Sik		1					1	Deceased	On road by Geo Shop	Site Road	
224	7-Aug-22	Ground	Caribou		1					1	Eating	West Side of Doris Mountain	Tundra	
225	8-Aug-22	Ground	Caribou		1					1	Walking	West Side of Doris Mountain	Tundra	
228	4-Sep-22	Ground	Grizzly bear		1					1	Walking/foraging	Rob's Bay, southeast of the jetty	Site	
229	4-Sep-22	Ground	Caribou		5					5	Walking/foraging	North of TIA crossing TLR by Varley's Corner	Site	
230	2-Sep-22	Ground	Grizzly bear		1	1				1	Hunting	North Dam	Site	
231	4-Sep-22	Ground	Swan		1					1	Swimming	Doris lake near Doris Creek	Site	
232	4-Sep-22	Ground	Sandhill Crane		15					15	Flying/migrating	Viewed east of South Dam	Site	
233	3-Sep-22	Water	Grizzly bear		1	1				1	Walking/foraging	Viewed from Rob's Bay, on NW slope	Tundra	
234	2-Sep-22	Ground	Grizzly bear		1					1	Walking/foraging	South of Windy Lake	Tundra	
235	25-Aug-22	Ground	Grizzly bear		1	1				1	Walking/hunting	Fish fence at Robert's Lake outflow	Tundra	

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236	7-Sep-22	Ground	Grizzly bear		1					1	Walking	Boulder field at Robert's Lake outflow	Outflow	
237	29-Aug-22	Ground	American robin		1					1	Flying	Observed passing under Doris Cr bridge	Site	
238	5-Sep-22	Ground	Sandhill Crane		2					2	Standing	Windy Road, west side, Km 8	Tundra	
239	6-Sep-22	Ground	Grizzly bear		1					1	Walking	Windy Lake Pumphouse area	Tundra/site	
240	6-Sep-22	Ground	Hooded Merganser		2					2	Swimming	Rob's Bay	Ocean	
241	6-Sep-22	Ground	Peregrine Falcon		1	1				1	Perched/flying	TLR Road, near Reagent berm	Site	
242	8-Sep-22	Ground	Grizzly Bear		2			1	1		Foraging	North West of Doris mountain	Site	
243	10-Sep-22	Ground	Grizzly Bear		2			1	1		Foraging	North Dam	Tundra	
244	10-Sep-22	Ground	Cross Fox	Red Fox with Melanistic Abnormality	1	1					Walking	Fish fence at Robert's Lake outflow	Tundra	
245	11-Sep-22	Ground	Grizzly Bear		2			1	1		Foraging	Roberts Bay	Tundra	
246	13-Sep-22	Ground	Caribou		5		3	2			Foraging	NE of TLR road near new WTP location	Tundra	Blast scheduled at 18:00 called off and rescheduled for the following morning at 07:00.Wildlife scan to take place at approximately 06:30-06:45.
247	23-Aug-22	Water	Red Throated Loon		7					7	Swimming	Imniagut Lake	Water	7 Loons diving and swimming on lake during Hydrology
248	18-Sep-22	Air	Golden Eagle		1				1		Flying	Circling North Bay	Air	Juvenile Golden Eagle dark morph
249	20-Sep-22	Ground	Red Fox	Vulpes, Vulpes	1					1	Hunting	south apron, airstrip	Ground	
250	25-Sep-22	Ground	Grizzlies		2			1	1		Foraging	Doris Creek North of the bridge	Tundra	
251	26-Sep-22	Ground	Grizzlies		2			1	1		Foraging	Doris Pump house area	Tundra/Site	Moved back over to the North side of the TLR by Doris Creek
252	23-Sep-22	Air	Loons		2						Flying	East of Roberts bay	Air	Quick action on the part of the Heli pilot avoided potential interaction with the Avians
253	29-Sep-22	Ground	Arctic Fox		1	1					Walking	Doris tank farm	Site	
254	3-Oct-22	Ground	Red fox		1	1					Walking	Smoke shack main entrance	Site	The fox seem to be curious, he looked at the individual and ran away.
255	3-Oct-22	Ground	Moose		3					3	Napping	20Km South of Doris Camp	Tundra	Sleeping by a creek in the snow
256	3-Oct-22	Ground	Caribou		15					15	Grazing	30 KM South of Doris Camp	Tundra	Grazing
257	3-Oct-22	Ground	Caribou		4					4	Grazing	.5KM south of Boston Camp	Tundra	Grazing
258	3-Oct-22	Air	Snowy Owl		1					1	Flying	5KM East of Boston Camp	Flying	Likely hunting
259	8-Oct-22	Ground	Wolf		1					1	Walking -	Mine portal area	Site	Tracks observed and reported
260	9-Oct-22	Ground	Ptarmigan		14					14	Walking, flying, feeding	North Dam	Tundra	
261	12-Oct-22	Ground	Grizzly Bear		1					1	Walking, foraging	south of Quarry 2	Tundra	
262	18-Oct-22	Ground	Red fox		1					1	Walking	Geotech laydown	Site	following skid steer
263	18-Oct-22	Ground	Arctic hare		1	1				1	Walking, bounding	Environment Lab parking lot	Site	
264	19-Oct-22	Ground	Grizzly Bear		1					1	Walking	Windy Road km 3-4 heading west	Tundra	
265	23-Oct-22	Ground	Arctic Hare		1					1	KIA	Diversion berm road	Site	Bounded across the road in front of a moving vehicle.

No.	Date (DD-MM-YYYY)	Sited From (ground, air)	Species Name (e.g. caribou)	Species Description	Total # Inds.	# A	# M	# F	# Y	# U	Activity	Location Description (e.g. east shore of Patch Lake)	Habitat Type	Comments (behavior: e.g., observed nest, chicks, den etc.)
266	29-Oct-22	Ground	Red Fox	Vulpes, Vulpes	1					1	Walking	KM4 Windy Road	Tundra	Walking
267	29-Oct-22	Ground	Musk OX		20					20	Grazing	KM 5 Windy Road	Tundra	Grazing
268	30-Oct-22	Ground	Musk OX		20					20	Grazing	KM 5 Windy Road	Tundra	Grazing
269	31-Oct-22	Ground	Musk OX		20					20	Grazing	KM 7 Windy Road	Tundra	Grazing
270	1-Nov-22	Ground	Red Fox	Vulpes, Vulpes	1					1	Walking	TLR	Tundra	Walking
271	1-Nov-22	Ground	Musk Ox		20					20	Grazing	KM 7 Windy Road West Side	Tundra	Grazing along Windy Road
272	2-Nov-22	Ground	Musk OX		20					20	Grazing	KM 8 Windy RD	Tundra	Grazing in a rock cut by KM 8 Windy Rd East Side
273	3-Nov-22	Ground	Musk OX		20					20	Grazing	Naartok Pit North End	Tundra	Grazing
274	5-Nov-22	Ground/Air	Ptarmigan		50					50	Walking on road	Windy Rd KM2	Road/Site	Walking
275	5-Nov-22	Ground	Cross Fox	Red Fox with Melanistic Abnormality	1					1	Walking	Windy Rd KM 5	Tundra	Heading North East
276	10-Nov-22	Ground	Musk OX		9					9	Grazing	Windy Rd KM 5	Tundra	Grazing
277	11-Nov-22	Ground	Musk OX		12					12	Grazing	Windy Rd KM 5	Tundra	Grazing
278	14-Nov-22	ground	red fox		1					1	Walking	Windy km 7,5	Tundra	
279	20-Nov-22	Ground	Arctic Hare		1					1	Bounding	behind kitchen by sea cans	Site	evading truck traffic through narrowing leading behind camp
280	28-Nov-22	Ground	Raven		1	1					Flying	Km 7 Windy Road	Tundra	
281	28-Nov-22	Ground	Ptarmigan		15					15	Flying	Km 7 Windy Road	Tundra	
282	28-Nov-22	Ground	Muskox		7					7	Resting	East of Km 7 Windy Road	Tundra	
283	2-Dec-22	Ground	Red Fox		1					1	Running	Doris Portal	Site	
284	11-Dec-22	ground	Arctic Hare	Lepus Arcticus	1					1	Running	TLR	Tundra	Running across the road
285	12-Dec-22	Ground	Arctic Hare	Lepus Arcticus	5					5	Resting	Windy Road between KM 7 & 8	Tundra	Running along the Tundra
286	13/24/2022	Ground	Caribou		24					24	Grazing	Windy Road KM4 West side	Tundra	Grazing
287	24-Dec-22	Ground	Ptarmigan		9					9	Resting	Behind the lab	Site	
288	28-Dec-22	Ground	Caribou		2				2		Resting/grazing	On TIA footprint opposite the powder mag	Tundra/Site	

Inds = Individuals, A = Adults, M = Males, F = Females, Y = Young (e.g. calves, chicks), U = Unknown

Note: Please record every observation of a species even if it is already listed, if the specific species is unknown describe it's colouration, size, etc.

APPENDIX 3.2-6 SUMMARY OF WILDLIFE RECORDED INCIDENTALLY BY BIOLOGISTS AT THE PROJECT, 1996 TO 2022

Appendix 3.2-6: Summary of Wildlife Recorded Incidentally by Biologists at the Project, 1996 to 2022

Species Group	Species	Baseline/Pre-development (Pre-FEIS Submission)		Pre-Development (Post-FEIS	Construction	Care and Maintenance	Construction	Operations	Care and Maintenance	No. Years Recorded[1]
		1996-2000[3]	2001-2005[3]	2006-2008[3]	2009-2012[3]	2013-2014[3]	2015-2017[3]	2018-2021[3]	2022	
Mammals	Arctic Fox	3	3	2	4	1		2		15
	Arctic Ground Squirrel	2	1		3	2		2		10
	Arctic Hare	1			3	2		3		9
	Bearded Seal	1			1		2			4
	Caribou	1	1	3	4	2	2	4		17
	Grizzly Bear	4	5	3	4	2	2	3		23
	Grey Wolf	3	5	3	4	2	1	1		19
	Least Weasel	1			3	1		1		6
	Muskox	1		2	4	2	2	3		14
	Red Fox	2	2	2	4	2	1	3		16
	Ringed Seal	2		1	4	2	3	1		13
	Sik Sik							2		2
	Snowshoe Hare							1		1
	Wolverine	3	2	3	4	1	1	2		16
	Unknown Fox				3	1	1	1		6
	Unknown Seal						1	1		2
Total Mammal Species[2]		**12**	**7**	**8**	**12**	**11**	**8**	**13**	**0**	
Upland Breeding Bird	American Golden-plover				1				X	2
	American Pipit	1	1		2	1	1	1	X	8
	American Robin					1		2		3
	American Tree Sparrow		1		3	1	1		X	7
	Common Redpoll		1		3				X	5
	Baird's Sandpiper	1			1					2
	Gray-cheeked Thrush		1							1
	Harris' Sparrow				1				X	2
	Hoary Redpoll				4	1				5
	Horned Lark		1		3	1	1	1		7
	Lapland Longspur	1	1		4	1	3	1	X	12
	Least Sandpiper		1		2	1	1	1		6
	Pectoral Sandpiper				2					2
	Rock Ptarmigan				3	1	1			5
	Red-necked Phalarope	1	1		1	2		1		6
	Savannah Sparrow	1	1		3	1	2	1	X	10
	Semipalmated Sandpiper		1		2	1		1	X	6
	Semipalmated Plover				2		1			3

Appendix 3.2-6: Summary of Wildlife Recorded Incidentally by Biologists at the Project, 1996 to 2022

Species Group	Species	Baseline/Pre-development (Pre-FEIS Submission)		Pre-Development (Post-FEIS	Construction	Care and Maintenance	Construction	Operations	Care and Maintenance	No. Years Recorded[1]
		1996-2000[3]	2001-2005[3]	2006-2008[3]	2009-2012[3]	2013-2014[3]	2015-2017[3]	2018-2021[3]	2022	
Upland Breeding Bird *(cont'd)*	Snow Bunting	1			2			1		4
	White-crowned Sparrow	1	1		3	1	2	1	X	10
	Willow Ptarmigan		1		4	1				6
	Wilson's Snipe			1	2	1	1			5
	Unknown Ptarmigan	1		2	4	1	1	3		12
	Unknown Redpoll	1			2	1	2	4		10
	Unknown Sandpiper						1			1
	Unknown Shorebird	1			2	2				5
Total Upland Breeding Bird Species[2]		**7**	**12**	**1**	**20**	**14**	**10**	**10**	**9**	
Waterbird	American Green-winged Teal					2	1			3
	Arctic Tern	3			3			1		7
	Brant Goose				1					1
	Common Goldeneye						1			1
	Canada Goose	2	1	2	4	2	3	3	X	18
	Common Eider				1	1		1		3
	Common Loon		1		3				X	5
	Common Merganser				1	1				2
	Gadwall				1	1				2
	Greater White-fronted Goose	2	1	1	4	2	2	3	X	17
	Greater Scaup		1	1	3	2	1	1		9
	Glaucous Gull	2	1		2	2	1	1		9
	Herring Gull	3			2	1	1	1	X	9
	King Eider	1			1	2	1	1		6
	Lesser Scaup			1		1				2
	Long-tailed Duck	1	1	1	4	2	1	2	X	13
	Long-tailed Jaeger	2			1			1		4
	Mallard							2		2
	Northern Pintail	1		1	3	2	1	2		10
	Parasitic Jaeger	3			1	1				5
	Pacific Loon	2	1	1	4	2	3	2	X	16
	Red-breasted Merganser	3	1	1	3	2	2	1	X	14
	Red-throated Loon	1	1		3	2	1	1	X	10
	Sandhill Crane	1	1	1	3	2	3	4		15
	Snow Goose	2	1		4	1	1	3		12
	Thayer's Gull					1				1

Appendix 3.2-6: Summary of Wildlife Recorded Incidentally by Biologists at the Project, 1996 to 2022

Species Group	Species	Baseline/Pre-development (Pre-FEIS Submission)		Pre-Development (Post-FEIS	Construction	Care and Maintenance	Construction	Operations	Care and Maintenance	No. Years Recorded[1]
		1996-2000[3]	2001-2005[3]	2006-2008[3]	2009-2012[3]	2013-2014[3]	2015-2017[3]	2018-2021[3]	2022	
Waterbird *(cont'd)*	Tundra Swan	2	1	1	4	2	2	3	X	16
	White-winged Scoter					1	1			2
	Yellow-billed Loon				2	1	2			5
	Unknown Duck				1	2	1	1		5
	Unknown Eider					1				1
	Unknown Goose				2	2	1	3		8
	Unknown Gull			1	4	2	2			9
	Unknown Loon					1	1	1		3
	Unknown Scaup					1				1
Sub-total Waterbird Species[2]		**16**	**12**	**11**	**23**	**23**	**18**	**18**	**9**	
Raptor	Bald Eagle			1	2			1		4
	Common Raven	2	1	1	4	2	2	3		15
	Golden Eagle	3	1	2	4	2	1	3		16
	Gyrfalcon			2	1	2	1	2		8
	Northern Harrier	1			1		1			3
	Peregrine Falcon	1	1	2	4	2	1	2		13
	Rough-legged Hawk	2	1	2	4	2	2	4		17
	Short-eared Owl	1		1	3	2		1		8
	Snowy Owl	2			1			2		5
	Unknown Falcon						1			1
	Unknown Raptor				3	1		1		6
Sub-total Raptor Species[2]		**12**	**4**	**7**	**9**	**6**	**6**	**8**	**0**	
Total Wildlife Species[2]		**47**	**35**	**27**	**64**	**54**	**42**	**49**	**18**	

