Appendix 27: 2021 Caribou Behaviour Study

AGNICO EAGLE

Meliadine Project

Caribou Behaviour Study, 2021

January 2022

Project No.: 0605387-2

The business of sustainability

ERM

January 2022

Meliadine Project

Caribou Behaviour Study, 2021

ERM Consultants Canada Ltd.

120 Adelaide Street West, Suite 2010
Toronto, ON
Canada M5H 1T1

T: +1 416 646 3608
F: +1 416 642 1269

EXECUTIVE SUMMARY

The Meliadine Mine (the Project), owned and operated by Agnico Eagle Mines Limited (Agnico Eagle), is located on Inuit Owned Land (IOL) approximately 25 km north of Rankin Inlet, Nunavut. A 34 km All Season Access Road (AWAR) connects the Project to Rankin Inlet. During June and July each year, groups of caribou from the Qamanirjuaq herd occur in the Project area, some crossing through the Project site and the AWAR.

As part of the Nunavut Impact Review Board (NIRB) Project Certificate #006, Agnico Eagle is required to study and report on effects of the Project on caribou behaviour (T&C 57, b.). The Agnico Eagle Terrestrial Environment Management and Monitoring Plan (TEMMP 2020) includes a behaviour monitoring program to i) determine if there are changes to behaviour with distance to the Project and ii) in response to disturbances such as passing vehicles.

During 2020, Agnico Eagle retained ERM to update the field protocols used for behaviour monitoring. ERM adapted standard methods for caribou behaviour monitoring developed by the Government of Northwest Territories Department of Environment and Natural Resources (GNWT ENR). Following the first year of data collection in 2020, the protocols were updated for the 2021 season to improve the quality of the data collected.

Field surveys were conducted during June and July 2021 by an ERM wildlife biologist and an Agnico Eagle environmental technician dedicated to behaviour monitoring. In addition, Project environmental technicians were trained in the updated method and conducted behaviour surveys on an opportunistic basis while conducting other duties. Each survey lasted 30 minutes, with scan samples conducted every three minutes.

The behaviour monitoring program in 2021 had several results:

- The standard monitoring protocols adapted from the GNWT ENR worked well at the Project site.
- Forty-six surveys were conducted with the majority of observations between June 29 and July 2. This was approximately one week earlier than peak caribou observations in 2020. The data from 2020 and 2021 were combined to reach the goal of 100 surveys across two years.
- Observations were well distributed across a range of caribou group sizes from 1 to 2 individuals to >1,000.
- Small groups of <50 caribou were observed both near (<300 m) and far (>300 m) from infrastructure while large groups (>50) occurred beyond 300 m from infrastructure. Small groups consistently had a higher proportion of response behaviours (running, alert) than larger groups. This was true in both 2020 and 2021.
- Groups of caribou were observed near the road in equal proportions on both the upstream and downstream sides of the road, but were more often observed further from the road on the downstream side of the road. Behaviour did not differ between caribou on the two sides.
- An analysis of the data across both years indicate a trend for caribou at greater distance from infrastructure (>300 m) to have a lower proportion of response behaviours. This analysis accounted for the difference in group size with distance, but should be interpreted with caution given the small sample size.
- The proportion of caribou with response behaviours in a group was unrelated to measured environmental variables including temperature and wind speed.

- Approximately half of the surveys included a disturbance event, typically from essential Project vehicles, mostly pickups, and all-terrain vehicles (ATVs) used by community members on the AWAR for travel and harvesting. The AWAR was closed to Project vehicles (with the exception of approved convoys) when caribou were near the road and all Project vehicles stop when caribou are on the road.
- Following a disturbance event, the proportion of response behaviours in a group of caribou rose, but typically returned to baseline behaviours within two sampling periods (six minutes).

The updates applied to the survey protocol in 2021 used feedback from the first year of data and analysis, and were helpful in improving the overall quality and accuracy of the data. Interestingly, even with these changes, the trends in the results were consistent between the two years of data. Caribou close to the road and in smaller groups typically had higher overall levels of response behaviour. Following a vehicle disturbance, caribou response behaviour tended to spike and return to background levels within ~6 minutes.

CONTENTS

List of Tables

List of Figures

ACRONYMS AND ABBREVIATIONS

Agnico Eagle	Agnico Eagle Mines Ltd.
AIC	Akaike information criterion
ATV	All-Terrain Vehicle
AWAR	Meliadine Mine All Weather Access Road
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
BQCMB	Beverly Qamanirjuaq Caribou Management Board
GLMs	Generalized linear models
GN	Government of Nunavut
GNWT ENR	Government of Northwest Territories Department of Environment and Natural Resources
IOL	Inuit Owned Land
KivIA	Kivalliq Inuit Association
km	Kilometre
km/hr	Speed expressed as kilometer per hour
m	Metre
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
NWT	Northwest Territories
T&C	Terms and Conditions
TEMMP	Terrestrial Environment Management and Monitoring Plan
the Project	The Meliadine Mine

1. PROJECT OVERVIEW

The Meliadine Mine (the Project), owned and operated by Agnico Eagle Mines Limited (Agnico Eagle), is located on Inuit Owned Land (IOL) approximately 25 km north of Rankin Inlet, Nunavut. A 34 km all weather access road (AWAR) connects the Project to Rankin Inlet. A bypass road was constructed to the west and south of Rankin Inlet to allow mine traffic to circumvent the hamlet when traveling from the AWAR to the Project marine laydown (Figure 1-1).

The Meliadine Mine was approved with a life of mine plan that includes production from five ore bodies by the NIRB in 2015 (Project Certificate #006). The mine plan includes open pits, underground mining and associated ore processing, waste management and ancillary infrastructure. Construction of the AWAR, camp, ore processing facilities and ancillary infrastructure began in 2017 and production from the Tiriganiaq deposit began in Q2 2019. The remainder of the orebodies are planned throughout the life of the Meliadine complex. In 2019, the Meliadine Mine NIRB Project Certificate (#006) was amended to include discharge of saline effluent to the marine environment via diffuser at Itivia Harbour and to convey via truck saline effluent along the AWAR to Itivia Harbour (i.e., Melvin Bay).

Studies of caribou behaviour were conducted in June and July 2020 and 2021 at the Meliadine Mine and AWAR in support of existing NIRB conditions as outlined in Project Certificate #006.

1.1 Terrestrial Environment Management and Monitoring Plan

The Meliadine Mine 2015 Project Certificate and 2019 Project Certificate Amendment from the Nunavut Impact Review Board (NIRB), Term and Condition 57 requires the Project to report in its annual NIRB report:

> *(T&C 57, b.) A detailed analysis of wildlife responses to operations with emphasis on wildlife behaviour, mortalities and displacements (if any), and responses to operations of the all-weather access road and associated access roads/trails;*

The Meliadine Mine Terrestrial Environment Management and Monitoring Plan (TEMMP; Agnico Eagle 2020) is designed to meet this condition, with a behaviour monitoring program (Section 4.5) that has two objectives:

- "To determine if caribou activity budgets change with distance from the mine, and to document caribou response to stressors.
- To determine if caribou distribution changes with proximity to the mine (i.e. do caribou avoid the mine)."

The behaviour monitoring program described in this report is designed to address the first of these objectives.

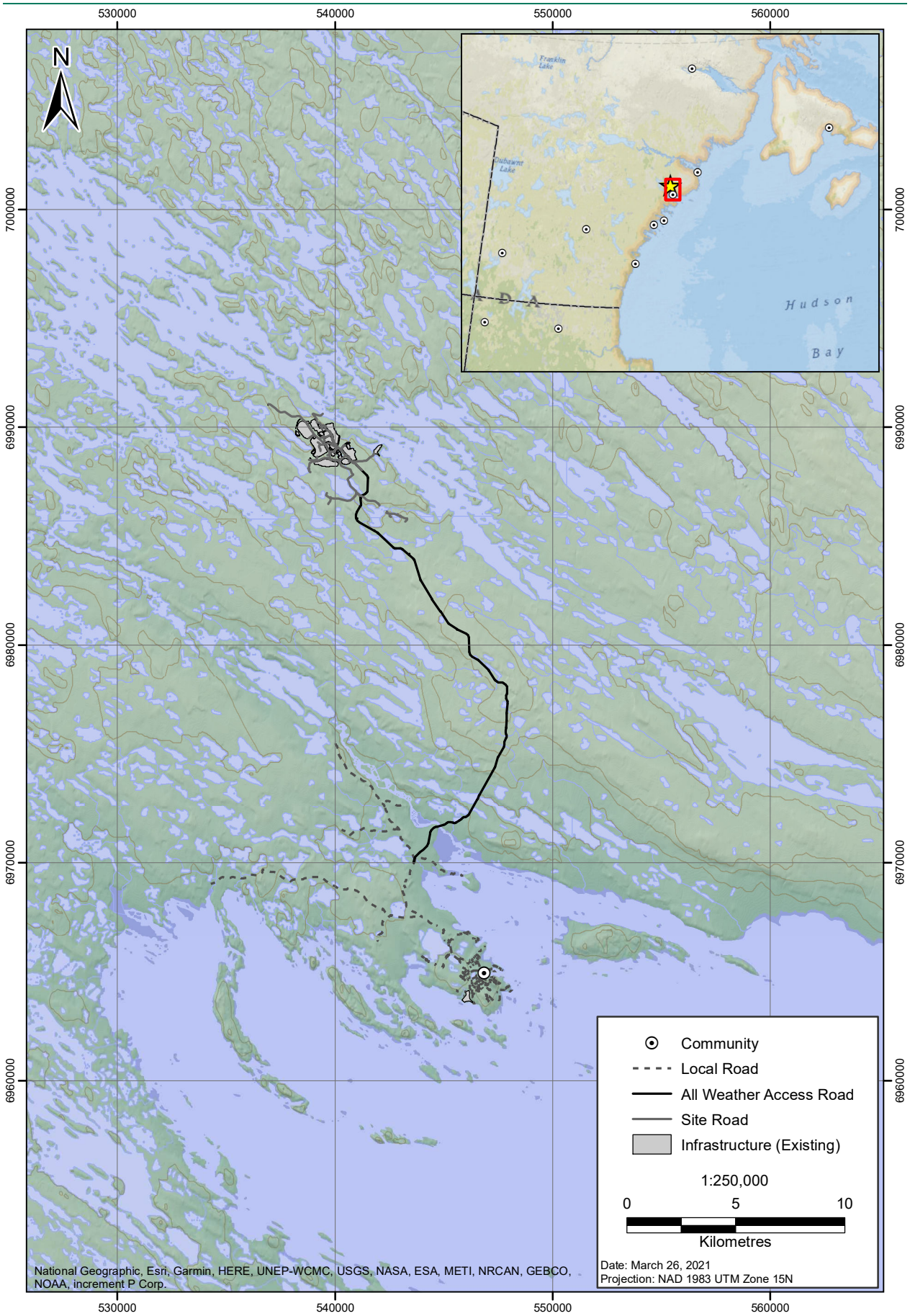


Figure 1-1: Meliadine Gold Project Location

2. STUDY OBJECTIVES

As stated, the overall objective of the caribou behaviour monitoring program as stated in the TEMMP is:

- To determine if caribou activity budgets change with distance from the mine, and to document caribou response to stressors.

The detailed objectives of the 2020 and 2021 study were:

1. To conduct a study using the Government of Northwest Territories Department of Environment and Natural Resources (GNWT ENR 2017) behaviour survey methodology at the Project site to estimate how the AWAR and site infrastructure contribute to cumulative effects of the project on caribou.
2. To collect a set of 100 samples of caribou behaviour across two years (2020 and 2021).
3. To use information from the surveys to determine what factors predict caribou behaviour, specifically comparing:
    - Near vs. far;
    - Large groups of caribou vs. small groups; and
    - Surveys with and without disturbances.

3. BACKGROUND

3.1 Qamanirjuaq Herd

The Qamanirjuaq caribou herd is a large caribou herd numbering approximately over 200,000 animals in 2017, down from over 300,000 animals reported in 2008 (COSEWIC 2016). The herd range is centered in south-eastern Nunavut. The herd range stretches approximately 1,000 km from Chesterfield Inlet in the north to northern Manitoba in the south, and from Hudson Bay on the east to eastern Northwest Territories and north-eastern Saskatchewan in the west (BQCMB 2020a).

The Beverly and Qamanirjuaq Caribou Management Board (BQCMB) has rated the Qamanirjuaq herd as having Medium vulnerability in 2014 due to continued population declines since 2008 (BQCMB 2014) and upgraded this rating to Medium-High in 2016 (BQCMB 2016).

The herd generally winters below the treeline in northern Manitoba, Saskatchewan and the adjoining areas of NWT and Nunavut. Spring migration is north along the coast of Hudson Bay, past the communities of Arviat, Whale Cove and Rankin Inlet to a broad calving ground generally centered on Qamanirjuaq Lake (BQCMB 2020a).

Following calving, the caribou form into large groups of hundreds to thousands of caribou and radiate out from the calving grounds, including east towards the coast. During July, groups of animals from this herd interact with the hamlet of Rankin Inlet, the Meliadine Mine and the AWAR connecting the two.

During summer and fall, the caribou generally move south and inland, gradually returning south towards their wintering areas by early December. Maps of the caribou range and movement are available on the BQCMB website (https://arctic-caribou.com/resources/).

4. STUDY AREA

The dominant terrain in the Project area comprises glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and lakes. A series of low relief ridges are composed of glacial deposits, oriented in a northwest-southeast direction, which control the regional surface drainage patterns. The property is about 60 meters above sea level in low-lying topography with numerous lakes (FEIS; Agnico Eagle 2015).

The study area for behaviour monitoring included the existing Project footprint or the Meliadine Mine site and the AWAR, plus a 1 km buffer surrounding these areas. Surveys were conducted on any caribou that could be visually surveyed from Project infrastructure up to a distance of 3 km with the aid of binoculars and a spotting scope.

5. METHODS

5.1 Field Surveys

Survey methods followed protocols for monitoring caribou behaviour developed by the GNWT ENR. During 2020, ERM refined these methods for Agnico Eagle's Nunavut mine operations. The updated methods focus on scan samples, in lieu of both scan and focal samples. Given time and personnel constraints, this was determined to be a more efficient use of time and produce better quality data that is suitable for statistical analysis. The updated methods also include an initial survey step to randomize which group of caribou to monitor when multiple groups are available. In 2021 these methods were further refined to reflect lessons learned in 2020. The 2021 updates included using a rangefinder to measure distance and recording additional information such as whether the caribou occurred on the east or west side of the road. Detailed protocols are attached in Appendix A.

Prior to the arrival of caribou in June, a wildlife biologist from ERM conducted a classroom and practical training program for Agnico Eagle environmental technicians from the Meliadine Mine. The ERM wildlife biologist with an assistant was tasked with conducting behaviour observations as a primary role during July, while Meliadine technicians conducted behaviour observations opportunistically during other fieldwork in alignment with the TEMMP.

The overall method for the field surveys was to identify caribou groups visible from the mine site and AWAR, to select some groups for observation, and to record the behaviour of individuals in groups of different sizes including their responses without any disturbance and in response to mine-related activities and natural factors. Surveys were conducted in late June and early July during the post-calving and early summer periods, when caribou pass through the Project area in large numbers.

The first step involved a reconnaissance survey to identify where caribou groups were located. Where multiple groups were observed, surveyors chose which group to sample using a random number table. Field methods included the recording of site information at the location of each survey, including GPS coordinates, weather conditions, road structure, and location of the caribou group in relation to the surveyors and the road. Individuals in the group being observed were categorized when the survey started and at three minute intervals for 30 minutes.

Behaviour categories and their definitions were standardized following GNWT ENR (2017) classifications. The behaviour categories were: feeding, lying down, standing, alert, walking, and trotting or running. Alert behaviour and trotting or running were considered disturbance "response" behaviours and were grouped together in the subsequent data analysis.

At each three-minute interval, surveyors recorded the numbers of individuals in the group exhibiting each behaviour at that time. If the group was too large to be counted in each interval (>100 individuals), an identifiable subset of the group was surveyed during each interval and the total group size was recorded on the datasheet. In the case that a disturbance event occurred during the survey, such as a vehicle driving on the road, the time and type of disturbance was recorded.

