

## Appendix 29 : 2020 Caribou Behaviour Study



## Meliadine Project

### Caribou Behaviour Study, 2020

March 2021

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## Signature Page

March 2021

# Meliadine Project

## Caribou Behaviour Study, 2020

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## 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 July each year, groups of Qamanirjuaq caribou 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). Studies of caribou behaviour were conducted in July 2020 at the Meliadine Mine and AWAR. As the first year of this study, 2020 represents a preliminary program meant to test and refine the methods and provide a first year of data.

Field surveys were conducted during July 2020 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 2020 had several results:

- The standard monitoring protocols adapted from the GNWT ENR worked well at the Project site.
- Fifty six surveys were conducted with the majority of observations between July 1 and 17. This is less than the 2020 objective of 100 surveys, largely due to safety requirements in areas of active harvest and due to COVID-19 safety measures.
- 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.
- An analysis of the first year's data indicated that there is a trend for caribou at greater distance from infrastructure (>300 m) to have a lower proportion of response behaviours. After disturbances from passing vehicles, caribou at greater distance returned to pre-disturbance/baseline behaviours more quickly. 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. The AWAR was closed to most Project vehicles when caribou were near the road and all Project vehicles stopped when caribou were 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).
- Following the 2020 program, Agnico Eagle plans to review the methods and results of this monitoring program with interested parties. Based on this review, Agnico Eagle may update the program as needed for the 2021 field season.

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## 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	Kilometer
Km/hr	Speed expressed as kilometer per hour
M	Meter
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

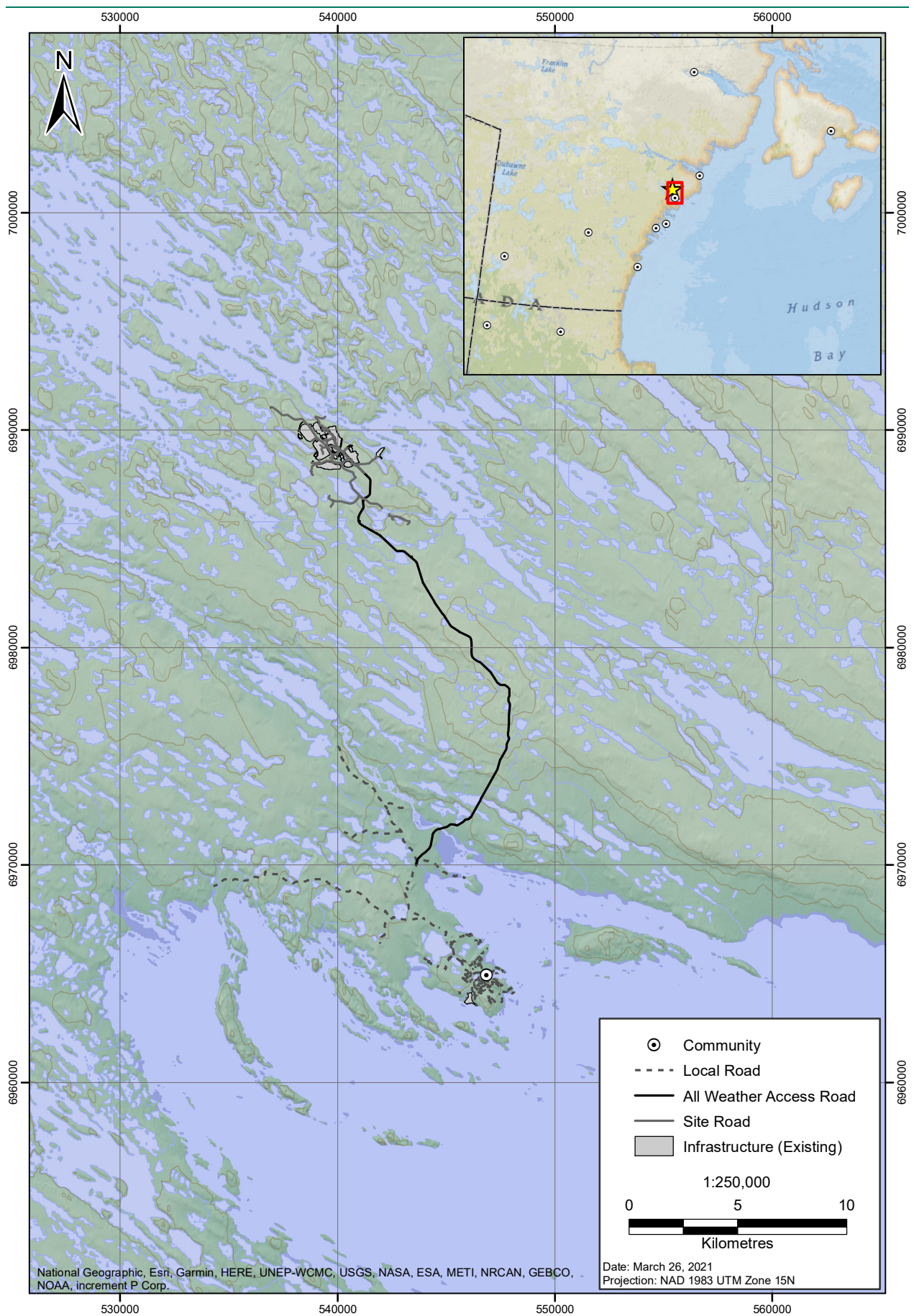
The Meliadine Mine (the Project), 100% owned by Agnico Eagle Mines Limited (Agnico Eagle), is located approximately 25 kilometres (km) north of Rankin Inlet, Nunavut. A 34 km All Season Access Road (AWAR) connects the Project to Rankin Inlet. A bypass road was constructed to the west and south of Rankin 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 six ore bodies Tiriganiaq, Wesmeg, Normeg, F-Zone, Pump and Discovery. A conceptual plan for mining these deposits was approved by the Nunavut Impact Review Board (NIRB) in 2016 (Project Certificate #006). Mining and ore processing of the Tiriganiaq deposit, including two open pits, underground mining and associated ore processing, waste management and ancillary infrastructure operation was subsequently licenced by the Nunavut Water Board (NWB) (Meliadine Mine Type A Water Licence No. 2AM-MEL1631).

Production from the Tiriganiaq deposit began in Q2 2019. The remainder of the orebodies are planned throughout the life of the Meliadine complex.

Studies of caribou behaviour were conducted in July 2020 at the Meliadine Mine and AWAR in support of existing NIRB conditions.





**Figure 1-1: Meliadine Gold Project Location**



## 2. STUDY OBJECTIVES

The objectives of the 2020 study were two-fold:

- To conduct a trial of the GNWT ENR behaviour survey methodology at the Project site to determine whether it is appropriate in this area, with these caribou, and at this time of year.
- For the first year of the program, to collect a set of 100 samples of caribou behaviour through conducting surveys comparing caribou behaviour: a) near vs. far, and b) 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 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/#maps>).

#### 3.2 Terrestrial Environment Management and Monitoring Plan

The Meliadine Mine 2014 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.

## 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 (TEMMP; Agnico Eagle 2020).

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 Government of Northwest Territories Department of Environment and Natural Resources (GNWT ENR 2017). 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. Detailed protocols are attached in Appendix A.

Prior to July 1, 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 July 2020 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, 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 preliminary regression analysis was conducted to test whether the data from these surveys could be analyzed statistically.

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).

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 thirty-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 manually 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 ( $\Delta AIC$ ) 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 caribou GPS collar locations were provided to the Project through a data sharing agreement by the GN. These data indicated that caribou were approaching the Project site. Field surveys were conducted three times per day 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 July 1 to 17, 2020, groups of caribou from the Qamanirjuaq herd were observed passing through or near the study area, with numbers peaking from July 4 to July 9. 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.

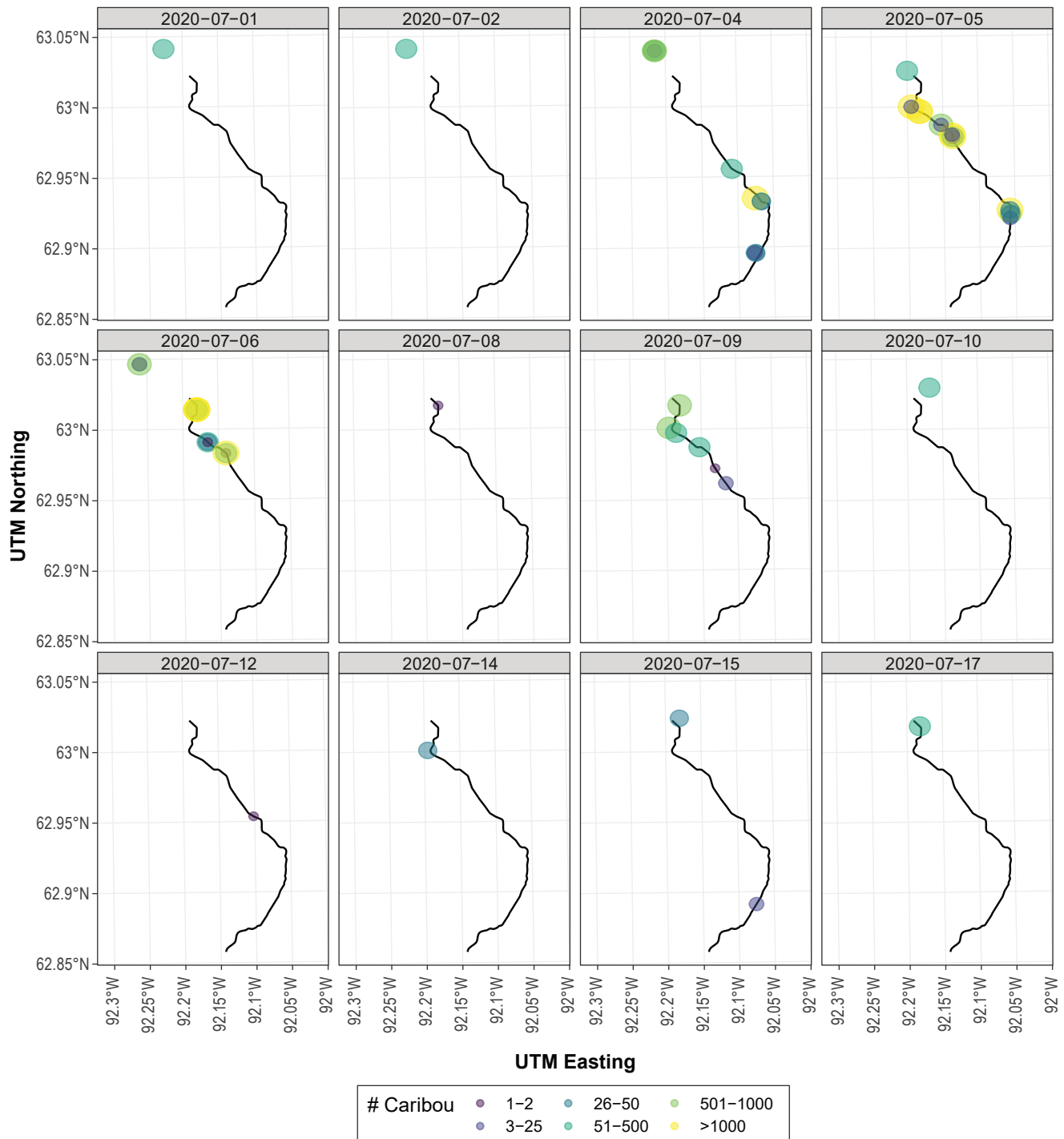
### 6.2 Field Surveys Completed

In total, 56 behaviour surveys were conducted during the two week period (July 1 to 17) when groups of caribou were near the Project (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	Total Number of Surveys	Surveys with Disturbances	Surveys with Observed Road Crossings
1-2	5	4	2
3-25	11	2	2
26-50	9	3	0
51-500	14	11	1
501-1000	6	3	1
>1000	11	6	0
<b>Total</b>	<b>56</b>	<b>29</b>	<b>6</b>

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.



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**

General observations on survey methodology and results included:

- 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.
- Of the 56 surveys, 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 convoys of mine vehicles that occurred approximately three times per week for crew change and exchange of essential goods. In total, 48% of disturbances were from ATV traffic, 30% were from light trucks, and 23% 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. 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 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.
- The methodology allowed for the estimation of baseline behaviour, response to disturbance, and return to baseline behaviour. Few, if any, 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.
- Approximately half of the 56 surveys were conducted by the ERM biologist and the other half were conducted by the Meliadine environmental technicians. 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, a goal of conducting 50 surveys per year is more achievable than 100 surveys (the goal for 2020).
- 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, primarily in small groups of less than 25 individuals.
- One source of uncertainty was consistently estimating distance. Hence, distance was categorized into blocks of 0 to 50 m, 50 to 100 m, etc. The use of a rangefinder would increase accuracy and allow distance to be considered as a continuous variable during analysis, rather than a categorical value.
- Overall, the 2020 survey methodology worked well for the Project location and circumstances and no major changes are planned for 2021.

## 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: group size, distance to the AWAR, distance to the mine site, proportion of caribou showing “disturbed” behaviours and road crossing.

## 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).

## Group Size and Distance to Infrastructure

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

This may have occurred as a result of small sample size, or may be indicative of a trend that caribou tend to avoid areas within 100-300 m of the road unless they intend to cross it. Regardless of the mechanism, these 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” decrease as group size increases, with the highest proportion observed in groups smaller than 25.