Notes:

[1] *The total number of years where the species or species sign (e.g., tracks, nests, evidence of use) was observed*

[2] *Total counts do not include counts of "unknowns"*

[3] *Numbers indicate how many years species were recorded in*

APPENDIX 3.2-7 SUMMARY OF THE HOPE BAY PROJECT WILDLIFE SIGHTINGS LOG AND INCIDENTAL SIGHTINGS

Appendix 3.2-7: Summary of the Hope Bay Project Wildlife Sightings Log and Incidental Sightings

Species Group	Species	Conservation Status[1]			2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		Incidental Sightings (Biologists/ Surveyors 1996- 2022)[2]
		Territorial Rank	COSEWIC	SARA Schedule 1	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	
Mammal	Arctic Fox	Apparently Secure			6	6	2	2			7	7	9	9	8	8	6	6	4	4	2	2	1	1	4	2	2	2	13
	Arctic Ground Squirrel	Secure			9	6	7	5	9	5	32	4	2	1			64	14	8	4	1	1			29	18	19	12	8
	Arctic Hare	Secure			5	5	8	8	4	4	5	5	3	3	44	26	37	26	11	9	19	13	8	7			30	23	7
	Bearded Seal	Unrankable													2	2											1	1	4
	Caribou[3]	Vulnerable	Threatened (Barrenground); Endangered (Dolphin Union)	Special Concern (Dolphin Union)	80	13	38	10	20	14	57	21	171	25	441	54	93	21	118	24	52	27	103	45	166	66	233	71	14*
	Ermine	Secure											1	1											2	2			
	Grey Wolf	Secure			11	11	12	5	19	12	17	13	8	5	33	23	56	34	8	4	5	3					4	3	19
	Grizzly Bear	Vulnerable	Special Concern	Special Concern	22	11	13	7	21	8	6	6	25	19	27	12	80	29	84	36	92	41	19	14	41	38	53	36	20
	Least Weasel	Secure			1	1							1	1															5
	Moose	Unrankable																									6	3	
	Muskox	Apparent Secure			160	14	86	10	50	4	75	4	44	3	380	11	676	26	81	10			40	2	66	2	267	21	12
	Red Fox	Secure			26	25	17	15	18	15	37	23	14	14	19	18	30	21	39	34	34	30	1	1	17	16	32	25	14
	Ringed Seal	Secure			7	6					5	1	1	1	1	1													12
	Snowshoe hare (likely misidentification)	Unrankable											1	1	1	1	5	5					1	1					
	Unknown Fox				9	6	4	4	2	2	3	3	4	4	1	1	1	1	4	4	3	3					5	5	
	Unknown Seal														12	1	1	1	2	1					3	1	2	2	
	Unknown Weasel				2	2	1	1	1	1									1	1	4	2							
	Wolverine	Vulnerable	Special Concern	Special Concern	13	13	8	8	4	4	2	2	10	9	5	5	5	5	4	4	9	7			4	4			16
Upland Breeding Bird	American Golden-plover	Vulnerable																											2
	American Pipit	Unrankable/ Undetermined																											8
	American Robin	Secure									3	1													2	1	1	1	3
	American Tree Sparrow	Unrankable/ Undetermined																											7
	Common Redpoll	Unrankable/ Undetermined									1	1	5	1	1	1									3	1			5
	Baird's Sandpiper	Secure																											2
	Gray-cheeked Thrush	Unrankable/ Undetermined																											1
	Harris' Sparrow	Unrankable/ Undetermined																											2
	Hoary Redpoll	Vulnerable																											5
	Horned Lark	Unrankable/ Undetermined																											7
	Lapland Longspur	Secure																									1	1	12
	Least Sandpiper	Vulnerable																											6
	Pectoral Sandpiper	Apparently Secure																											2
	Rock Ptarmigan	Secure													8	1	13	1											5
	Red-necked Phalarope	Vulnerable	Special Concern	Special Concern																									6
	Ruby-throated hummingbird (likely misidentification)												1	1															
	Savannah Sparrow	Unrankable/ Undetermined																											10
	Semipalmated Sandpiper	Vulnerable																									1	1	6
	Semipalmated Plover	Apparently Secure			11	6	27	5	11	5	25	6	4	1	16	7	6	2	28	6	18	3							4
	Snow Bunting	Vulnerable																							6	1	9	2	4
	Unknown Grouse (likely misidentification)												20	1															
	Unknown Ptarmigan				47	5	10	1	7	2	2	1	68	6	30	1	46	6	20	1	84	15	43	6	90	6	168	12	
	Unknown Songbird												1	1			3	1			1	1			2	1			
	White-crowned Sparrow	Unrankable/ Undetermined																							1	1			10
	Willow Ptarmigan	Secure																									243	16	6
	Wilson's Snipe	Secure																											5
Waterbird	American Green-winged Teal	Unrankable/ Undetermined																											3
	Arctic Tern	Apparently Secure																											7
	Brant Goose	Vulnerable																											1
	Common Goldeneye	Unrankable/ Undetermined																											1
	Canada Goose	Secure			50	1	30	2	8	1	6	2	4	1	42	4	47	2	100	2	20*	1			62	7	42	6	18

Appendix 3.2-7: Summary of the Hope Bay Project Wildlife Sightings Log and Incidental Sightings

Species Group	Species	Conservation Status[1]			2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		Incidental Sightings (Biologists/ Surveyors 1996- 2022)[2]
		Territorial Rank	COSEWIC	SARA Schedule 1	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	No. Ind.	No. Records	
Waterbird *(cont'd)*	Common Eider	Vulnerable																											3
	Common Loon	Secure	Not at Risk																						3	2			5
	Common Merganser	Unrankable/ Undetermined																									2	1	2
	Gadwall	Not Applicable																											2
	Greater White-fronted Goose	Secure							21	2	36	2	12	3	24	3	12	1	12	1					30	5	17	3	17
	Greater Scaup	Unrankable/ Undetermined																											9
	Glaucous Gull	Apparently Secure																											9
	Herring Gull	Apparently Secure																											9
	King Eider	Vulnerable																							3	1			6
	Lesser Scaup	Unrankable/ Undetermined																											2
	Long-tailed Duck	Apparently Secure											1*	1	3	1									3	1			13
	Long-tailed Jaeger	Secure																											4
	Parasitic Jaeger	Apparently Secure																											5
	Northern Pintail	Secure							2	1	6	2	1	1											3	1			8
	Pacific Loon	Unrankable/ Undetermined																							2	1	2	1	16
	Red-breasted Merganser	Secure																											14
	Red-throated Loon	Apparently Secure																									7	1	10
	Sandhill Crane	Secure			11	6	27	5	11	5	25	6	4	1	16	7	6	2	28	6	18	3	13	3	72	12	38	11	15
	Snow Goose	Secure									21	2							31	3	20*	1	15	2	15	3	12	1	12
	Thayer's Gull	Apparently Secure																											1
	Tundra Swan	Secure			2	1	3	2	1	1	7	2	2*	2	6	4	6	4	10	1					8	3	5	1	16
	Unknown Duck				5	1																			1	1	2	1	
	Unknown Goose				38	6	488	10	60	2	150	4							220	2	105*	2	>1600	3	15	1	44	3	
	Unknown Gull								2	2	1	1			11	2											1	1	
	Unknown Loon										1	1	3*	2	8	4	1	1							1	1	3	2	
	Unknown Swan																								3	2	1	1	
	White-winged Scoter	Unrankable/ Undetermined																											2
	Yellow-billed Loon	Apparently Secure	Not at Risk																										5
Raptor	Bald Eagle	Unrankable/ Undetermined	Not at Risk								2	2															1	1	4
	Common Raven	Secure			1	1			3	2	4	3	1	1					3	3	1	1			2	1	1	1	15
	Golden Eagle	Apparently Secure	Not at Risk		1	1	1	1			1	1	2	2	4	3	1	1	2	2			3	2	1	1	1	1	16
	Gyrfalcon	Apparently Secure	Not at Risk						2	2	1	1	1	1	1	1									1	1			8
	Northern Harrier	Unrankable/ Undetermined	Not at Risk																										3
	Peregrine Falcon	Apparently Secure	Not at Risk	Special Concern			2	2			6	6	1	1	2	2	5	4							1	1	6	5	13
	Rough-legged Hawk	Unrankable/ Undetermined	Not at Risk		4	3	6	3	3	3	7	6	4	4	2	2	1	1	3	2	1	1	4	2	7	6	3	3	17
	Short-eared Owl	Vulnerable	Special Concern	Special Concern																									8
	Snowy Owl	Apparently Secure	Not at Risk														1	1							1	1	1	1	5
	Unknown Eagle												2	2					1	1							4	4	
	Unknown Owl										1	1																	
	Unknown Raptor				2	1	13	5	2	2	2	1			2	2	4	3			1	1							
Fish	Arctic Char																										1	1	

Notes:

** Contains records where number observed was not recorded; value of one was assigned.*

[1] Territorial Rankings provided in the 2015 Wild Species Report (CESCC 2020), COSEWIC and SARA status as indicated on the Species At Risk Act Public Registry (Government of Canada 2022).

[2] Incidental observations by ERM crew and other Biologists were not recorded in 2019 or 2020 due to minimal compliance monitoring work on site.

[3] Caribou recorded incidentally and in the wildlife sightings log are not identified to herd but based on timing, both herds have been observed.

APPENDIX 3.2-8 MONTHLY AVERAGE OF PERSONNEL ON SITE, HOPE BAY PROJECT, 2009 TO 2022

Appendix 3.2-8: Monthly Average of Personnel on Site, Hope Bay Project, 2009 to 2022

Month	Year													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
January	69	83	214	183	0	7	13	60	172	202	265	316	140	123
February	84	106	250	193	0	7	16	73	168	239	279	332	143	178
March	94	131	265	180	3	8	30	78	176	261	286	282	147	160
April	102	172	278	127	13	14	28	93	173	264	291	133	169	134
May	102	182	274	90	20	63	32	110	188	261	287	130	176	135
June	103	200	280	103	44	71	41	123	189	266	304	139	189	162
July	113	220	284	90	61	77	46	123	185	265	304	137	193	164
August	109	205	277	93	59	79	84	129	178	271	285	136	230	172
September	98	484	277	0	54	73	105	144	179	272	293	128	240	174
October	66	332	270	0	49	79	114	158	179	273	306	133	89	181
November	16	147	252	0	19	44	93	172	184	270	324	149	171	189
December	14	108	0	0	8	7	89	173	179	246	300	143	185	114
Average	**81**	**197**	**243**	**88**	**27**	**44**	**58**	**120**	**179**	**258**	**294**	**180**	**173**	**157**

APPENDIX 3.3-1 WILDLIFE EVENTS RECORDED BY WILDLIFE CAMERAS, BOSTON PROJECT, SEPTEMBER 2021 TO SEPTEMBER 2022

Appendix 3.3-1: Wildlife Events Recorded by Wildlife Cameras, Boston Project, September 2021 to September 2022

Camera No.	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species[1]	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
71	5/30/2022	1	6:37	6:39		1482	1531	50	5	Caribou	2	0	2	Walking	Tundra	
63	5/26/2022	1	15:12	15:14	M	1450	1491	40	4	Caribou	2	0	2	Walking	Tundra	
68	10/22/2021	1	9:46	9:46	M	312	321	10	1	Caribou	3	0	3	Walking	Tundra	
69	6/22/2022	1	10:07	10:07	M	183	192	10	1	Caribou	1	0	1	Walking	Tundra	
69	8/28/2022	1	7:07	7:08	M	454	543	90	9	Caribou	1	0	1	Investigating camera	Tundra	
70	9/13/2022	1	7:23	7:26	M	332	441	90	9	Caribou	5	0	5	Grazing	Tundra	
71	5/22/2022	1	5:50	5:50	M	1278	1287	10	1	Caribou	4	0	4	Grazing	Tundra	
71	5/24/2022	1	18:48	18:50	M	1297	1356	60	6	Caribou	11	0	11	Walking	Tundra	
71	5/28/2022	1	13:05	13:05	M	1379	1388	10	1	Caribou	2	0	2	Grazing	Tundra	
71	5/29/2022	1	22:17	22:36	M	1392	1481	90	9	Caribou	8	0	8	Walking	Tundra	
72	8/18/2022	1	2:28	2:28	M	274	283	10	1	Caribou	1	0	1	Walking	Tundra	
73	7/28/2022	1	15:26	15:26	M	184	193	10	1	Caribou	1	0	1	Investigating camera	Tundra	
73	7/29/2022	2	9:25	9:25	M	194	203	10	1	Caribou	1	0	1	Walking	Tundra	
73	8/18/2022	1	12:32	12:33	M	267	326	60	6	Caribou	1	0	1	Investigating camera	Tundra	
74	7/22/2022	1	23:50	23:50	M	166	175	10	1	Caribou	1	0	1	Walking	Tundra	
74	8/17/2022	1	4:19	4:20	M	251	260	10	1	Caribou	1	0	1	Walking	Tundra	
74	8/22/2022	1	14:06	14:08	M	279	298	20	2	Caribou	2	0	2	Walking	Tundra	
74	8/25/2022	1	6:11	6:11	M	305	314	10	1	Caribou	1	0	1	Walking	Tundra	
74	9/3/2022	1	18:33	18:33	M	355	374	20	2	Caribou	1	0	1	Walking	Tundra	
74	9/15/2022	1	20:33	20:34	M	411	420	10	1	Caribou	1	0	1	Walking	Tundra	
75	6/18/2022	1	10:37	10:43	M	71	120	50	5	Caribou	4	0	4	Grazing	Tundra	Look like all females but can not be positive.
75	6/12/2022	1	19:43	19:47	M	1224	1253	30	3	Caribou	1	0	1	Walking	Tundra	
76	10/15/2021	1	21:03	21:03	M	543	552	10	1	Caribou	1	0	1	Walking	Tundra	
78	8/5/2022	2	6:04	6:04	M	316	317	2	1	Caribou	1	0	1	Walking	Tundra	
79	9/25/2022	1	7:41	7:45	M	329	348	20	2	Caribou	1	0	1	Grazing	Tundra	
79	6/14/2022	1	18:25	18:26	M	1479	1528	50	5	Caribou	4	0	4	Walking	Tundra	
81	9/26/2022	1	16:19	16:24	M	845	894	50	5	Caribou	2	0	2	Grazing	Tundra	
82	7/8/2022	1	22:44	22:45	M	75	77	10	1	Caribou	1	0	1	Walking	Tundra	
82	7/9/2022	1	3:55	3:55	M	85	94	10	1	Caribou	1	0	1	Walking	Tundra	
82	7/10/2022	1	6:03	6:03	M	98	107	10	1	Caribou	1	0	1	Walking	Tundra	
82	7/11/2022	1	0:41	0:41	M	111	120	10	1	Caribou	1	0	1	Walking	Tundra	
82	7/11/2022	2	4:57	4:57	M	121	130	10	1	Caribou	1	0	1	Walking	Tundra	
82	7/13/2022	1	1:22	1:22	M	137	146	10	1	Caribou	1	0	1	Walking	Tundra	
82	7/17/2022	2	11:05	11:05	M	189	198	10	1	Caribou	1	0	1	Walking	Tundra	
82	7/22/2022	1	13:03	13:03	M	217	226	10	1	Caribou	1	0	1	Walking	Tundra	
83	6/2/2022	1	19:57	19:58	M	1343	1362	20	2	Caribou	2	0	2	Grazing	Tundra	
85	8/7/2022	1	5:53	5:53	M	49	66	18	6	Caribou	1	0	1	Grazing	Tundra	
85	8/9/2022	1	6:53	6:53	M	82	93	12	4	Caribou	1	0	1	Walking	Tundra	
85	8/12/2022	1	18:14	18:14	M	94	105	12	4	Caribou	1	0	1	Grazing	Tundra	
85	8/27/2022	1	18:13	18:28	M	106	147	39	13	Caribou	1	0	1	Investigating camera	Tundra	
87	8/22/2022	1	2:29	2:29	M	207	226	20	2	Caribou	1	0	1	Investigating camera	Tundra	
88	7/28/2022	1	5:47	5:47	M	162	171	10	1	Caribou	1	0	1	Grazing	Tundra	
66	6/22/2022	1	16:43	16:44	M	1077	1086	10	1	Grizzly Bear	1	0	1	Investigating camera	Tundra	
71	5/26/2022	1	14:06	14:06	M	1363	1372	10	1	Grizzly Bear	1	0	1	Investigating camera	Tundra	
74	7/12/2022	1	0:41	0:42	M	103	122	20	2	Grizzly Bear	1	0	1	Investigating camera	Tundra	