5.2 Data Analysis

The objective of the data analysis was to quantify trends in the survey data, and determine whether factors such as distance to infrastructure, group size, or the disturbances could be used to explain caribou behavior. An initial exploratory analysis was conducted to visualize the data and determine the appropriate method for analyzing the data. A regression analysis was conducted to test for statistically significant trends in the data.

To increase the statistical power to detect changes in caribou behaviour, the behaviour categories were grouped for analysis into “response” behaviours (alert and running) and non-response behaviours (feeding, lying down, standing, and walking). It is acknowledged that walking may be considered a response behaviour in some situations, but given the sample size after 2021 it was not possible to subdivide the data further without losing statistical stability.

Generalized linear models (GLMs) were used to assess the differences in the proportion of response behaviours in surveyed animals as a function of various controlling variables, including the occurrence of disturbances. This regression framework provides a means to control for habitat, environmental variables, repeated measurements, and spatial correlation.

Statistical analysis were conducted using variables averaged over the entire 30-minute survey period, rather than breaking the data down by three-minute intervals. Two dependent variables were tested:

1. The first dependent variable tested was the average proportion of response behaviours in each survey, and this variable was modelled using a binomial distribution.
2. A second dependent variable was developed to track the number of minutes it took caribou to return to background behavior levels every time there was a disturbance. This variable, called “duration of response”, was assessed for each survey and modelled with a normal distribution.

The two dependent variables were each modelled against a suite of potentially important variables to determine if there was any statistical relationship with response behaviour. The variables included in this preliminary analysis were group size, distance to road, temperature, wind speed, and a binary variable identifying whether or not a disturbance occurred in the survey.

For each dependent variable, GLMs were constructed and tested for model fit, as evidenced by the Akaike Information Criterion (AIC). AIC is a number that is helpful for comparing models as it includes measures of both how well the model fits the data and how complex the model is (simpler is usually better). The top models were identified as having a low AIC and were within a 2-unit difference in AIC ($\Delta AIC \leq 2$) of the top-ranked model (i.e. the model with the lowest AIC; Burnham & Anderson 2004). This is the industry standard for identifying models that are essentially ‘equally good’ at explaining the data. Models with a difference in AIC (ΔAIC) of 2 to 4 from the top model are generally considered to have ‘limited support’.

6. RESULTS AND DISCUSSION

6.1 Caribou Distribution Relative to the Project

During late June and early July in both 2020 and 2021, caribou GPS collar locations were provided to the Project though a data sharing agreement by the GN. These data indicated that caribou were approaching the Project site. Height of Land and road surveys were conducted three times per day by Agnico Eagle environment technicians in order to trigger management actions. These data informed the decision to begin behaviour surveys for caribou as they approached the site.

Survey locations by date are presented in Figure 6.1-1. From June 27 to July 12, 2021, groups of caribou from the Qamanirjuaq herd were observed passing through or near the study area, with numbers peaking from June 29 to July 2. This was approximately one week earlier than peak caribou detections in 2020, which occurred from July 4 to 9, 2020. In both years the majority of surveys were conducted on the northern portion of the AWAR.

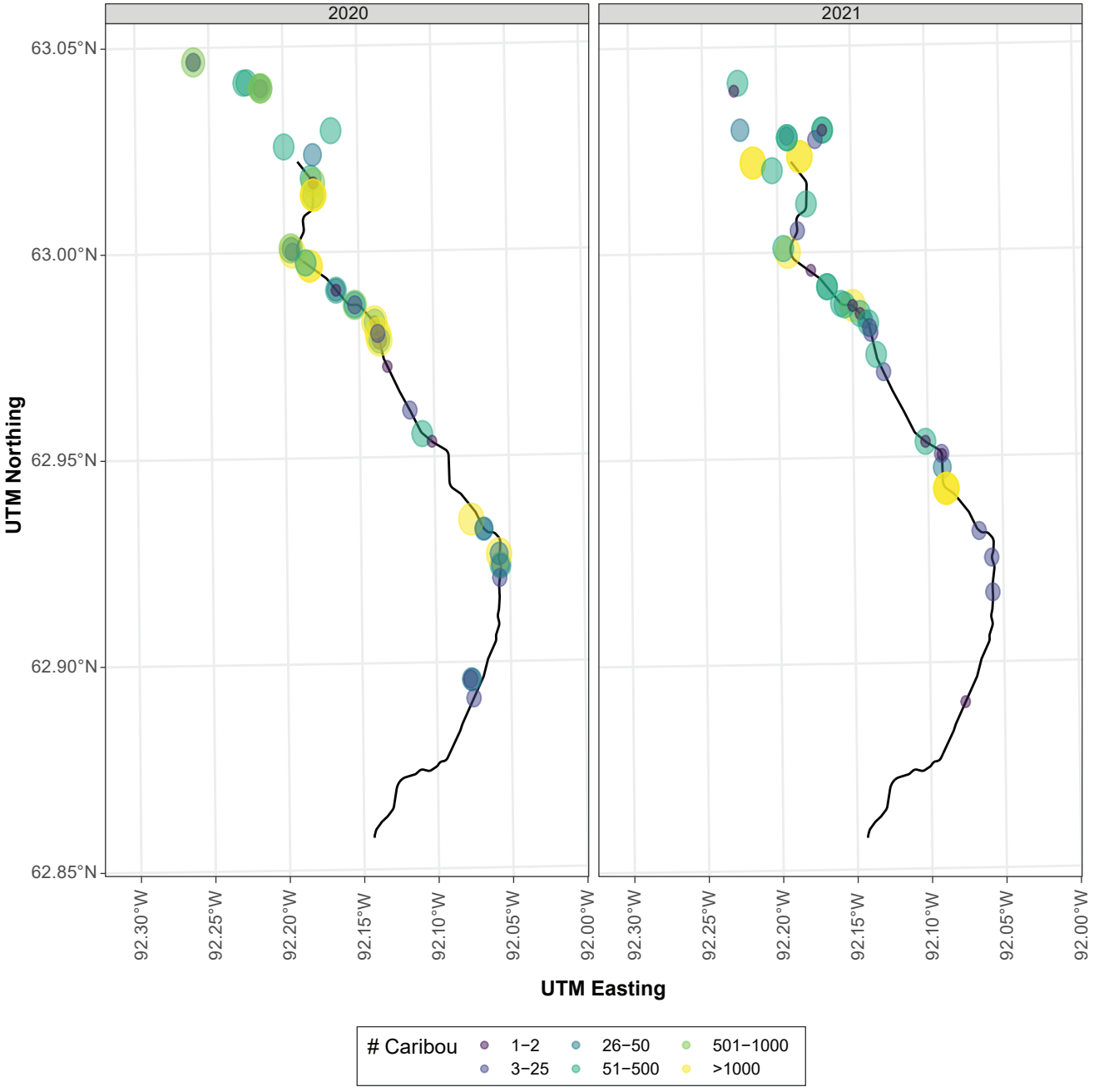
As the post-calving period progressed, caribou were observed more frequently in the southern portion of the road near Rankin Inlet. Fewer behaviour observations were conducted on the southern portion of the AWAR due to safety concerns near active harvesting activities and COVID-19 safety rules prohibiting contact between mine site personnel and community members.

6.2 Field Surveys Completed

In total, 46 behaviour surveys were conducted during the two-week period in 2021 (June 29 to July 12) when groups of caribou were near the Project. This is compared to the 56 surveys completed in 2020 (Table 6.2-1). Surveys were conducted opportunistically whenever caribou were encountered during daily reconnaissance drives, primarily along the AWAR but also around the mine site when the opportunity arose.

Table 6.2-1: Meliadine Caribou Behaviour Surveys Data Summary

Caribou Group Size	2020			2021		
	Total Number of Surveys	Surveys with Disturbances	Surveys with Observed Road Crossings	Total Number of Surveys	Surveys with Disturbances	Surveys with Observed Road Crossings
1-2	5	4	2	8	5	0
3-25	11	2	2	11	7	3
26-50	9	3	0	2	0	0
51-500	14	11	1	16	8	6
501-1,000	6	3	1	0	0	0
>1,000	11	6	0	9	7	3
Total	**56**	**29**	**6**	**46**	**27**	**12**



Note: Colour and size indicate group size, and the location of the All-Weather Access Road is indicated by the black line.

Figure 6.1-1: Locations of Behaviour Surveys by Date

In general, in July during the post-calving and early summer periods, barren-ground caribou aggregate into large groups (COSEWIC 2016; Russell and Gunn 2019). There were several days where only a single group of more than 1,000 individuals and up to 50,000 individuals was encountered. In order to diminish the risk of pseudo-replication, surveyors waited at least one hour before surveying the same group. This should be considered when assessing the robustness of subsequent statistical analyses. A logistical constraint on sample size will likely also have to be a consideration for future behaviour surveys at Meliadine, which will always occur during the high density post-calving season.

Overall, the survey methodology worked well for the Project location and circumstances, and the survey results were generally consistent between 2020 and 2021. All reported results use the combined data from 2020 and 2021, unless otherwise stated. General observations on survey methodology and results included:

- In 2020, fifty-six surveys were conducted by an ERM biologist and Meliadine environmental technicians, compared to forty-six in 2021. Given the logistical challenges of: 1) the caribou being on-site for a short period; 2) the southern part of the road being unusable during harvesting activities; and 3) the vehicles being stopped by caribou on the road, the goal of 50 surveys per year represents the upper limit of what can reasonably be achieved.
- Surveys were well distributed across a range of group sizes (Table 6.2-1). Surveyors reported that the addition of a reconnaissance survey and random selection of which group to survey assisted with a relatively even distribution of survey intensity across group sizes. An exception in 2021 was that there were no surveys of groups of 501-1000 individuals because none were encountered.
- Of the 102 surveys completed across both years, more than half recorded at least one disturbance during the survey (Table 6.2-1). During much of the period when caribou were present in the study area and surveys were being conducted, there were sufficient caribou near the road that the AWAR was closed to mine traffic. An exception was made for approved convoys of mine vehicles that occurred approximately three times per week for crew change and exchange of essential goods.
- In total, 43% of disturbances were from ATV traffic, 30% were from light trucks, and 12% were from convoys. Light trucks (pickups) included trucks from community groups conducting monitoring, the Hunters and Trappers Association and Kivalliq Inuit Association, the pickup used for caribou surveys, or other Project environment pickups.
- The AWAR was closed to mine traffic during many of the surveys, leaving a small number of essential vehicles on the road, generally pickup trucks. It is expected that the ratio of ATVs to total traffic would therefore be higher during road closures because total traffic is much reduced.
- It should be noted that surveyors specifically sought to survey caribou during convoys and would be stationed to monitor any nearby caribou during convoys. This was due to the relative shortage of data on mine-related traffic disturbances.
- The methodology allowed for the estimation of baseline behaviour, response to disturbance, and return to baseline behaviour. Few surveys ended before caribou returned to baseline behaviour. Thus, 30 minutes appears to be an appropriate survey length. Caribou surveys were considered an essential activity by the Project, allowing the survey pickup truck to be used on the AWAR even when the road was closed to normal mine traffic. However, all vehicles must stop when caribou are on the road, leading to long periods where the survey truck was stopped on the road.
- Most caribou behaviours were calm, generally foraging, and not moving quickly (non-response). The one exception was smaller groups who moved more than larger groups – more walking and trotting. As a consequence, caribou were observed crossing the road in only 10% of surveys in 2020 and in 25% of surveys in 2021, primarily in small groups of less than 25 individuals.

- One source of uncertainty in 2020 was consistently estimating distance. Hence, distance was categorized into blocks of 0 to 50 m, 50 to 100 m, etc. A rangefinder was used in 2021, which allowed for increased accuracy and for distance to be considered as a continuous variable rather than a categorical value. However, in this analysis the categories of distance were maintained in order to be able to group the two years of data together.

6.3 Survey Results

6.3.1 Exploratory Analysis

The exploratory analysis was conducted to determine if there were any trends or interactions in the following variables: road crossing, group size, distance to the infrastructure (AWAR/mine), weather and timing, side of the road (east or west), number of disturbances, and response time following disturbances. All results use the combined data from 2020 and 2021, unless otherwise stated.

Road Crossing

Results of the exploratory analysis indicated, unsurprisingly, that groups closer to the road at the start of the survey were more likely to cross the road during the survey (Figure 6.3-1). This trend was seen in both 2020 and 2021.

Group Size and Distance to Infrastructure

Plotting the caribou group size against the distance of caribou groups to the road at the start of the survey revealed that small groups (less than 50 individuals) were observed in equal proportions across all distances, regardless of year (Figure 6.3-1).

Large groups tended to be observed further from the road at the start of the survey. No groups larger than 50 individuals were recorded within 100 m of the road at the start of the survey, and no group larger than 500 individuals was recorded within 300 m of the road at the start of the survey. Regardless of the mechanism, these potential trends need to be considered so that statistical analyses are not confounded.

Behaviour Type, Group Size and Distance to Infrastructure

Average proportions of each behaviour type by group size and by distance to road are presented in Figure 6.3-2. When analyzed by group size, the results suggest that the average proportion of the response behaviours of “Alert” and “Trotting” are largest in small groups, with the highest proportion consistently observed in groups smaller than 25.

When analyzed by distance to road, the results suggest that the proportion of response behaviours is higher closer to the road than further away, with the proportion dropping off in groups further than 300 m from the road. However, due to the previously mentioned correlation between group size and distance to road, these data cannot discern between two possibilities – that caribou are more likely to be disturbed near the road, or that small groups of caribou are more likely to have a higher baseline level of response behaviours. In future years of surveys, additional data with large groups observed close to the road will be required to resolve between these two possibilities.

The result that smaller groups displayed alert behaviours more frequently than large groups is interesting. The activity level of smaller groups was higher, with 50% or more of time spent in alert behaviour and running in the absence of any disturbance. This was especially true near the road (i.e., within 50 m when the survey started). This was a clear trend in both the 2020 and 2021 data.

It should be noted that the variable used here to approximate distance to road is actually distance to observer, which is usually but not always the same as distance to road. In 2021 distance to road and

distance to observer were collected separately, but for the purpose of continuity across the two years, distance to observer was used throughout this analysis. Additional years of data will allow for the more accurate distance to road variable to be used in place of distance to observer.

Behaviour Type and Environmental Variables

Figure 6.3-3 shows the relationship between 1) the proportion of response behaviours and 2) environmental variables temperature, wind speed, and date. This comparison was included to explore the possibility that environmental factors such as heat or high winds were influencing caribou behaviour during the survey. No trend is visible in the data and trend lines fit to the weather data are nearly flat with wide confidence intervals, suggesting that weather does not have a substantial effect on behaviour. Date was also not associated with caribou behaviour.

Upstream or Downstream Observations

The movement pattern for caribou in the Project area is variable. In some years, caribou primarily cross the road travelling east to west, and in other years it is the opposite. In both 2020 and 2021, most of the observed caribou were travelling northwest to southeast from their calving grounds, around the west side of Meliadine Lake, and on to the coast to feed. Because of this, caribou were most often seen crossing the road from the west side (or the “upstream” side) to the east side (or the “downstream” side). It was hypothesised that behaviour may vary depending on whether the caribou had crossed the road already (East) or whether they were anticipating doing so (West). This statistic was recorded in 2021 only.