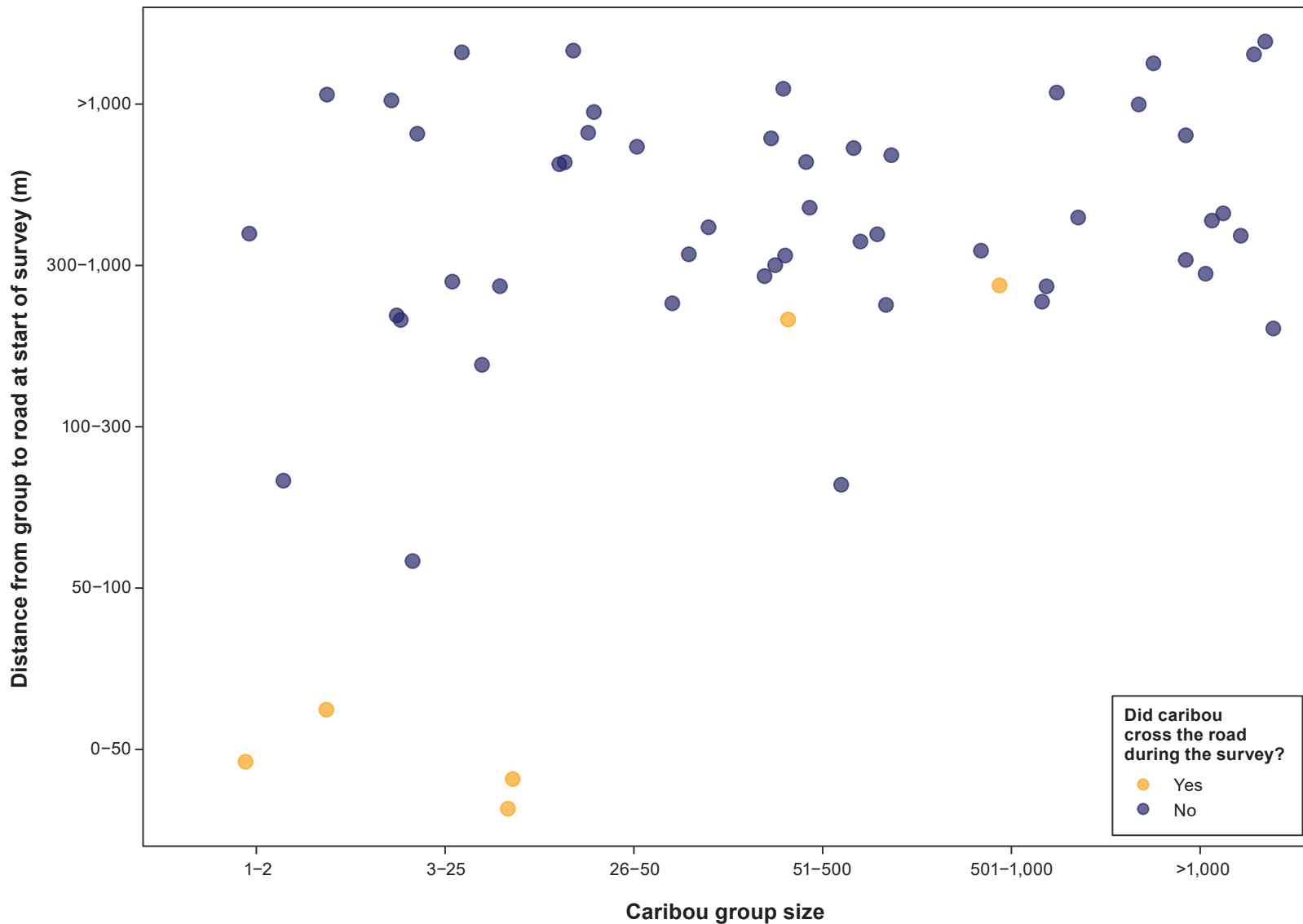
When analyzed by distance to road, the results suggest that the proportion of response behaviours is higher closer to the road than further away, with the proportion dropping off in groups further than 300 m from the road. However, due to the previously mentioned correlation between group size and distance 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 be disturbed. 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.

Wolfe, Griffith and Wolfe (2000) reviewed behaviour research on reindeer and caribou in relation to development, and reported that larger groups are more likely to be disturbed by human activities. At first glance, this may seem at odds with the current study, which finds that *small* groups are more likely to be disturbed. However, it is important to note that Wolfe et al (2000) review examined response to disturbances, while this study only compares group size with the response to infrastructure, with or without disturbances. Unfortunately, there was not enough data in the current study to determine if the response to disturbances changed with group sizes, but additional years of data will help address this question.

## Behaviour Type and Environmental Variables

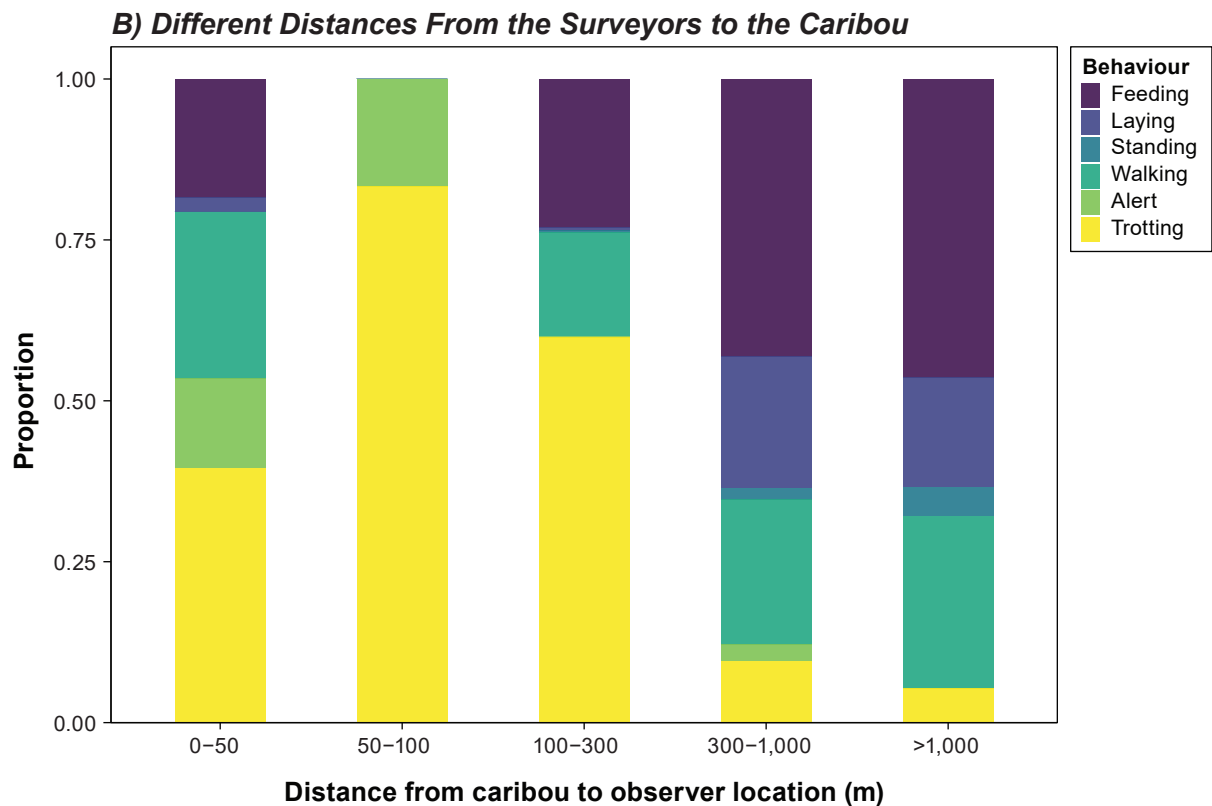
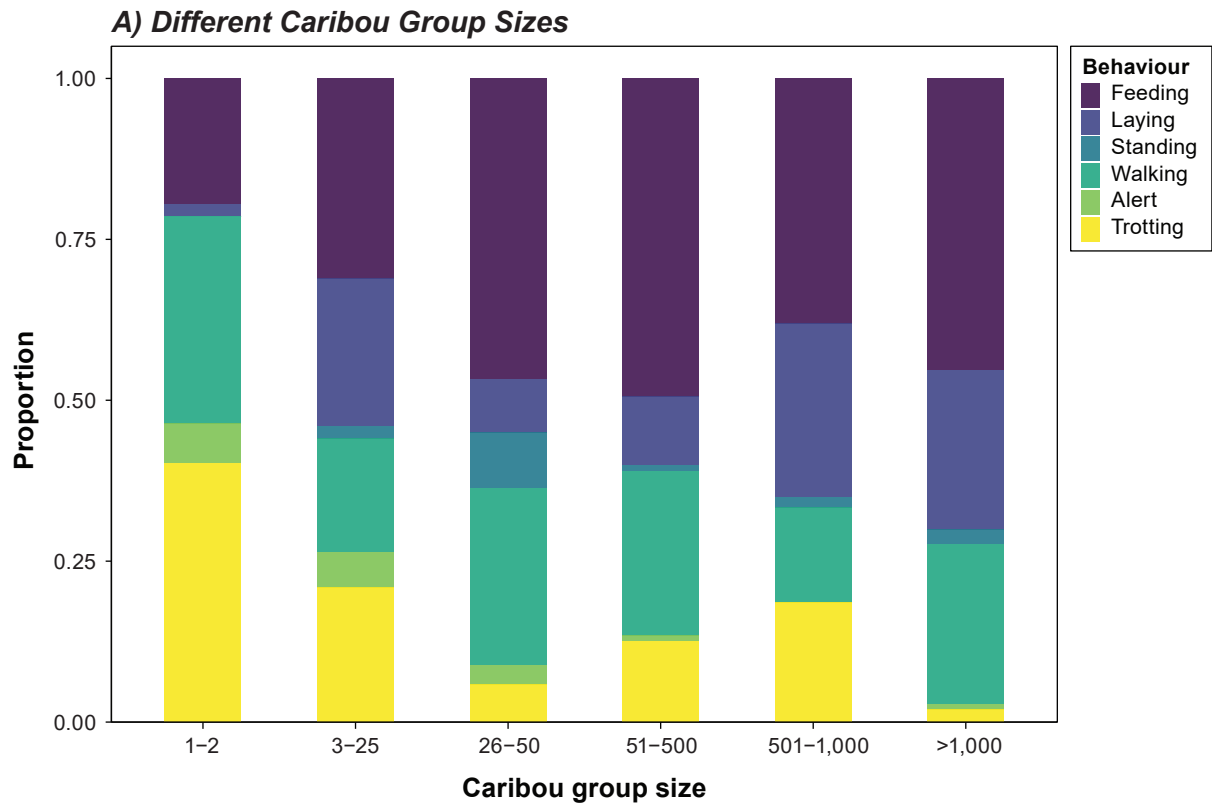
Figure 6.3-3 shows the relationship between 1) the proportion of response behaviours and 2) various environmental variables, including temperature, wind speed, date, and whether or not a disturbance such as a vehicle passing occurred during the survey. The results suggest a slightly higher proportion of alert or running caribou in surveys where a disturbance occurred. It should be noted that this figure is an average proportion of response behaviours across the entire thirty 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.



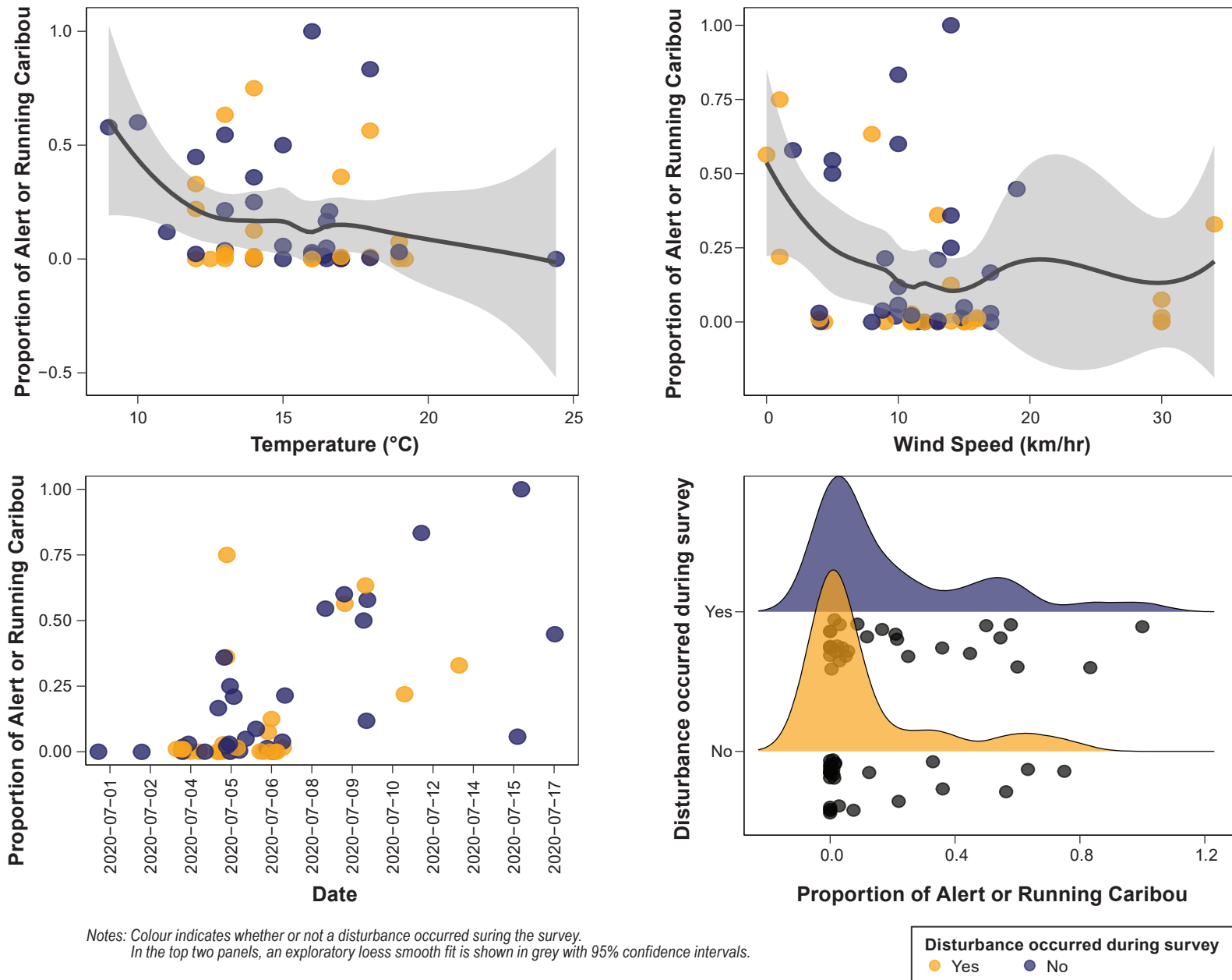
Note: Colour indicates whether the group of caribou were observed crossing the road during the survey.