Appendix 3.3-1: Wildlife Events Recorded by Wildlife Cameras, Boston Project, September 2021 to September 2022

Camera No.	Date	Series	Start Time	End Time	Photo Type	Start Photo No.	End Photo No.	No. Photos	No. Triggers	Species[1]	No. Adults	No. Young	Total	Behaviour	Location of Wildlife	Comment
79	5/7/2022	1	15:13	15:15	M	1255	1344	90	9	Grizzly Bear	1	0	1	Investigating camera	Tundra	
83	8/11/2022	3	20:15	20:15	M	1877	1886	10	1	Grizzly Bear	1	0	1	Hunting	Tundra	
85	8/8/2022	1	23:35	23:36	M	67	81	15	5	Muskox	1	0	1	Investigating camera	Tundra	
62	7/27/2022	1	20:23	20:23	M	181	189	10	1	Common Raven	3	0	3	Flying	Tundra	
65	8/3/2022	1	17:48	17:49	M	242	251	10	1	Common Raven	1	0	1	Flying	Tundra	
70	5/18/2022	1	8:26	8:26	M	1249	1258	10	1	Arctic Fox	1	0	1	Walking	Tundra	
70	6/9/2022	1	1:27	1:27	M	1485	1494	10	1	Fox	1	0	1	Walking	Tundra	
71	6/16/2022	1	0:26	0:28	M	1673	1692	20	2	Grey Wolf	2	0	2	Walking	Tundra	
71	6/16/2022	2	23:00	23:00	M	1706	1715	10	1	Grey Wolf	1	0	1	Walking	Tundra	
75	4/30/2022	1	18:37	18:37	M	1045	1057	11	2	Fox	1	0	1	Walking	Tundra	
78	8/2/2022	1	15:12	15:12	M	300	309	10	1	Common Raven	1	0	1	Flying	Tundra	
79	10/15/2021	1	22:37	22:37	M	603	612	10	1	Red Fox	1	0	1	Walking	Tundra	
81	8/12/2022	1	13:16	13:18	M	310	379	70	7	Common Raven	2	0	2	Investigating camera	Tripod	
82	5/2/2022	1	7:35	7:35	M	2347	2356	10	1	Red Fox	1	0	1	Walking	Tundra	
76	9/7/2022	1	17:50	17:14	M	268	467	100	10	Wolverine	1	0	1	Investigating camera	Tripod	
82	7/17/2022	1	4:15	4:16	M	159	188	30	3	Wolverine	1	0	1	Investigating camera	Tripod	
81	8/23/2022	1	21:30	21:31	M	463	492	30	3	Peregrine Falcon	1	0	1	Investigating camera	Tripod	
83	7/5/2022	1	16:27	17:31	M	66	845	780	78	Peregrine Falcon	1	0	1	Investigating camera	Tripod	
83	7/20/2022	2	12:30	13:18	M	891	1780	890	89	Peregrine Falcon	1	0	1	Investigating camera	Tripod	

[1] *Only VEC and Monitored Species are included: Caribou, Muskox, Grizzly Bear, Wolverine, and Nest Predators.*

APPENDIX 3.4-1 SUMMARY OF CARIBOU CAMERA EVENTS FOR ZOI ANALYSIS, JUNE 2016 TO SEPTEMBER 2022

Appendix 3.4-1: Summary of Caribou Camera Events for ZOI Analysis, June 2016 to September 2022

Camera No.	Camera Type	Species Specific Monitoring Objective	2020												2021												2022									Total 2016 - 2021	Total by Camera
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept		
1	Treatment	-	-	-	-	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	10	5	-	-	-	-	-	-	-	-	-	-	17	-	-	20	37
2	Treatment	Road Crossing Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	N/A
3	Control	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	1	13	8	3	-	-	-	-	-	-	-	-	-	-	-	-	37	37
4	Control	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	3	-	-	8	11
5	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	2		-	-	-	-	-	-	-	-	2	-	1	-	6	9
6	Control	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	4	6
7	Control	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	1	1	4	7
8	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	2	2	-	-	-	4	8
9	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	14
10	ZOI	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	3	3	3	-	6	15
11	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	2
12	ZOI	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	2	4	11
13	Treatment	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-	4	7
14	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	2	1	1	1	7
15	Treatment	-	-	-	-	-	-	-	3	-	-					-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	3	3
16	Control	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	1	1	2	1	10	15
17	Treatment	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3	5
18	Treatment	Waste Management Facility	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	14	-	-	7	21
19	Treatment	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	-	4	10
21	Treatment	Waste Management Facility	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	41	1	-	11	53
22	Treatment	ERM Fish Fence	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	4
23	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2			-	-	-	-	-	-	-	-	4	-	-	-	7	11
24	ZOI/Ladder	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	14	2	2	-	-	-	-	-	-	-	-	3	16	3	-	32	54
25	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	0	3
26	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	7
28	Treatment	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	4	-	-	3	9
29	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-	1	6	8
30	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	1	2	2	4	9
31	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
32	Treatment	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	9	5	-	-	-	-	-	-	-	-	-	-	-	-	1	17	18
33	Control	-	-	-	-	-	-	-	21	1	-	-	-	-	-	-	-	-	-	3	2	1	-	-	-	-	-	-	-	-	1	2	-	-	-	36	39
34	ZOI/Ladder	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-	-	-	-	-	-	-	-	-	7	7
35	Treatment	Road Crossing Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	N/A
36	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	3
37	Control	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	6	1	4	13
39	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
40	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	5	6
41	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	2	5
42	Treatment	-	-	-	-	-	-	-	6	1	-	-	-	-	-	-	-	-	-		8	1	1	-	-	-	-	-	-	-	-	-	7	2	-	21	30
43	Control	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	18	21
44	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	3
45	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
46	ZOI	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	4	7
47	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	3	1	3	4	11
48	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5	2		-	-	-	-	-	-	-	-	2	2	2	4	13	23
49	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2

Appendix 3.4-1: Summary of Caribou Camera Events for ZOI Analysis, June 2016 to September 2022

Camera No.	Camera Type	Species Specific Monitoring Objective	2020												2021												2022									Total 2016 - 2021	Total by Camera
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept		
50	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	-	2	6
51	Treatment	TIA	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	7	1		-	-	-	-	-	-	-	-	-	18	1	1	9	29
52	Treatment	TIA	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
53	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	2	-	-	-	3	5
54	Treatment	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	7	8
55	ZOI	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4	-	-	7	14
56	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	3	2	9	15
57	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2
58	Control	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	2	1	1	-	-	-	-	-	-	-	-	-	-	1	1	3	9	14
59	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
60	Treatment	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
		Total	**NA**	**1**	**1**	**2**	**0**	**4**	**91**	**13**	**1**	**0**	**0**	**NA**	**NA**	**0**	**0**	**0**	**1**	**17**	**101**	**39**	**8**	**0**	**0**	**NA**	**NA**	**0**	**0**	**0**	**5**	**43**	**161**	**35**	**25**	**402**	**671**

Notes:
Shaded columns (December and January) were not included in analysis due to low effort.
Shaded rows (Cameras 2 and 35) were not included in analysis because they are likely to have higher densities of caribou.

APPENDIX 3.4-2 CARIBOU OBSERVATIONS FROM THE WILDLIFE SIGHTINGS LOG CORRECTED FOR PERSONNEL, HOPE BAY PROJECT, 2009 TO 2022

Appendix 3.4-2: Caribou Observations from the Wildlife Sightings Log Corrected for Personnel, Hope Bay Project, 2009 to 2022

Year	Month	Number of Observations from Raw Data		Monthly Average of Personnel on Site	Number of Observations per Personnel	
		No. Individuals	No. Records		No. Individuals	No. Records
2009	Apr	141	3	102	1.38	0.03
	May	114	7	102	1.12	0.07
	Jun	10	2	103	0.1	0.02
	Jul	21	6	113	0.19	0.05
	Sep	14	1	98	0.14	0.01
2010	Mar	1	1	131	0.01	0.01
	Apr	16	1	172	0.09	0.01
	May	148	16	182	0.81	0.09
	Jun	1	1	200	0.01	0.01
	Jul	9	4	220	0.04	0.02
	Aug	2	2	205	0.01	0.01
2011	Apr	24	4	278	0.09	0.01
	May	43	5	274	0.16	0.02
	Jun	9	2	280	0.03	0.01
	Jul	4	2	284	0.01	0.01
2012	Apr	7	1	127	0.06	0.01
	May	28	6	90	0.31	0.07
	Jul	2	2	90	0.02	0.02
	Aug	1	1	93	0.01	0.01
2013	May	6	2	20	0.3	0.1
	Jun	4	4	44	0.09	0.09
	Jul	5	4	61	0.08	0.07
	Aug	5	4	59	0.08	0.07
2014	Apr	10	1	14	0.71	0.07
	May	3	1	63	0.05	0.02
	Jun	11	5	71	0.15	0.07
	Jul	23	13	77	0.3	0.17
	Dec	10	1	7	1.43	0.14
2015	Feb	6	1	16	0.38	0.06
	May	34	3	32	1.06	0.09
	Jun	9	3	41	0.22	0.07
	Jul	2	2	46	0.04	0.04
	Aug	10	7	84	0.12	0.08
	Nov	44	5	93	0.47	0.05
	Dec	66	4	89	0.74	0.04
2016	Jan	29	5	60	0.48	0.08
	Feb	27	3	73	0.37	0.04
	Mar	152	9	78	1.95	0.12
	Apr	51	5	93	0.55	0.05
	May	79	14	110	0.72	0.13
	Jul	10	9	123	0.08	0.07
	Aug	1	1	129	0.01	0.01

Appendix 3.4-2: Caribou Observations from the Wildlife Sightings Log Corrected for Personnel, Hope Bay Project, 2009 to 2022

Year	Month	Number of Observations from Raw Data		Monthly Average of Personnel on Site	Number of Observations per Personnel	
		No. Individuals	No. Records		No. Individuals	No. Records
2016	Nov	11	2	172	0.06	0.01
	Dec	51	6	173	0.29	0.03
2017	Mar	84	4	176	0.48	0.02
	Jun	4	4	189	0.02	0.02
	Jul	12	12	185	0.06	0.06
	Aug	2	2	178	0.01	0.01
2018	Mar	80	1	261	0.307	0.004
	May	12	6	261	0.046	0.023
	Jun	7	2	266	0.026	0.008
	Jul	14	12	265	0.053	0.045
	Aug	5	3	271	0.018	0.011
2019	Mar	2	1	286	0.01	0
	Apr	12	5	291	0.04	0.02
	May	21	10	287	0.07	0.03
	Jun	3	2	304	0.01	0.01
	Jul	2	1	304	0.01	0
	Aug	6	5	285	0.02	0.02
	Dec	unknown	1	300	-	-
2020	Jan	17	2	316	0.05	0.006
	Mar	7	1	282	0.03	0.004
	Jun	17	3	139	0.12	0.02
	Jul	57	34	137	0.42	0.25
	Aug	5	5	136	0.04	0.04
2021	Feb	14	3	143	0.1	0.02
	Mar	5	1	147	0.03	0.01
	Apr	5	1	169	0.03	0.01
	May	10	2	176	0.06	0.01
	Jun	4	1	189	0.02	0.01
	Jul	83	26	193	0.43	0.13
	Aug	40	29	230	0.17	0.13
	Sep	5	3	240	0.02	0.01
2022	Apr	20	5	134	0.15	0.04
	May	3	1	135	0.02	0.01
	Jun	35	9	162	0.22	0.06
	Jul	106	37	164	0.65	0.23
	Aug	14	13	172	0.08	0.08
	Sept	10	2	174	0.06	0.01
	Oct	19	2	181	0.10	0.01
	Nov	0	0	189	0.00	0.00
	Dec	26	2	114	0.23	0.02

APPENDIX 3.5-1 SUMMARY OF MUSKOX CAMERA EVENTS, JUNE 2016 TO SEPTEMBER 2022

Appendix 3.5-1: Summary of Muskox Camera Events, June 2016 to September 2022

Camera No	Camera Type	Species Specific Monitoring Objective	2020												2021												2022									Total 2016-2021	Total by Camera
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
1	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
2	Treatment	Road Crossing Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	**3**
3	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
4	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
5	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
6	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
7	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
8	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
9	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
10	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
11	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
12	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	**3**
13	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
14	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**	**2**
15	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
16	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
17	Treatment	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**	**2**
18	Treatment	Waste Management Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
19	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
21	Treatment	Waste Management Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
22	Treatment	ERM Fish Fence	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
23	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
24	ZOI/Ladder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
25	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**	**1**
26	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	**0**	**1**
28	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
29	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	**0**	**1**
30	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
31	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
32	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**	**1**
33	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	**3**
34	ZOI/Ladder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
35	Treatment	Road Crossing Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
36	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	**0**	**1**
37	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
39	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
40	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
41	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
42	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
43	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
44	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
45	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
46	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
47	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
48	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**	**1**
49	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	**3**

Appendix 3.5-1: Summary of Muskox Camera Events, June 2016 to September 2022

Camera No	Camera Type	Species Specific Monitoring Objective	2020												2021												2022									Total 2016-2021	Total by Camera
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
50	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
51	Treatment	TIA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**NA**	**NA**
52	Treatment	TIA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**NA**	**NA**
53	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**5**	**5**
54	Treatment	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**17**	**17**
55	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	**3**
56	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
57	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
58	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
59	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**	**2**
60	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**	**0**
		Total	**N/A**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**N/A**	**N/A**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**N/A**	**N/A**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**0**	**46**	**49**

Notes:
Shaded columns (December and January) are periods of low effort which should be removed from analysis in future years
Shaded rows (Cameras 51 and 52) are specifically in place to monitor wildlife, including muskox, at the TIA. These cameras will not be included in analysis.