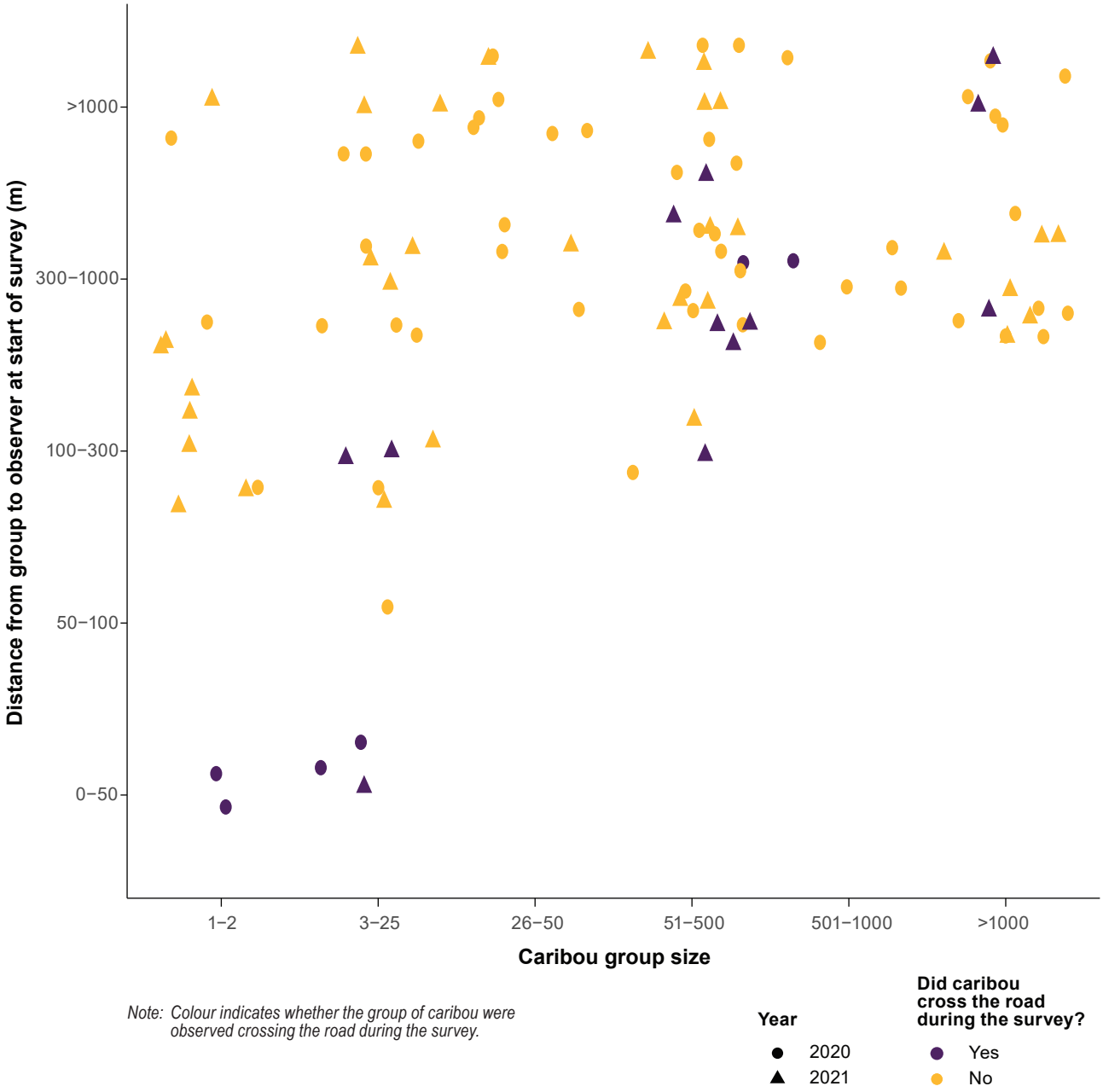
One hypothesis is that caribou are hesitating to cross the road but that once they cross the road, they move away quickly. If this were the case, the prediction would be that groups of caribou would be observed close to the road on the upstream side with fewer groups or groups further away on the downstream side. This predicted distribution was not observed. Instead, groups of caribou were observed near the road on both sides of the road. Figure 6.3-4 compares the distance to the road at the start of the survey with the location relative to the road (East or West). More surveys occurred further from the road on the east side of the road, downstream of the direction of travel. Nearly all surveys on the west (upstream) side of the road occurred within a kilometer of the road (panel b), but there were surveys close to the road on both sides of the road.

When proportion of each behaviour type was compared between surveys on the East and West (Figure 6.3-4; panel a), the two subsets were almost identical and no difference could be observed.

Number of Disturbances

Figure 6.3-5 shows a density plot for the proportion of response behaviours in three subsets of surveys; those with no disturbances, those with one disturbance, and those with multiple disturbances. The results suggest a slightly higher proportion of alert or running caribou in surveys where one or more disturbances occurred. This is more apparent in surveys with multiple disturbances than in those with only one. It should be noted that this figure is an average proportion of response behaviours across the entire 30-minute survey, so in some instances the proportion of response behaviours may have been obscured by the large number of intervals with no response behaviour.

When duration of response (i.e., time taken for caribou to return to a baseline condition following a disturbance) is compared with the proportion of alert behaviours, it appears that surveys with a higher proportion of caribou responding to the disturbance tend to take longer to recover to a baseline condition (Figure 6.3-5). Interestingly, it appears that surveys with multiple disturbances don't consistently produce a larger response or a longer one. Although the long-lasting full-group responses are in surveys with multiple disturbances, there are surveys with multiple disturbances that don't have large reactions or longer-lasting response durations.



Note: Colour indicates whether the group of caribou were observed crossing the road during the survey.

Figure 6.3-1: Caribou Group Size Versus Distance From the Surveyors to the Caribou at the Start of the Survey

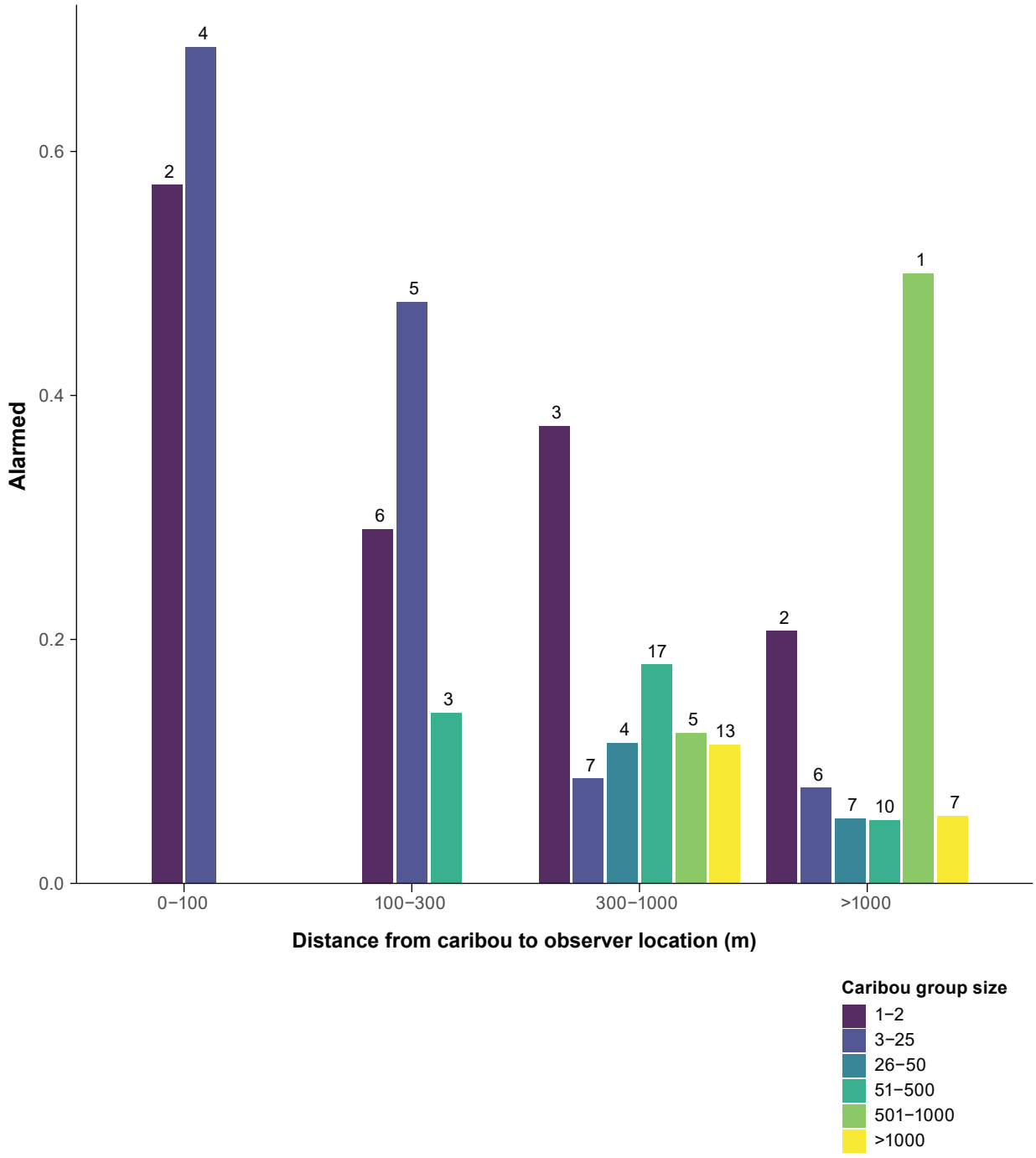
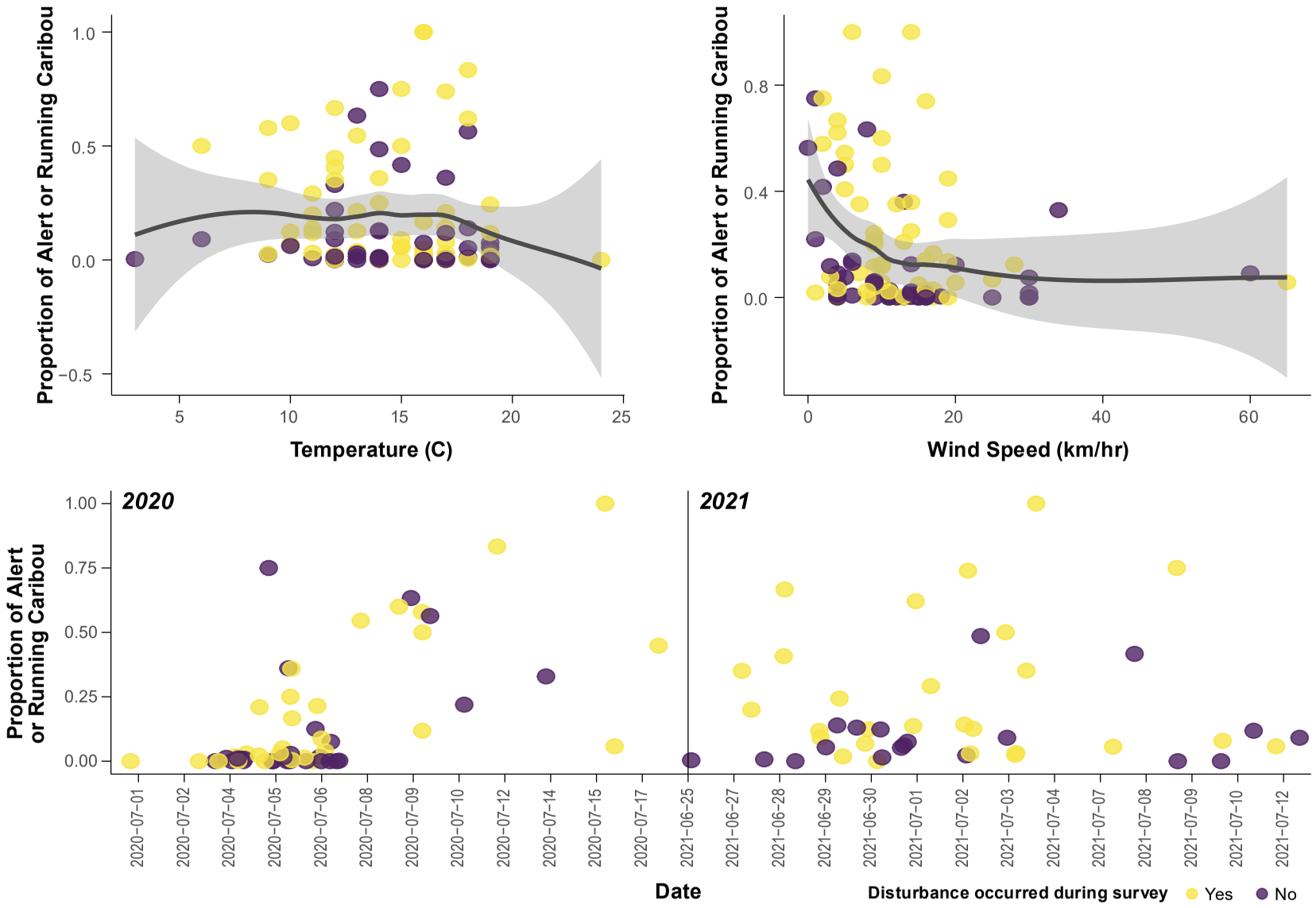


Figure 6.3-2: Average Proportion of Each Behaviour Type Observed Among; A) Different Caribou Group Sizes, and; B) Different Distances From the Surveyors to the Caribou at the Start of the Survey



Notes: Colour indicates whether or not a disturbance occurred suring the survey.
In the top two panels, an exploratory loess smooth fit is shown in grey with 95% confidence intervals.

Figure 6.3-3: Proportion of Alert or Running Caribou by Temperature, Wind Speed, Date, and Whether or Not a Disturbance Occurred During the Survey

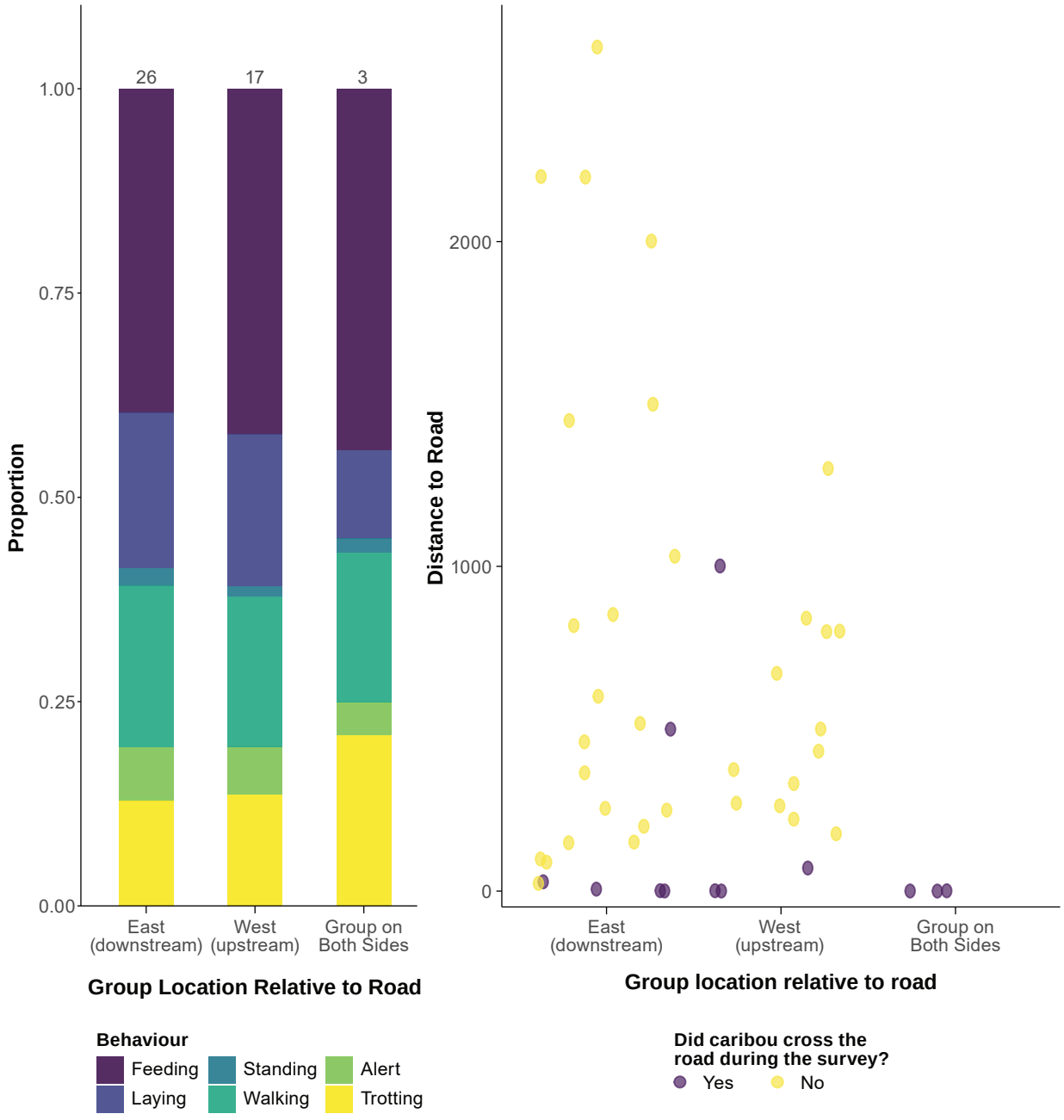


Figure 6.3-4: Comparison of Caribou on Upstream (West) and Downstream (East) Side of the Road