**Figure 6.3-1: Caribou Group Size versus Distance From the Road or Infrastructure to the Caribou at the Start of the Survey**





**Figure 6.3-2: Average Proportion of Each Behaviour Type Observed at the Start of the Survey**



**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**

## Response to Disturbances

To examine response to disturbances, the proportion of response behaviours was plotted by three-minute interval for each survey in Figure 6.3-4. The baseline behaviours (in the absence of recent disturbances) were typically 5-10% caribou with response behaviours in a group. Figure 6.3-4 suggests that following a disturbance event, there was commonly a spike in the proportion of caribou with response behaviours to 60-90% of caribou in the group. The proportion of caribou with response behaviours returned to a pre-disturbance levels quickly, often within two intervals (6 minutes).

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

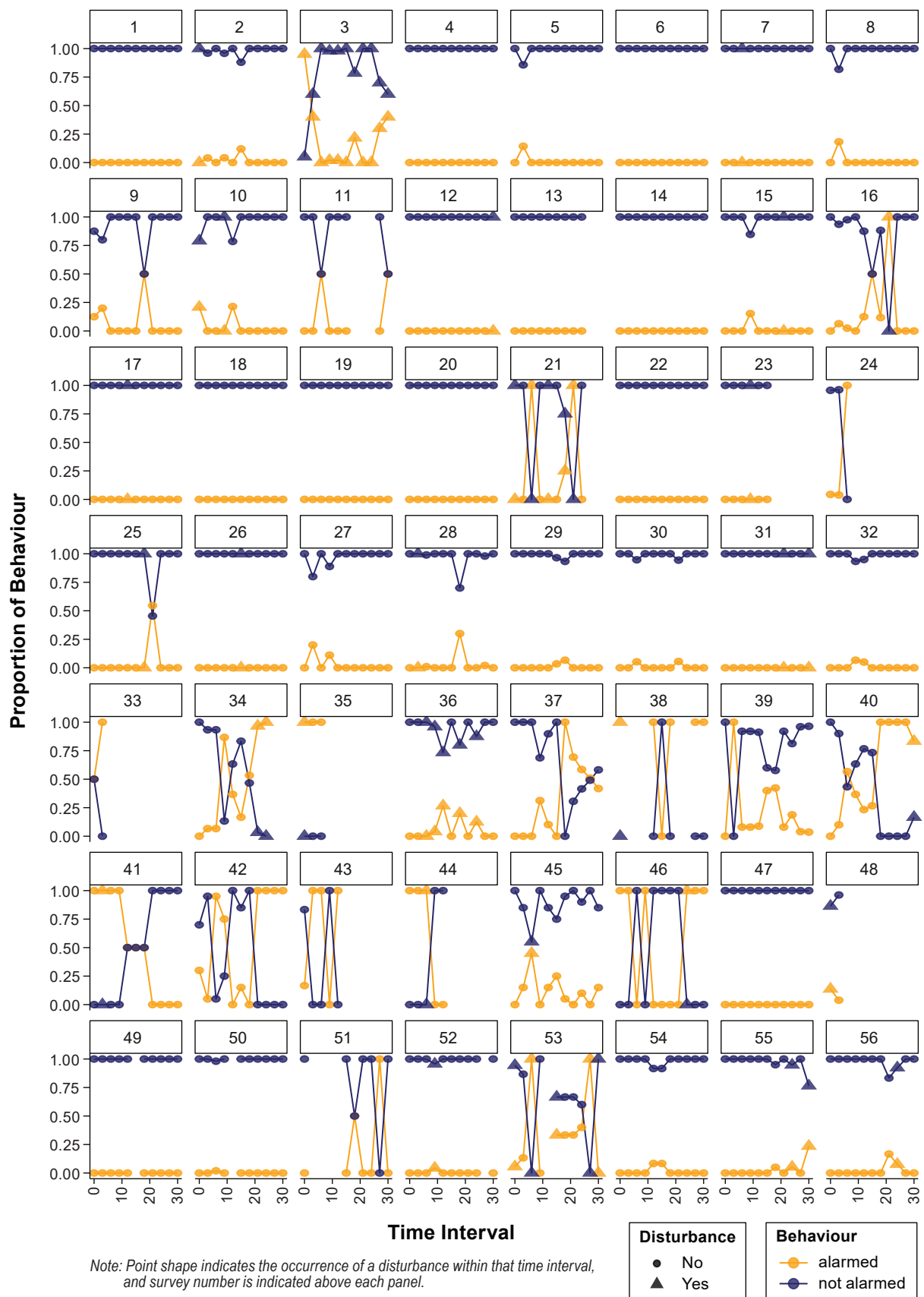
As group size and distance to road were identified as being potentially correlated during the exploratory analysis, a Chi-square test was conducted between the two variables to determine if they were too closely related to be included in a model together. A Chi-square ( $\chi^2$ ) statistic is a test 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 not significant ( $p=0.107$ ), indicating that group size is not associated with distance to road. However, the small number of samples in each category and the fact that the data were not normally distributed mean that some of the key assumptions of the Chi-squared test were violated, and the output statistic should be treated with extreme caution. 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.

The results indicated that distance to road out-performed group size in all variable combinations, based on the equivalent model cutoff 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 model that used proportion of response behaviours as a dependent variable are presented in Table 6.3-1, and for the model that used duration of response as a dependent variable in Table 6.3-2.

**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)	1.43	2.51	0.569
Distance to road 50-100 m	17.43	3956.18	0.997
Distance to road 100-300 m	0.46	1.68	0.784
Distance to road 300-1000 m	-2.01	1.28	0.117
Distance to road >1000 m	-2.72	1.49	0.067
Temperature (°C)	-0.11	0.17	0.508
Wind speed (km/hr)	-0.02	0.08	0.827
Disturbance during survey (Yes)	0.78	0.94	0.408

Note: statistically significant p-values <0.05 are indicated with an asterisk.



**Figure 6.3-4: Proportion of Response Behaviour during Each Survey**

**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)	6.90	2.63	0.017
Distance to road 50-100 m	-1.78	2.89	0.545
Distance to road 100-300 m	7.18	2.92	0.024*
Distance to road 300-1000 m	-3.82	1.79	0.046*
Distance to road >1000 m	-7.41	2.01	0.002*
Temperature (°C)	0.05	0.17	0.790
Wind speed (km/hr)	0.01	0.10	0.913

*Note: statistically significant p-values <0.05 are indicated with an asterisk.*

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 temperature 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.

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 duration of response as the dependent variable ( $p=0.002$ ), with an estimate of  $-7.41 \pm 2.01$ . This effect was near-significant in models that used proportion of response behaviour as the dependent variable ( $p=0.067$ ), with an estimate of  $-2.72 \pm 1.49$ .

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  $-3.82 \pm 1.79$  in duration of response models ( $p=0.046$ ) and  $-2.01 \pm 1.28$  in proportion responding models ( $p=0.117$ ). Temperature and wind speed were not found to have an effect on response behaviours in either model set.

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 (6 minutes). Using average behaviour type across the 30 minute (10 sampling periods) effectively dilutes the caribou response. 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.



This analysis of the 2020 study represents a first year of analyzing data from behavior surveys. As noted, these analyses could be improved in future years by:

- Including information on harvesting activities and traffic;
- Increasing sample size; and
- Using a rangefinder to measure distance to caribou groups would improve data quality and ease of analysis, especially given the apparent importance of the distance variable as a predictor of caribou response.

## 7. SUMMARY

The behaviour monitoring program in 2020 had several results:

- The standard monitoring protocols adapted from the GNWT ENR worked well at the Project site.
- Fifty six surveys were conducted with the majority of observations between July 1 and 17. This is less than the 2020 objective of 100 surveys, largely due to safety requirements in areas of active harvest and due to COVID-19 safety measures.
- 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.
- An analysis of the first year's data indicated that there is a trend for caribou at greater distance from infrastructure (>300 m) to have a lower proportion of response behaviours. After disturbances from passing vehicles, caribou at greater distance returned to pre-disturbance/baseline behaviours more quickly. 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. 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.
- 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).
- Following the 2020 program, Agnico Eagle plans to review the methods and results of this monitoring program with interested parties. Based on this review, Agnico Eagle may update the program as needed for the 2021 field season.

## 8. REFERENCES

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## **APPENDIX A      DETAILED METHODS FOR CARIBOU BEHAVIOUR SURVEYS**



## Meliadine Project

### Caribou Behaviour Monitoring

April 2020

Project No.: 0530275-0011



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## **1. INTRODUCTION**

Agnico Eagle Mines Ltd. (Agnico Eagle) would like to determine whether caribou behaviour changes in response to Project activities such as: 1) having roads largely closed in 2020 due to the COVID-19 outbreak vs. open in 2021, 2) passing vehicles and 3) other activities such as predators or mine operations. This monitoring program is designed to collect baseline data on caribou behaviour using standardized, scientifically-defensible methods. The data will be used to monitor project effects and as part of predicting the effects of future expansions during permitting.

Monitoring is to be carried out by on-site technicians as part of normal monitoring operations. The objective for the 2020 season is to collect observations on at least 100 groups of caribou; ideally 25 groups in each of the four group size categories (1-2; 3-25; 26-50; >50).

## **2. STUDY AREA**

The study area for behaviour monitoring is anywhere that caribou may interact with the Project, including the All Weather Access Road (AWAR), and the Meliadine Mine site.

### 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). 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 responses without any disturbance and 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 and fall migration periods.
- The survey team will consist of a driver/observer and a second observer when available.

Surveys should be performed:

- Every day that caribou may be in the Project area, and
- At least an hour before convoy deployment so that the potential effect of the passing convoy can be recorded on 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 (if a high resolution camera is available):
  - Take a photo of the caribou every time an observation is recorded so that the observations can be verified by another 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, e.g., a phone).
- Binoculars or spotting scope.
- Compass (or use compass function on GPS unit).
- Portable weather station (temperature and wind speed).
- Camera.

## 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 to the end of the road and noting relevant information about the groups and their sizes along the way (Appendix A). At the end of the road, the observers will have a list of the total number of groups present and the group sizes.

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 2.
  - a. 1 or 2 caribou
  - b. 3 to 25 caribou
  - c. 26 to 50 caribou
  - d. >50 caribou
2. For the remainder of groups, use the random number table in Appendix C to select which groups to survey.
  - a. Start with the number of groups of caribou on the road. For example, if there are 9 groups of caribou on the road, but the team can only survey 6 of them in a day.
  - b. Close your eyes and point at the random number table.
  - c. From where your finger lands, read the numbers sequentially to the right until you land on a number that is less than 9 (the number of groups on the road). If that number is #3, then write that down. Repeat that method until you have 6 groups identified (the number you can survey in a day). If there are 10 or more groups then use two digits at a time on the table (for group numbers less than 10 they need a zero in front of them, e.g., group 3 would be chosen when the two digits are "03").
  - d. If you get a repeat number or a number bigger than the number of groups you have, ignore it and move to the next number.

Drive back along the road, surveying the groups that you identified in the procedure above.

### 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 B. The start time to record is the time that observations begin.

#### 3.3.3.1 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. Estimate the distance to the group (see data sheet for distance categories) and, using a compass or the GPS unit compass feature, record the bearing (0° to 360°) to the group being observed.

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.

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.

#### 3.3.3.2 Weather Conditions

Use the portable weather station to record:

- Air temperature;
- Wind speed;
- Wind direction; 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 3.3.3). 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.

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.

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. 2020 is being used as a control year with few disturbance events, to be compared to 2021, when road use returns to normal. 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.

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.

### 3.3.4 Behaviour Classification

With the exception of Alert behaviour, the primary behaviour categories and their definitions follow GNWT (2017) classifications. The categories appear as columns on the data form, with descriptions on the reverse of 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. REFERENCES

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

## Appendix A Data Sheet for Recording All Groups of Caribou along the Road

Pre-survey caribou reconnaissance.

Date:

Group Number	Road km marker	Group size	East or West of Road?
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
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22			
23			
24			
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26			
27			
29			
30			
31			
32			
33			
34			
35			

## Appendix B Meliadine 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. Circle one: <b>0-50 m</b> <b>51-100 m</b> <b>100- 300 m</b> <b>300-1000 m</b> <b>&gt;1000 m</b> Bearing: _____°							
Is group location East or West of the Road at start of survey? Circle one: <b>E</b> <b>W</b>				Did the group cross the road during the survey? Circle one: <b>Y</b> <b>N</b>			
Caribou group size: Exact count when possible: _____ Estimated size (for larger groups). Circle one: <b>50-100</b> <b>101-200</b> <b>201-500</b> <b>501-1000</b> <b>&gt;1000</b>							
Temperature: ____°C Wind speed: _____km/h Wind direction: _____° Humidity: _____% Days since last snow or wind event: _____							
Weather observations:							
Road Height:		Road Side Width:		Structures 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 since previous observation)
	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)							
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<sup>1</sup>:

- **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.

<sup>1</sup> Primary source: GNWT-ENR 2017 caribou behaviour monitoring field protocols, courtesy of GNWT Yellowknife, NT.