APPENDIX 3.6-1 SUMMARY OF GRIZZLY BEAR CAMERA EVENTS FOR ZOI ANALYSIS, JUNE 2016 TO SEPTEMBER 2022

Appendix 3.6-1: Summary of Grizzly Bear Camera Events for ZOI Anaylsis, June 2016-September 2022

Camera No	Camera Type	Species Specific Monitoring Objective	2020												2021												2022									Total 2016-2021	Total by Camera
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept		
1	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
2	Treatment	Road Crossing Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
3	Control	-	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-		18	19
4	Control	-	-	-	-	-	-	1	2	1	-	-	-	-	-	-	-	-	-		1		-	1	-	-	-	-	-	-	-	-	1	-	1	18	20
5	Control	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	1	1		-	-	-	-	-	-	-	-	-	1	-	-	-	14	15
6	Control	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-		1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	7	8
7	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	4	5
8	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	11
9	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-	-	23	24
10	ZOI	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	15	15
11	Treatment	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-		-	-	-	-	-	-	-	-	1	-	-	11	12
12	ZOI	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	23	24
13	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	1	-	-	1	6	8
14	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	4	4
15	Treatment	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	30
16	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	6	6
17	Treatment	-	-	-	-	-	-	-	4	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	13
18	Treatment	Waste Management Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		NA	NA
19	Treatment	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	2	4
21	Treatment	Waste Management Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		NA	NA
22	Treatment	ERM Fish Fence	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		NA	NA
23	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	1	-	-	-	-	-	-	-	-	1	-	2	45	48
24	ZOI/Ladder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	7	7
25	ZOI	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	1	-	-	1	1	11	14
26	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8
28	Treatment	-	-	-	-	-	-	1	1	-	1	1	-	-	-	-	-	-	-	-	1	2	-	1	-	-	-	-	-	-	-	-	1	-	-	21	22
29	Control	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	5
30	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	1	-	14	16
31	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
32	Treatment	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	16	16
33	Control	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	3	1	1	1	-	-	-	-	1	1	-	-	-	-	-	26	28
34	ZOI/Ladder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	6	7
35	Treatment	Road Crossing Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
36	Control	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	25
37	Control	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	1	-	-	1	-	9	11
39	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
40	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5
41	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	12	13
42	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
43	Control	-	-	-	-	-	-		1	-	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	1	11	13
44	ZOI	-	-	-	-	-	-		1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	11
45	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	12	13
46	ZOI	-	-	-	-	-	-	-	-		3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	11
47	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
48	ZOI	-	-	-	-	-	-	-	-	-		1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
49	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	4	5

Appendix 3.6-1: Summary of Grizzly Bear Camera Events for ZOI Anaylsis, June 2016-September 2022

Camera No	Camera Type	Species Specific Monitoring Objective	2020												2021												2022									Total 2016-2021	Total by Camera
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept		
50	Treatment	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
51	Treatment	TIA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2
52	Treatment	TIA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
53	Treatment	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	18	19
54	Treatment	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	19
55	ZOI	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	1	3	-	54	58
56	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3	4
57	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-	7	8
58	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2
59	Treatment	-	-	-	-	-	-	-	1	2	4	-	-	-	-	-	-	-	-	4	1	1	2	-	-	-	-	-	-	-	-	2	-	-	2	56	60
60	Treatment	-	-	-	-	-	-	-	2	1	1	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	14
		Total	**NA**	**NA**	**0**	**0**	**0**	**5**	**32**	**14**	**14**	**5**	**NA**	**NA**	**NA**	**NA**	**0**	**0**	**0**	**14**	**24**	**18**	**7**	**13**	**NA**	**NA**	**NA**	**NA**	**1**	**2**	**7**	**8**	**10**	**9**	**9**	**651**	**677**

Notes:
Shaded columns (November - February) are hibernation months and were not included in analysis
Shaded rows (Cameras 18, 21, and 22) were not included in analysis because they monitor facilities which may attract bears

APPENDIX 3.6-2 GRIZZLY BEAR OBSERVATIONS FROM THE WILDLIFE SIGHTINGS LOG CORRECTED FOR PERSONNEL, HOPE BAY PROJECT, 2009 TO 2022

Appendix 3.6-2: Grizzly Bear Observations from the Wildlife Sightings Log Corrected for Personnel, Hope Bay Project, 2009 to 2022

Year	Month	Number of Observations from Raw Data		Monthly Average of Personnel on Site	Number of Observations per Personnel	
		No. Individuals	No. Records		No. Individuals	No. Records
2009	May	11	5	102	0.11	0.05
	Jun	4	4	103	0.04	0.04
	Jul	18	10	113	0.16	0.09
	Aug	18	17	109	0.17	0.16
	Sep	6	6	98	0.06	0.06
2010	May	6	6	182	0.03	0.03
	Jun	2	1	200	0.01	0.01
	Jul	7	7	220	0.03	0.03
	Aug	4	4	205	0.02	0.02
	Sep	7	5	484	0.01	0.01
2011	May	3	3	274	0.01	0.01
	Jul	3	1	284	0.01	0
	Aug	10	5	277	0.04	0.02
	Sep	3	1	277	0.01	0
	Oct	3	1	270	0.01	0
2012	Apr	1	1	127	0.01	0.01
	May	2	2	90	0.02	0.02
	Jun	1	1	103	0.01	0.01
	Jul	3	1	90	0.03	0.01
	Aug	6	2	93	0.06	0.02
2013	Jul	9	3	61	0.15	0.05
	Aug	8	3	59	0.14	0.05
	Sep	3	1	54	0.06	0.02
	Oct	1	1	49	0.02	0.02
2014	Jun	2	2	71	0.03	0.03
	Jul	2	2	77	0.03	0.03
	Aug	1	1	79	0.01	0.01
	Oct	1	1	79	0.01	0.01
2015	May	1	1	32	0.03	0.03
	Jun	3	3	41	0.07	0.07
	Jul	1	1	46	0.02	0.02
	Aug	17	11	84	0.2	0.13
	Sep	2	2	105	0.02	0.02
2016	Jul	14	5	123	0.11	0.04
	Aug	10	4	129	0.08	0.03
	Oct	3	3	158	0.02	0.02
2017	May	8	3	188	0.02	0.02
	Jun	26	9	189	0.05	0.05
	Jul	6	2	185	0.01	0.01
	Aug	13	5	178	0.03	0.03
	Sep	11	4	179	0.02	0.02
	Oct	13	5	179	0.03	0.03

Appendix 3.6-2: Grizzly Bear Observations from the Wildlife Sightings Log Corrected for Personnel, Hope Bay Project, 2009 to 2022

Year	Month	Number of Observations from Raw Data		Monthly Average of Personnel on Site	Number of Observations per Personnel	
		No. Individuals	No. Records		No. Individuals	No. Records
2018	May	9	3	261	0.01	0.01
	Jun	7	3	266	0.01	0.01
	Jul	17	8	265	0.03	0.03
	Aug	12	6	271	0.02	0.02
	Sep	25	8	272	0.03	0.03
	Oct	13	5	273	0.02	0.02
	Nov	3	3	270	0.01	0.01
2019	May	4	1	287	0	0
	Jun	14	6	304	0.02	0.02
	Aug	23	13	285	0.05	0.05
	Sept	33	11	293	0.04	0.04
	Oct	4	4	306	0.01	0.01
2020	Jun	5	2	139	0.04	0.01
	Jul	3	3	137	0.02	0.02
	Aug	4	4	136	0.03	0.03
	Sep	7	5	128	0.06	0.04
2021	May	5	5	176	0.03	0.03
	Jun	12	12	189	0.06	0.06
	Jul	14	11	193	0.07	0.06
	Aug	5	5	230	0.02	0.02
	Sep	4	4	240	0.02	0.02
	Oct	1	1	89	0.01	0.01
2022	May	10	5	135	0.07	0.04
	Jun	11	4	162	0.07	0.02
	Jul	17	10	164	0.10	0.06
	Aug	3	2	172	0.02	0.01
	Sep	18	11	174	0.10	0.06
	Oct	2	2	181	0.01	0.01

APPENDIX 3.7-1 SUMMARY OF WOLVERINE CAMERA EVENTS FOR ZOI ANALYSIS, JUNE 2016 TO SEPTEMBER 2022

Appendix 3.7-1: Summary of Wolverine Camera Events for ZOI Analysis, June 2016 to September 2022

Camera No	Camera Type	Species Specific Monitoring Objective	2020												2021												2022									Total 2016-2021	Total by Camera
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept		
1	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
2	Treatment	Road Crossing Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
3	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
4	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
5	Control	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
6	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
7	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
8	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
9	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
10	ZOI	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
11	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
12	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
13	Treatment	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3	4
14	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
15	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
16	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
17	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
18	Treatment	Waste Management Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	N/A
19	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
21	Treatment	Waste Management Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	N/A
22	Treatment	ERM Fish Fence	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	N/A
23	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	15
24	ZOI/Ladder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	0	1
25	ZOI	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
26	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
28	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
29	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
30	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6
31	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
32	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
33	Control	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3	4
34	ZOI/Ladder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
35	Treatment	Road Crossing Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
36	Control	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
37	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
39	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
40	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
41	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	2
42	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
43	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
44	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
45	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
46	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
47	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	2
48	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
49	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
50	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0

Appendix 3.7-1: Summary of Wolverine Camera Events for ZOI Analysis, June 2016 to September 2022

Camera No	Camera Type	Species Specific Monitoring Objective	2020												2021												2022									Total 2016-2021	Total by Camera
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept		
51	Treatment	TIA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
52	Treatment	TIA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
53	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
54	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
55	ZOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
56	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
57	ZOI	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	2
58	Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	1	-	-	16	18
59	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
60	Treatment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
		Total	**NA**	**0**	**1**	**3**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**NA**	**NA**	**0**	**1**	**0**	**0**	**2**	**1**	**1**	**0**	**1**	**0**	**NA**	**NA**	**0**	**2**	**1**	**2**	**1**	**1**	**1**	**0**	**92**	**100**

Notes:
No new wolverine camera events were recorded for the annual 2020 period.
Shaded columns (December and January) were not included in analysis due to low effort.
Shaded rows (Cameras 18, 21, and 22) were not included in analysis because they monitor facilities which may attract wolverines.

APPENDIX 3.7-2 WOLVERINE OBSERVATIONS FROM THE WILDLIFE SIGHTINGS LOG CORRECTED FOR PERSONNEL, HOPE BAY PROJECT, 2009 TO 2022

Appendix 3.7-2: Wolverine Observations from
the Wildlife Sightings Log Corrected for Personnel, Hope Bay Project, 2009 to 2022

Year	Month	Number of Observations from Raw Data		Monthly Average of Personnel on Site	Number of Observations per Personnel	
		No. Individuals	No. Records		No. Individuals	No. Records
2009	Feb	1	1	84	0.012	0.012
	May	1	1	102	0.01	0.01
	Aug	1	1	109	0.009	0.009
2010	Mar	1	1	131	0.008	0.008
	Apr	1	1	172	0.006	0.006
2011	Jan	1	1	214	0.005	0.005
	Feb	2	2	250	0.008	0.008
	Apr	2	2	278	0.007	0.007
	May	3	3	274	0.011	0.011
	Jun	1	1	280	0.004	0.004
	Aug	2	2	277	0.007	0.007
	Nov	1	1	252	0.004	0.004
	Dec	1	1	Unknown	-	-
2012	Feb	2	2	193	0.01	0.01
	Mar	1	1	180	0.006	0.006
	Apr	2	2	127	0.016	0.016
	May	3	3	90	0.033	0.033
2013	May	2	2	20	0.099	0.099
	Nov	2	2	19	0.105	0.105
2014	Feb	1	1	7	0.143	0.143
	May	1	1	63	0.016	0.016
2015	Jan	1	1	13	0.075	0.075
	Feb	1	1	16	0.062	0.062
	Mar	1	1	30	0.033	0.033
	May	2	2	32	0.063	0.063
	Jul	1	1	46	0.022	0.022
	Aug	1	1	84	0.012	0.012
	Oct	2	1	114	0.018	0.009
	Dec	1	1	89	0.011	0.011
2016	Feb	1	1	73	0.01	0.01
	Mar	2	2	78	0.03	0.03
	Nov	1	1	172	0.01	0.01
2017	Mar	1	1	176	0.006	0.006
	Apr	1	1	173	0.006	0.006
	Sep	1	1	179	0.006	0.006
	Dec	2	2	179	0.011	0.011
2018	Jan	1	1	202	0.005	0.005
	Feb	1	1	261	0.004	0.004
	Oct	1	1	266	0.004	0.004
	Dec	1	1	272	0.004	0.004

Appendix 3.7-2: Wolverine Observations from the Wildlife Sightings Log Corrected for Personnel, Hope Bay Project, 2009 to 2022

Year	Month	Number of Observations from Raw Data		Monthly Average of Personnel on Site	Number of Observations per Personnel	
		No. Individuals	No. Records		No. Individuals	No. Records
2019	Apr	1	1	291	0	0
	Jul	6	4	304	0.02	0.01
	Sep	1	1	293	0	0
	Oct	1	1	306	0	0
2020	-	0	0	-	0	0
2021	May	1	1	176	0.01	0.01
	Aug	1	1	230	0	0
	Sep	1	1	240	0	0
	Oct	1	1	89	0.01	0.01
2022	*No incidental sightings of wolverine in 2022*					