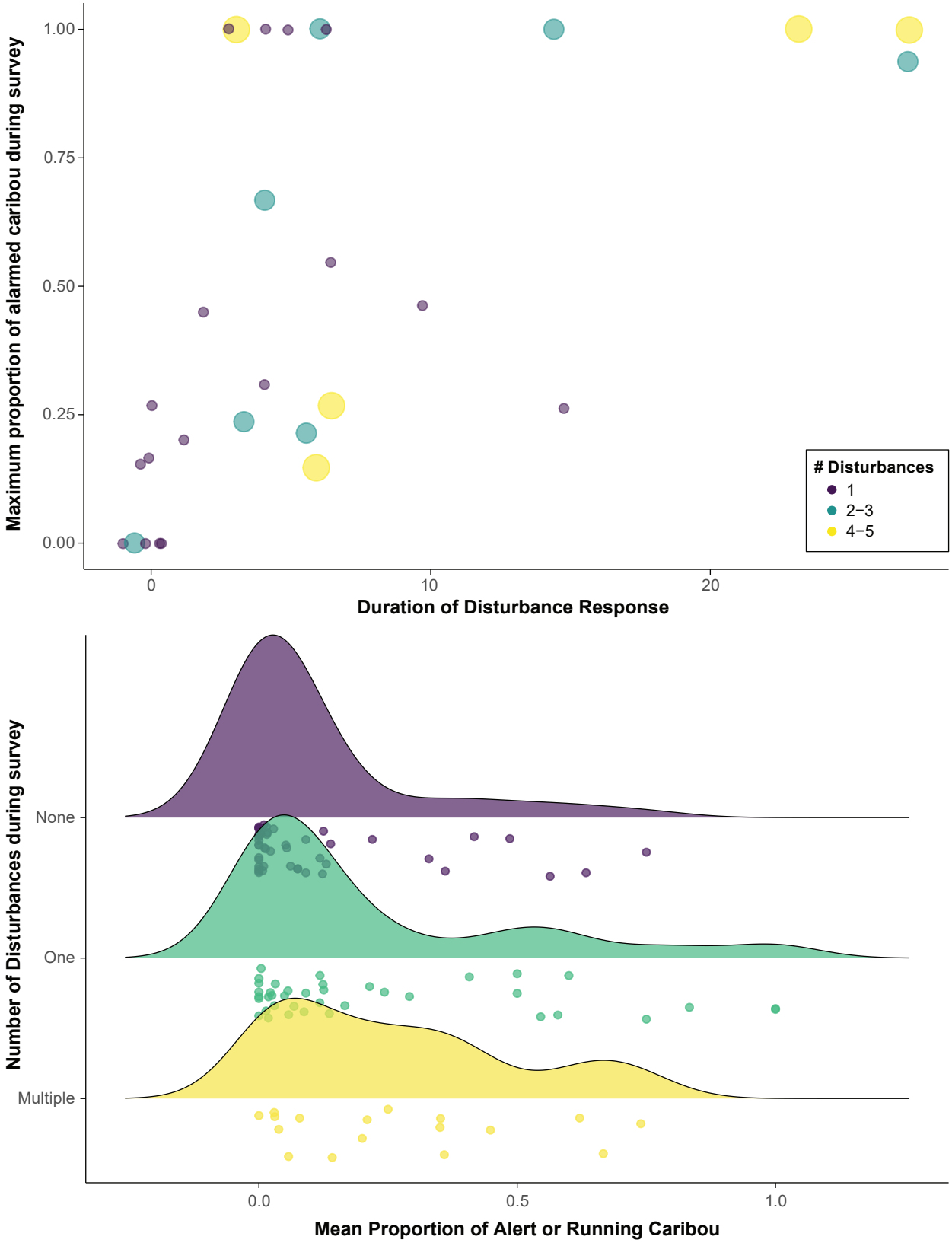


Figure 6.3-5: Comparison of Response Behaviours by Number of Disturbances

Response to Disturbances

Summarizing data over the entire 30-minute survey is useful for broad comparisons, but has the disadvantage that response behaviour can be washed out in a relatively uneventful survey. To examine the response to disturbances within a survey, the proportion of response behaviours was plotted by three-minute interval for each survey, as shown in Figure 6.3-6. In Figure 6.3-6, the response behaviours of "alert" and "trotting or running" are combined to create the total proportion of responding caribou in any given time interval, and plotted over time within the 30 minute survey. Disturbances are denoted with a vertical bar. A spike in response behaviours in the interval during a disturbance or immediately following a disturbance, suggests that the caribou are responding to the disturbance.

The results show that even in the absence of disturbances, an average of 5-10% of caribou typically exhibit response behaviours at any given time. This may be considered a "baseline" from which response to disturbances can be estimated. Figure 6.3-6 suggests that following a disturbance event, there was commonly a spike in the proportion of caribou with response behaviours increasing from 5-10% up to 60-90% of the group. The proportion of caribou with response behaviours returned to a pre-disturbance levels quickly, often within two intervals (6 minutes). For example, when a truck passed, most caribou would look up (which is classified as a response behaviour) and then return to feeding or standing (a pre-disturbance behaviour).

There was some variability in the proportion of response behaviours. During some surveys, there was a spike in response behaviours when no vehicle or other obvious disturbance was observed. In some surveys a vehicle passed by (a disturbance), but there was no increase in response behaviours observed in the caribou group on the subsequent time period.

6.3.2 Statistical Analysis

As group size and distance to road were identified as being potentially correlated during the exploratory analysis, a Chi-square test was conducted between the two variables to determine if they were too closely related to be included in a model together. A Chi-square ($\chi 2$) statistic is a test that measures how a model compares to actual observed data, and can be used to test for the correlation between two categorical variables. The resulting Chi-square statistic was significant ($p=0.003$), indicating that group size is associated with distance to road. In light of this, and in order to prevent overfitting the models, two separate models were run that included group size as an independent variable and distance to road as an independent variable, respectively. To bolster the sample size for statistical analyses, all analyses in this section were conducted on the pooled dataset of 2020 and 2021 data.

The results indicated that distance to road out-performed group size in all variable combinations, based on the equivalent model cut-off of $\Delta AIC<2$ suggested by Burnham and Anderson (2004). As a result, distance to road was used instead of group size in final models. The estimates and significance levels for the best-fitting model that used proportion of response behaviours as a dependent variable are presented in Table 6.3-1, and for the best-fitting model that used duration of response as a dependent variable in Table 6.3-2.

The statistics presented include the variable estimate, which can be interpreted as the expected effect on the dependent variable as the independent variable increases. For example, in Table 6.3-1 the negative estimate for temperature indicates that as the wind speed increases, the proportion of caribou with response behaviours decreases. However, estimates should always be considered in tandem with the standard error; if the standard error is larger than the estimate, the estimate is meaningless. The p-value statistic indicates whether the model is a "statistically significant" predictor of the dependent variable, regardless of how large the estimate is. A p-value of less than 0.05 suggests that the variable is an important determinant of the response, as it indicates there was less than 5% probability that the results occurred by chance.

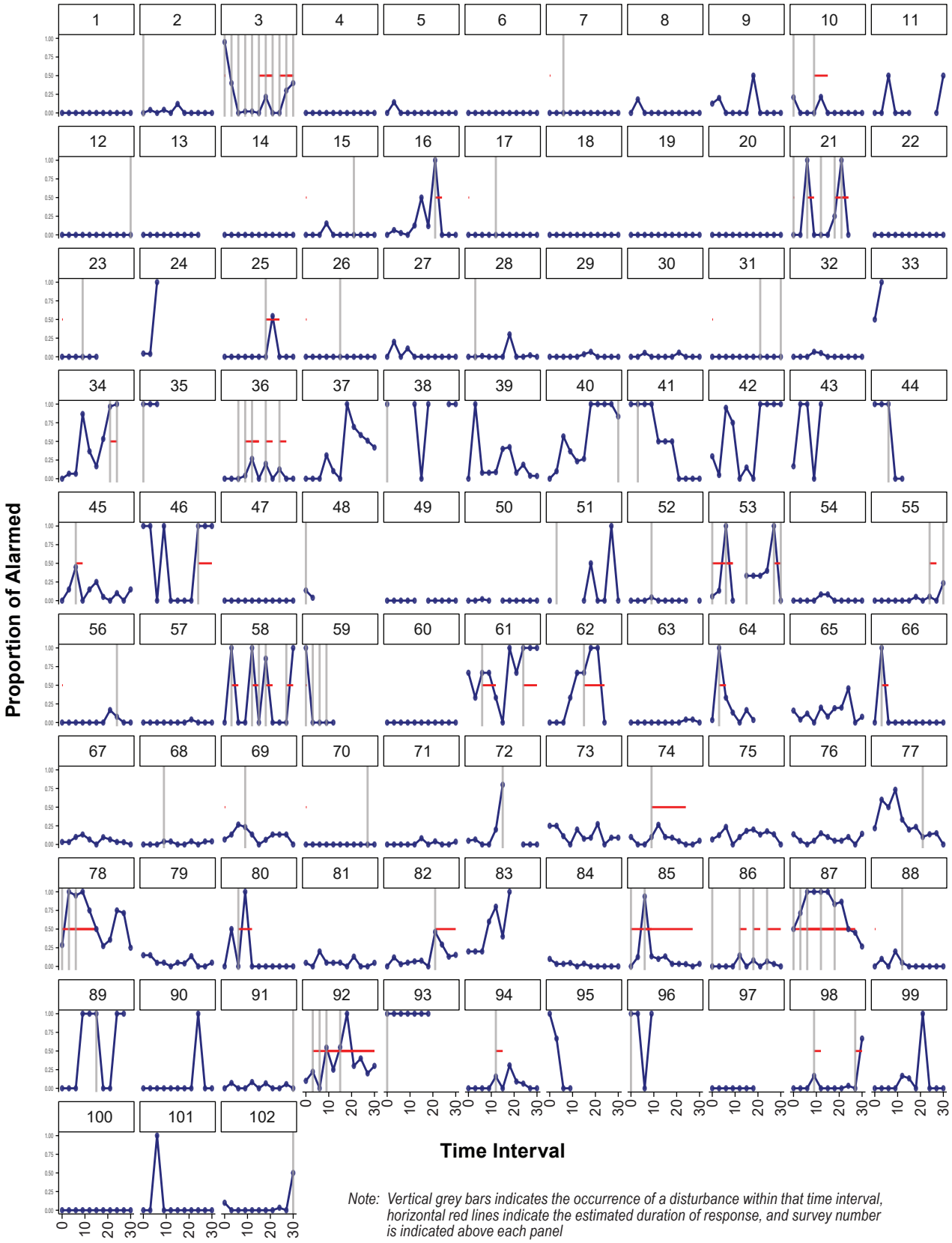


Figure 6.3-6: Proportion of Response Behaviour during Each Survey

Table 6.3-1: Summary of Model Coefficients and Significance Levels for Model Using Average Proportion of Response Behaviours as the Dependent Variable

Variable	Estimate	Standard Error	P-value
(Intercept)	0.19	1.06	0.861
Distance to road 50-100 m	16.20	2399.54	0.995
Distance to road 100-300 m	-0.95	1.11	0.395
Distance to road 300-1000 m	-1.84	1.04	0.080
Distance to road >1000 m	-2.63	1.15	0.022*
Wind speed (km/hr)	-0.05	0.04	0.226
Disturbance during survey (Yes)	0.93	0.62	0.130

Note:

** Statistically significant p-values <0.05 are indicated with an asterisk.*

Table 6.3-2: Summary of Model Coefficients and Significance Levels for Model Using Duration of Response as the Dependent Variable

Variable	Estimate	Standard Error	P-value
(Intercept)	6.00	7.39	0.423
Distance to road 100-300 m	-0.60	8.10	0.941
Distance to road 300-1000 m	1.42	7.59	0.853
Distance to road >1000 m	-2.73	7.72	0.726

Notes:

** Statistically significant p-values <0.05 are indicated with an asterisk.*

The bin of distance to road 50-100m is not included as there was no data on duration disturbed for caribou occurring at that distance.

The results of this analysis suggest that there is a weak differential effect of distance to the road on response behaviour, and that caribou were less likely to be exhibiting response behaviours further from the road. This effect was most apparent in the surveys on caribou greater than 1,000 m from the road, as the effect was significant in models that used proportion of response behaviour as the dependent variable (p=0.02), with an estimate of -2.63±1.15. This effect was not significant in models that used duration of response as the dependent variable, and in fact the standard errors in the best-fitting model were larger than the estimates. This indicates that a link between distance to road and duration of response could not be detected, possibly due to the small sample size.

There is some evidence that caribou were less likely to exhibit response behaviour in distances of 300 to 1,000 m from the road, with an estimate of -1.84±1.04 in proportion of response behaviour models (p=0.080). Temperature and wind speed were not found to have an effect on response behaviours in either model set.

When a subset of only 2021 data was used, which contains the more accurate distance to road variable, similar trends were detected. Once again, the distance to road variable provides a better model fit than caribou group size. Caribou further from the road were less likely to exhibit response behaviours (-0.0008±0.0007), but the effect was not significant (p=0.261). No model that incorporated side of the road (east or west) at the start of survey showed an effect.

These results should be treated with caution due to the relatively small sample size and because response behaviours were averaged over each 30-minute survey period. Nevertheless, these results are consistent with other surveys recorded on barren-ground caribou during the post-calving and early summer periods, which suggest that caribou behavioural responses to all-season haul roads tend to taper off beyond a zone of influence of approximately 500 m (Murphy and Curlato 1987; Johnson and Lawhead 1989; Dyer et al. 2001). However, zone of influence estimates are highly variable in the literature and further analysis will be required to adequately address this question for Meliadine. Responses to roads and infrastructure have previously been linked to increased harvest from roadways (Plante et al. 2018; Russell and Gunn 2019), a factor which was not included in this analysis.

One consideration with analyzing these data, is that the response of caribou to disturbances is relatively brief, lasting on-average 2 sampling periods (5.83 minutes). Using average behaviour type across the 30-minute (10 sampling periods) effectively dilutes the caribou response, and likely explains why duration of response models performed so poorly. With the addition of future sampling, it may be possible to examine average behaviours within a 30-minute sampling period; before a disturbance, immediately following the disturbance, and following return to pre-disturbance behaviour.