## Appendix C Random Number Table to Select Groups to Survey

13962	70992	65172	28053	02190	83634	66012	70305	66761	88344
43905	46941	72300	11641	43548	30455	07686	31840	03261	89139
00504	48658	38051	59408	16508	82979	92002	63606	41078	86326
61274	57238	47267	35303	29066	02140	60867	39847	50968	96719
43753	21159	16239	50595	62509	61207	86816	29902	23395	72640
83503	51662	21636	68192	84294	38754	84755	34053	94582	29215
36807	71420	35804	44862	23577	79551	42003	58684	09271	68396
19110	55680	18792	41487	16614	83053	00812	16749	45347	88199
82615	86984	93290	87971	60022	35415	20852	02909	99476	45568
05621	26584	36493	63013	68181	57702	49510	75304	38724	15712
06936	37293	55875	71213	83025	46063	74665	12178	10741	58362
84981	60458	16194	92403	80951	80068	47076	23310	74899	87929
66354	88441	96191	04794	14714	64749	43097	83976	83281	72038
49602	94109	36460	62353	00721	66980	82554	90270	12312	56299
78430	72391	96973	70437	97803	78683	04670	70667	58912	21883
33331	51803	15934	75807	46561	80188	78984	29317	27971	16440
62843	84445	56652	91797	45284	25842	96246	73504	21631	81223
19528	15445	77764	33446	41204	70067	33354	70680	66664	75486
16737	01887	50934	43306	75190	86997	56561	79018	34273	25196
99389	06685	45945	62000	76228	60645	87750	46329	46544	95665
36160	38196	77705	28891	12106	56281	86222	66116	39626	06080
05505	45420	44016	79662	92069	27628	50002	32540	19848	27319
85962	19758	92795	00458	71289	05884	37963	23322	73243	98185
28763	04900	54460	22083	89279	43492	00066	40857	86568	49336
42222	40446	82240	79159	44168	38213	46839	26598	29983	67645
43626	40039	51492	36488	70280	24218	14596	04744	89336	35630
97761	43444	95895	24102	07006	71923	04800	32062	41425	66862
49275	44270	52512	03951	21651	53867	73531	70073	45542	22831
15797	75134	39856	73527	78417	36208	59510	76913	22499	68467
04497	24853	43879	07613	26400	17180	18880	66083	02196	10638
95468	87411	30647	88711	01765	57688	60665	57636	36070	37285
01420	74218	71047	14401	74537	14820	45248	78007	65911	38583
74633	40171	97092	79137	30698	97915	36305	42613	87251	75608
46662	99688	59576	04887	02310	35508	69481	30300	94047	57096
10853	10393	03013	90372	89639	65800	88532	71789	59964	50681
68583	01032	67938	29733	71176	35699	10551	15091	52947	20134
75818	78982	24258	93051	02081	83890	66944	99856	87950	13952
16395	16837	00538	57133	89398	78205	72122	99655	25294	20941
53892	15105	40963	69267	85534	00533	27130	90420	72584	84576
66009	26869	91829	65078	89616	49016	14200	97469	88307	92282
45292	93427	92326	70206	15847	14302	60043	30530	57149	08642
34033	45008	41621	79437	98745	84455	66769	94729	17975	50963
13364	09937	00535	88122	47278	90758	23542	35273	67912	97670
03343	62593	93332	09921	25306	57483	98115	33460	55304	43572
46145	24476	62507	19530	41257	97919	02290	40357	38408	50031
37703	51658	17420	30593	39637	64220	45486	03698	80220	12139
12622	98083	17689	59677	56603	93316	79858	52548	67367	72416
56043	00251	70085	28067	78135	53000	18138	40564	77086	49557
43401	35924	28308	55140	07515	53854	23023	70268	80435	24269
18053	53460	32125	81357	26935	67234	78460	47833	20496	35645

## **APPENDIX B      DATA FROM CARIBOU BEHAVIOUR SURVEYS**

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Observers	Waypoint	UTM Easting	UTM Northing	Distance Marker	Distance from Caribou to Observer Location (m)
1	7/4/2020	10:43	11:13	Emilie Fouilloux, Matthew Frey	39	546967	6974303	AWAR KM 12	>1000
2	7/4/2020	12:00	12:30	Daphne Morin, Bethany H	NA	539676	6990311	Mine Site	300-1000
3	7/5/2020	16:45	17:15	Nina Morrell, Daphne Morin	390	540503	6988701	Explo	300-1000
4	7/4/2020	9:13	9:43	Emilie Fouilloux, Matthew Frey	38	547348	6978368	AWAR KM 16	>1000
5	7/4/2020	11:56	12:26	Emilie Fouilloux, Matthew Frey	40	546924	6974314	AWAR KM 12	>1000
6	7/4/2020	16:35	17:05	Emilie Fouilloux, Matthew Frey	7	539704	6990280	Mine Site	>1000
7	7/4/2020	17:35	18:04	Emilie Fouilloux, Matthew Frey	40	546924	6978638	Mine Site	>1000
8	7/6/2020	14:38	13:08	Emilie Fouilloux, Matthew Frey	395	537407	6990986	Dyno	300-1000
9	7/6/2020	14:38	13:08	Nina Morrell	395	537407	6990986	Dyno	300-1000
10	7/6/2020	8:48	9:18	Bryce and Katarina	391	542291	6984827	AWAR KM 26	300-1000
11	7/6/2020	10:34	11:05	Bryce Pippy, Katarina	393	543606	6983974	AWAR KM 23	300-1000
12	7/6/2020	11:44	11:47	Bryce Pippy, Katarina F	394	541510	6987399	AWAR KM 29	>1000
13	7/6/2020	9:04	9:34	Emilie Fouilloux, Matthew Frey	9	542291	6984835	AWAR KM 25	>1000
14	7/6/2020	10:40	11:10	Emilie Fouilloux, Matthew Frey	11	543613	6983967	AWAR KM 23	>1000
15	7/6/2020	11:51	12:28	Emilie Fouilloux, Matthew Frey	12	541506	6987391	AWAR KM 29	>1000
16	7/5/2020	15:30	16:00	Nina Morrell, Emilie Fouilloux	389	541390	6985477	AWAR KM 27	300-1000
17	7/2/2020	14:15	17:35	Nina Morrell	BLAST 2	539222	6990437	Mine Site	>1000
18	7/5/2020	8:47	9:15	Daphne Morin, Katarina F	382	540801	6985856	AWAR KM 27	>1000
19	7/5/2020	9:52	10:24	Daphne Morin, Katarina F	383	542934	6984431	AWAR KM 24	300-1000
20	7/5/2020	10:45	11:15	Daphne Morin, Katarina F	384	543721	6983660	AWAR KM 24	300-1000
21	7/5/2020	12:00	12:30	Daphne Morin, Katarina F	385	547921	6977400	AWAR KM 27	300-1000
22	7/5/2020	13:10	13:40	Daphne Morin, Katarina F	387	547873	6977706	AWAR KM 16	300-1000
23	7/5/2020	14:25	14:55	Daphne Morin, Katarina F	388	543774	6983481	AWAR KM 23	300-1000
24	7/5/2020	14:55	15:25	Daphne Morin, Katarina F	388	543774	6983481	AWAR KM 23	0-50
25	7/5/2020	15:30	16:00	Daphne Morin, Katarina F	389	541390	6985477	AWAR KM 27	300-1000
26	7/1/2020	18:45	17:15	Nina Morrell, Daphne Morin	BLAST 1	539121	6990423	Mine Site	>1000
27	7/5/2020	8:47	9:15	Nm, ef	382	540801	6985856	AWAR KM 27	>1000m
28	7/4/2020	17:34	18:05	Nina Bryce	BLAST 3	539701	6990283	Mine site	300-1000m
29	7/4/2020	16:35	17:06	Nina Bryce	381	539700	6990283	Site	300-1000m
30	7/4/2020	12:00	12:31	Nina Bryce	380	546906	6974317	AWAR KM 12	>1000m
31	7/4/2020	10:30	11:03	Nina and Bryce	379	545243	6980951	AWAR KM 20	>1000m
32	7/4/2020	8:56	9:27	Nina Morrell	378	547358	6978390	AWAR KM 16	>1000m
33	7/5/2020	12:42	12:43	Nm	386	547896	6977062	AWAR KM 15	100-300m
34	7/17/2020	7:32	7:59	Nina Morrell	409	541422	6987852	AWAR KM 29	300-1000m
35	7/15/2020	12:58	13:08	Nina Morrell	408	547015	6973804	AWAR KM 11	50-100m
36	7/15/2020	10:33	11:00	Nina Morrell	407	541487	6988488	Explo	300-1000m
37	7/14/2020	14:12	14:46	Nina Morrell	406	540760	6985949	AWAR KM 27	>1000m
38	7/12/2020	9:06	9:32	Nina	405	545577	6980743	AWAR KM 20	100-300m
39	7/10/2020	7:39	8:09	Nina Morrell, Bryce Pippy	403	542107	6989141	Explo	100-300m
40	7/9/2020	13:48	14:20	Nina	402	541505	6987736	AWAR KM 27	300-1000m
41	7/9/2020	12:14	12:42	Nina	401	540742	6985958	AWAR KM 27	>1000m
42	7/9/2020	11:30	12:09	Nina Morrell, Katarina Fleury	400	542929	6984433	AWAR KM 25	300-1000m
43	7/9/2020	10:51	11:20	Nina	399	544821	6981586	AWAR KM 21	0-50m
44	7/9/2020	9:43	10:10	Nina	398	544048	6982766	AWAR KM 23	0-50m
45	7/9/2020	8:39	9:12	Nina	397	541253	6985565	AWAR KM 25	300-1000m
46	7/8/2020	8:52	NA	Nina Morrell	396	541504	6987728	AWAR KM 29	0-50m
47	7/6/2020	14:35	15:08	Katerina	395	537407	6990986	AWAR KM Dyno	300-1000m
48	7/6/2020	12:20	12:23	Nina and Chris	394	541510	6987399	AWAR KM 29	300-1000m
49	7/6/2020	11:41	12:13	Nina and Chris	394	541510	6987399	AWAR KM 29	300-1000m
50	7/6/2020	10:37	11:07	Nina and Chris	393	543606	6983974	AWAR KM 23	>1000m
51	7/6/2020	8:44	9:21	Nina and Chris	391	542291	6984827	AWAR KM 26	>1000m
52	7/5/2020	14:30	15:07	EF, NM	388	543774	6983481	AWAR KM 23	>1000m
53	7/5/2020	12:01	12:28	Nm, ef	385	547921	6977400	AWAR KM 15	300-1000m
54	7/5/2020	10:44	11:16	Nm, ef	384	543721	6983660	AWAR KM 24	300-1000m
55	7/5/2020	13:10	13:43	Nm, ef	387	547873	6977710	AWAR KM 16	300-1000m
56	7/5/2020	9:52	10:24	Nm, EF	383	542934	6984431	AWAR KM 24	300-1000m



Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Bearing to Caribou Group	Is Group East or West of Survey	Did the Group Cross the Road during the Survey	Caribou Group Size	Temp	Wind Speed (km/h)	Wind Direction	Humidity
1	7/4/2020	10:43	11:13	300	West	No	35	14	13	207	65
2	7/4/2020	12:00	12:30	NA	East	No	500	16	9.8	5	57.6
3	7/5/2020	16:45	17:15	160	East	No	390	16.6	13	180	65
4	7/4/2020	9:13	9:43	285	West	No	45	14	9	225	65
5	7/4/2020	11:56	12:26	300	West	No	40	14	11	190	64
6	7/4/2020	16:35	17:05	75	East	No	11	16	30	200	58
7	7/4/2020	17:35	18:04	30	East	No	>1000	14	17	200	60
8	7/6/2020	14:38	13:08	370	NA	No	25	19	30	200	55
9	7/6/2020	14:38	13:08	240	NA	No	8	19	30	200	55
10	7/6/2020	8:48	9:18	NA	West	No	71	13	8.8	180	NA
11	7/6/2020	10:34	11:05	280	West	No	2	14	14	180	NA
12	7/6/2020	11:44	11:47	45	West	No	>1000	16.5	12	180	NA
13	7/6/2020	9:04	9:34	80	East	No	30	16	15	190	65
14	7/6/2020	10:40	11:10	NA	East	No	200	17	15	200	41
15	7/6/2020	11:51	12:28	NA	East	No	101-200	16.4	14.8	257	51
16	7/5/2020	15:30	16:00	200	East	No	>1000	16.5	17	200	62
17	7/2/2020	14:15	17:35	210	East	No	51-100	17	11.5	135	NA
18	7/5/2020	8:47	9:15	NA	West	No	>1000	13	11	180	65.2
19	7/5/2020	9:52	10:24	NA	West	No	501-1000	12	11	180	65.2
20	7/5/2020	10:45	11:15	NA	East	No	>1000	12.5	15.5	200	65
21	7/5/2020	12:00	12:30	NA	West	No	51-100	14	14	180	65
22	7/5/2020	13:10	13:40	270	West	No	>1000	19.2	4.4	180	65
23	7/5/2020	14:25	14:55	240	West	No	201-500	17	13	180	65
24	7/5/2020	14:55	15:25	NA	East	Yes	23	17	13	180	65
25	7/5/2020	15:30	16:00	200	West	No	>1000	16.5	15	180	65
26	7/1/2020	18:45	17:15	0	East	No	250	24.4	4.1	315	NA
27	7/5/2020	8:47	9:15	180	West	No	15	13	11	180	65
28	7/4/2020	17:34	18:05	30	East	No	501-1000	16	17	200	60
29	7/4/2020	16:35	17:06	70	East	No	501-1000	17	16	210	NA
30	7/4/2020	12:00	12:31	250	West	No	24	14	11	180	NA
31	7/4/2020	10:30	11:03	230	West	No	65	15	8	200	NA
32	7/4/2020	8:56	9:27	200	West	No	50-100	18	4	320	NA
33	7/5/2020	12:42	12:43	180	West	No	6	14	1	220	65
34	7/17/2020	7:32	7:59	140	East	No	201-500	12	19	360	NA
35	7/15/2020	12:58	13:08	90	East	No	4	16	14	100	NA
36	7/15/2020	10:33	11:00	360	West	No	26	15	10	180	NA
37	7/14/2020	14:12	14:46	140	West	No	50-100	12	34	80	NA
38	7/12/2020	9:06	9:32	40	East	No	1	18	10	270	NA
39	7/10/2020	7:39	8:09	220	East	No	201-500	12	1	260	NA
40	7/9/2020	13:48	14:20	350	East	Yes	501-1000	9	2	180	NA
41	7/9/2020	12:14	12:42	180	West	No	501-1000	15	5	200	NA
42	7/9/2020	11:30	12:09	270	West	Yes	201-500	18	0	200	NA
43	7/9/2020	10:51	11:20	320	East	Yes	12	13	8	200	NA
44	7/9/2020	9:43	10:10	180	West	Yes	1	10	10	200	NA
45	7/9/2020	8:39	9:12	200	West	No	201-500	11	10	200	NA
46	7/8/2020	8:52	NA	270	East	Yes	1	13	5	180	16
47	7/6/2020	14:35	15:08	10	East	No	501-1000	19	30	180	55
48	7/6/2020	12:20	12:23	45	East	No	>1000	NA	NA	NA	NA
49	7/6/2020	11:41	12:13	45	East	No	>1000	16	12	180	NA
50	7/6/2020	10:37	11:07	10	East	No	>1000	14	14	180	NA
51	7/6/2020	8:44	9:21	290	West	No	1	13	9	180	NA
52	7/5/2020	14:30	15:07	60	East	No	>1000	18	13	200	65
53	7/5/2020	12:01	12:28	180	West	No	50-100	14	14	180	65
54	7/5/2020	10:44	11:16	180	East	No	12	13	16	200	65
55	7/5/2020	13:10	13:43	270	West	No	50-100	19	4	180	65
56	7/5/2020	9:52	10:24	120	West	No	20	12	11	180	65