APPENDIX 3.9-1 PRISM PLOT LOCATIONS AND HABITAT DATA, 2022

Appendix 3.9-1: PRISM Plot Locations and Habitat Data, 2022

PRISM Plot ID	Date	Start Time	End Time	UTM Corner	Zone	Easting	Northing	Survey Conditions			
								Temp	Cloud Cover (%)	Wind Beaufort	Noise
HOB-018	30-Jun-22	11:30:00	13:00:00	NW	13 W	427744	7554255	13	Mainly Clear	4	Slight
HOB-002	30-Jun-22	14:00:00	15:10:00	NW	13 W	425645	7553454	14	Mainly Clear	3	Slight
HOB-016	2-Jul-22	7:15:00	9:00:00	-	13 W	425266	7545467	7	Cloudy	1	None
HOB-004	2-Jul-22	10:20:00	11:40:00	SW	13 W	438544	7523453	8	Cloudy	1	None
HOB-001	2-Jul-22	13:10:00	14:10:00	SE	13 W	451744	7565854	8	Cloudy	2	None
HOB-010	3-Jul-22	7:40:00	9:10:00	-	13 W	451145	7509055	8	Mostly Cloudy	0	None
HOB-003	3-Jul-22	10:00:00	12:00:00	SE	13 W	451445	7509453	10	Mostly Cloudy	0	None
HOB-011	3-Jul-22	13:25:00	14:30:00	-	13 W	430145	7506255	15	Mainly Clear	1	None
HOB-012	4-Jul-22	8:25:00	9:35:00	SE	13 W	442745	7499055	14	Mainly Clear	1	None
HOB-013	4-Jul-22	10:05:00	11:25:00	SE	13 W	444545	7494655	17	Mainly Clear	1	None
HOB-014	5-Jul-22	7:55:00	9:15:00	SW	13 W	424144	7485855	17	Mainly Clear	0	None
HOB-006	5-Jul-22	11:25:00	12:35:00	NE	13 W	440945	7488656	20	Mainly Clear	0	None

Appendix 3.9-1: PRISM Plot Locations and Habitat Data, 2022

PRISM Plot ID	Detailed Habitat								
	%Pond	%Lake	%River	%Ocean	%Upland Standing Water	%Upland Barren	%Upland Moss/Lichen	%Upland Graminoid	%Upland Herbs
HOB-018	0	0	5	0	0	20	10	0	15
HOB-002	0	0	0	0	0	7	5	0	15
HOB-016	0	0	2	0	0	50	15	0	0
HOB-004	10	0	0	0	0	0	15	0	15
HOB-001	25	0	0	0	3	35	15	0	2
HOB-010	0	0	3	0	0	5	7	0	7
HOB-003	10	0	0	0	0	0	2	0	5
HOB-011	5	0	0	0	0	20	25	0	15
HOB-012	35	0	0	0	0	10	15	0	10
HOB-013	0	0	0	0	0	20	15	0	15
HOB-014	45	0	0	0	0	2	5	0	5
HOB-006	40	0	0	0	0	5	10	0	5

Appendix 3.9-1: PRISM Plot Locations and Habitat Data, 2022

PRISM Plot ID	Detailed Habitat								
	%Upland Dwarf Shrub Heath	%Upland Other Shrub	%Lowland Standing Water	%Lowland Barren	%Lowland Moss/Lichen	%Lowland Graminoid	%Lowland Herbs	%Lowland Dwarf Shrub Heath	%Lowland Other Shrub
HOB-018	5	25	2	0	0	0	3		15
HOB-002	0	15	3	0	0	0	30	0	25
HOB-016	7	8	0	0	0	0	10	0	8
HOB-004	2	10	3	0	0	5	20	0	20
HOB-001	15	0	0	0	0	0	5	0	0
HOB-010	5	0	8	0	10	0	40	15	0
HOB-003	3	0	15	0	5	5	50	5	0
HOB-011	25	0	4	0	0	0	6	0	0
HOB-012	15	0	5	0	0	0	10	0	0
HOB-013	20	0	5	0	0	0	15	10	0
HOB-014	5	0	0	2	0	0	30	3	3
HOB-006	10	0	0	5	0	0	25	0	0

Appendix 3.9-1: PRISM Plot Locations and Habitat Data, 2022

PRISM Plot ID	Comments
HOB-018	Rocky upland with low shrub dominating, small creek with lowland shrub had most pf the bird presence
HOB-002	Flat tussocky in S and W, upland dry in NE
HOB-016	Rocky hills through plot, low wet with creek in NE. small lake on N end of plot.
HOB-004	Ponds all around
HOB-001	
HOB-010	
HOB-003	
HOB-011	Mostly boulders with moss and low shrub cover
HOB-012	Pond in middle of plot
HOB-013	
HOB-014	Pond in middle of plot and others nearby. Extensive goose activity.
HOB-006	Pond in center / W side of plot

APPENDIX 3.9-2 BIRD OBSERVATION DATA FOR PRISM PLOT SURVEYS, 2022

Appendix 3.9-2: Bird Observation Data for PRISM Plot Surveys, 2022

Plot Name	Date	Species	Scientific Name	Incidental?	Number Solo Males	Number Solo Females	Number Pairs	Number Unknown	Number Young	Male Cue	Female Cue	Unknown Cue	Pair Cue
HOB-012	4-Jul-22	AGWT - Green-winged Teal	*Anas crecca*	No	0	1	0	0			Visual		
HOB-003	3-Jul-22	AMGP - American Golden-Plover	*Pluvialis dominica*	No	1	0	0	0		Visual			
HOB-012	4-Jul-22	AMGP - American Golden-Plover	*Pluvialis dominica*	Yes	1	0	0	0		Visual			
HOB-018	30-Jun-22	AMPI - American Pipit	*Anthus rubescens*	Yes	0	0	0	1				Flyover	
HOB-018	30-Jun-22	ATSP - American Tree Sparrow	*Spizella arborea*	No	2	0	0	0		Singing			
HOB-018	30-Jun-22	ATSP - American Tree Sparrow	*Spizella arborea*	Yes	0	0	0	0		Singing			
HOB-016	2-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	No	2	0	2	0		Singing			Flushed
HOB-004	2-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	No	0	0	0	2				Food_carry,Visual	
HOB-010	3-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	Yes	1	0	0	0		Singing			
HOB-013	4-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	No	1	0	0	0		Singing			
HOB-014	17-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	Yes	1	0	0	0		Singing			
HOB-004	2-Jul-22	CAGO - Canada Goose	*Branta canadensis*	Yes	0	0	0	2					
HOB-010	3-Jul-22	CAGO - Canada Goose	*Branta canadensis*	Yes	0	0	0	6					Flyover
HOB-003	3-Jul-22	CAGO - Canada Goose	*Branta canadensis*	Yes	0	0	0	29				Flyover	
HOB-012	4-Jul-22	CAGO - Canada Goose	*Branta canadensis*	No	0	0	0	6				Visual,Flyover	
HOB-013	4-Jul-22	CAGO - Canada Goose	*Branta canadensis*	Yes	0	0	0	5				Flyover	
HOB-014	15-Jul-22	CAGO - Canada Goose	*Branta canadensis*	Yes	0	0	0	2				Visual,Flyover	
HOB-006	24-Jul-22	CAGO - Canada Goose	*Branta canadensis*	Yes	0	0	0	50				Visual	
HOB-016	2-Jul-22	COLO - Common Loon	*Gavia immer*	Yes	0	0	0	1				Visual,Flyover	
HOB-001	2-Jul-22	COLO - Common Loon	*Gavia immer*	Yes	0	0	0	1				Calling	
HOB-018	30-Jun-22	CORE - Common Redpoll	*Acanthis flammea*	No	0	0	0	1		Flushed			
HOB-018	30-Jun-22	CORE - Common Redpoll	*Acanthis flammea*	Yes	0	0	0	2				Flushed	
HOB-016	2-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No	0	0	0	6				Calling,Flyover,Visual	
HOB-004	2-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No	0	0	0	6				Calling,Visual	
HOB-010	3-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No	0	0	0	3				Calling,Flyover	
HOB-003	3-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No	0	0	0	3				Calling	
HOB-011	3-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No	0	0	0	3				Calling,Flyover	
HOB-013	4-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No	0	0	0	2				Visual,Calling	
HOB-014	12-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No	0	0	0	5				Flyover,Calling	
HOB-003	3-Jul-22	DUNL - Dunlin	*Calidris alpina*	No	0	1	0	0	3		Territorial,Visual		
HOB-004	2-Jul-22	GRSC - Greater Scaup	*Aythya marila*	No	0	0	1	0			Visual		Flyover
HOB-001	2-Jul-22	GRSC - Greater Scaup	*Aythya marila*	No	0	1	0	0			Visual		
HOB-012	4-Jul-22	GRSC - Greater Scaup	*Aythya marila*	No	1	0	1	0		Visual			Visual
HOB-010	3-Jul-22	GWFG - Greater White-fronted	*Anser albifrons*	Yes	0	0	0	3		Flyover			
HOB-003	3-Jul-22	GWFG - Greater White-fronted	*Anser albifrons*	Yes	0	0	0	3				Flyover,Visual	
HOB-016	2-Jul-22	HASP - Harris's Sparrow	*Zonotrichia querula*	Yes	1	0	0	0		Singing			
HOB-018	30-Jun-22	HEGU - Herring Gull	*Larus argentatus*	Yes	0	0	1	0					Resting
HOB-004	2-Jul-22	HEGU - Herring Gull	*Larus argentatus*	Yes	0	0	0	2				Visual,Flyover	
HOB-003	3-Jul-22	HEGU - Herring Gull	*Larus argentatus*	No	0	0	0	2				Visual,Flyover	
HOB-014	14-Jul-22	HEGU - Herring Gull	*Larus argentatus*	Yes	0	0	0	1				Visual,Flyover	
HOB-018	30-Jun-22	HOLA - Horned Lark	*Eremophila alpestris*	No	0	0	0	1				Flushed	
HOB-018	30-Jun-22	HOLA - Horned Lark	*Eremophila alpestris*	No	0	0	0	1				Flushed	
HOB-001	2-Jul-22	HOLA - Horned Lark	*Eremophila alpestris*	No	1	0	1	0		Singing			Visual,Food_carry
HOB-012	4-Jul-22	HOLA - Horned Lark	*Eremophila alpestris*	No	0	0	3	1					Calling,Visual
HOB-013	4-Jul-22	HOLA - Horned Lark	*Eremophila alpestris*	No	1	0	1	0	1	Calling,Singing,Territorial,Visual			Calling,Visual,Territorial
HOB-016	2-Jul-22	HORE - Hoary Redpoll	*Acanthis hornemanni*	No	1	0	0	0		Calling,Visual,Resting			
HOB-002	30-Jun-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	1	1	2	0		Visual	Calling,Visual		Visual,Calling
HOB-016	2-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	0	0	1	0					Calling,Territorial
HOB-004	2-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	0	0	2	0					Calling,Visual
HOB-001	2-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	4	0	1	2		Visual,Calling		Calling	Calling,Territorial
HOB-010	3-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	1	0	0	2		Calling		Calling	
HOB-003	3-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	0	0	3	0		Food_carry			Calling,Food_carry,Territo
HOB-011	3-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	1	1	0	3		Visual,Calling	Visual,Calling	Calling	
HOB-011	3-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	Yes	1	0	0	0		Visual,Calling			

Appendix 3.9-2: Bird Observation Data for PRISM Plot Surveys, 2022

Plot Name	Date	Species	Scientific Name	Nest Indication?	Nest In Plot?	Nest Stage	Nestling Age	Nest Substrate	Percent Nest Cover	Comments
HOB-012	4-Jul-22	AGWT - Green-winged Teal	*Anas crecca*	No						
HOB-003	3-Jul-22	AMGP - American Golden-Plover	*Pluvialis dominica*	No						
HOB-012	4-Jul-22	AMGP - American Golden-Plover	*Pluvialis dominica*	No						
HOB-018	30-Jun-22	AMPI - American Pipit	*Anthus rubescens*	No						
HOB-018	30-Jun-22	ATSP - American Tree Sparrow	*Spizella arborea*	No						
HOB-018	30-Jun-22	ATSP - American Tree Sparrow	*Spizella arborea*	No						
HOB-016	2-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	Yes	Yes	Incubating		In shrub	100	
HOB-004	2-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	Yes	Yes	Nestlings				
HOB-010	3-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	No						
HOB-013	4-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	No						
HOB-014	17-Jul-22	ATSP - American Tree Sparrow	*Spizella arborea*	No						
HOB-004	2-Jul-22	CAGO - Canada Goose	*Branta canadensis*	No						
HOB-010	3-Jul-22	CAGO - Canada Goose	*Branta canadensis*	No						
HOB-003	3-Jul-22	CAGO - Canada Goose	*Branta canadensis*	No						
HOB-012	4-Jul-22	CAGO - Canada Goose	*Branta canadensis*	No						
HOB-013	4-Jul-22	CAGO - Canada Goose	*Branta canadensis*	No						
HOB-014	15-Jul-22	CAGO - Canada Goose	*Branta canadensis*	No						
HOB-006	24-Jul-22	CAGO - Canada Goose	*Branta canadensis*	No						Flock on pond N of site, unsure total, but minimum 50
HOB-016	2-Jul-22	COLO - Common Loon	*Gavia immer*	No						
HOB-001	2-Jul-22	COLO - Common Loon	*Gavia immer*	No						
HOB-018	30-Jun-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-018	30-Jun-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-016	2-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-004	2-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-010	3-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-003	3-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-011	3-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-013	4-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-014	12-Jul-22	CORE - Common Redpoll	*Acanthis flammea*	No						
HOB-003	3-Jul-22	DUNL - Dunlin	*Calidris alpina*	Yes	Yes	Nestlings	3	Grasses		
HOB-004	2-Jul-22	GRSC - Greater Scaup	*Aythya marila*	No						
HOB-001	2-Jul-22	GRSC - Greater Scaup	*Aythya marila*	No						
HOB-012	4-Jul-22	GRSC - Greater Scaup	*Aythya marila*	No						
HOB-010	3-Jul-22	GWFG - Greater White-fronted	*Anser albifrons*	No						
HOB-003	3-Jul-22	GWFG - Greater White-fronted	*Anser albifrons*	No						
HOB-016	2-Jul-22	HASP - Harris's Sparrow	*Zonotrichia querula*	No						
HOB-018	30-Jun-22	HEGU - Herring Gull	*Larus argentatus*	No						
HOB-004	2-Jul-22	HEGU - Herring Gull	*Larus argentatus*	No						
HOB-003	3-Jul-22	HEGU - Herring Gull	*Larus argentatus*	No						
HOB-014	14-Jul-22	HEGU - Herring Gull	*Larus argentatus*	No						
HOB-018	30-Jun-22	HOLA - Horned Lark	*Eremophila alpestris*	No						
HOB-018	30-Jun-22	HOLA - Horned Lark	*Eremophila alpestris*	No						
HOB-001	2-Jul-22	HOLA - Horned Lark	*Eremophila alpestris*	Yes	Yes	Nestlings				
HOB-012	4-Jul-22	HOLA - Horned Lark	*Eremophila alpestris*	No						
HOB-013	4-Jul-22	HOLA - Horned Lark	*Eremophila alpestris*	No						
HOB-016	2-Jul-22	HORE - Hoary Redpoll	*Acanthis hornemanni*	No						
HOB-002	30-Jun-22	LALO - Lapland Longspur	*Calcarius lapponicus*	Yes	Yes			In shrub		Female flushed and called repeatedly, nest not located
HOB-016	2-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	Yes	Yes					
HOB-004	2-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No						
HOB-001	2-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No						
HOB-010	3-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No						
HOB-003	3-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	Yes	No	Nestlings	2	Grasses	80	
HOB-011	3-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No						
HOB-011	3-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No						