7. SUMMARY

The behaviour monitoring data from 2021 were combined with data from 2020, and all results outlined in this report use both years, unless otherwise stated. The program and combined data resulted in several key findings:

- The standard monitoring protocols adapted from the GNWT ENR worked well at the Project site.
- Forty-six surveys were conducted with the majority of observations between June 29 and July 2, 2021. This was approximately one week earlier than peak caribou observations in 2020. The data from 2020 and 2021 were combined to reach the goal of 100 surveys across two years.
- Observations were well distributed across a range of caribou group sizes from 1 to 2 individuals to >1,000.
- Small groups of <50 caribou were observed both near (<300 m) and far (>300 m) from infrastructure while large groups (>50) occurred beyond 300 m from infrastructure. Small groups consistently had a higher proportion of response behaviours (running, alert) than larger groups. This was true in both 2020 and 2021.
- Groups of caribou were observed near the road in equal proportions on both the upstream and downstream sides of the road, but were more often observed further from the road on the downstream side of the road. Behaviour did not differ between caribou on the two sides.
- An analysis of the data across both years indicated that there is a trend for caribou at greater distance from infrastructure (>300 m) to have a lower proportion of response behaviours. This analysis accounted for the difference in group size with distance, but should be interpreted with caution with only one year of data.
- The proportion of caribou with response behaviours in a group was unrelated to environmental variables including temperature and wind speed.
- Approximately half of the surveys included a disturbance event, typically from essential Project vehicles, mostly pickups, and all-terrain vehicles (ATVs) used by community members on the AWAR for travel and harvesting. Only one disturbance was recorded from a predator; the rest were from vehicles. The AWAR was closed to most Project vehicles when caribou were near the road and all Project vehicles stop when caribou are on the road.
- It should be noted that surveyors specifically sought to survey caribou during convoys and would be stationed to monitor any nearby caribou during convoys. This was due to the relative shortage of data on mine-related traffic potential disturbances.
- Following a disturbance event, the proportion of response behaviours in a group of caribou rose, but typically returned to baseline behaviours within two sampling periods (six minutes).
- The updates applied to the survey protocol in 2021 used feedback from the first year of data and analysis, and were helpful in improving the overall quality and accuracy of the data.
- Even with some changes to the protocol between 2020 and 2021, the trends in the results were highly consistent between the two years of data. This increases the confidence that an underlying effect has been detected. Additional data collection would bolster the sample size and improve the likelihood of detecting statistically significant effects.

8. REFERENCES

Agnico Eagle 2020. *Agnico Eagle Meliadine Division Terrestrial Environment Management and Monitoring Plan (TEMMP)*.

BQCMB. 2014. *The Beverly and Qamanirjuaq Caribou Management Plan 2013-2022.* Beverly and Qamanirjuaq Caribou Management Board.

BQCMB. 2020a. *Home page.* Beverly and Qamanirjuaq Caribou Management Board. https://arctic-caribou.com/

BQCMB. 2020b. *The Beverly and Qamanirjuaq Caribou Management Board Annual Report 2019-2020.* Beverly and Qamanirjuaq Caribou Management Board.

Burnham, K.P., Anderson, D.R. 2004. *Multimodel inference: understanding AIC and BIC in model selection.* Sociol. Methods Res. 33, 261–304.

COSEWIC. 2016. *COSEWIC assessment and status report on the Caribou* Rangifer tarandus*, Barren-ground population, in Canada.* Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 123 pp. (http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1).

Curatolo, James A.; Murphy, Stephen M. 1986. The effects of pipelines, roads, and traffic on the movements of caribou, *Rangifer tarandus*. *The Canadian Field-Naturalist* 100(2):218-224.

Dyer, S., O'Neill, J., Wasel, S., & Boutin, S. 2001. Avoidance of Industrial Development by Woodland Caribou. *The Journal of Wildlife Management,* 65(3), 531-542. doi:10.2307/3803106.

GNWT-ENR. 2017. *Caribou behaviour monitoring field protocols.* Government of the Northwest Territories Environment and Natural Resources, 10 page unpublished document. Yellowknife, NT.

Johnson, C. B., and B. E. Lawhead. 1989. *Distribution, Movements, and Behavior of Caribou in the Kuparuk Oilfield, Summer 1988.* Report by Alaska Biological Research, Inc., to ARCO Alaska, Inc., and the Kuparuk River Unit, Anchorage, Alaska.

Plante, S., Dussault, C., Richard, J.H., Cote, S. 2018. Human disturbance effects and cumulative habitat loss in endangered migratory caribou. *Biological Conservation* 224: 129-143.

Russell, D., and A. Gunn. 2019. *Vulnerability Analysis of the Porcupine Caribou Herd to Potential Development of the 1002 Lands in the Arctic National Wildlife Refuge, Alaska.* Report prepared for: Environment Yukon, Canadian Wildlife Service, and GNWT ENR Department of Environment and Natural Resources. 143 pp.

Wolfe S.A., Griffith B., and Wolfe C.A.G. 2000. *Response of Reindeer and Caribou to Human Activities.* Polar Research 19(1), 63-13.

APPENDIX A DETAILED METHODS FOR CARIBOU BEHAVIOUR SURVEYS

DRAFT

AGNICO EAGLE

Meadowbank Gold Mine

Caribou Behaviour Monitoring

September 15, 2021

Project No.: 0597635

The business of sustainability

ERM

CONTENTS

1. INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) would like to determine whether caribou behaviour changes in response to mine activities. The purpose of caribou behaviour surveys is to provide information to characterize the effects of the physical road and mine-related activities on caribou behaviour, including the All Weather Access Road (AWAR) and Haul Road.

The planned monitoring program is designed to collect data on caribou behaviour using standardized, scientifically-defensible methods. The data will be used to monitor Project effects.

1.1 Objectives

Following discussions with the Kivalliq Inuit Association and Government of Nunavut during the spring of 2021, the objectives of the behaviour monitoring program for caribou have been updated to the following:

- Evaluate the baseline behaviour of caribou (behaviour in the absence of disturbance);
- Evaluate the response of caribou to disturbances;
- Compare the behaviour of caribou between the following categories, if there is sufficient data:
    1) in large vs. small groups,
    2) near vs. far from the road,
    3) when the road is open vs. closed,
    4) east vs. west of the road, (upstream and downstream), and
    5) spring migration vs. summer and fall periods.

2. STUDY AREA

The study area for behaviour monitoring is anywhere that caribou may interact with the mine, including the All Weather Access Road (AWAR), the Meadowbank Mine site, Whale Tail site and the Haul Road connecting Meadowbank to Whale Tail.

3. STANDARD OPERATING PROCEDURES

The purpose of caribou behaviour surveys is to provide information to characterize the effects of the physical road and mine-related activities on caribou behaviour, including the All Weather Access Road (AWAR) and Haul Road. The overall method for the surveys is to identify caribou groups visible from the road, to select some groups for observation, and to record the behaviour of individuals in groups of different sizes including their behaviour without any disturbance and responses to both mine-related activities and natural factors.

Notes to guide the work include:

- Systematic surveys will be conducted along all Project roads during spring, summer and fall periods.
- The survey team will consist of a driver/observer and a second observer when available.

Surveys should be performed:

- During spring, summer and fall when caribou may be in the Project area,
- Of caribou at various distances from the road and group sizes, and
- If surveying effects of a convoy, conduct two surveys, one at least an hour before convoy deployment so that a pre-disturbance measurement can be made, and a second survey during the convoy passing by caribou.

3.1 General Field Data

For each survey day, the appropriate general field data will be recorded onto field data sheets supplied in Appendix A and B. A new data sheet will be used for each survey, including additional sheets as necessary to record all observations. General information includes:

- Survey date and start and end times.
- Field personnel (full names on the data sheet header and initials thereafter).
- Weather conditions during and prior to sampling (e.g., snow in the last 24 hours, current wind conditions).
- Site description: provide location and description (GPS coordinates, road name and distance marker).
- Photographs or video (if possible):
    - Take a photo of the caribou every time an observation is recorded so that the observations can be verified by a biologist.
    - For any photographs taken, record the picture IDs in the comments field on the field data sheet.
    - Write descriptions of any photos taken for specific reasons.
- General observations/notes of the environment/sampling procedures.
- Any deviation from the SOPs outlined below.

Note: When in doubt take pictures and make field notes explaining the situation, your response or consequent changes in methods. It is better to have more data/notes than not enough when interpreting the results later on.

3.2 General Equipment List

- A GPS unit with waypoints of road km markings.
- Field data sheets (Appendix A and B), clipboard, pencils, or iPad with data form.
- A timer capable of alarm setting for repeat time intervals (i.e., can be set to go off every three minutes, like a smart phone).
- Binoculars or spotting scope.
- Compass (or use compass function on GPS unit).
- Portable weather station (temperature and wind speed).
- Camera.
- Rangefinder.

3.3 Field Methods

3.3.1 Group Selection

The survey day will begin with a reconnaissance survey to determine how many caribou groups are present near the road, how large they are, and where they are. This will be accomplished by driving from the mine site along the road and noting relevant information about the groups and their sizes along the way (using the standard, tablet-based road survey form). Observers will preferentially choose groups to survey to across group sizes and distances from the road. Ideally, caribou would be sampled in an even distribution across these variables and along the AWAR and Haul Road. However, the nature of caribou and field sampling mean that observers may need to survey what caribou are available, rather than what is “ideal”.

Allow approximately one hour to survey each group. If the length of the survey day permits all groups to be surveyed then they should all be surveyed. If there are more groups to survey than the time in the day, then do the following:

1. Look at how many of each group size (bullet list below) have been surveyed to date. If one of them is under-represented and there is a group of that size on the road, then go survey that group. If there is more than one group of that size, choose it randomly using the procedure in step 4.
    - 1 or 2 caribou
    - 3 to 25 caribou
    - 26 to 50 caribou
    - >50 caribou
2. During 2020, few groups of caribou within 300 m of the road were observed or sampled. Preferentially choose groups of caribou within 300 m of the road, with a soft target of approximately 1/3 of samples in this area.
3. If any Project-tolerant caribou are observed (e.g., caribou observed near the road or mine site for more than 72 hours in summer and 48 hours in other seasons; TEMP 2020), then select these animals for sampling. In Appendix A data sheet, record that the group is Project tolerant in the notes field.
4. If there are multiple groups available, choose groups to fill in an even distribution of group sizes and distances from roads.

Record all caribou groups observed during the reconnaissance survey in the standard, tablet-based survey form and submit that data along with the results of behaviour monitoring.

3.3.2 Selection of an Observation Site

Find a safe parking location and follow site safety protocols. The observation location may be the vehicle itself or a safe location off the road. If observers exit the vehicle, the observation location should be chosen where observer activity is not likely to influence caribou behaviour and where the observer can remain comfortable for a period of approximately 45 minutes without needing to move. Ideally, the vehicle should be stopped a minimum of ~250-300 m from the caribou – adapt this distance as needed. If the animals are staring at the truck or moving away, then the truck is too close.

3.3.3 Data Recording

Allow 15 minutes between arrival and the time at which behavioural observations begin. This is to allow animals to return to behaviour that may have been interrupted by the arrival of observers. In the time before recording behaviour, fill in the top portion of the form with location, weather, and group size information.

After 15 minutes, begin recording data in the form in Appendix A. The start time to record is the time that observations begin.

3.3.3.1 Location

Location: Collect a waypoint of the location from which the observations will be made. Note the waypoint number and the UTM coordinates on the data sheet.

Road Condition: If observing caribou on a road, record whether the AWAR or Haul Road are open or closed.

Distance: Estimate the distance to the group using a laser rangefinder and, using a compass or the GPS unit compass feature, record the bearing (0° to 360°) to the group being observed. If the group of caribou is large and spread over a considerable distance from the road, estimate the distance to nearby caribou and the caribou furthest away that will be sampled. If some caribou in the group are too far away to sample, then do not include them in the distance estimate.

Behaviour: At each time interval during the survey, observers should record the number of individuals in the group exhibiting behaviour in each category. For clarity, observers should record zero values for behaviours not observed.

East vs. West: Note if the group is on the east or west side of the road. At the end of the 30 minute observation period return to the top of the form and record (Y or N) if the group crossed the road during the survey period. If monitoring at the mine site or Whale Tail, leave this section blank.

Sex: Note the sex of the group. This can be difficult in large groups, so record in the following categories: mostly males, mostly females, mostly females with calves, juveniles, or mixed group.

3.3.3.2 Weather Conditions

Use the portable weather station to record:

- Air temperature;
- Wind speed;
- Wind direction;
- Precipitation; and
- Humidity (if the weather station has this function).

3.3.3.3 Road Structure

At the location of the caribou group, record the road characteristics:

- Height of the road above the tundra (m);
- Slope of the road side (with of the slope in m);
- Approximate height of snow bank (m); and
- Any structures, such as bridges, present.

3.3.3.4 Caribou Behaviour

Individuals in the group being observed will be categorized when the survey starts and at three minute intervals. Standardized behaviour categories will be used (Section 3.3.4). The standardization of behaviour is necessary for clarity and data analysis. If the observed behaviour does not fit within any of the categories then observers have the option of noting other behaviour in the comments field. However, this should be used only rarely as most behaviour should fit in the primary categories listed below.
If noting a new/different behaviour, please take a photo or video of the caribou.

The data to record at each three-minute interval are the numbers of individuals in the group exhibiting each behaviour at that time. Do not attempt to characterize the behaviour that occurred during the interval. If the group is too large to be counted in each interval, choose an identifiable subset of the group, count the individuals exhibiting each behaviour at each time interval, and add a comment that a subset of the group was sampled.

Indicate the total group size at the top of the data form, not the size of the subset whose behaviour was recorded. Count the number of caribou up to 100 animals, and then record group size in categories above 100; 100-200 animals, etc. (see Appendix A).

Practically, the easiest way to do this is to have the observer scan across the group of caribou from Left to Right, calling out the behaviour of each animal, while the recorder adds tick marks to the data sheet. When complete, count up the tick marks.

3.3.3.5 Disturbance Events

Caribou behaviour is expected to vary in response to some disturbance events. The bottom of the data form should be used to record any potential disturbance events evident to the observer regardless of whether caribou respond to them. The main categories of events are included in the data sheet:

- Light truck;
- Haul truck;
- Road maintenance vehicle (e.g., grader);
- ATV or skidoo;
- Aircraft; and
- Predator (note species).

Record the number and approximate speed of the vehicle (regular driving speed, or moving slowly, ~10 km/h, past caribou).

Record the time of the disturbance event (0:00 to 30:00 of the survey), indicate which type of disturbance was observed in the appropriate column. Record any additional comments and records of photographs taken in the final column.

Record whether the vehicle stopped when approaching caribou or continued to drive slowly. If possible, coordinate with passing vehicles on the road to have some vehicles stop for 10 minutes, and others drive by slowly.

3.3.4 Behaviour Classification

With the exception of Alert behaviour, the primary behaviour categories and their definitions follow classifications from the Government of Northwest Territories (GNWT 2017). The categories appear as columns on the data form, with descriptions on the form. The behaviour categories are:

- **Feeding** – standing or walking posture, with the muzzle touching or nearly touching the ground; can be ingesting food or not; head down or moving from side to side.
- **Lying down** – bedded on the ground, either upright or lying on its side, in a resting or ruminating position.
- **Standing** – stationary in an upright, standing posture with head elevated above the ground, and usually above the knees; if cow is nursing, if possible record the time spend nursing.
- **Alert** – head up scanning horizon or focused on a source of disturbance (e.g., vehicle, predator, human).
- **Walking** – similar to standing posture but moving at a slow gait (<5 km/h).
- **Trotting/running** – similar to standing posture but moving rapidly in symmetrical or asymmetrical gait.

Other behaviours that may be observed (record in comments field on form) are:

- **Nursing** – calf is suckling cow.
- **Sparring** – two males in contact.
- **Insect response behavior** – twitching, stamping, tossing head.

In the comments, record if any animals are moving towards the road, parallel or away from the road.

4. DATA MANAGEMENT

Please scan all data sheets at the end of the day. Data from behaviour surveys should be entered into Excel. Data from group selection surveys (standard tablet data form) and behaviour surveys should be delivered at the end of each month to ERM for QA/QC.

5. CLOSURE

This SOP has been produced for Agnico Eagle Meadowbank Division by ERM Canada. Please contact the authors with any questions.

DRAFT

Nina Morrell, MSc
Wildlife Biologist, Statistician
Nina.Morrell@erm.com

DRAFT

Dr. Greg Sharam
Technical Director, Wildlife
Greg.Sharam@erm.com

6. REFERENCES

GNWT-ENR. 2017. *Caribou behaviour monitoring field protocols.* Government of the Northwest Territories Environment and Natural Resources, 10 page unpublished document. Yellowknife, NT.