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Days since Last Snow or Wind Event	Weather Observations	Road Height (cm)	Road Side Width (cm)	Structures Present
1	7/4/2020	10:43	11:13	>14	sun, wind, not many clouds	NA	NA	quarry
2	7/4/2020	12:00	12:30	>14	sunny	NA	NA	mine site
3	7/5/2020	16:45	17:15	>14	NA	100	100	16" pipeline
4	7/4/2020	9:13	9:43	>14	low wind, some sun	NA	NA	blind hill sign on road
5	7/4/2020	11:56	12:26	>14	partly cloudy, minor heat haze	NA	NA	quarry
6	7/4/2020	16:35	17:05	>14	NA	NA	NA	none
7	7/4/2020	17:35	18:04	>14	NA	NA	NA	none
8	7/6/2020	14:38	13:08	>14	NA	NA	NA	none
9	7/6/2020	14:38	13:08	>14	NA	NA	NA	none
10	7/6/2020	8:48	9:18	>14	mostly cloudy	50	50	none
11	7/6/2020	10:34	11:05	>14	NA	NA	NA	none
12	7/6/2020	11:44	11:47	>14	NA	NA	NA	none
13	7/6/2020	9:04	9:34	>14	cloudy, moderate wind	NA	NA	none
14	7/6/2020	10:40	11:10	>14	a bit of sun, clouds	NA	NA	none
15	7/6/2020	11:51	12:28	>14	sun and clouds, wind	300	NA	none
16	7/5/2020	15:30	16:00	>14	NA	50	100	lake between road and caribou
17	7/2/2020	14:15	17:35	>14	heatwaves reduce observation ability	NA	NA	Meliadine lake between mine and caribou
18	7/5/2020	8:47	9:15	>14	sunny	NA	NA	none
19	7/5/2020	9:52	10:24	>14	sunny	200	100	lake between road and caribou
20	7/5/2020	10:45	11:15	>14	sunny	NA	NA	lakes, tundra
21	7/5/2020	12:00	12:30	>14	sunny w/ some clouds	150	200	quarry and outcrops and lakes
22	7/5/2020	13:10	13:40	>14	sunny	150	NA	lakes, tundra
23	7/5/2020	14:25	14:55	>14	NA	150	100	lake
24	7/5/2020	14:55	15:25	>14	NA	NA	NA	road
25	7/5/2020	15:30	16:00	>14	NA	50	100	lake in between road and caribou
26	7/1/2020	18:45	17:15	>14	NA	NA	NA	mine site
27	7/5/2020	8:47	9:15	NA	NA	0	0	Quarry
28	7/4/2020	17:34	18:05	14	NA	0	0	Mine site
29	7/4/2020	16:35	17:06	14	Nothing to stay	0	0	Mine site
30	7/4/2020	12:00	12:31	14	NA	0	0	Quarry
31	7/4/2020	10:30	11:03	14	Nice day	100	200	Boulders
32	7/4/2020	8:56	9:27	14	NA	200	300	Natural esker
33	7/5/2020	12:42	12:43	NA	NA	100	200	Quarry
34	7/17/2020	7:32	7:59	3	Cloudy and windy	200	300	None
35	7/15/2020	12:58	13:08	1	Cloudy and windy	100	150	NA
36	7/15/2020	10:33	11:00	1	Partly cloudy, quite windy	100	100	Explo camp and mine
37	7/14/2020	14:12	14:46	0	Very windy	100	150	NA
38	7/12/2020	9:06	9:32	14	NA	200	400	Lakes
39	7/10/2020	7:39	8:09	14	NA	0	0	Explo camp
40	7/9/2020	13:48	14:20	14	NA	125	175	NA
41	7/9/2020	12:14	12:42	14	NA	100	100	NA
42	7/9/2020	11:30	12:09	14	Thick fog	200	200	Quarry
43	7/9/2020	10:51	11:20	14	NA	150	250	NA
44	7/9/2020	9:43	10:10	14	NA	100	150	Road
45	7/9/2020	8:39	9:12	14	Overcast	200	300	Lake, quarry
46	7/8/2020	8:52	NA	NA	Muggy overcast day	100	100	Close to mine, tractor trailers stopped on road (6)
47	7/6/2020	14:35	15:08	14	Sunny some cloud, gusting winds to 30	100	100	No road north of dyno
48	7/6/2020	12:20	12:23	NA	NA	100	200	NA
49	7/6/2020	11:41	12:13	14	Sunny partly cloudy	100	200	NA
50	7/6/2020	10:37	11:07	14	Sunny with cloud	100	100	NA
51	7/6/2020	8:44	9:21	14	Cloudy some sun	100	100	Quarry
52	7/5/2020	14:30	15:07	NA	Sun, few clouds, some wind	2	3	NA
53	7/5/2020	12:01	12:28	15	NA	150	200	Quarry and rocky outcrops
54	7/5/2020	10:44	11:16	NA	NA	100	100	Lakes,
55	7/5/2020	13:10	13:43	NA	NA	200	150	Rocky outcrop
56	7/5/2020	9:52	10:24	NA	NA	200	100	Lake between road and caribou

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 0	Laying 0	Standing 0	Walking 0	Alert 0	Trotting 0	Comments 0
1	7/4/2020	10:43	11:13	10	3	20	2	0	0	Observing from quarry at km 12
2	7/4/2020	12:00	12:30	11	24	0	0	0	0	NA
3	7/5/2020	16:45	17:15	4	0	1	0	0	95	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	4	10	5	24	0	0	herd size is approximate count, not enough for 50-100 category
5	7/4/2020	11:56	12:26	10	0	8	3	0	0	NA
6	7/4/2020	16:35	17:05	0	10	0	1	0	0	NA
7	7/4/2020	17:35	18:04	20	9	10	21	0	0	no discernable behaviour
8	7/6/2020	14:38	13:08	20	0	0	5	0	0	NA
9	7/6/2020	14:38	13:08	7	0	0	0	1	0	NA
10	7/6/2020	8:48	9:18	27	0	0	7	1	8	NA
11	7/6/2020	10:34	11:05	2	0	0	0	0	0	NA
12	7/6/2020	11:44	11:47	27	23	0	0	0	0	NA
13	7/6/2020	9:04	9:34	28	0	0	2	0	0	NA
14	7/6/2020	10:40	11:10	11	0	0	1	0	0	sub group of 12
15	7/6/2020	11:51	12:28	85	5	0	10	0	0	percentage of group
16	7/5/2020	15:30	16:00	20	5	0	3	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south, feeding
18	7/5/2020	8:47	9:15	15	2	1	1	0	0	NA
19	7/5/2020	9:52	10:24	11	0	1	3	0	0	NA
20	7/5/2020	10:45	11:15	12	1	1	1	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	15	0	0	ATV disturbance
22	7/5/2020	13:10	13:40	21	8	0	0	0	0	NA
23	7/5/2020	14:25	14:55	0	13	0	2	0	0	NA
24	7/5/2020	14:55	15:25	12	0	0	10	1	0	NA
25	7/5/2020	15:30	16:00	20	0	0	3	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	0	0	0	5	0	0	NA
28	7/4/2020	17:34	18:05	1	0	1	8	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	5	18	1	1	0	0	NA
30	7/4/2020	12:00	12:31	13	0	0	3	0	0	NA
31	7/4/2020	10:30	11:03	29	0	0	9	0	0	NA
32	7/4/2020	8:56	9:27	2	0	0	15	0	0	NA
33	7/5/2020	12:42	12:43	3	0	0	0	0	3	NA
34	7/17/2020	7:32	7:59	22	0	0	8	0	0	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	4	NA
36	7/15/2020	10:33	11:00	10	14	1	1	0	0	NA
37	7/14/2020	14:12	14:46	30	0	0	5	0	0	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	8	0	1	13	0	0	Explo camp
40	7/9/2020	13:48	14:20	26	2	0	2	0	0	NA
41	7/9/2020	12:14	12:42	0	0	0	0	0	20	NA
42	7/9/2020	11:30	12:09	14	0	0	0	0	6	Foggy, group seems a little anxious
43	7/9/2020	10:51	11:20	4	0	0	6	1	1	Crossed the road
44	7/9/2020	9:43	10:10	0	0	0	0	0	1	NA
45	7/9/2020	8:39	9:12	6	0	0	14	0	0	NA
46	7/8/2020	8:52	NA	0	0	0	0	0	1	Female
47	7/6/2020	14:35	15:08	8	5	0	0	0	0	Swanpy area
48	7/6/2020	12:20	12:23	0	2	1	16	2	1	NA
49	7/6/2020	11:41	12:13	5	24	0	0	0	0	NA
50	7/6/2020	10:37	11:07	12	43	0	2	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	1	0	0	NA
52	7/5/2020	14:30	15:07	13	7	1	2	0	0	1 nursing
53	7/5/2020	12:01	12:28	13	0	0	4	1	0	NA
54	7/5/2020	10:44	11:16	2	4	0	6	0	0	NA
55	7/5/2020	13:10	13:43	17	0	2	7	0	0	NA
56	7/5/2020	9:52	10:24	0	0	2	2	0	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 3	Laying 3	Standing 3	Walking 3	Alert 3	Trotting 3	Comments 3
1	7/4/2020	10:43	11:13	11	4	16	4	0	0	NA
2	7/4/2020	12:00	12:30	13	11	0	0	0	1	NA
3	7/5/2020	16:45	17:15	10	0	10	40	0	40	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	4	10	6	23	0	0	NA
5	7/4/2020	11:56	12:26	0	0	0	18	0	3	NA
6	7/4/2020	16:35	17:05	0	8	0	0	0	0	3 moved into other group
7	7/4/2020	17:35	18:04	6	18	10	26	0	0	blast occurred
8	7/6/2020	14:38	13:08	12	3	0	3	0	4	group down to 22
9	7/6/2020	14:38	13:08	2	2	0	0	1	0	some out of sight
10	7/6/2020	8:48	9:18	21	0	0	7	0	0	NA
11	7/6/2020	10:34	11:05	2	0	0	0	0	0	NA
12	7/6/2020	11:44	11:47	21	25	0	0	0	0	NA
13	7/6/2020	9:04	9:34	34	0	0	1	0	0	5 came over ridge and joined group
14	7/6/2020	10:40	11:10	12	0	0	0	0	0	NA
15	7/6/2020	11:51	12:28	90	5	0	5	0	0	NA
16	7/5/2020	15:30	16:00	40	0	0	4	3	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south, feeding
18	7/5/2020	8:47	9:15	11	8	0	1	0	0	NA
19	7/5/2020	9:52	10:24	15	0	0	0	0	0	NA
20	7/5/2020	10:45	11:15	13	0	0	2	0	0	NA
21	7/5/2020	12:00	12:30	13	0	0	2	0	0	NA
22	7/5/2020	13:10	13:40	19	2	0	3	0	0	NA
23	7/5/2020	14:25	14:55	1	13	1	0	0	0	NA
24	7/5/2020	14:55	15:25	16	0	0	9	1	0	NA
25	7/5/2020	15:30	16:00	19	2	0	1	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	3	0	0	1	0	1	NA
28	7/4/2020	17:34	18:05	4	0	2	4	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	3	18	0	3	0	0	Rock babies.
30	7/4/2020	12:00	12:31	14	0	0	3	0	0	NA
31	7/4/2020	10:30	11:03	39	0	1	4	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	19	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	6	Ran out of sight
34	7/17/2020	7:32	7:59	23	0	0	5	0	2	NA
35	7/15/2020	12:58	13:08	0	0	0	0	2	2	NA
36	7/15/2020	10:33	11:00	13	8	0	2	0	0	Rest over the hill
37	7/14/2020	14:12	14:46	30	0	0	4	0	0	Heat waves on horizon
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	0	0	0	0	0	1	NA
40	7/9/2020	13:48	14:20	24	0	0	3	0	3	NA
41	7/9/2020	12:14	12:42	0	0	0	0	0	20	NA
42	7/9/2020	11:30	12:09	16	0	0	3	1	0	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	12	They are trotting into the fog, losing sight of them quickly
44	7/9/2020	9:43	10:10	0	0	0	0	0	1	NA
45	7/9/2020	8:39	9:12	8	0	0	9	0	3	NA
46	7/8/2020	8:52	NA	0	0	0	0	0	1	NA
47	7/6/2020	14:35	15:08	6	7	0	3	0	0	NA
48	7/6/2020	12:20	12:23	5	0	2	18	1	0	Post disturbance
49	7/6/2020	11:41	12:13	9	28	2	0	0	0	NA
50	7/6/2020	10:37	11:07	9	38	0	3	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	0	Out of site
52	7/5/2020	14:30	15:07	18	4	1	0	0	0	NA
53	7/5/2020	12:01	12:28	11	0	0	2	2	0	NA
54	7/5/2020	10:44	11:16	5	5	0	0	0	0	NA
55	7/5/2020	13:10	13:43	21	0	0	2	0	0	Some drifted away
56	7/5/2020	9:52	10:24	3	0	0	2	0	0	Walking out of site