Appendix 3.9-2: Bird Observation Data for PRISM Plot Surveys, 2022

Plot Name	Date	Species	Scientific Name	Incidental?	Number Solo Males	Number Solo Females	Number Pairs	Number Unknown	Number Young	Male Cue	Female Cue	Unknown Cue	Pair Cue
HOB-012	4-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	1	0	4	0		Visual,Calling			Calling,Visual
HOB-013	4-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	2	1	5	0	1	Calling,Territorial,Visual,Food_carry	Calling,Food_carry,Territorial,Visua		Calling,Molting,Territorial,
HOB-014	6-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	1	1	3	0		Visual,Flyover,Calling	Visual,Calling	Calling,Food_carry,Visual	
HOB-006	18-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No	2	0	5	0	1	Calling,Territorial,Visual			
HOB-004	2-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No	0	0	0	1				Calling,Visual	
HOB-010	3-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No	0	0	3	3	1			Calling,Territorial,Flyover	Calling,Territorial,Flyover
HOB-003	3-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No	0	0	0	3				Calling,Visual,Flyover	
HOB-012	4-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No	0	0	2	3				Visual,Calling	Territorial,Calling,Visual
HOB-014	7-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No	0	0	0	1				Calling	
HOB-006	21-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No	0	0	0	2				Visual,Calling	
HOB-016	2-Jul-22	LTDU - Long-tailed duck	*Clangula hyemalis*	Yes	1	0	2	0		Visual	Visual		
HOB-001	2-Jul-22	LTDU - Long-tailed duck	*Clangula hyemalis*	No	1	2	0	0		Calling,Visual	Calling,Visual		
HOB-011	3-Jul-22	LTDU - Long-tailed duck	*Clangula hyemalis*	No	1	0	0	0		Visual,Flyover,Calling			
HOB-014	9-Jul-22	LTDU - Long-tailed duck	*Clangula hyemalis*	No	0	1	0	0			Calling,Territorial,Visual		
HOB-004	2-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	Yes	0	0	1	1					
HOB-011	3-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	Yes	0	0	1	0					Calling,Visual
HOB-013	4-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	Yes	0	0	0	1				Visual	
HOB-014	10-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	No	0	0	0	1				Visual,Flyover	
HOB-014	13-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	Yes	0	0	1	0					Visual
HOB-006	22-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	No	0	0	0	1				Visual	
HOB-003	3-Jul-22	PESA - Pectoral Sandpiper	*Calidris melanotos*	No	0	0	1	1	2			Territorial,Visual	Territorial,Visual
HOB-016	2-Jul-22	RBME - Red-breasted Merganser	*Mergus serrator*	Yes	5	2	0	0		Flyover,Visual	Flyover,Visual		
HOB-004	2-Jul-22	RBME - Red-breasted Merganser	*Mergus serrator*	Yes	1	0	0	0		Visual			
HOB-014	11-Jul-22	RBME - Red-breasted Merganser	*Mergus serrator*	No	0	1	0	0			Calling,Visual,Flyover		
HOB-003	3-Jul-22	RNPH - Red-necked Phalarope	*Phalaropus fulicarius*	No	2	0	0	0		Visual			
HOB-012	4-Jul-22	RNPH - Red-necked Phalarope	*Phalaropus fulicarius*	No	0	0	1	0					Aggression,Calling,Visual,
HOB-001	2-Jul-22	RTLO - Red-throated Loon	*Gavia stellata*	Yes	0	0	0	1				Calling	
HOB-018	30-Jun-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	1	0	0	0		Singing			
HOB-018	30-Jun-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	Yes	1	0	0	0		Singing			
HOB-002	30-Jun-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	1	0	0	1		Singing		Calling	
HOB-016	2-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	2	0	1	0		Singing,Visual			Visual,Calling
HOB-004	2-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	1	0	2	2		Singing		Visual,Calling	Visual,Territorial
HOB-001	2-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	1	0	0	0		Singing			
HOB-010	3-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	4	0	2	2		Singing,Territorial		Calling,Territorial	Calling,Territorial
HOB-003	3-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	2	0	1	0		Singing			Territorial
HOB-011	3-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	1	0	0	0		Visual,Singing			
HOB-012	4-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	1	0	1	0		Singing,Visual			Visual,Calling
HOB-013	4-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	0	0	0	1				Calling	
HOB-014	5-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	0	0	3	0					Calling,Singing,Territorial,
HOB-006	20-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No	0	0	0	2				Visual,Calling	
HOB-003	3-Jul-22	SESA - Semipalmated Sandpiper	*Calidris pusilla*	Yes	0	0	0	1				Visual	
HOB-014	8-Jul-22	SESA - Semipalmated Sandpiper	*Calidris pusilla*	No	0	0	1	0					Territorial,Visual,Calling
HOB-006	19-Jul-22	SESA - Semipalmated Sandpiper	*Calidris pusilla*	No	0	0	0	1				Calling,Visual	
HOB-004	2-Jul-22	TUSW - Tundra Swan	*Cygnus columbianus*	Yes	0	0	1	0					Visual
HOB-016	2-Jul-22	UNKN - Unidentified Bird	-	No	0	0	0	0					
HOB-001	2-Jul-22	UNKN - Unidentified Bird	-	No	0	0	0	0					
HOB-018	30-Jun-22	WCSP - White-crowned Sparrow	*Zonotrichia leucophrys*	No	1	0	2	0		Singing,Foraging	Calling,Foraging		
HOB-016	2-Jul-22	WCSP - White-crowned Sparrow	*Zonotrichia leucophrys*	No	3	0	0	0		Singing			
HOB-014	16-Jul-22	WCSP - White-crowned Sparrow	*Zonotrichia leucophrys*	Yes	1	0	0	0		Singing			
HOB-004	2-Jul-22	WIPT - Willow Ptarmigan	Lagopus lagopus	No	1	0	0	0		Calling,Flushed,Visual			
HOB-010	3-Jul-22	WIPT - Willow Ptarmigan	*Lagopus lagopus*	No	1	0	0	0		Visual			
HOB-006	23-Jul-22	WIPT - Willow Ptarmigan	*Lagopus lagopus*	No	0	1	0	0	5		Visual,Territorial		

Appendix 3.9-2: Bird Observation Data for PRISM Plot Surveys, 2022

Plot Name	Date	Species	Scientific Name	Nest Indication?	Nest In Plot?	Nest Stage	Nestling Age	Nest Substrate	Percent Nest Cover	Comments
HOB-012	4-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	No						
HOB-013	4-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	Yes	Yes					2 males seen carrying food, one nestling flushed
HOB-014	6-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	Yes	Yes					
HOB-006	18-Jul-22	LALO - Lapland Longspur	*Calcarius lapponicus*	Yes	Yes	Fledged				
HOB-004	2-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No						
HOB-010	3-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	Yes	Yes					
HOB-003	3-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No						
HOB-012	4-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No						
HOB-014	7-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No						
HOB-006	21-Jul-22	LESA - Least Sandpiper	*Calidris minutilla*	No						
HOB-016	2-Jul-22	LTDU - Long-tailed duck	*Clangula hyemalis*	No						
HOB-001	2-Jul-22	LTDU - Long-tailed duck	*Clangula hyemalis*	No						
HOB-011	3-Jul-22	LTDU - Long-tailed duck	*Clangula hyemalis*	No						
HOB-014	9-Jul-22	LTDU - Long-tailed duck	*Clangula hyemalis*	Yes	Yes					
HOB-004	2-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	No						
HOB-011	3-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	No						
HOB-013	4-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	No						
HOB-014	10-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	No						
HOB-014	13-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	No						
HOB-006	22-Jul-22	PALO - Pacific Loon	*Gavia pacifica*	No						
HOB-003	3-Jul-22	PESA - Pectoral Sandpiper	*Calidris melanotos*	Yes	Yes	Nestlings	4		0	Some nestlings walking
HOB-016	2-Jul-22	RBME - Red-breasted Merganser	*Mergus serrator*	No						
HOB-004	2-Jul-22	RBME - Red-breasted Merganser	*Mergus serrator*	No						
HOB-014	11-Jul-22	RBME - Red-breasted Merganser	*Mergus serrator*	No						
HOB-003	3-Jul-22	RNPH - Red-necked Phalarope	*Phalaropus fulicarius*	No						
HOB-012	4-Jul-22	RNPH - Red-necked Phalarope	*Phalaropus fulicarius*	Yes	Yes					
HOB-001	2-Jul-22	RTLO - Red-throated Loon	*Gavia stellata*	No						
HOB-018	30-Jun-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-018	30-Jun-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-002	30-Jun-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-016	2-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-004	2-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	Yes	Yes					
HOB-001	2-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-010	3-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	Yes	Yes					
HOB-003	3-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-011	3-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-012	4-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	Yes	Yes	Nestlings		Grasses		
HOB-013	4-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-014	5-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	Yes	Yes					
HOB-006	20-Jul-22	SAVS - Savannah Sparrow	*Passerculus sandwichensis*	No						
HOB-003	3-Jul-22	SESA - Semipalmated Sandpiper	*Calidris pusilla*	No						
HOB-014	8-Jul-22	SESA - Semipalmated Sandpiper	*Calidris pusilla*	Yes	Yes					
HOB-006	19-Jul-22	SESA - Semipalmated Sandpiper	*Calidris pusilla*	No						
HOB-004	2-Jul-22	TUSW - Tundra Swan	*Cygnus columbianus*	No						
HOB-016	2-Jul-22	UNKN - Unidentified Bird	-	Yes	Yes	Abandoned		In shrub	0	Nest in willow, damp abandoned.
HOB-001	2-Jul-22	UNKN - Unidentified Bird	-	Yes	Yes	Abandoned		In shrub	10	Unsure if empty or abandoned. Fur lined.
HOB-018	30-Jun-22	WCSP - White-crowned Sparrow	*Zonotrichia leucophrys*	No						
HOB-016	2-Jul-22	WCSP - White-crowned Sparrow	*Zonotrichia leucophrys*	Yes	Yes					Adult seen with insect
HOB-014	16-Jul-22	WCSP - White-crowned Sparrow	*Zonotrichia leucophrys*	No						
HOB-004	2-Jul-22	WIPT - Willow Ptarmigan	Lagopus lagopus	No						
HOB-010	3-Jul-22	WIPT - Willow Ptarmigan	*Lagopus lagopus*	No						
HOB-006	23-Jul-22	WIPT - Willow Ptarmigan	*Lagopus lagopus*	Yes	No					

APPENDIX 3.10-1 WATER QUALITY DATA AT THE TIA IN 2022 FOR PARAMETERS WITH GUIDELINES RELEVANT TO WILDLIFE

Appendix 3.10-1: Water Quality Data at the TIA in 2022 for Parameters with Guidelines Relevant to Wildlife

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Arsenic (As)-Total	mg/L	T	TL1	1/3/2022	0.00315	0.025
Arsenic (As)-Total	mg/L	T	TL1	1/4/2022	0.0029	0.025
Arsenic (As)-Total	mg/L	T	TL1	1/13/2022	0.00277	0.025
Arsenic (As)-Total	mg/L	T	TL1	1/18/2022	0.00304	0.025
Arsenic (As)-Total	mg/L	T	TL1	1/24/2022	0.00263	0.025
Arsenic (As)-Total	mg/L	T	TL1	2/3/2022	0.00288	0.025
Arsenic (As)-Total	mg/L	T	TL1	2/8/2022	0.00279	0.025
Arsenic (As)-Total	mg/L	T	TL1	2/15/2022	0.00302	0.025
Arsenic (As)-Total	mg/L	T	TL1	2/22/2022	0.00326	0.025
Arsenic (As)-Total	mg/L	T	TL1	3/1/2022	0.00315	0.025
Arsenic (As)-Total	mg/L	T	TL1	3/8/2022	0.00275	0.025
Arsenic (As)-Total	mg/L	T	TL1	3/12/2022	0.00286	0.025
Arsenic (As)-Total	ug/L	T	TL1	4/14/2022	2.14	0.025
Arsenic (As)-Total	mg/L	T	TL1	4/20/2022	0.00346	0.025
Arsenic (As)-Total	mg/L	T	TL1	6/28/2022	0.00287	0.025
Arsenic (As)-Total	mg/L	T	TL1	6/30/2022	< 0.00010	0.025
Arsenic (As)-Total	mg/L	T	TL1	7/5/2022	0.00307	0.025
Arsenic (As)-Total	mg/L	T	TL1	7/7/2022	0.00233	0.025
Arsenic (As)-Total	mg/L	T	TL1	7/12/2022	0.00297	0.025
Arsenic (As)-Total	mg/L	T	TL1	7/16/2022	0.00186	0.025
Arsenic (As)-Total	mg/L	T	TL1	7/19/2022	0.00284	0.025
Arsenic (As)-Total	mg/L	T	TL1	7/26/2022	0.00213	0.025
Arsenic (As)-Total	mg/L	T	TL1	7/27/2022	0.00291	0.025
Arsenic (As)-Total	mg/L	T	TL1	8/2/2022	0.00229	0.025
Arsenic (As)-Total	mg/L	T	TL1	8/9/2022	0.00261	0.025
Arsenic (As)-Total	mg/L	T	TL1	8/10/2022	0.00870	0.025
Arsenic (As)-Total	mg/L	T	TL1	8/17/2022	0.00280	0.025
Arsenic (As)-Total	mg/L	T	TL1	8/23/2022	0.00308	0.025
Arsenic (As)-Total	mg/L	T	TL1	9/6/2022	0.00291	0.025
Arsenic (As)-Total	mg/L	T	TL1	9/13/2022	0.00251	0.025
Arsenic (As)-Total	mg/L	T	TL1	9/15/2022	0.00257	0.025
Arsenic (As)-Total	mg/L	T	TL1	9/20/2022	0.0211	0.025

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Arsenic (As)-Total	mg/L	T	TL1	9/27/2022	0.0118	0.025
Arsenic (As)-Total	mg/L	T	TL1	10/4/2022	0.00290	0.025
Arsenic (As)-Total	mg/L	T	TL1	10/11/2022	0.00442	0.025
Arsenic (As)-Total	mg/L	T	TL1	10/18/2022	0.00311	0.025
Arsenic (As)-Total	mg/L	T	TL1	10/25/2022	0.00281	0.025
Arsenic (As)-Total	mg/L	T	TL1	11/1/2022	0.00313	0.025
Arsenic (As)-Total	mg/L	T	TL1	11/8/2022	0.00300	0.025
Arsenic (As)-Total	mg/L	T	TL1	11/15/2022	0.00297	0.025
Arsenic (As)-Total	mg/L	T	TL1	11/22/2022	0.00294	0.025
Arsenic (As)-Total	mg/L	T	TL1	11/29/2022	0.00309	0.025
Arsenic (As)-Total	mg/L	T	TL1	12/6/2022	0.00300	0.025
Arsenic (As)-Total	mg/L	T	TL1	12/13/2022	0.00293	0.025
Arsenic (As)-Total	mg/L	T	TL1	12/27/2022	0.00279	0.025
Cadmium (Cd)-Total	mg/L	T	TL1	1/3/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	1/4/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	1/13/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	1/18/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	1/24/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	2/3/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	2/8/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	2/15/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	2/22/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	3/1/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	3/8/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	3/12/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	ug/L	T	TL1	4/14/2022	0.075	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	4/20/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	6/28/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	6/30/2022	0.0000076	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	7/5/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	7/7/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	7/12/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	7/16/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	7/19/2022	< 0.0000500	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	7/26/2022	< 0.0000250	0.08