TEMP. 2020. Meadowbank Division. Terrestrial Ecosystem Management Plan. Version 8, April 2020

APPENDIX A MEADOWBANK GOLD MINE: CARIBOU BEHAVIOUR MONITORING DATA SHEET

Meadowbank Gold Mine: Caribou Behaviour Monitoring Data Sheet

Date:		Time (24 hr [00:00 to 24:00]) Start:	End:
Observers:			
Location Waypoint number:	UTM Easting:	UTM Northing:	Road name and distance marker:
Distance from caribou to observer location (use rangefinder).		(if group diffuse, estimate average distance)	Bearing:
Is group location East or West of the Road at start of survey? Circle one: **E W**		Did the group cross the road during the survey? Circle one: **Y N**	
Caribou group size: Exact count (up to 100): _____ Estimated size for larger groups. Circle one: **101-200 201-500 501-1000 >1000**			
Record sex of group (mostly males, females, females with calves, mostly juveniles, or mixed group):			
Temperature: ___°C Wind speed: _____km/h Wind direction:_____° Humidity:_____% Days since last snow or wind event: _____			
Weather observations:			
Road: Open? Closed? Road Height:		Road Side Width:	Structures/snowbank Present:

Observation time from start of survey	Number of animals exhibiting each behaviour type						Comments and photo numbers (Note if any caribou crossed road or travelled along road)
	Feeding	Lying Down	Standing	Walking	Alert	Trotting or running	
0 minutes							
3 minutes							
6 minutes							
9 minutes							
12 minutes							
15 minutes							
18 minutes							
21 minutes							
24 minutes							
27 minutes							
30 minutes							

Observed disturbance events

(record time from start of survey and check type of disturbance. Record whether vehicle stopped (s) or drove slowly (d) past caribou)

Time from start of survey	Light truck	Haul Truck	Road maintenance vehicle (e.g., grader)	ATV	Aircraft	Predator (note species)	Comments and photo numbers. Note other disturbances here

Categories and Definitions of Behaviour[1]:

- **Feeding** – standing or walking posture, with the muzzle touching or nearly touching the ground; can be ingesting food or not; head down or moving from side to side.
- **Lying down** – bedded on the ground, either upright or lying on its side, in a resting or ruminating position.
- **Standing** – stationary in an upright, standing posture with head elevated above the ground, and usually above the knees; if cow is nursing, if possible record the time spend nursing.
- **Alert** – head up scanning horizon or focused on a source of disturbance (e.g., vehicle, predator, human).
- **Walking** – similar to standing posture but moving at a slow gait (<5 km/h).
- **Trotting/running** – similar to standing posture but moving rapidly in symmetrical or asymmetrical gait.

Other behaviours that may be observed (record in comments field on form) are:

- **Nursing** – calf is suckling cow.
- **Sparring** – two males in contact.
- **Insect response behavior** – twitching, stamping, tossing head.

[1] Primary source: GNWT-ENR 2017 caribou behaviour monitoring field protocols, courtesy of GNWT Yellowknife, NT.

APPENDIX B DATA FROM CARIBOU BEHAVIOUR SURVEYS

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Observers	Waypoint	UTM E	UTM N	Road Name and Distance Marker	Distance from Caribou to Observer Location (m)	Distance from Caribou to Road (if different)	Bearing	Is Group East or West of Survey?	Did the Group Cross the Road during the Survey?	Caribou Group Size (Exact Count or Estimate)	Dominant Group Sex	Temp. (°C)
1	25-Jun-21	9:15	9:45	NM, NZ	C01	539148	6990423	Mine Site	600	600	270	E	N	250	females with calves	3
2	27-Jun-21	16:10	16:39	NM, NZ	C03	547416	6978330	AWAR km 16	261	261	90	W	N	8	females	9
3		11:24	11:54	NM	C02	539021	6990208	Mine Site	2100	1500	360	E	N	1	females	11
4	28-Jun-21	9:49	10:20	NM, NZ	C04	542045	6989158	Explo	2200	2200	45	E	N	117	females with calves	11.6
5		12:17	12:47	NM, NZ	C05	544145	6982624	AWAR km 22	225	5	320	E	Y	3	females	11.5
6		13:44	14:14	NM, NZ	C06	543519	6984046	AWAR km 24	1030	1030	40	E	N	3	females	12
7		14:41	15:13	NM, NZ	C04	5042045	6989158	Explo	2200	2200	40	E	N	150	females with calves	11
8	29-Jun-21	17:18	17:48	NM	C09	541267	6988440	AWAR km 30, explo	1900	1000	180	W	Y	5000	females with calves	19
9		14:16	14:46	NM	C08	539672	6988266	TIRI1, AWAR km 28	2000	0	130	W	Y	5000	females with calves	18
10		12:12	12:42	NM	C07	542033	6989156	Explo	300	200	350	E	N	1	females	15
11		16:48	17:18	NM	C09	541267	6988440	AWAR km 30, explo	463	0	180	E	Y	5000	females with calves	19
12		13:30	14:00	NM	C08	539672	6988266	AWAR km 28, TIRI1	430	430	190	W	N	5000	females with calves	19
13		17:56	18:26	NM	C10	540326	6988058	AWAR km 28	1000	500	180	E	Y	500	mixed	19
14	30-Jun-21	11:49	12:22	NM, JR	C13	541794	6988900	Explo road	460	460	330	E	N	5	females with calves	11.5
15		10:57	11:33	NM, JR	C12	539232	6989153	Mine site	730	500	220	W	N	28	females with calves	12.5
16		14:15	14:45	NM, JR	C14	540865	6985852	AWAR km 27	708	330	160	W	N	2000	mixed group	10.4
17		8:54	9:25	NM, JR	C11	540825	6988994	Explo road	246	30	120	E	Y	17	mixed group	13.5
18		15:57	16:32	NM, JR	C16	543091	6984413	AWAR km 26	670	670	224	W	N	2000	mixed group	10.4
19		15:21	15:50	NM, JR	C15	542685	6984470	AWAR km 26	380	270	257	W	N	200	mixed group	11.5
20	1-Jul-21	10:33	11:05	NM, JR	C19	542809	6984429	AWAR km 24	202	0	300	E/W	Y	500	mixed gtoup	16.5
21		8:55	9:57	NM, JR	C18	543339	6984198	AWAR km 23	500	70	170	W	Y	60	females with calves	10.8
22		12:40	13:28	NM, JR	C20	542210	6984922	AWAR km 24	350	0	310	E/W	Y	275	mixed group	18
23		7:47	8:26	NM, JR	C17	540714	6985954	AWAR km 23	840	840	235	W	N	83	females with calves	10.5
24		8:38	9:08	NM, JR	C18	543339	6984198	AWAR km 23	234	150	85	E	N	2	females	10.8
25		12:02	12:32	NM, JR	C20	542210	6984922	AWAR km 24	350	0	310	E/W	Y	275	mixed group	18
26	2-Jul-21	10:23	10:53	NM, SK	C23	545579	6980741	AWAR km 20	213	175	320	W	N	107	females with calves	13.4
27		9:38	9:54	NM, SK	C22	547885	6976672	AWAR km 13	300	250	40	E	N	5	females with calves	14.4
28		8:02	8:40	NM, SK	C21	546154	6980043	AWAR km 19	1000	364	180	E	N	50	females with calves	8.8
29		14:31	15:01	NM, SK	C24	596294	6979469	AWAR km 17	800	800	175	W	N	2000	mixed group	17
30		13:45	14:15	NM, SK	C24	546294	6979469	AWAR km 17	375	375	214	W	N	2000	mixed group	17
31		15:58	16:28	NM, SK	C24	546294	6979469	AWAR km 17	800	800	214	W	N	2000	mixed group	17
32	3-Jul-21	13:16	13:46	NM, SJW, NAM	C29	543893	6983091	AWAR km 23	2400	2000	53	E	N	400	females with calves	11
33		7:16	7:45	NM, SJW, NAM	C23	545579	6980741	AWAR km 20	254	254	140	E	N	1	females	6
34		8:05	8:36	NM, SJW, NAM	C27	546955	6973703	AWAR km 11	271	220	270	W	N	1	females	6
35		9:06	9:37	NM, SJW, NAM	C28	543708	6983688	AWAR km 23	2600	2600	70	E	N	18	females with calves	8.7
36		17:12	17:42	NM	C30	543623	6983946	AWAR km 24	1600	1450	15	E	N	400	females with calves	12
37	4-Jul-21	14:36	15:06	NM, JR	C31	541658	6985365	AWAR km 27	790	25	309	E	N	2	females with calves	15.8
38	7-Jul-21	12:43	13:13	HV, JR	C32	546131	6980415	AWAR km 20	850	850	87	E	N	20	females with calves	14.7
39	8-Jul-21	7:25	7:36	HV, JR	C33	543663	6983817	AWAR km 25	818	818	113	E	N	3	females with calves	15.1
40	9-Jul-21	8:23	8:31	HV	C34	541195	6986436	AWAR km 28	25	0	10	W	Y	3	females	15
41		12:13	12:31	HV	C35	546141	6980387	AWAR km 20	515	515	80	E	N	2	females with calves	17
42	10-Jul-21	10:11	10:41	HV, SK	C36	540836	6988950	Explo Road/ WRSF 3	400	100	60	E	N	70	males	17
43		10:50	11:10	HV, SK	C36	540836	6988950	Explo Road/ WRSF 4	600	0	70	E	Y	70	males	17
44		13:27	13:57	HV, SK	C37	547845	6977612	AWAR km 16	1500	1300	270	W	N	4	males	19
45	12-Jul-21	13:13	13:43	HV	C38	543086	6984415	AWAR km 24	200	150	115	E	N	1	males	12
46		15:28	15:58	HV	C39	541492	6987160	AWAR km 28	450	90	185	E	N	275	mixed group	15

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Wind Speed (km/h)	Wind Direction	Days since Last Snow or Wind Event	Weather Observations	Road Open or Closed	Road Height	Road Side Width	Structures Present	Feeding_0	Lying Down_0	Standing_0	Walking_0	Alert_0	Trotting/Running_0	Photo Number_0	Comments_0
1	25-Jun-21	9:15	9:45	18	0	0	very windy cold day, overcast, no rain	open	N/A	N/A	mine site	19	6	0	0	0	0		
2	27-Jun-21	16:10	16:39	12	140	3	Light rain	open	150	200	AWAR, culvert	0	7	0	0	0	0		
3		11:24	11:54	9	90	3	warm, overcast, no rain	closed	N/A	N/A	mine site	0	0	0	0	1	0		
4	28-Jun-21	9:49	10:20	3.9	320	4	overcast	open	N/A	N/A	Explo camp	14	11	0	0	0	0		
5		12:17	12:47	4	320	4	overcast, no rain	open	100	200	AWAR, camera wpt 138	1	0	0	0	2	0		
6		13:44	14:14	5	320	4		open	100	200	AWAR	0	0	0	3	0	0		
7		14:41	15:13	6	320	4	overcast, no rain	open	N/A	N/A	Explo camp	7	18	0	0	0	0		
8	29-Jun-21	17:18	17:48	9.1	320	5	sunny, warm, wind picked up	closed	100	150	AWAR	19	0	10	0	1	0		
9		14:16	14:46	5.5	320	5	sunny	closed	100	150	AWAR, mine site	11	0	0	10	2	2		
10		12:12	12:42	7.4	320	5	clear, sunny	closed	N/A	N/A	mine, explo	0	1	0	0	0	0		
11		16:48	17:18	9.1	320	5	sunny, warm, wind picking up	closed	100	150	mine, AWAR	20	0	0	9	1	0		
12		13:30	14:00	1.2	320	5	warm, sunny, no insects yet	closed	N/A	N/A	mine, AWAR	16	4	0	5	0	0		
13		17:56	18:26	9	320	5	warm, sunny	closed	100	150	mine, AWAR	4	4	0	20	2	0		
14	30-Jun-21	11:49	12:22	18.9	220	6	sunny	closed	100	100	Explo camp	0	7	0	0	0	0		
15		10:57	11:33	13.7	220	6	sunny	closed	N/A	N/A	Waste rock pile, mine	5	23	0	0	0	0		
16		14:15	14:45	28.2	220	6	cloudy	closed	100	100	AWAR, quarry	14	3	0	2	0	1		
17		8:54	9:25	6.3	220	6	sunny	closed	100	100	waterline, road, mine	2	0	0	1	0	1		
18		15:57	16:32	25	140	6		closed	100	100	AWAR	7	1	0	10	0	2		
19		15:21	15:50	20.5	140	6	sunny	closed	100	100	AWAR	12	0	0	2	0	1		
20	1-Jul-21	10:33	11:05	5	180	7		closed	100	100	AWAR	16	3	0	0	0	3		
21		8:55	9:57	18.7	180	7	cloudy	closed	100	100	AWAR	9	0	0	9	0	5		
22		12:40	13:28	4.3	180	7		closed	100	100	AWAR	12	2	0	1	2	4		on road
23		7:47	8:26	8.8	180	7		closed	100	100	AWAR, quarry	12	0	0	5	3	0		
24		8:38	9:08	18.7	180	7	cloudy	closed	100	100	AWAR	2	0	0	0	0	0		
25		12:02	12:32	4.3	180	7	cloudy	closed	100	100	AWAR	11	3	0	6	0	1		group on road
26	2-Jul-21	10:23	10:53	9.8	320	7	sunny, heating up	closed	100	100	AWAR	22	0	0	4	0	0		
27		9:38	9:54	4.5	320	7	sunny	closed	100	100	AWAR	4	0	0	0	1	0		
28		8:02	8:40	13.5	320	7		closed			AWAR	21	3	0	3	2	1		
29		14:31	15:01	16.5	320	7	sunny, windy	closed	100	100	AWAR	4	0	1	25	0	0		
30		13:45	14:15	16.5	320	7		closed	100	100	AWAR	12	1	2	15	0	0		group in lowland area below road
31		15:58	16:28	16.5	320	7		closed			AWAR	5	0	5	5	15	0		
32	3-Jul-21	13:16	13:46	4.4	20	0	overcast	open			AWAR	7	0	0	13	0	0		
33		7:16	7:45	9.5	0	0	fog	closed			AWAR	1	0	0	0	0	0		
34		8:05	8:36	3.8	0	0	overcast	closed			AWAR	0	0	0	1	0	0		1 additional caribou observed to east, not behaviourally linked
35		9:06	9:37	8.5	0	0	overcast	closed			AWAR	9	2	0	3	0	0		
36		17:12	17:42	6.6	320	0		closed			AWAR	12	0	0	6	0	2		hunters on hill overlooking
37	4-Jul-21	14:36	15:06	6.4	180	1		open			AWAR, quarry	0	0	0	0	0	2		
38	7-Jul-21	12:43	13:13	20.5	300	4	very light rain right before survey	open			AWAR	2	18	0	0	0	0		
39	8-Jul-21	7:25	7:36	2.2	0	5		open			AWAR	0	0	0	0	0	3		
40	9-Jul-21	8:23	8:31	2	0	6	sunny	open			AWAR	0	0	0	0	0	3		crossing AWAR W to E
41		12:13	12:31	25	250	6		open			AWAR	2	0	0	0	0	0		
42	10-Jul-21	10:11	10:41	2.7	130	7		open			WRSF 3, Explo Camp, Waterline	30	0	0	0	0	0		group is E of explo camp and waterline
43		10:50	11:10	3	130	7		closed			WRSF 3, Explo Camp, Waterline	0	0	0	30	0	0		
44		13:27	13:57	15.5	180	7		closed			AWAR	0	4	0	0	0	0		looks like there are maybe 1-2 more males but they are behind a hill
45	12-Jul-21	13:13	13:43	60	45	0	rained overnight, foggy today and high winds starting in afternoon	open			AWAR	0	0	0	1	0	0		headed N/NE away from road
46		15:28	15:58	65	0	0	light rain on/off, high winds	closed			AWAR	5	7	0	15	3	0		two hunters watching herd