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 6	Laying 6	Standing 6	Walking 6	Alert 6	Trotting 6	Comments 6
1	7/4/2020	10:43	11:13	12	5	15	3	0	0	NA
2	7/4/2020	12:00	12:30	13	11	0	0	0	0	NA
3	7/5/2020	16:45	17:15	40	0	20	40	0	0	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	5	9	7	24	0	0	NA
5	7/4/2020	11:56	12:26	11	0	0	10	0	0	NA
6	7/4/2020	16:35	17:05	0	8	0	0	0	0	NA
7	7/4/2020	17:35	18:04	12	17	7	22	0	0	NA
8	7/6/2020	14:38	13:08	8	6	0	2	0	0	group down to 16
9	7/6/2020	14:38	13:08	3	2	0	0	0	0	NA
10	7/6/2020	8:48	9:18	41	0	0	2	0	0	NA
11	7/6/2020	10:34	11:05	1	0	0	0	1	0	mother limping
12	7/6/2020	11:44	11:47	24	21	0	0	0	0	NA
13	7/6/2020	9:04	9:34	35	0	0	0	0	0	NA
14	7/6/2020	10:40	11:10	12	0	0	0	0	0	NA
15	7/6/2020	11:51	12:28	99	0	0	1	0	0	NA
16	7/5/2020	15:30	16:00	30	0	0	10	1	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking out of sight
18	7/5/2020	8:47	9:15	17	5	0	2	0	0	NA
19	7/5/2020	9:52	10:24	13	0	0	2	0	0	NA
20	7/5/2020	10:45	11:15	4	2	0	9	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	0	0	15	ATV dust/whole group running
22	7/5/2020	13:10	13:40	19	1	0	4	0	0	NA
23	7/5/2020	14:25	14:55	0	16	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	3	0	crossed the road, the rest out of sight
25	7/5/2020	15:30	16:00	16	2	2	2	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	6	1	0	2	0	0	NA
28	7/4/2020	17:34	18:05	80	0	4	15	0	1	Percent of large herd
29	7/4/2020	16:35	17:06	4	19	0	1	0	0	NA
30	7/4/2020	12:00	12:31	13	0	1	4	0	1	NA
31	7/4/2020	10:30	11:03	42	0	1	1	0	0	NA
32	7/4/2020	8:56	9:27	0	0	0	23	0	0	Some are out of site
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	18	0	0	10	1	1	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	4	Out of sight
36	7/15/2020	10:33	11:00	13	4	0	6	0	0	Rest over the hill
37	7/14/2020	14:12	14:46	34	0	0	5	0	0	Some showing up on horizon
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	10	4	2	7	1	1	1 nursing,cute. 1 scratching self, both as standing
40	7/9/2020	13:48	14:20	10	0	0	3	0	17	NA
41	7/9/2020	12:14	12:42	0	0	0	0	0	20	NA
42	7/9/2020	11:30	12:09	1	0	0	0	1	18	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	12	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	1	NA
45	7/9/2020	8:39	9:12	11	0	0	0	0	9	NA
46	7/8/2020	8:52	NA	1	0	0	0	0	0	Out of sight after crossing road, came back into sight
47	7/6/2020	14:35	15:08	6	8	1	1	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	8	27	1	1	0	0	NA
50	7/6/2020	10:37	11:07	12	36	0	3	0	1	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	0	Out of sight
52	7/5/2020	14:30	15:07	16	5	0	2	0	0	NA
53	7/5/2020	12:01	12:28	0	0	0	0	5	13	NA
54	7/5/2020	10:44	11:16	2	2	0	6	0	0	NA
55	7/5/2020	13:10	13:43	18	0	0	3	0	0	NA
56	7/5/2020	9:52	10:24	4	0	0	3	0	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 9	Laying 9	Standing 9	Walking 9	Alert 9	Trotting 9	Comments 9
1	7/4/2020	10:43	11:13	18	7	6	4	0	0	NA
2	7/4/2020	12:00	12:30	11	12	0	0	0	1	2 nursing
3	7/5/2020	16:45	17:15	0	0	0	98	0	2	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	3	3	26	13	0	0	NA
5	7/4/2020	11:56	12:26	35	0	0	5	0	0	NA
6	7/4/2020	16:35	17:05	0	8	0	0	0	0	NA
7	7/4/2020	17:35	18:04	5	23	0	32	0	0	NA
8	7/6/2020	14:38	13:08	10	6	0	0	0	0	NA
9	7/6/2020	14:38	13:08	3	2	0	0	0	0	NA
10	7/6/2020	8:48	9:18	65	0	3	3	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	2	0	0	NA
12	7/6/2020	11:44	11:47	22	24	0	0	0	0	NA
13	7/6/2020	9:04	9:34	34	0	0	1	0	0	NA
14	7/6/2020	10:40	11:10	10	0	0	0	0	0	2 of group out of sight
15	7/6/2020	11:51	12:28	99	0	0	1	9	9	NA
16	7/5/2020	15:30	16:00	15	0	0	25	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	10	3	0	7	0	0	NA
19	7/5/2020	9:52	10:24	12	2	1	0	0	0	NA
20	7/5/2020	10:45	11:15	9	1	1	4	0	0	NA
21	7/5/2020	12:00	12:30	1	0	0	1	0	0	all but 2 have gone
22	7/5/2020	13:10	13:40	21	3	0	0	0	0	NA
23	7/5/2020	14:25	14:55	0	14	0	1	0	0	ATV dust
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	all out of sight
25	7/5/2020	15:30	16:00	18	0	0	4	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	5	2	0	1	0	1	NA
28	7/4/2020	17:34	18:05	19	0	0	1	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	3	20	0	1	0	0	NA
30	7/4/2020	12:00	12:31	12	0	0	7	0	0	NA
31	7/4/2020	10:30	11:03	40	0	0	3	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	13	0	1	Trailing group starting to merge with larger group
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	3	0	0	1	0	26	Heading SW, caribou trotting are catching up the ones walking
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	Out of sight
36	7/15/2020	10:33	11:00	16	2	0	6	0	1	Located on the edge of the hill
37	7/14/2020	14:12	14:46	14	0	0	8	0	10	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	20	0	0	3	0	2	Appear to be bothered by bugs
40	7/9/2020	13:48	14:20	6	0	1	12	0	11	NA
41	7/9/2020	12:14	12:42	0	0	0	0	0	20	NA
42	7/9/2020	11:30	12:09	5	0	0	0	0	15	NA
43	7/9/2020	10:51	11:20	1	0	0	11	0	0	They have gone about 700m from our position on the road
44	7/9/2020	9:43	10:10	0	0	0	1	0	0	Way too far for pictures
45	7/9/2020	8:39	9:12	14	0	0	6	0	0	NA
46	7/8/2020	8:52	NA	0	0	0	0	1	0	50m from road
47	7/6/2020	14:35	15:08	9	11	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	6	30	0	0	0	0	NA
50	7/6/2020	10:37	11:07	12	39	0	3	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	0	Out of sight
52	7/5/2020	14:30	15:07	10	6	2	4	1	0	NA
53	7/5/2020	12:01	12:28	0	0	0	18	0	0	Walking out of sight away from road
54	7/5/2020	10:44	11:16	2	5	1	3	0	0	Some merged with larger
55	7/5/2020	13:10	13:43	12	0	0	7	0	0	On road
56	7/5/2020	9:52	10:24	2	0	3	4	0	0	Walking out of site



Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 12	Laying 12	Standing 12	Walking 12	Alert 12	Trotting 12	Comments 12
1	7/4/2020	10:43	11:13	3	14	5	13	0	0	NA
2	7/4/2020	12:00	12:30	9	9	4	1	0	0	11 nursing
3	7/5/2020	16:45	17:15	0	0	0	98	2	0	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	8	4	27	10	0	0	NA
5	7/4/2020	11:56	12:26	30	0	0	10	0	0	NA
6	7/4/2020	16:35	17:05	1	7	0	0	0	0	NA
7	7/4/2020	17:35	18:04	5	16	4	2	0	0	group down to 27, 33 walked to join larger group
8	7/6/2020	14:38	13:08	10	6	2	0	0	0	2 calves came into group
9	7/6/2020	14:38	13:08	2	2	0	0	0	0	NA
10	7/6/2020	8:48	9:18	31	0	0	13	0	12	NA
11	7/6/2020	10:34	11:05	2	0	0	0	0	0	NA
12	7/6/2020	11:44	11:47	19	26	0	1	0	0	NA
13	7/6/2020	9:04	9:34	18	0	0	4	0	0	group down to 22, some went over ridge
14	7/6/2020	10:40	11:10	10	0	0	0	0	0	NA
15	7/6/2020	11:51	12:28	98	1	0	1	0	0	NA
16	7/5/2020	15:30	16:00	25	0	0	10	0	5	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	11	4	0	5	0	0	NA
19	7/5/2020	9:52	10:24	14	1	0	0	0	0	NA
20	7/5/2020	10:45	11:15	11	0	0	4	0	0	NA
21	7/5/2020	12:00	12:30	3	0	0	1	0	0	some have returned and ATV return
22	7/5/2020	13:10	13:40	22	3	1	2	0	0	NA
23	7/5/2020	14:25	14:55	0	10	2	1	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	17	0	0	5	0	0	NA
26	7/1/2020	18:45	17:15	30	0	0	20	0	0	NA
27	7/5/2020	8:47	9:15	7	3	0	1	0	0	1 cow nursing
28	7/4/2020	17:34	18:05	0	0	1	19	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	3	21	0	0	0	0	NA
30	7/4/2020	12:00	12:31	19	0	0	3	0	0	NA
31	7/4/2020	10:30	11:03	35	0	0	11	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	18	0	1	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	5	0	0	14	0	11	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	7	2	0	2	2	2	Rest over the hill
37	7/14/2020	14:12	14:46	3	0	1	40	0	5	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	24	0	0	7	0	3	NA
40	7/9/2020	13:48	14:20	17	0	0	6	1	6	NA
41	7/9/2020	12:14	12:42	0	0	0	10	0	10	NA
42	7/9/2020	11:30	12:09	14	0	0	6	0	0	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	12	NA
44	7/9/2020	9:43	10:10	0	0	0	1	0	0	Fog rolled in, visibilty getting worse at a distance
45	7/9/2020	8:39	9:12	6	0	0	11	1	2	NA
46	7/8/2020	8:52	NA	0	0	0	1	0	0	NA
47	7/6/2020	14:35	15:08	7	11	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	8	24	0	0	0	0	NA
50	7/6/2020	10:37	11:07	0	0	0	0	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	0	Out of sight
52	7/5/2020	14:30	15:07	10	5	4	4	0	0	1 nursing
53	7/5/2020	12:01	12:28	0	0	0	0	0	0	All out of sight
54	7/5/2020	10:44	11:16	2	4	1	4	1	0	NA
55	7/5/2020	13:10	13:43	18	0	0	3	0	0	NA
56	7/5/2020	9:52	10:24	1	0	0	8	0	0	On ridge



Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 15	Laying 15	Standing 15	Walking 15	Alert 15	Trotting 15	Comments 15
1	7/4/2020	10:43	11:13	4	12	18	1	0	0	NA
2	7/4/2020	12:00	12:30	11	8	0	3	0	3	NA
3	7/5/2020	16:45	17:15	70	0	0	30	0	0	group back and forth in corner of pipeline
4	7/4/2020	9:13	9:43	6	3	32	6	0	0	NA
5	7/4/2020	11:56	12:26	40	0	0	0	0	0	NA
6	7/4/2020	16:35	17:05	0	7	1	0	0	0	NA
7	7/4/2020	17:35	18:04	6	19	0	2	0	0	NA
8	7/6/2020	14:38	13:08	11	6	0	1	0	0	NA
9	7/6/2020	14:38	13:08	2	1	1	2	0	0	NA
10	7/6/2020	8:48	9:18	20	0	0	1	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	1	0	0	NA
12	7/6/2020	11:44	11:47	19	30	0	0	0	0	NA
13	7/6/2020	9:04	9:34	21	0	0	1	0	0	NA
14	7/6/2020	10:40	11:10	19	0	0	4	0	0	number of caribou increased to 22
15	7/6/2020	11:51	12:28	99	1	0	0	0	0	NA
16	7/5/2020	15:30	16:00	20	0	0	0	0	20	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking S, some out of sight
18	7/5/2020	8:47	9:15	15	1	0	4	0	0	NA
19	7/5/2020	9:52	10:24	11	2	0	1	0	0	NA
20	7/5/2020	10:45	11:15	11	1	0	3	0	0	NA
21	7/5/2020	12:00	12:30	4	0	0	0	0	0	hunting disturbance
22	7/5/2020	13:10	13:40	22	1	0	1	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	1	0	0	the rest out of sight
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	19	0	0	3	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	2	2	1	6	0	0	NA
28	7/4/2020	17:34	18:05	0	0	0	1	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	4	22	1	1	0	1	NA
30	7/4/2020	12:00	12:31	17	0	0	2	0	0	Caribou very fluid
31	7/4/2020	10:30	11:03	38	0	0	12	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	19	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	5	0	0	20	1	4	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	5	0	0	0	0	0	NA
37	7/14/2020	14:12	14:46	1	0	0	3	0	0	Rest are out of sight
38	7/12/2020	9:06	9:32	0	0	0	1	0	0	NA
39	7/10/2020	7:39	8:09	5	0	0	10	0	10	NA
40	7/9/2020	13:48	14:20	10	0	0	12	1	7	NA
41	7/9/2020	12:14	12:42	10	0	0	0	0	10	Getting further away, cant see well from such a distance
42	7/9/2020	11:30	12:09	0	0	0	17	0	3	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	No visual
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual, foggy
45	7/9/2020	8:39	9:12	0	0	1	14	0	5	NA
46	7/8/2020	8:52	NA	1	0	0	0	0	0	NA
47	7/6/2020	14:35	15:08	4	13	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	0	0	0	0	0	0	NA
50	7/6/2020	10:37	11:07	12	39	0	2	0	0	NA
51	7/6/2020	8:44	9:21	2	0	0	0	0	0	Found caribou with a new partner
52	7/5/2020	14:30	15:07	0	0	3	20	0	0	NA
53	7/5/2020	12:01	12:28	2	0	0	0	1	0	Out of site
54	7/5/2020	10:44	11:16	3	8	0	0	1	0	NA
55	7/5/2020	13:10	13:43	14	0	0	2	0	0	One crossed road
56	7/5/2020	9:52	10:24	1	0	0	7	0	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 18	Laying 18	Standing 18	Walking 18	Alert 18	Trotting 18	Comments 18
1	7/4/2020	10:43	11:13	17	17	0	1	0	0	Group starting to diverge
2	7/4/2020	12:00	12:30	8	15	1	1	0	0	NA
3	7/5/2020	16:45	17:15	20	5	0	15	0	11	11 crossed ramp over pipeline
4	7/4/2020	9:13	9:43	8	0	17	20	0	0	NA
5	7/4/2020	11:56	12:26	35	0	0	5	0	0	NA
6	7/4/2020	16:35	17:05	0	7	0	1	0	0	NA
7	7/4/2020	17:35	18:04	0	8	0	12	0	0	group dispersed more
8	7/6/2020	14:38	13:08	8	6	0	0	0	0	group down to 18
9	7/6/2020	14:38	13:08	1	1	0	0	0	2	NA
10	7/6/2020	8:48	9:18	12	2	0	3	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	0	0	0	Disappeared over ridge
12	7/6/2020	11:44	11:47	19	27	0	0	0	0	NA
13	7/6/2020	9:04	9:34	19	0	0	3	0	0	NA
14	7/6/2020	10:40	11:10	20	0	0	2	0	0	NA
15	7/6/2020	11:51	12:28	95	5	0	0	0	0	NA
16	7/5/2020	15:30	16:00	5	0	0	10	2	0	NA
17	7/2/2020	14:15	17:35	0	0	0	20	0	0	walking south
18	7/5/2020	8:47	9:15	13	2	0	5	0	0	NA
19	7/5/2020	9:52	10:24	9	4	0	2	0	0	NA
20	7/5/2020	10:45	11:15	9	2	2	2	0	0	NA
21	7/5/2020	12:00	12:30	3	0	0	0	1	0	hunting shots
22	7/5/2020	13:10	13:40	21	0	0	2	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	22	0	0	0	0	0	NA
26	7/1/2020	18:45	17:15	20	0	0	0	0	0	out of sight
27	7/5/2020	8:47	9:15	5	5	0	0	0	0	NA
28	7/4/2020	17:34	18:05	1	0	0	6	0	3	Percent of large herd. Bab very smol
29	7/4/2020	16:35	17:06	6	21	0	1	0	2	The babies are sooo cute. Also, they pranced onto the scene.
30	7/4/2020	12:00	12:31	17	0	0	7	0	0	NA
31	7/4/2020	10:30	11:03	46	6	2	0	0	0	NA
32	7/4/2020	8:56	9:27	1	0	0	22	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	3	0	0	11	0	16	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	3	0	0	1	1	0	NA
37	7/14/2020	14:12	14:46	0	0	0	0	0	1	Rest are out of sight
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	10	0	0	5	0	11	NA
40	7/9/2020	13:48	14:20	0	0	0	0	0	2	Out of sight
41	7/9/2020	12:14	12:42	10	0	0	0	0	10	0
42	7/9/2020	11:30	12:09	7	0	0	13	0	0	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	Still no visual
45	7/9/2020	8:39	9:12	3	0	0	16	0	1	NA
46	7/8/2020	8:52	NA	0	1	0	0	0	0	Flopped down in marsh
47	7/6/2020	14:35	15:08	5	9	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	4	24	0	0	0	0	NA
50	7/6/2020	10:37	11:07	18	28	0	1	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	1	0	1	NA
52	7/5/2020	14:30	15:07	0	0	0	23	0	0	Group blended in with rest of the herd.
53	7/5/2020	12:01	12:28	1	0	0	1	1	0	NA
54	7/5/2020	10:44	11:16	4	5	0	1	0	0	Hard to see calves
55	7/5/2020	13:10	13:43	15	0	0	4	1	0	NA
56	7/5/2020	9:52	10:24	4	0	0	2	0	0	In and out of site on ridge

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 21	Laying 21	Standing 21	Walking 21	Alert 21	Trotting 21	Comments 21
1	7/4/2020	10:43	11:13	2	18	0	0	0	0	Group starting to diverge
2	7/4/2020	12:00	12:30	7	15	2	1	0	0	NA
3	7/5/2020	16:45	17:15	80	10	0	10	0	0	10 crossed ramp over pipeline
4	7/4/2020	9:13	9:43	2	0	38	20	0	0	up to approximately 30
5	7/4/2020	11:56	12:26	25	0	0	15	0	0	NA
6	7/4/2020	16:35	17:05	4	8	0	0	0	0	4 joined group from other group
7	7/4/2020	17:35	18:04	0	1	0	17	0	0	group joining larger group
8	7/6/2020	14:38	13:08	8	6	0	0	0	0	NA
9	7/6/2020	14:38	13:08	0	1	0	0	0	0	only calf visible
10	7/6/2020	8:48	9:18	13	2	0	3	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	0	0	0	disappeared over ridge
12	7/6/2020	11:44	11:47	19	22	0	0	0	0	NA
13	7/6/2020	9:04	9:34	6	0	0	0	0	0	grroup down to 6, others went over ridge
14	7/6/2020	10:40	11:10	21	0	0	1	0	0	NA
15	7/6/2020	11:51	12:28	95	5	0	0	0	0	NA
16	7/5/2020	15:30	16:00	0	0	0	0	0	40	NA
17	7/2/2020	14:15	17:35	0	0	0	20	0	0	walking south
18	7/5/2020	8:47	9:15	12	1	1	7	0	0	NA
19	7/5/2020	9:52	10:24	7	5	0	3	0	0	NA
20	7/5/2020	10:45	11:15	10	4	0	1	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	0	3	3	hunting shots
22	7/5/2020	13:10	13:40	20	2	1	2	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	7	0	0	3	2	10	NA
26	7/1/2020	18:45	17:15	20	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	4	6	0	0	0	0	1 nursing, some merged with larger group
28	7/4/2020	17:34	18:05	7	0	0	3	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	7	22	0	1	0	0	NA
30	7/4/2020	12:00	12:31	13	0	0	4	0	1	NA
31	7/4/2020	10:30	11:03	44	6	0	2	0	0	NA
32	7/4/2020	8:56	9:27	5	0	0	15	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	0	0	0	1	0	29	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	4	0	0	1	0	0	NA
37	7/14/2020	14:12	14:46	0	0	0	15	0	34	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	0	0	0	23	0	2	NA
40	7/9/2020	13:48	14:20	0	0	0	0	0	2	Out of sight
41	7/9/2020	12:14	12:42	13	0	0	7	0	0	NA
42	7/9/2020	11:30	12:09	0	0	0	0	0	20	Group veered north to join much larger herd crossing road to east
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual
45	7/9/2020	8:39	9:12	4	0	0	16	0	0	NA
46	7/8/2020	8:52	NA	1	0	0	0	0	0	NA
47	7/6/2020	14:35	15:08	5	8	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	2	19	0	6	0	0	NA
50	7/6/2020	10:37	11:07	19	18	0	0	0	0	Many have moved out of sight
51	7/6/2020	8:44	9:21	0	0	0	2	0	0	NA
52	7/5/2020	14:30	15:07	0	0	0	23	0	0	NA
53	7/5/2020	12:01	12:28	2	0	0	0	1	0	NA
54	7/5/2020	10:44	11:16	3	7	0	2	0	0	NA
55	7/5/2020	13:10	13:43	14	0	0	5	0	0	NA
56	7/5/2020	9:52	10:24	1	0	0	4	1	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 24	Laying 24	Standing 24	Walking 24	Alert 24	Trotting 24	Comments 24
1	7/4/2020	10:43	11:13	0	19	0	0	0	0	Group down to 19 visible, some went over ridge
2	7/4/2020	12:00	12:30	9	15	1	0	0	0	NA
3	7/5/2020	16:45	17:15	80	10	0	10	0	0	40 crossed ramp
4	7/4/2020	9:13	9:43	4	10	43	3	0	0	NA
5	7/4/2020	11:56	12:26	33	0	0	7	0	0	NA
6	7/4/2020	16:35	17:05	0	8	0	0	0	0	4 left, straggling feeders
7	7/4/2020	17:35	18:04	0	0	0	18	0	0	still working towards larger group
8	7/6/2020	14:38	13:08	7	6	0	1	0	0	NA
9	7/6/2020	14:38	13:08	0	1	0	0	0	0	NA
10	7/6/2020	8:48	9:18	13	5	0	0	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	0	0	0	disappeared over ridge
12	7/6/2020	11:44	11:47	16	31	0	0	0	0	NA
13	7/6/2020	9:04	9:34	2	0	0	2	0	0	group down to 4, others went over ridge
14	7/6/2020	10:40	11:10	22	0	0	4	0	0	4 more joined
15	7/6/2020	11:51	12:28	95	5	0	0	0	0	NA
16	7/5/2020	15:30	16:00	0	0	0	40	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	13	1	1	5	0	0	NA
19	7/5/2020	9:52	10:24	6	7	1	1	0	0	NA
20	7/5/2020	10:45	11:15	7	3	0	5	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	8	0	0	NA
22	7/5/2020	13:10	13:40	18	0	1	2	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	19	2	0	1	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	7	6	2	0	0	0	1 nursing
28	7/4/2020	17:34	18:05	4	0	1	5	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	8	21	1	0	0	0	NA
30	7/4/2020	12:00	12:31	12	0	0	9	0	0	NA
31	7/4/2020	10:30	11:03	53	6	0	3	0	0	NA
32	7/4/2020	8:56	9:27	2	2	1	15	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	0	0	0	0	0	5	Rest are out of sight over the hill
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	3	0	0	4	0	1	NA
37	7/14/2020	14:12	14:46	6	0	0	16	0	31	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	0	Out of sight
39	7/10/2020	7:39	8:09	17	0	0	9	1	5	NA
40	7/9/2020	13:48	14:20	0	0	0	0	0	2	NA
41	7/9/2020	12:14	12:42	0	0	0	20	0	0	NA
42	7/9/2020	11:30	12:09	0	0	0	0	0	20	Have joined large group
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual
45	7/9/2020	8:39	9:12	3	0	0	15	0	2	NA
46	7/8/2020	8:52	NA	0	0	0	0	1	0	50 m from road
47	7/6/2020	14:35	15:08	6	12	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	2	19	0	7	0	0	NA
50	7/6/2020	10:37	11:07	14	19	0	2	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	1	0	0	Partner is now out of sight
52	7/5/2020	14:30	15:07	0	0	0	23	0	0	NA
53	7/5/2020	12:01	12:28	2	0	0	1	2	0	NA
54	7/5/2020	10:44	11:16	2	8	0	0	0	0	NA
55	7/5/2020	13:10	13:43	14	0	0	4	1	0	NA
56	7/5/2020	9:52	10:24	3	0	0	21	2	0	Some appeared on ridge

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 27	Laying 27	Standing 27	Walking 27	Alert 27	Trotting 27	Comments 27
1	7/4/2020	10:43	11:13	0	18	1	0	0	0	NA
2	7/4/2020	12:00	12:30	10	15	1	0	0	0	NA
3	7/5/2020	16:45	17:15	30	10	0	30	0	30	46 crossed ramp
4	7/4/2020	9:13	9:43	5	0	35	20	0	0	NA
5	7/4/2020	11:56	12:26	33	0	0	7	0	0	NA
6	7/4/2020	16:35	17:05	0	6	2	0	0	0	NA
7	7/4/2020	17:35	18:04	11	0	0	7	0	0	NA
8	7/6/2020	14:38	13:08	7	6	0	1	0	0	NA
9	7/6/2020	14:38	13:08	0	1	0	0	0	0	NA
10	7/6/2020	8:48	9:18	14	2	0	3	0	0	NA
11	7/6/2020	10:34	11:05	2	0	0	0	0	0	NA
12	7/6/2020	11:44	11:47	19	31	0	1	0	0	NA
13	7/6/2020	9:04	9:34	0	0	0	0	0	0	out of sight
14	7/6/2020	10:40	11:10	26	0	0	0	0	0	NA
15	7/6/2020	11:51	12:28	90	10	0	0	0	0	NA
16	7/5/2020	15:30	16:00	9	0	0	10	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	6	3	1	10	0	0	NA
19	7/5/2020	9:52	10:24	2	8	1	4	0	0	NA
20	7/5/2020	10:45	11:15	12	2	0	1	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	0	0	0	all out of sight
22	7/5/2020	13:10	13:40	18	1	1	3	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	20	2	0	2	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	4	4	2	4	0	0	NA
28	7/4/2020	17:34	18:05	44	0	0	5	0	1	Percent of large herd
29	7/4/2020	16:35	17:06	7	23	0	1	0	0	NA
30	7/4/2020	12:00	12:31	15	0	0	5	0	0	NA
31	7/4/2020	10:30	11:03	50	6	0	2	0	0	NA
32	7/4/2020	8:56	9:27	9	2	0	11	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	0	0	0	0	0	0	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	5	0	0	0	0	0	NA
37	7/14/2020	14:12	14:46	18	0	0	9	0	28	The ones running are trying to catch up with the group
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	17	0	0	7	0	1	NA
40	7/9/2020	13:48	14:20	0	0	0	0	0	2	NA
41	7/9/2020	12:14	12:42	20	0	0	0	0	0	NA
42	7/9/2020	11:30	12:09	0	0	0	0	0	20	NA
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual
45	7/9/2020	8:39	9:12	12	0	0	7	0	0	Some out of sight
46	7/8/2020	8:52	NA	0	0	0	0	0	1	Running out of sight
47	7/6/2020	14:35	15:08	1	10	1	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	10	14	0	2	0	0	NA
50	7/6/2020	10:37	11:07	13	27	0	0	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	0	0	1	NA
52	7/5/2020	14:30	15:07	0	0	0	0	0	0	50% walking and 50% eating
53	7/5/2020	12:01	12:28	0	0	0	0	3	4	NA
54	7/5/2020	10:44	11:16	2	8	0	0	0	0	NA
55	7/5/2020	13:10	13:43	10	0	1	0	0	0	NA
56	7/5/2020	9:52	10:24	2	0	0	1	0	0	Out of site