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Cadmium (Cd)-Total	mg/L	T	TL1	7/27/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	8/2/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	8/9/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	8/10/2022	< 0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	8/17/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	8/23/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	9/6/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	9/13/2022	0.0000254	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	9/15/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	9/20/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	9/27/2022	0.0000391	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	10/4/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	10/11/2022	0.0000255	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	10/18/2022	0.0000356	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	10/25/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	11/1/2022	0.0000252	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	11/8/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	11/15/2022	0.0000262	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	11/22/2022	0.0000191	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	11/29/2022	0.0000257	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	12/6/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	12/13/2022	<0.0000250	0.08
Cadmium (Cd)-Total	mg/L	T	TL1	12/27/2022	0.0000272	0.08
Copper (Cu)-Total	mg/L	T	TL1	1/3/2022	0.0639	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	1/4/2022	0.0569	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	1/13/2022	0.0606	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	1/18/2022	0.0652	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	1/24/2022	0.0622	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	2/3/2022	0.0701	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	2/8/2022	0.0625	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	2/15/2022	0.0602	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	2/22/2022	0.0683	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	3/1/2022	0.0639	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	3/8/2022	0.0561	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	3/12/2022	0.0536	5.000[b]

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Copper (Cu)-Total	ug/L	T	TL1	4/14/2022	4.8	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	4/20/2022	0.0767	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	6/28/2022	0.0612	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	6/30/2022	0.0412	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	7/5/2022	0.0623	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	7/7/2022	0.0491	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	7/12/2022	0.0604	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	7/16/2022	0.0330	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	7/19/2022	0.0573	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	7/26/2022	0.0323	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	7/27/2022	0.0456	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	8/2/2022	0.0351	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	8/9/2022	0.0374	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	8/10/2022	0.0353	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	8/17/2022	0.0332	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	8/23/2022	0.0306	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	9/6/2022	0.0270	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	9/13/2022	0.0239	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	9/15/2022	0.0238	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	9/20/2022	0.0236	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	9/27/2022	0.0322	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	10/4/2022	0.0265	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	10/11/2022	0.0235	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	10/18/2022	0.0242	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	10/25/2022	0.0225	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	11/1/2022	0.0238	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	11/8/2022	0.0239	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	11/15/2022	0.0238	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	11/22/2022	0.0222	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	11/29/2022	0.0235	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	12/6/2022	0.0245	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	12/13/2022	0.0223	5.000[b]
Copper (Cu)-Total	mg/L	T	TL1	12/27/2022	0.0234	5.000[b]
Lead (Pb)-Total	mg/L	T	TL1	1/3/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	1/4/2022	< 0.000250	0.1

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Lead (Pb)-Total	mg/L	T	TL1	1/13/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	1/18/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	1/24/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	2/3/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	2/8/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	2/15/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	2/22/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	3/1/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	3/8/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	3/12/2022	< 0.000500	0.1
Lead (Pb)-Total	ug/L	T	TL1	4/14/2022	< 1.0	0.1
Lead (Pb)-Total	mg/L	T	TL1	4/20/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	6/28/2022	0.00278	0.1
Lead (Pb)-Total	mg/L	T	TL1	6/30/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	7/5/2022	0.000844	0.1
Lead (Pb)-Total	mg/L	T	TL1	7/7/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	7/12/2022	0.000767	0.1
Lead (Pb)-Total	mg/L	T	TL1	7/16/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	7/19/2022	< 0.000500	0.1
Lead (Pb)-Total	mg/L	T	TL1	7/26/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	7/27/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	8/2/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	8/9/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	8/10/2022	< 0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	8/17/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	8/23/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	9/6/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	9/13/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	9/15/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	9/20/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	9/27/2022	0.000496	0.1
Lead (Pb)-Total	mg/L	T	TL1	10/4/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	10/11/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	10/18/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	10/25/2022	<0.000250	0.1

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Lead (Pb)-Total	mg/L	T	TL1	11/1/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	11/8/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	11/15/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	11/22/2022	0.000076	0.1
Lead (Pb)-Total	mg/L	T	TL1	11/29/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	12/6/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	12/13/2022	<0.000250	0.1
Lead (Pb)-Total	mg/L	T	TL1	12/27/2022	<0.000250	0.1
Mercury (Hg)-Total	mg/L	T	TL1	1/3/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	1/4/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	1/13/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	1/18/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	1/24/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	2/3/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	2/8/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	2/15/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	2/22/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	3/1/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	3/8/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	3/12/2022	< 0.0000050	0.003
Mercury (Hg)-Total	ug/L	T	TL1	4/14/2022	< 0.25	0.003
Mercury (Hg)-Total	mg/L	T	TL1	4/20/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	6/21/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	6/28/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	6/30/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	7/5/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	7/7/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	7/12/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	7/16/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	7/19/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	7/26/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	7/27/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	8/2/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	8/9/2022	< 0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	8/10/2022	< 0.0000050	0.003

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Mercury (Hg)-Total	mg/L	T	TL1	8/17/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	8/23/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	9/6/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	9/13/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	9/15/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	9/20/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	9/27/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	10/4/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	10/11/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	10/18/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	10/25/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	11/1/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	11/8/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	11/15/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	11/22/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	11/29/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	12/6/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	12/13/2022	<0.0000050	0.003
Mercury (Hg)-Total	mg/L	T	TL1	12/27/2022	<0.0000050	0.003
Nickel (Ni)-Total	mg/L	T	TL1	1/3/2022	0.0122	1
Nickel (Ni)-Total	mg/L	T	TL1	1/4/2022	0.0116	1
Nickel (Ni)-Total	mg/L	T	TL1	1/13/2022	0.0114	1
Nickel (Ni)-Total	mg/L	T	TL1	1/18/2022	0.0124	1
Nickel (Ni)-Total	mg/L	T	TL1	1/24/2022	0.0105	1
Nickel (Ni)-Total	mg/L	T	TL1	2/3/2022	0.0131	1
Nickel (Ni)-Total	mg/L	T	TL1	2/8/2022	0.0122	1
Nickel (Ni)-Total	mg/L	T	TL1	2/15/2022	0.0129	1
Nickel (Ni)-Total	mg/L	T	TL1	2/22/2022	0.0126	1
Nickel (Ni)-Total	mg/L	T	TL1	3/1/2022	0.0122	1
Nickel (Ni)-Total	mg/L	T	TL1	3/8/2022	0.013	1
Nickel (Ni)-Total	mg/L	T	TL1	3/12/2022	0.011	1
Nickel (Ni)-Total	ug/L	T	TL1	4/14/2022	< 5.0	1
Nickel (Ni)-Total	mg/L	T	TL1	4/20/2022	0.0143	1
Nickel (Ni)-Total	mg/L	T	TL1	6/28/2022	0.0124	1
Nickel (Ni)-Total	mg/L	T	TL1	6/30/2022	0.0128	1

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Nickel (Ni)-Total	mg/L	T	TL1	7/5/2022	0.0126	1
Nickel (Ni)-Total	mg/L	T	TL1	7/7/2022	0.0128	1
Nickel (Ni)-Total	mg/L	T	TL1	7/12/2022	0.0123	1
Nickel (Ni)-Total	mg/L	T	TL1	7/16/2022	0.00656	1
Nickel (Ni)-Total	mg/L	T	TL1	7/19/2022	0.0119	1
Nickel (Ni)-Total	mg/L	T	TL1	7/26/2022	0.00656	1
Nickel (Ni)-Total	mg/L	T	TL1	7/27/2022	0.00973	1
Nickel (Ni)-Total	mg/L	T	TL1	8/2/2022	0.00779	1
Nickel (Ni)-Total	mg/L	T	TL1	8/9/2022	0.00821	1
Nickel (Ni)-Total	mg/L	T	TL1	8/10/2022	0.0103	1
Nickel (Ni)-Total	mg/L	T	TL1	8/17/2022	0.00858	1
Nickel (Ni)-Total	mg/L	T	TL1	8/23/2022	0.00867	1
Nickel (Ni)-Total	mg/L	T	TL1	9/6/2022	0.00825	1
Nickel (Ni)-Total	mg/L	T	TL1	9/13/2022	0.00784	1
Nickel (Ni)-Total	mg/L	T	TL1	9/15/2022	0.00825	1
Nickel (Ni)-Total	mg/L	T	TL1	9/20/2022	0.0238	1
Nickel (Ni)-Total	mg/L	T	TL1	9/27/2022	0.0135	1
Nickel (Ni)-Total	mg/L	T	TL1	10/4/2022	0.00845	1
Nickel (Ni)-Total	mg/L	T	TL1	10/11/2022	0.00983	1
Nickel (Ni)-Total	mg/L	T	TL1	10/18/2022	0.00885	1
Nickel (Ni)-Total	mg/L	T	TL1	10/25/2022	0.00835	1
Nickel (Ni)-Total	mg/L	T	TL1	11/1/2022	0.00863	1
Nickel (Ni)-Total	mg/L	T	TL1	11/8/2022	0.00901	1
Nickel (Ni)-Total	mg/L	T	TL1	11/15/2022	0.00874	1
Nickel (Ni)-Total	mg/L	T	TL1	11/22/2022	0.00823	1
Nickel (Ni)-Total	mg/L	T	TL1	11/29/2022	0.00868	1
Nickel (Ni)-Total	mg/L	T	TL1	12/6/2022	0.00923	1
Nickel (Ni)-Total	mg/L	T	TL1	12/13/2022	0.00915	1
Nickel (Ni)-Total	mg/L	T	TL1	12/27/2022	0.00870	1
Selenium (Se)-Total	mg/L	T	TL1	1/3/2022	0.000535	0.05
Selenium (Se)-Total	mg/L	T	TL1	1/4/2022	0.000426	0.05
Selenium (Se)-Total	mg/L	T	TL1	1/13/2022	0.000504	0.05
Selenium (Se)-Total	mg/L	T	TL1	1/18/2022	< 0.000500	0.05
Selenium (Se)-Total	mg/L	T	TL1	1/24/2022	0.000479	0.05
Selenium (Se)-Total	mg/L	T	TL1	2/3/2022	0.000384	0.05

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Selenium (Se)-Total	mg/L	T	TL1	2/8/2022	0.000523	0.05
Selenium (Se)-Total	mg/L	T	TL1	2/15/2022	< 0.000500	0.05
Selenium (Se)-Total	mg/L	T	TL1	2/22/2022	< 0.000500	0.05
Selenium (Se)-Total	mg/L	T	TL1	3/1/2022	0.000535	0.05
Selenium (Se)-Total	mg/L	T	TL1	3/8/2022	0.000549	0.05
Selenium (Se)-Total	mg/L	T	TL1	3/12/2022	< 0.000500	0.05
Selenium (Se)-Total	ug/L	T	TL1	4/14/2022	< 0.50	0.05
Selenium (Se)-Total	mg/L	T	TL1	4/20/2022	0.000659	0.05
Selenium (Se)-Total	mg/L	T	TL1	6/28/2022	0.000600	0.05
Selenium (Se)-Total	mg/L	T	TL1	6/30/2022	< 0.000050	0.05
Selenium (Se)-Total	mg/L	T	TL1	7/5/2022	< 0.000500	0.05
Selenium (Se)-Total	mg/L	T	TL1	7/7/2022	0.000370	0.05
Selenium (Se)-Total	mg/L	T	TL1	7/12/2022	0.000521	0.05
Selenium (Se)-Total	mg/L	T	TL1	7/16/2022	< 0.000250	0.05
Selenium (Se)-Total	mg/L	T	TL1	7/19/2022	< 0.000500	0.05
Selenium (Se)-Total	mg/L	T	TL1	7/26/2022	< 0.000250	0.05
Selenium (Se)-Total	mg/L	T	TL1	7/27/2022	0.000391	0.05
Selenium (Se)-Total	mg/L	T	TL1	8/2/2022	0.000308	0.05
Selenium (Se)-Total	mg/L	T	TL1	8/9/2022	< 0.000250	0.05
Selenium (Se)-Total	mg/L	T	TL1	8/10/2022	< 0.000250	0.05
Selenium (Se)-Total	mg/L	T	TL1	8/17/2022	0.000276	0.05
Selenium (Se)-Total	mg/L	T	TL1	8/23/2022	0.000334	0.05
Selenium (Se)-Total	mg/L	T	TL1	9/6/2022	0.000433	0.05
Selenium (Se)-Total	mg/L	T	TL1	9/13/2022	<0.000250	0.05
Selenium (Se)-Total	mg/L	T	TL1	9/15/2022	0.000255	0.05
Selenium (Se)-Total	mg/L	T	TL1	9/20/2022	0.000727	0.05
Selenium (Se)-Total	mg/L	T	TL1	9/27/2022	0.000294	0.05
Selenium (Se)-Total	mg/L	T	TL1	10/4/2022	0.000300	0.05
Selenium (Se)-Total	mg/L	T	TL1	10/11/2022	0.000307	0.05
Selenium (Se)-Total	mg/L	T	TL1	10/18/2022	0.000392	0.05
Selenium (Se)-Total	mg/L	T	TL1	10/25/2022	0.000435	0.05
Selenium (Se)-Total	mg/L	T	TL1	11/1/2022	0.000387	0.05
Selenium (Se)-Total	mg/L	T	TL1	11/8/2022	0.000328	0.05
Selenium (Se)-Total	mg/L	T	TL1	11/15/2022	0.000273	0.05
Selenium (Se)-Total	mg/L	T	TL1	11/22/2022	0.000388	0.05

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Selenium (Se)-Total	mg/L	T	TL1	11/29/2022	0.000348	0.05
Selenium (Se)-Total	mg/L	T	TL1	12/6/2022	0.000457	0.05
Selenium (Se)-Total	mg/L	T	TL1	12/13/2022	0.000333	0.05
Selenium (Se)-Total	mg/L	T	TL1	12/27/2022	0.000287	0.05
Zinc (Zn)-Total	mg/L	T	TL1	1/3/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	1/4/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	1/13/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	1/18/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	1/24/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	2/3/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	2/8/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	2/15/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	2/22/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	3/1/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	3/8/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	3/12/2022	< 0.0300	50
Zinc (Zn)-Total	ug/L	T	TL1	4/14/2022	< 25	50
Zinc (Zn)-Total	mg/L	T	TL1	4/20/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	6/28/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	6/30/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	7/5/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	7/7/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	7/12/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	7/16/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	7/19/2022	< 0.0300	50
Zinc (Zn)-Total	mg/L	T	TL1	7/26/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	7/27/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	8/2/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	8/9/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	8/10/2022	< 0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	8/17/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	8/23/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	9/6/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	9/13/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	9/15/2022	<0.0150	50