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Feeding_3	Lying down_3	Standing_3	Walking_3	Alert_3	Trotting/Running_3	Photo Number_3	Comments_3	Feeding_6	Lying down_6	Standing_6	Walking_6	Alert_6	Trotting/Running_6	Photo Number_6	Comments_6
1	25-Jun-21	9:15	9:45	19	6	0	0	0	0			20	0	2	3	0	0		
2	27-Jun-21	16:10	16:39	0	0	0	0	7	0		pick up truck driving by and caribou still lying down	0	7	0	0	0	0		
3		11:24	11:54	1	0	0	0	0	0			1	0	0	0	0	0		
4	28-Jun-21	9:49	10:20	8	16	0	1	0	0			12	13	0	0	0	0		
5		12:17	12:47	1	0	0	1	1	0			0	0	0	1	2	0		
6		13:44	14:14	0	0	0	3	0	0			3	0	0	0	0	0		
7		14:41	15:13	10	15	0	0	0	0			8	17	0	0	0	0		
8	29-Jun-21	17:18	17:48	0	0	0	0	0	30		ATV	5	0	0	15	0	10		majority of group out of sight
9		14:16	14:46	15	0	0	9	0	1			15	0	0	7	2	1		
10		12:12	12:42	0	0	0	0	1	0			0	1	0	0	0	0		
11		16:48	17:18	20	0	0	10	1	0		crossing over road into view from east	23	0	0	4	0	3		crossing over road into view from east
12		13:30	14:00	15	3	0	7	0	0			20	2	0	3	0	0		
13		17:56	18:26	1	4	0	21	4	0		convoy slowly approaching	4	6	0	12	2	6		crossing road
14	30-Jun-21	11:49	12:22	0	7	0	0	0	0			0	7	0	0	0	0		
15		10:57	11:33	5	23	0	0	0	0			6	18	0	0	0	0		
16		14:15	14:45	13	1	0	0	1	0			16	4	0	0	0	0		
17		8:54	9:25	2	0	0	1	1	0			6	0	0	2	1	0		
18		15:57	16:32	12	5	0	3	0	0			15	3	0	2	0	0		
19		15:21	15:50	13	0	0	1	2	0			6	0	0	7	2	2		
20	1-Jul-21	10:33	11:05	13	2	0	4	0	1			17	3	0	1	0	0		
21		8:55	9:57	7	0	0	1	2	10		crossing road	1	0	0	9	2	8		crossing/travelling on road
22		12:40	13:28	0	0	0	0	2	18		group running for entire 3 minute interval, truck proceeding slowly	1	0	0	0	5	14		
23		7:47	8:26	14	0	0	3	3	0			17	1	1	1	1	0		group merged into larger group of ~300
24		8:38	9:08	0	1	0	0	1	0			2	0	0	0	0	0		
25		12:02	12:32	10	1	1	8	0	0			11	1	0	4	0	4		
26	2-Jul-21	10:23	10:53	16	0	0	6	3	0			16	0	0	17	0	1		
27		9:38	9:54	3	0	0	1	1	0			4	0	0	0	1	0		
28		8:02	8:40	27	1	0	2	1	0			26	1	0	2	0	1		
29		14:31	15:01	3	0	0	25	4	0			0	1	0	1	5	25		one caribou shot down, possibly one wounded
30		13:45	14:15	25	1	2	3	0	0			19	3	0	8	0	0		
31		15:58	16:28	5	0	0	5	10	15			0	0	0	0	0	30		
32	3-Jul-21	13:16	13:46	14	0	0	4	0	2			14	0	0	6	0	0		
33		7:16	7:45	1	0	0	0	0	0			0	0	0	1	0	0		
34		8:05	8:36	0	1	0	0	0	0		additional caribou behind survey crossed road towards this caribou	1	0	0	0	0	0		
35		9:06	9:37	12	0	0	1	1	0			8	0	0	4	0	0		3 out of sight
36		17:12	17:42	12	0	0	2	0	4			16	0	0	4	0	0		
37	4-Jul-21	14:36	15:06	0	0	0	0	0	2			0	0	0	0	0	2		
38	7-Jul-21	12:43	13:13	1	18	0	0	0	0		one out of sight	3	17	0	0	0	0		
39	8-Jul-21	7:25	7:36	1	0	0	0	0	2		moving E, away from road	0	0	2	0	0	0		>1 km away
40	9-Jul-21	8:23	8:31	0	0	0	0	0	3		Running S	3	0	0	0	0	0		
41		12:13	12:31	2	0	0	0	0	0			2	0	0	0	0	0		
42	10-Jul-21	10:11	10:41	30	0	0	0	0	0			25	0	0	5	0	0		
43		10:50	11:10	15	0	0	15	0	0		looking for way across waterline	15	0	0	15	0	0		
44		13:27	13:57	0	4	0	0	0	0			0	4	0	0	0	0		
45	12-Jul-21	13:13	13:43	1	0	0	0	0	0			0	0	0	0	0	1		
46		15:28	15:58	15	5	0	10	0	0		moving W slowly towards road	15	5	0	10	0	o		moving E, away from road

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Feeding_9	Lying Down_9	Standing_9	Walking_9	Alert_9	Trotting/Running_9	Comments_9	Photo Number_9	Feeding_12	Lying Down_12	Standing_12	Walking_12	Alert_12	Trotting/Running_12	Photo Number_12	Comments_12
1	25-Jun-21	9:15	9:45	18	5	1	1	0	0			16	7	1	1	0	0		
2	27-Jun-21	16:10	16:39	0	7	0	0	0	0			0	0	0	0	7	0		five stood up, all alert
3		11:24	11:54	0	0	0	1	0	0	walking out of sight		0	0	0	1	0	0		walking out of sight
4	28-Jun-21	9:49	10:20	11	9	0	4	0	0			9	14	0	2	0	0		
5		12:17	12:47	0	0	0	1	2	0	crossing road		2	0	0	0	1	0		crossing road, shaking heads from insects
6		13:44	14:14	1	0	0	1	0	1			0	0	0	1	1	1		
7		14:41	15:13	9	11	0	5	0	0			6	19	0	0	0	0		
8	29-Jun-21	17:18	17:48	11	0	0	15	0	4	surveying segment further away		10	0	0	20	0	0		
9		14:16	14:46	20	0	0	5	0	0			10	0	0	10	0	5		
10		12:12	12:42	0	1	0	0	0	0			0	1	0	0	0	0		
11		16:48	17:18	19	0	0	7	0	4	crossing over road into view from east		19	0	0	9	1	1		stopping to look around on the road
12		13:30	14:00	16	4	0	4	1	0			13	5	1	5	1	0		
13		17:56	18:26	3	0	0	20	3	4	crossing road		0	0	0	26	4	0		crossing road
14	30-Jun-21	11:49	12:22	0	7	0	0	0	0			0	7	0	0	0	0		
15		10:57	11:33	4	23	0	1	0	0			3	20	0	3	0	0		
16		14:15	14:45	16	3	0	1	0	0			13	1	0	2	2	2		
17		8:54	9:25	10	0	0	0	0	0			8	0	0	0	2	0		
18		15:57	16:32	15	1	0	2	1	1			4	3	0	7	3	2		
19		15:21	15:50	12	0	0	2	0	0			8	0	0	1	1	0		
20	1-Jul-21	10:33	11:05	16	2	0	1	1	0			8	1	0	8	3	0		
21		8:55	9:57	1	0	0	3	2	9			8	0	0	6	0	7		
22		12:40	13:28	0	0	0	0	0	20			1	0	0	4	0	15		
23		7:47	8:26	18	0	0	1	1	0			17	2	0	1	0	0		
24		8:38	9:08	0	0	0	0	0	2			1	1	0	0	0	0		
25		12:02	12:32	13	3	1	2	1	0			10	2	2	6	1	0		
26	2-Jul-21	10:23	10:53	18	0	2	18	2	0			25	0	1	16	1	2		
27		9:38	9:54	0	0	0	2	0	3			0	0	0	1	0	4		
28		8:02	8:40	18	1	0	2	1	0			25	1	0	4	0	0		
29		14:31	15:01	20	0	0	12	5	0			26	1	0	0	3	0		3 caribou watching hunter
30		13:45	14:15	23	4	1	3	0	0			16	13	0	0	5	0		
31		15:58	16:28	0	0	0	0	0	30			0	0	0	0	0	30		
32	3-Jul-21	13:16	13:46	10	0	0	6	0	4			12	1	0	6	0	1		
33		7:16	7:45	0	0	0	0	1	0			0	0	0	0	0	1		
34		8:05	8:36	1	0	0	0	0	0			1	0	0	0	0	0		
35		9:06	9:37	10	1	0	0	0	0			9	1	0	1	1	0		
36		17:12	17:42	4	0	0	6	2	10			5	0	0	10	2	3		
37	4-Jul-21	14:36	15:06	0	0	0	0	0	2			0	0	0	0	1	1		
38	7-Jul-21	12:43	13:13	3	17	0	0	0	0			4	8	0	4	3	0		
39	8-Jul-21	7:25	7:36	0	0	1	0	0	0	out of sight		0	0	0	0	0	0		out of sight
40	9-Jul-21	8:23	8:31	0	0	0	0	0	3	running S out of sight		0	0	0	0	0	0		out of sight
41		12:13	12:31	1	0	0	1	0	0	walking south slowly		2	0	0	0	0	0		
42	10-Jul-21	10:11	10:41	5	0	0	20	5	0			0	0	0	30	0	0		
43		10:50	11:10	0	0	0	30	0	0			0	0	0	25	0	5		
44		13:27	13:57	0	3	1	0	0	0			0	2	2	0	0	0		
45	12-Jul-21	13:13	13:43	1	0	0	0	0	0			0	0	0	1	0	0		headed East, away from road
46		15:28	15:58	22	3	0	5	0	0			20	10	0	0	0	0		

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Feeding_15	Lying Down_15	Standing_15	Walking_15	Alert_15	Trotting/Running_15	Photo Number_15	Comments_15	Feeding_18	Lying Down_18	Standing_18	Walking_18	Alert_18	Trotting/Running_18	Photo Number_18	Comments_18
1	25-Jun-21	9:15	9:45	16	7	1	1	0	0			15	8	0	2	0	0		
2	27-Jun-21	16:10	16:39	0	7	0	0	0	0			0	1	0	0	6	0		
3		11:24	11:54	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
4	28-Jun-21	9:49	10:20	8	16	0	1	0	0			7	18	0	0	0	0		
5		12:17	12:47	3	0	0	0	0	0			0	0	0	0	0	3		
6		13:44	14:14	0	0	0	1	2	0			0	0	0	0	0	3		
7		14:41	15:13	12	13	0	0	0	0			10	15	0	0	0	0		
8	29-Jun-21	17:18	17:48	15	0	0	10	0	5			15	0	0	13	1	0		
9		14:16	14:46	15	0	0	8	1	1		small group running	1	0	0	20	0	5		on the move
10		12:12	12:42	0	1	0	0	0	0			0	1	0	0	0	0		
11		16:48	17:18	17	0	0	3	0	0			20	0	0	8	2	1		
12		13:30	14:00	16	7	1	1	0	0			19	6	0	0	0	0		
13		17:56	18:26	4	3	0	30	0	0			10	0	0	20	2	0		HTO truck visible -> not moving
14	30-Jun-21	11:49	12:22	1	6	0	0	0	0			0	7	0	0	0	0		
15		10:57	11:33	6	8	0	8	2	0			10	13	1	3	0	0		
16		14:15	14:45	4	0	0	0	6	10			0	0	0	0	0	0		survey interrupted by conversation with local on ATV
17		8:54	9:25	12	0	0	0	1	0			10	0	0	0	1	0		
18		15:57	16:32	16	0	0	2	1	1			15	3	0	2	0	2		
19		15:21	15:50	8	0	0	1	2	0		main group out of site	3	0	0	1	1	0		
20	1-Jul-21	10:33	11:05	11	3	2	2	0	2			14	1	1	3	1	0		
21		8:55	9:57	2	0	0	10	0	3			7	0	0	6	2	2		still walking on road
22		12:40	13:28	0	0	0	10	0	10			1	0	0	15	0	6		
23		7:47	8:26	18	1	0	0	1	0			19	1	0	4	1	0		
24		8:38	9:08	1	1	0	0	0	0			0	2	0	0	0	0		
25		12:02	12:32	14	3	1	1	1	0			14	3	2	1	0	0		
26	2-Jul-21	10:23	10:53	14	0	0	22	3	0			5	0	0	31	0	0		
27		9:38	9:54	1	0	0	2	0	2			0	0	0	0	0	5		running out of sight
28		8:02	8:40	20	2	0	4	0	1			23	3	0	4	0	0		
29		14:31	15:01	26	0	0	0	2	2			27	1	1	0	0	1		1 panicked caribou running around hunter
30		13:45	14:15	18	12	1	1	0	0			13	8	3	10	3	0		
31		15:58	16:28	0	0	0	0	0	30			5	0	0	0	2	23		
32	3-Jul-21	13:16	13:46	15	1	0	4	0	0			18	2	0	0	0	0		
33		7:16	7:45	0	0	0	0	1	0			0	0	0	1	0	0		
34		8:05	8:36	1	0	0	0	0	0			1	0	0	0	0	0		
35		9:06	9:37	14	1	0	1	0	0			13	0	0	1	0	1		
36		17:12	17:42	0	0	0	9	5	6			0	0	0	0	10	10		shots fired? Some of group looking back
37	4-Jul-21	14:36	15:06	0	0	0	0	0	2			0	0	0	0	0	2		running out of sight
38	7-Jul-21	12:43	13:13	11	10	0	2	0	0			0	6	0	3	4	0		moving south/southwest, can't see all of them
39	8-Jul-21	7:25	7:36	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
40	9-Jul-21	8:23	8:31	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
41		12:13	12:31	0	0	0	2	0	0		walked southeast	2	0	0	0	0	0		
42	10-Jul-21	10:11	10:41	1	0	0	29	0	0		circling around water pipeline area	27	0	0	3	0	0		
43		10:50	11:10	16	0	0	10	4	0		circling around water pipeline area	0	0	0	30	0	0		group crossed waterline at S ramp at 17min
44		13:27	13:57	0	4	0	0	0	0			0	4	0	0	0	0		
45	12-Jul-21	13:13	13:43	1	0	0	0	0	0			0	0	0	1	0	0		
46		15:28	15:58	15	13	0	2	0	0			10	20	0	0	0	0		