Variable	Report Result Unit	Fraction	Sample Point	Date	Data Point	CCME Water Quality Criteria, Livestock (mg/L)[a]
Zinc (Zn)-Total	mg/L	T	TL1	9/20/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	9/27/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	10/4/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	10/11/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	10/18/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	10/25/2022	0.0182	50
Zinc (Zn)-Total	mg/L	T	TL1	11/1/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	11/8/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	11/15/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	11/22/2022	<0.0030	50
Zinc (Zn)-Total	mg/L	T	TL1	11/29/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	12/6/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	12/13/2022	<0.0150	50
Zinc (Zn)-Total	mg/L	T	TL1	12/27/2022	<0.0150	50

Notes:

[a] *Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Agriculture, Livestock*

[b] *Guideline is variable. 5 mg/L for poultry (CCREM 1987)*
Canadian Council of Resource and Environment Ministers (CCREM). 1987 (Updated 2008). Canadian Water Quality Guidelines (CWQG)

APPENDIX 3.10-2 GROUND-BASED WATERBIRD SURVEY SITE LOCATIONS AND HABITAT DATA, 2022

Appendix 3.10-2: Ground-based Waterbird Survey Site Locations and Habitat Data, 2022

Site Name	Site Type	Zone	Easting	Northing	Distance from Infrastructrue (km)	Date	Start Time	End Time	Duration	Cloud Cover (%)	Light	Wind Speed (km/hr)
WB001	Control	13W	427462	7550708	5.21	30-Jun-22	16:00	16:20	0:20	10	Bright	25
WB002	Control	13W	425816	7552256	6.80	30-Jun-22	16:43	17:03	0:20	10	Bright	25
WB003	Potential Impact	13W	433533	7558612	0.06	1-Jul-22	14:26	14:46	0:20	100	Flat	15
WB004	Potential Impact	13W	434105	7559414	0.03	1-Jul-22	14:55	15:15	0:20	100	Flat	10
WB005	Potential Impact	13W	432543	7550552	0.14	1-Jul-22	15:40	16:00	0:20	100	Hazy	10
WB006	Control	13W	435776	7562277	2.65	2-Jul-22	15:12	15:36	0:24	100	Flat	10
WB007	Potential Impact	13W	431052	7561292	1.72	2-Jul-22	16:02	16:26	0:24	100	Flat	15
WB008	Potential Impact	13W	430253	7559486	2.09	2-Jul-22	16:43	17:07	0:24	100	Flat	10
WB009	Ladder (Currently Control)	13W	436264	7548926	3.00	3-Jul-22	15:55	16:19	0:24	0	Bright	4
WB010	Ladder (Currently Control)	13W	437120	7553209	3.00	3-Jul-22	16:44	17:08	0:24	10	Bright	5
WB011	Potential Impact	13W	432721	7553640	0.12	4-Jul-22	15:35	15:55	0:20	0	Bright	10
WB012	Control	13W	428610	7547787	4.87	5-Jul-22	13:35	13:59	0:24	0	Bright	8
WB013	Ladder (Currently Control)	13W	434808	7545386	4.56	5-Jul-22	14:18	14:43	0:25	0	Bright	5
WB014	Control	13W	441500	7550001	7.80	5-Jul-22	15:03	15:27	0:24	0	Bright	8
WB015	Control	13W	439175	7555790	3.21	5-Jul-22	15:48	16:10	0:22	0	Bright	10

Appendix 3.10-2: Ground-based Waterbird Survey Site Locations and Habitat Data, 2022

Site Name	Wind Direction	Precipitation	Temperature (°C)	Noise	Wetland Type	Wetland Size	% Riparian Shrub	% Upland Shrub	% Grasses	% Bare Ground	% Wetland
WB001	S	Nil	15	None	Lake	Medium	0	10	0	10	80
WB002	S	Nil	15	None	Lake	Medium	0	15	0	0	85
WB003	NW	Rain-Light	5	Slight	Lake	Large	0	20	0	0	80
WB004	NW	Nil	6	None	Lake	Large	0	0	20	0	80
WB005	NE	Nil	7	Slight	Lake	Large	5	0	0	10	85
WB006	NE	Nil	7	None	Lake	Large	0	10	0	10	80
WB007	NE	Nil	7	Slight	Lake	Small	0	0	15	10	75
WB008	NE	Nil	7	Slight	Lake	Large	0	10	10	0	80
WB009	NE	Nil	15	None	Lake	Large	0	15	0	5	80
WB010	NW	Nil	15	None	Lake	Medium	0	10	0	10	80
WB011	SW	Nil	18	None	Pond	Small	0	0	50	0	50
WB012	N	Nil	20	None	Lake	Large	0	15	0	0	85
WB013	NW	Nil	22	None	Lake	Large	0	15	0	0	85
WB014	NE	Nil	22	None	Lake	Small	0	10	10	0	80
WB015	N	Nil	22	None	Lake	Large	0	15	0	0	85

Appendix 3.10-2: Ground-based Waterbird Survey Site Locations and Habitat Data, 2022

Site Name	Comments
WB001	Rocky outcrop among waterbody, split into several small pond areas
WB002	Medium large lake, ice covering main body about 70%.
WB003	Doris lake intake area. Lots of goose poop
WB004	Doris lake near TLR bridge
WB005	Windy lake, ice covering over half of water
WB006	Across from roberts bay outflow/fish fence
WB007	Looking onto small lake wwest of airstrip
WB008	Glen lake, directly west of camp
WB009	
WB010	Two small/medium lakes E of ogama
WB011	Series of ponds E of road, walkable from truck
WB012	
WB013	Wolverine lake
WB014	Two small pond/lakes
WB015	

APPENDIX 3.10-3 WATERBIRD OBSERVATION DATA FOR GROUND-BASED SURVEYS, 2022

Appendix 3.10-3: Waterbird Observation Data for Ground-based Surveys, 2022

Site	Incidental	Species	Scientific Name	Male	Female	Adults - Unknown Sex	Young	Total	Primary Behaviour	Secondary Behaviour	Comment on Observation
WB001	No	American Pipit	*Anthus rubescens*	0	0	1	0	1	Calling		
WB015	No	American Pipit	*Anthus rubescens*	1	1	1	0	3	Food Carry	Calling	All 3 carrying food.
WB004	No	American Robin	*Turdus migratorius*	0	0	1	0	1	Resting		
WB009	Yes	American Tree Sparrow	*Spizelloides arborea*	1	0	0	0	1	Singing		
WB013	No	American Tree Sparrow	*Spizelloides arborea*	1	0	0	0	1	Singing		
WB014	No	American Tree Sparrow	*Spizelloides arborea*	1	0	0	0	1	Singing		
WB009	No	Canada Goose	*Branta canadensis*	0	0	1	0	1	Flying/Flyover		
WB011	No	Canada Goose	*Branta canadensis*	1	1	0	0	2	Nest Found		Incubating.
WB001	No	Common Redpoll	*Acanthis flammea*	0	0	2	0	2	Calling		
WB004	No	Common Redpoll	*Acanthis flammea*	0	0	3	0	3	Calling	Flying/Flyover	
WB005	No	Common Redpoll	*Acanthis flammea*	0	0	2	0	2	Calling		
WB009	No	Common Redpoll	*Acanthis flammea*	0	0	2	0	2	Calling		
WB012	No	Common Redpoll	*Acanthis flammea*	0	0	2	0	2	Calling	Flying/Flyover	
WB015	No	Common Redpoll	*Acanthis flammea*	0	0	2	0	2	Flying/Flyover	Calling	
WB001	No	Greater Scaup	*Aythya marila*	2	1	0	0	3	Preening	Resting	
WB009	No	Greater Scaup	*Aythya marila*	3	3	0	0	6	Resting		
WB013	No	Greater Scaup	*Aythya marila*	4	7	0	0	11	Resting		
WB005	No	Greater White-fronted Goose	*Anser albifrons*	1	1	0	4	6	Resting		Young look class 2.
WB011	No	Greater White-fronted Goose	*Anser albifrons*	4	1	0	0	5	Resting		
WB009	No	Green-winged Teal	*Anas crecca*	0	3	0	0	3	Resting		All 3 together.
WB013	No	Green-winged Teal	*Anas crecca*	0	1	0	0	1	Resting		
WB015	No	Harris's Sparrow	*Zonotrichia querula*	1	0	0	0	1	Singing		
WB002	No	Herring Gull	*Larus argentatus*	0	0	1	0	1			
WB006	No	Herring Gull	*Larus argentatus*	0	0	3	0	3	Flying/Flyover	Resting	
WB009	No	Herring Gull	*Larus argentatus*	0	0	3	0	3	Resting		
WB015	No	Herring Gull	*Larus argentatus*	0	0	1	0	1	Resting	Flying/Flyover	
WB001	No	Lapland Longspur	*Calcarius lapponicus*	2	1	0	0	3	Resting	Calling	
WB002	No	Lapland Longspur	*Calcarius lapponicus*	0	1	0	0	1	Flying/Flyover		
WB010	No	Lapland Longspur	*Calcarius lapponicus*	0	1	0	0	1	Flying/Flyover		
WB005	No	Least Sandpiper	*Calidris minutilla*	0	0	1	0	1	Foraging		
WB013	No	Least Sandpiper	*Calidris minutilla*	0	0	1	0	1			
WB001	No	Long-tailed duck	*Clangula hyemalis*	5	2	0	0	7	Resting	Flying/Flyover	Pair and lone males.
WB015	No	Long-tailed duck	*Clangula hyemalis*	1	1	0	0	2	Resting		
WB007	No	Pacific Loon	*Gavia pacifica*	0	0	1	0	1	Territorial	Flying/Flyover	Chased RBME around lake several times.
WB008	No	Pacific Loon	*Gavia pacifica*	0	0	1	0	1	Flying/Flyover		
WB009	Yes	Pacific Loon	*Gavia pacifica*	0	0	1	0	1	Flying/Flyover		
WB010	No	Pacific Loon	*Gavia pacifica*	2	2	0	0	4	Foraging	Resting	One pair on each waterbody.
WB011	No	Pacific Loon	*Gavia pacifica*	1	1	0	0	2	Nest Found		Female incubating.
WB013	No	Pacific Loon	*Gavia pacifica*	1	1	1	0	3			Pair and single loon on separate parts of lake.
WB014	No	Pacific Loon	*Gavia pacifica*	1	1	0	0	2			
WB001	No	Red-breasted Merganser	*Mergus serrator*	5	2	0	0	7	Resting		
WB006	No	Red-breasted Merganser	*Mergus serrator*	0	1	0	0	1	Flying/Flyover		
WB006	No	Red-breasted Merganser	*Mergus serrator*	1	1	0	0	2	Resting	Preening	Pair.
WB007	No	Red-breasted Merganser	*Mergus serrator*	0	1	0	0	1	Flying/Flyover	Resting	
WB009	No	Red-breasted Merganser	*Mergus serrator*	2	2	0	0	4	Resting		
WB012	No	Red-breasted Merganser	*Mergus serrator*	1	1	0	0	2	Flushed		
WB013	No	Red-breasted Merganser	*Mergus serrator*	1	1	1	0	3	Flushed	Resting	
WB003	No	Red-throated Loon	*Gavia stellata*	0	0	1	0	1	Resting	Nest Found	Defensive with raven, potential nest. Nest confirmed with Enviro Dept later in day.
WB006	No	Red-throated Loon	*Gavia stellata*	0	0	1	0	1	Resting		
WB008	No	Red-throated Loon	*Gavia stellata*	0	0	1	0	1	Resting		
WB002	No	Savannah Sparrow	*Passerculus sandwichensis*	1	0	0	0	1	Singing		

Appendix 3.10-3: Waterbird Observation Data for Ground-based Surveys, 2022

Site	Incidental	Species	Scientific Name	Male	Female	Adults - Unknown Sex	Young	Total	Primary Behaviour	Secondary Behaviour	Comment on Observation
WB005	No	Savannah Sparrow	*Passerculus sandwichensis*	1	0	0	0	1	Singing		
WB008	No	Savannah Sparrow	*Passerculus sandwichensis*	1	0	0	0	1			
WB009	No	Savannah Sparrow	*Passerculus sandwichensis*	1	0	0	0	1			
WB012	No	Savannah Sparrow	*Passerculus sandwichensis*	0	0	1	1	2			
WB013	No	Savannah Sparrow	*Passerculus sandwichensis*	1	0	0	0	1	Singing		
WB005	No	Semipalmated Plover	*Charadrius semipalmatus*	1	1	0	0	2	Courting Display	Foraging	
WB002	No	Tundra Swan	*Cygnus columbianus*	0	0	2	0	2	Resting		Likely pair.
WB007	No	Tundra Swan	*Cygnus columbianus*	1	1	0	0	2	Resting		
WB013	No	Tundra Swan	*Cygnus columbianus*	1	1	0	0	2			
WB005	Yes	Unidentified Bird	*Unidentified Bird*	0	0	0	0	0	Flying/Flyover		Unknown loon flying overhead before survey.
WB011	No	Unidentified Bird	*Unidentified Bird*	1	0	1	0	2	Resting		Cackling geese.
WB015	No	Unidentified Duck	*Unidentified Duck*	0	0	2	0	2	Resting		Too far and backlit.
WB013	No	Unidentified Gull	*Unidentified Gull*	0	0	1	0	1	Flushed		
WB001	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1	Singing		
WB004	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1	Singing		
WB008	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1			
WB009	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1	Singing		
WB010	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1	Singing		
WB012	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1	Singing		
WB013	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1	Singing		
WB014	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1	Singing		
WB015	No	White-crowned Sparrow	*Zonotrichia leucophrys*	1	0	0	0	1	Singing		
WB014	No	Yellow Warbler	*Setophaga petechia*	2	1	0	0	3	Singing		Tall willow between ponds.
WB012	No	Yellow-billed Loon	*Gavia adamsii*	1	1	0	0	2	Resting		SO COOL!!!!!

APPENDIX 3.12-1 MARINE MAMMAL MONITORING IN ROBERTS BAY, 2022

Appendix 3.12-1: Marine Mammal Monitoring in Roberts Bay, 2022

Date	Time	Zone	Easting	Northing	Species	No. Individuals	Age	Sex	Behaviour	Mitigation Action	Comments
3/9/2022	16:30	13W	432219	7565410	Unknown Seal	1	UNK	UNK	Travel	N	
4/9/2022	No observations										
5/9/2022	No observations										
6/9/2022	No observations										
8/9/2022	No observations										
9/9/2022	No observations										
10/9/2022	No observations										
12/9/2022	No observations										
13/09/2022	No observations										
15/09/2022	No observations										
16/09/2022	No observations										
20/9/2022	9:30				Bearded Seal	1	UNK	UNK	Resting	N	The seal spent the entire day resting on a shoal, unperturbed by sea lift activities
21/09/2022	No observations										
22/09/2022	No observations										
23/09/2022	No observations										
24/09/2022	No observations										

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