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Feeding_21	Lying Down_21	Standing_21	Walking_21	Alert_21	Trotting/Running_21	Photo Number_21	Comments_21	Feeding_24	Lying Down_24	Standing_24	Walking_24	Alert_24	Trotting/Running_24	Photo Number_24	Comments_24
1	25-Jun-21	9:15	9:45	15	8	0	1	1	0			15	7	0	3	0	0		
2	27-Jun-21	16:10	16:39	0	7	0	0	0	0			0	7	0	0	0	0		
3		11:24	11:54	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
4	28-Jun-21	9:49	10:20	7	18	0	0	0	0			2	23	0	0	0	0		
5		12:17	12:47	1	0	0	0	2	0			0	0	0	0	0	3		
6		13:44	14:14	0	0	0	0	0	3			0	0	0	3	0	0		
7		14:41	15:13	7	18	0	0	0	0			9	15	0	0	1	0		
8	29-Jun-21	17:18	17:48	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
9		14:16	14:46	11	0	0	9	0	5			10	0	0	3	1	10		
10		12:12	12:42	1	0	0	0	0	0			0	1	0	0	0	0		
11		16:48	17:18	25	0	0	3	2	0			24	0	0	5	1	0		
12		13:30	14:00	14	6	1	2	1	0			15	8	0	3	0	0		
13		17:56	18:26	6	0	0	20	4	0			0	0	0	26	4	0		
14	30-Jun-21	11:49	12:22	0	7	0	0	0	0			0	7	0	0	0	0		
15		10:57	11:33	7	16	0	0	1	0			6	21	0	0	0	0		
16		14:15	14:45	0	0	0	0	0	0		survey interrupted by conversation with local on ATV	0	0	0	20	0	0		
17		8:54	9:25	8	0	0	0	3	0			10	0	0	1	0	0		
18		15:57	16:32	16	5	0	1	1	0			17	2	0	2	0	0		
19		15:21	15:50	16	0	0	10	4	0			14	0	0	0	1	2		1 nursing
20	1-Jul-21	10:33	11:05	15	2	0	2	0	1			15	2	0	1	2	0		
21		8:55	9:57	6	0	0	12	2	0			6	0	0	13	0	3		most have crossed road W to E
22		12:40	13:28	1	0	0	8	1	4		group going out of sight - appear to be relocating following disturbance	0	0	0	5	0	15		
23		7:47	8:26	11	0	2	6	1	2			17	1	0	2	0	0		
24		8:38	9:08	0	2	0	0	0	0			0	2	0	0	0	0		
25		12:02	12:32	12	8	0	0	3	0			12	6	1	2	0	0		
26	2-Jul-21	10:23	10:53	8	0	1	5	2	10		convoy approaching	13	0	0	16	4	8		
27		9:38	9:54	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
28		8:02	8:40	15	2	0	7	0	0			23	2	0	5	0	0		
29		14:31	15:01	27	1	0	1	0	1		1 panicked caribou running around hunter	30	2	0	0	0	1		1 panicked caribou running around hunter
30		13:45	14:15	14	10	2	4	0	0			10	18	0	0	2	0		
31		15:58	16:28	0	0	0	4	0	26			3	0	0	12	0	15		
32	3-Jul-21	13:16	13:46	15	0	0	5	0	0			17	2	0	1	0	0		
33		7:16	7:45	1	0	0	0	0	0			0	0	0	0	0	1		running out of sight
34		8:05	8:36	1	0	0	0	0	0			0	0	0	0	1	0		
35		9:06	9:37	11	0	0	2	0	0			11	1	0	1	0	0		
36		17:12	17:42	4	0	0	10	0	6			4	0	0	8	0	8		
37	4-Jul-21	14:36	15:06	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
38	7-Jul-21	12:43	13:13	5	0	0	5	1	0			0	0	0	15	0	1		two males with antlers, at least 5 calves
39	8-Jul-21	7:25	7:36	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
40	9-Jul-21	8:23	8:31	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
41		12:13	12:31	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
42	10-Jul-21	10:11	10:41	15	0	0	15	0	0			9	0	0	20	1	0		
43		10:50	11:10	0	0	0	0	0	30		group ran as soon as across waterline	2	0	0	0	0	0		two did not make it across ramp, still near explo camp. All others out of site.
44		13:27	13:57	0	4	0	0	0	0			0	4	0	0	0	0		
45	12-Jul-21	13:13	13:43	1	0	0	0	0	0		stopped ~ 1 km E of the road	1	0	0	0	0	0		
46		15:28	15:58	7	23	0	0	0	0			5	24	0	0	1	0		not sure why some are alert now

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Feeding_27	Lying Down_27	Standing_27	Walking_27	Alert_27	Trotting/Running_27	Photo Number_27	Comments_27	Feeding_30	Lying Down_30	Standing_30	Walking_30	Alert_30	Trotting/Running_30	Photo Number_30	Comments_30
1	25-Jun-21	9:15	9:45	13	11	0	1	0	0			18	5	0	2	0	0		
2	27-Jun-21	16:10	16:39	0	7	0	0	0	0			0	0	0	0	7	0		
3		11:24	11:54	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		
4	28-Jun-21	9:49	10:20	3	22	0	0	0	0			4	21	0	0	0	0		
5		12:17	12:47	0	0	0	0	0	3			0	0	0	0	0	3		ran out of sight
6		13:44	14:14	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
7		14:41	15:13	9	13	0	2	1	0			7	17	0	1	0	0		
8	29-Jun-21	17:18	17:48	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
9		14:16	14:46	12	0	0	13	0	0			12	0	0	12	0	2		
10		12:12	12:42	0	1	0	0	0	0			0	1	0	0	0	0		
11		16:48	17:18	25	3	0	4	1	0			28	3	0	3	0	0		
12		13:30	14:00	16	6	0	2	1	0		1 nursing	15	6	0	2	0	1		
13		17:56	18:26	0	0	0	26	4	0		caribou going along road	10	0	0	20	0	0		
14	30-Jun-21	11:49	12:22	3	2	2	0	0	0			3	3	1	0	0	0		1 nursing
15		10:57	11:33	8	21	0	0	0	0			5	20	0	1	1	0		
16		14:15	14:45	0	0	0	20	0	0			5	0	0	15	0	0		
17		8:54	9:25	10	0	0	0	1	0			10	0	0	0	1	0		
18		15:57	16:32	15	3	0	3	0	0			14	2	0	3	0	1		
19		15:21	15:50	4	0	0	15	2	1			3	0	0	0	0	0		
20	1-Jul-21	10:33	11:05	16	4	1	3	0	0			15	3	0	0	3	0		
21		8:55	9:57	10	0	0	7	2	1			12	0	0	8	0	0		
22		12:40	13:28	1	0	0	5	0	15			0	0	0	15	0	5		
23		7:47	8:26	19	2	0	0	0	0			16	2	1	0	1	0		
24		8:38	9:08	0	2	0	0	0	0			0	2	0	0	0	0		
25		12:02	12:32	12	8	0	1	0	0			10	9	0	1	1	0		group still on road
26	2-Jul-21	10:23	10:53	5	0	0	35	0	6			4	0	0	29	2	4		
27		9:38	9:54	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
28		8:02	8:40	25	3	0	2	0	0			20	5	0	8	0	0		
29		14:31	15:01	30	0	1	0	0	0			27	2	0	0	1	0		
30		13:45	14:15	10	20	0	0	0	1			6	23	0	1	0	0		
31		15:58	16:28	6	0	0	11	0	14			10	0	0	12	1	7		
32	3-Jul-21	13:16	13:46	16	1	0	3	0	0			17	2	0	1	0	0		
33		7:16	7:45	0	0	0	0	1	0			0	0	0	0	0	0		out of sight
34		8:05	8:36	1	0	0	0	0	0			1	0	0	0	0	0		
35		9:06	9:37	12	1	0	4	0	1			14	0	0	3	0	0		
36		17:12	17:42	6	0	0	10	0	4			10	0	0	4	2	4		
37	4-Jul-21	14:36	15:06	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
38	7-Jul-21	12:43	13:13	0	0	0	7	0	0		rest out of sight	0	0	0	2	0	0		out of sight
39	8-Jul-21	7:25	7:36	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
40	9-Jul-21	8:23	8:31	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
41		12:13	12:31	0	0	0	0	0	0		out of sight	0	0	0	0	0	0		out of sight
42	10-Jul-21	10:11	10:41	30	0	0	0	0	0			0	0	0	10	0	20		
43		10:50	11:10	2	0	0	0	0	0		two left behind	2	0	0	0	0	0		
44		13:27	13:57	0	4	0	0	0	0			0	4	0	0	0	0		
45	12-Jul-21	13:13	13:43	1	0	0	0	0	0	truck drove by, no reaction		0	0	0	1	0	0		
46		15:28	15:58	3	27	0	0	0	0			0	15	0	0	15	0		Hop ~150m away, walking around to pick up plastic and alerted herd. Group trotted away after this.

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Disturbance_0	Dist_comments_0	Disturbance_3	Dist_comments_3	Disturbance_6	Dist_comments_6
1	25-Jun-21	9:15	9:45						
2	27-Jun-21	16:10	16:39			Light truck	two		
3		11:24	11:54	Hyster	noise from mine site	Hyster	noise from mine site	Hyster	noise from mine site
4	28-Jun-21	9:49	10:20						
5		12:17	12:47					Arctic fox	Arctic fox interacting with caribou.
6		13:44	14:14						
7		14:41	15:13						
8	29-Jun-21	17:18	17:48			ATV	blasted thru caribou herd caribou scattered everywhere		
9		14:16	14:46						
10		12:12	12:42			Light Truck	my vehicle -> turning off engine caught her attention		
11		16:48	17:18						
12		13:30	14:00						
13		17:56	18:26						
14	30-Jun-21	11:49	12:22						
15		10:57	11:33						
16		14:15	14:45						
17		8:54	9:25						
18		15:57	16:32						
19		15:21	15:50						
20	1-Jul-21	10:33	11:05						
21		8:55	9:57						
22		12:40	13:28	Light Truck	Proceeding slowly on road at 5km/hr	Light Truck	Proceeding slowly on road at 5 km/hr	Light Truck	at 8 minutes - Proceeding slowly on road at 5km/hr
23		7:47	8:26						
24		8:38	9:08					Light truck	
25		12:02	12:32						
26	2-Jul-21	10:23	10:53						
27		9:38	9:54						
28		8:02	8:40						
29		14:31	15:01	ATV	slowly approaching herd off road			hunter	3 gunshots, one caribou killed
30		13:45	14:15	Light truck	our truck, upwind				
31		15:58	16:28	convoy	approaching at 5 km/h	convoy	3 pickups, 7 buses, 2 hinos, 2 tractor trailors	convoy	passing slowly
32	3-Jul-21	13:16	13:46						
33		7:16	7:45						
34		8:05	8:36						
35		9:06	9:37						
36		17:12	17:42			ATV	2 side by sides. Stopped @ km 24	ATV	3 approaching herd
37	4-Jul-21	14:36	15:06	Light truck	Surveyor truck approaching				
38	7-Jul-21	12:43	13:13						
39	8-Jul-21	7:25	7:36						
40	9-Jul-21	8:23	8:31	Light truck	Survey vehicle approaching, group was already running when				
41		12:13	12:31						
42	10-Jul-21	10:11	10:41						
43		10:50	11:10						
44		13:27	13:57						
45	12-Jul-21	13:13	13:43						
46		15:28	15:58						

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Disturbance_9	Dist_comments_9	Disturbance_12	Dist_comments_12	Disturbance_15	Dist_comments_15
1	25-Jun-21	9:15	9:45						
2	27-Jun-21	16:10	16:39			ATV	three	ATV	two, far away
3		11:24	11:54	Hyster	noise from mine site				
4	28-Jun-21	9:49	10:20						
5		12:17	12:47						
6		13:44	14:14					Convoy	4 buses, 2 pickups, 4 hinos
7		14:41	15:13						
8	29-Jun-21	17:18	17:48						
9		14:16	14:46						
10		12:12	12:42						
11		16:48	17:18						
12		13:30	14:00	Light truck	Sean's truck leaving survey site. 11 minutes				
13		17:56	18:26	light truck	HTO advance truck ahead of convoy				
14	30-Jun-21	11:49	12:22						
15		10:57	11:33						
16		14:15	14:45					ATV	
17		8:54	9:25						
18		15:57	16:32	ATV					
19		15:21	15:50						
20	1-Jul-21	10:33	11:05						
21		8:55	9:57						
22		12:40	13:28						
23		7:47	8:26						
24		8:38	9:08						
25		12:02	12:32						
26	2-Jul-21	10:23	10:53						
27		9:38	9:54						
28		8:02	8:40						
29		14:31	15:01						
30		13:45	14:15			ATV	two, stopping by herd		
31		15:58	16:28			ATV	two		
32	3-Jul-21	13:16	13:46			ATV	approaching slowly		
33		7:16	7:45					Light truck	surveyor truck approaching caribou
34		8:05	8:36						
35		9:06	9:37						
36		17:12	17:42	ATV	2 side by sides moving again			hunter	Approaching herd, shots fired
37	4-Jul-21	14:36	15:06						
38	7-Jul-21	12:43	13:13			ATV	two passed by on the road, about 30 sec apart.		
39	8-Jul-21	7:25	7:36						
40	9-Jul-21	8:23	8:31						
41		12:13	12:31						
42	10-Jul-21	10:11	10:41	Light truck	truck on explo road at 7 min, whole group started running				
43		10:50	11:10						
44		13:27	13:57						
45	12-Jul-21	13:13	13:43						
46		15:28	15:58						

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Disturbance_18	Dist_comments_18	Disturbance_21	Dist_comments_21	Disturbance_24	Dist_comments_24
1	25-Jun-21	9:15	9:45						
2	27-Jun-21	16:10	16:39	ATV	one				
3		11:24	11:54						
4	28-Jun-21	9:49	10:20						
5		12:17	12:47					ATV	
6		13:44	14:14						
7		14:41	15:13						
8	29-Jun-21	17:18	17:48						
9		14:16	14:46						
10		12:12	12:42						
11		16:48	17:18						
12		13:30	14:00						
13		17:56	18:26						
14	30-Jun-21	11:49	12:22						
15		10:57	11:33						
16		14:15	14:45						
17		8:54	9:25						
18		15:57	16:32						
19		15:21	15:50						
20	1-Jul-21	10:33	11:05						
21		8:55	9:57			Light truck			
22		12:40	13:28						
23		7:47	8:26						
24		8:38	9:08						
25		12:02	12:32						
26	2-Jul-21	10:23	10:53			convoy	approaching slowly: 3 light trucks, 7 bus, 2 hino, 2 tractor trailer		
27		9:38	9:54						
28		8:02	8:40						
29		14:31	15:01						
30		13:45	14:15	ATV	two, leaving, downwind from herd			hunter	gunshot @ 25 minutes and 26 minutes, downwind from caribou so they barely reacted
31		15:58	16:28	hunter	shots fired				
32	3-Jul-21	13:16	13:46						
33		7:16	7:45						
34		8:05	8:36						
35		9:06	9:37						
36		17:12	17:42						
37	4-Jul-21	14:36	15:06						
38	7-Jul-21	12:43	13:13						
39	8-Jul-21	7:25	7:36						
40	9-Jul-21	8:23	8:31						
41		12:13	12:31						
42	10-Jul-21	10:11	10:41						
43		10:50	11:10						
44		13:27	13:57						
45	12-Jul-21	13:13	13:43						
46		15:28	15:58						

Appendix B: Caribou Behaviour Monitoring Data Sheet

Survey ID	Date	Time Start	Time End	Disturbance_27	Dist_comments_27	Disturbance_30	Dist_comments_30	General_comments
1	25-Jun-21	9:15	9:45					
2	27-Jun-21	16:10	16:39	ATV and Light Truck	at 29 minutes			One individual out of sight for duration of survey but with group
3		11:24	11:54					
4	28-Jun-21	9:49	10:20					
5		12:17	12:47					
6		13:44	14:14					
7		14:41	15:13					
8	29-Jun-21	17:18	17:48					
9		14:16	14:46					convoy waiting @ km 21 -> this survey was for the lead group on the road @ km 28
10		12:12	12:42					
11		16:48	17:18					front of herd, only surveying what I could see - rest out of view
12		13:30	14:00					
13		17:56	18:26					
14	30-Jun-21	11:49	12:22	Sewage truck				
15		10:57	11:33					
16		14:15	14:45					
17		8:54	9:25					
18		15:57	16:32					group across lake from surveyor - may have altered response
19		15:21	15:50					
20	1-Jul-21	10:33	11:05					
21		8:55	9:57					
22		12:40	13:28					kept watching: at 33 minutes 15 walking and 5 running; at 36 minutes 10 walking, 3 alert, and 4 running. Group then out of sight.
23		7:47	8:26					
24		8:38	9:08					
25		12:02	12:32					
26	2-Jul-21	10:23	10:53					
27		9:38	9:54					
28		8:02	8:40					
29		14:31	15:01					
30		13:45	14:15					
31		15:58	16:28					
32	3-Jul-21	13:16	13:46					
33		7:16	7:45					
34		8:05	8:36					
35		9:06	9:37			ATV	driving	
36		17:12	17:42					
37	4-Jul-21	14:36	15:06					
38	7-Jul-21	12:43	13:13					at least 5-6 calves out of group of 20, two males with large antlers also in the group.
39	8-Jul-21	7:25	7:36					
40	9-Jul-21	8:23	8:31					one caribou looked smaller than the other two, but not small enough to be a new calf.
41		12:13	12:31					
42	10-Jul-21	10:11	10:41	Light truck	second truck on explo road at 25 min			
43		10:50	11:10					SAME group surveyed again, continued surveying as group looked for crossing at waterline.
44		13:27	13:57					
45	12-Jul-21	13:13	13:43					
46		15:28	15:58			Human	Hop got out of truck to pick up plastic on the side of the road, caribou moved away and shortly after ran towards Explo camp.	

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
Chile
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
Myanmar
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Senegal
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UAE
UK
US
Vietnam

ERM's Toronto Office

120 Adelaide Street West, Suite 2010
Toronto, ON
Canada M5H 1T1

T: +1 416 646 3608
F: +1 416 642 1269

www.erm.com

The business of sustainability

ERM