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Feeding 30	Laying 30	Standing 30	Walking 30	Alert 30	Trotting 30	Comments 30
1	7/4/2020	10:43	11:13	0	18	1	0	0	0	NA
2	7/4/2020	12:00	12:30	10	14	1	1	0	0	NA
3	7/5/2020	16:45	17:15	30	10	0	20	0	40	64 crossed ramp
4	7/4/2020	9:13	9:43	5	0	40	15	0	0	NA
5	7/4/2020	11:56	12:26	20	0	0	20	0	0	NA
6	7/4/2020	16:35	17:05	4	5	0	6	0	0	NA
7	7/4/2020	17:35	18:04	18	0	0	0	0	0	NA
8	7/6/2020	14:38	13:08	6	8	0	0	0	0	NA
9	7/6/2020	14:38	13:08	1	1	0	0	0	0	mother of calf back in sight
10	7/6/2020	8:48	9:18	11	4	0	2	0	0	NA
11	7/6/2020	10:34	11:05	0	0	0	1	1	0	NA
12	7/6/2020	11:44	11:47	11	31	1	0	0	0	NA
13	7/6/2020	9:04	9:34	0	0	0	0	0	0	out of sight
14	7/6/2020	10:40	11:10	22	0	0	4	0	0	NA
15	7/6/2020	11:51	12:28	80	20	0	0	0	0	NA
16	7/5/2020	15:30	16:00	20	0	0	20	0	0	NA
17	7/2/2020	14:15	17:35	0	0	0	50	0	0	walking south
18	7/5/2020	8:47	9:15	14	0	0	6	0	0	NA
19	7/5/2020	9:52	10:24	1	5	0	0	0	0	rest out of sight
20	7/5/2020	10:45	11:15	11	3	0	1	0	0	NA
21	7/5/2020	12:00	12:30	0	0	0	0	0	0	ATV disturbance
22	7/5/2020	13:10	13:40	19	6	0	2	0	0	NA
23	7/5/2020	14:25	14:55	0	0	0	0	0	0	NA
24	7/5/2020	14:55	15:25	0	0	0	0	0	0	NA
25	7/5/2020	15:30	16:00	20	0	1	1	0	0	NA
26	7/1/2020	18:45	17:15	50	0	0	0	0	0	NA
27	7/5/2020	8:47	9:15	4	6	0	2	0	0	NA
28	7/4/2020	17:34	18:05	1	0	0	0	0	0	Percent of large herd
29	7/4/2020	16:35	17:06	7	23	0	2	0	0	NA
30	7/4/2020	12:00	12:31	11	0	1	1	0	0	NA
31	7/4/2020	10:30	11:03	54	6	0	5	0	0	NA
32	7/4/2020	8:56	9:27	9	2	0	11	0	0	NA
33	7/5/2020	12:42	12:43	0	0	0	0	0	0	NA
34	7/17/2020	7:32	7:59	0	0	0	0	0	0	NA
35	7/15/2020	12:58	13:08	0	0	0	0	0	0	NA
36	7/15/2020	10:33	11:00	1	0	1	1	0	0	NA
37	7/14/2020	14:12	14:46	27	0	0	5	0	23	NA
38	7/12/2020	9:06	9:32	0	0	0	0	0	1	NA
39	7/10/2020	7:39	8:09	22	0	0	5	0	1	They have approched the truck
40	7/9/2020	13:48	14:20	5	0	0	0	0	25	NA
41	7/9/2020	12:14	12:42	20	0	0	0	0	0	NA
42	7/9/2020	11:30	12:09	0	0	0	0	0	20	Out of sight
43	7/9/2020	10:51	11:20	0	0	0	0	0	0	NA
44	7/9/2020	9:43	10:10	0	0	0	0	0	0	No visual
45	7/9/2020	8:39	9:12	3	0	0	14	0	3	NA
46	7/8/2020	8:52	NA	0	0	0	0	0	1	Trotted back across road to east
47	7/6/2020	14:35	15:08	6	10	0	0	0	0	NA
48	7/6/2020	12:20	12:23	0	0	0	0	0	0	NA
49	7/6/2020	11:41	12:13	1	8	0	12	0	0	NA
50	7/6/2020	10:37	11:07	20	21	0	4	0	0	NA
51	7/6/2020	8:44	9:21	0	0	0	1	0	0	NA
52	7/5/2020	14:30	15:07	20	0	0	3	0	0	NA
53	7/5/2020	12:01	12:28	2	0	0	0	0	0	NA
54	7/5/2020	10:44	11:16	1	7	1	0	0	0	NA
55	7/5/2020	13:10	13:43	7	0	0	6	1	3	Walked away from road
56	7/5/2020	9:52	10:24	0	0	0	12	0	0	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Disturbance 0	Dist comments 0	Disturbance 3
1	7/4/2020	10:43	11:13	NA	NA	NA
2	7/4/2020	12:00	12:30	Haul Truck	noise in background	NA
3	7/5/2020	16:45	17:15	Waterline	Entire group passed over pipeline at the Atv ramp, except for 2 individuals that jumped the pipeline - the last of the group crossed at 17:58	Waterline
4	7/4/2020	9:13	9:43	NA	NA	NA
5	7/4/2020	11:56	12:26	NA	NA	NA
6	7/4/2020	16:35	17:05	NA	NA	NA
7	7/4/2020	17:35	18:04	NA	NA	NA
8	7/6/2020	14:38	13:08	NA	NA	NA
9	7/6/2020	14:38	13:08	NA	NA	NA
10	7/6/2020	8:48	9:18	Light Truck	NA	NA
11	7/6/2020	10:34	11:05	NA	NA	NA
12	7/6/2020	11:44	11:47	NA	NA	NA
13	7/6/2020	9:04	9:34	NA	NA	NA
14	7/6/2020	10:40	11:10	NA	NA	NA
15	7/6/2020	11:51	12:28	NA	NA	NA
16	7/5/2020	15:30	16:00	NA	NA	NA
17	7/2/2020	14:15	17:35	NA	NA	NA
18	7/5/2020	8:47	9:15	NA	NA	NA
19	7/5/2020	9:52	10:24	NA	NA	NA
20	7/5/2020	10:45	11:15	NA	NA	NA
21	7/5/2020	12:00	12:30	ATV	NA	NA
22	7/5/2020	13:10	13:40	NA	NA	NA
23	7/5/2020	14:25	14:55	NA	NA	NA
24	7/5/2020	14:55	15:25	NA	NA	NA
25	7/5/2020	15:30	16:00	NA	NA	NA
26	7/1/2020	18:45	17:15	NA	NA	NA
27	7/5/2020	8:47	9:15	NA	NA	NA
28	7/4/2020	17:34	18:05	NA	NA	Blast
29	7/4/2020	16:35	17:06	NA	NA	NA
30	7/4/2020	12:00	12:31	NA	NA	NA
31	7/4/2020	10:30	11:03	NA	NA	NA
32	7/4/2020	8:56	9:27	NA	NA	NA
33	7/5/2020	12:42	12:43	NA	NA	NA
34	7/17/2020	7:32	7:59	NA	NA	NA
35	7/15/2020	12:58	13:08	Light Truck	Us, tye caribou saw us before we saw them	NA
36	7/15/2020	10:33	11:00	NA	NA	NA
37	7/14/2020	14:12	14:46	NA	NA	NA
38	7/12/2020	9:06	9:32	Convoy	NA	NA
39	7/10/2020	7:39	8:09	NA	NA	NA
40	7/9/2020	13:48	14:20	NA	NA	NA
41	7/9/2020	12:14	12:42	NA	NA	Maintenance Vehicl
42	7/9/2020	11:30	12:09	NA	NA	NA
43	7/9/2020	10:51	11:20	NA	NA	NA
44	7/9/2020	9:43	10:10	NA	NA	NA
45	7/9/2020	8:39	9:12	NA	NA	NA
46	7/8/2020	8:52	NA	NA	Sound of haul trucks in distance for duration of survey	NA
47	7/6/2020	14:35	15:08	NA	NA	NA
48	7/6/2020	12:20	12:23	Convoy	Haul trucks were tractor trailers and maintenance vehiclea were school buses	NA
49	7/6/2020	11:41	12:13	NA	NA	NA
50	7/6/2020	10:37	11:07	NA	NA	NA
51	7/6/2020	8:44	9:21	NA	NA	ATV
52	7/5/2020	14:30	15:07	NA	NA	NA
53	7/5/2020	12:01	12:28	ATV	Atvs pulled up and stopped 200m from road	NA
54	7/5/2020	10:44	11:16	NA	NA	NA
55	7/5/2020	13:10	13:43	NA	NA	NA
56	7/5/2020	9:52	10:24	NA	NA	NA



Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Dist Comments 3	Disturbance 6	Dist Comments 6	Disturbance 9	Dist Comments 9	Disturbance 12	Dist Comments 12
1	7/4/2020	10:43	11:13	NA	NA	NA	NA	NA	NA	NA
2	7/4/2020	12:00	12:30	NA	NA	NA	NA	NA	NA	NA
3	7/5/2020	16:45	17:15	NA	Waterline	NA	Waterline	NA	Waterline	NA
4	7/4/2020	9:13	9:43	NA	NA	NA	NA	NA	NA	NA
5	7/4/2020	11:56	12:26	NA	NA	NA	NA	NA	NA	NA
6	7/4/2020	16:35	17:05	NA	NA	NA	NA	NA	NA	NA
7	7/4/2020	17:35	18:04	NA	Blast	underground blast	NA	NA	NA	NA
8	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA	NA
9	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA	NA
10	7/6/2020	8:48	9:18	NA	NA	NA	ATV	NA	NA	NA
11	7/6/2020	10:34	11:05	NA	NA	NA	NA	NA	NA	NA
12	7/6/2020	11:44	11:47	NA	NA	NA	NA	NA	NA	NA
13	7/6/2020	9:04	9:34	NA	NA	NA	NA	NA	NA	NA
14	7/6/2020	10:40	11:10	NA	NA	NA	NA	NA	NA	NA
15	7/6/2020	11:51	12:28	NA	NA	NA	NA	NA	NA	NA
16	7/5/2020	15:30	16:00	NA	NA	NA	NA	NA	NA	NA
17	7/2/2020	14:15	17:35	NA	NA	NA	NA	NA	Blast	underground blast
18	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA	NA
19	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA	NA
20	7/5/2020	10:45	11:15	NA	NA	NA	NA	NA	NA	NA
21	7/5/2020	12:00	12:30	NA	ATV	NA	NA	NA	ATV	NA
22	7/5/2020	13:10	13:40	NA	NA	NA	NA	NA	NA	NA
23	7/5/2020	14:25	14:55	NA	NA	NA	ATV	NA	NA	NA
24	7/5/2020	14:55	15:25	NA	NA	NA	NA	NA	NA	NA
25	7/5/2020	15:30	16:00	NA	NA	NA	NA	NA	NA	NA
26	7/1/2020	18:45	17:15	NA	NA	NA	NA	NA	NA	NA
27	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA	NA
28	7/4/2020	17:34	18:05	NA	NA	NA	NA	NA	NA	NA
29	7/4/2020	16:35	17:06	NA	NA	NA	NA	NA	NA	NA
30	7/4/2020	12:00	12:31	NA	NA	NA	NA	NA	NA	NA
31	7/4/2020	10:30	11:03	NA	NA	NA	NA	NA	NA	NA
32	7/4/2020	8:56	9:27	NA	NA	NA	NA	NA	NA	NA
33	7/5/2020	12:42	12:43	NA	NA	NA	NA	NA	NA	NA
34	7/17/2020	7:32	7:59	NA	NA	NA	NA	NA	NA	NA
35	7/15/2020	12:58	13:08	NA	NA	NA	NA	NA	NA	NA
36	7/15/2020	10:33	11:00	NA	Light Truck	re on, going more than	Convoy	NA	Light Truck	Beacons are on, going more than 15 km/h
37	7/14/2020	14:12	14:46	NA	NA	NA	NA	NA	NA	NA
38	7/12/2020	9:06	9:32	NA	NA	NA	NA	NA	NA	NA
39	7/10/2020	7:39	8:09	NA	NA	NA	NA	NA	NA	NA
40	7/9/2020	13:48	14:20	NA	NA	NA	NA	NA	NA	NA
41	7/9/2020	12:14	12:42	NA	NA	NA	NA	NA	NA	NA
42	7/9/2020	11:30	12:09	NA	NA	NA	NA	NA	NA	NA
43	7/9/2020	10:51	11:20	NA	NA	NA	NA	NA	NA	NA
44	7/9/2020	9:43	10:10	NA	Haul Truck	Tractor trailer	NA	NA	NA	NA
45	7/9/2020	8:39	9:12	NA	Haul Truck	ed, it was driving at	NA	NA	NA	NA
46	7/8/2020	8:52	NA	NA	NA	NA	NA	NA	NA	NA
47	7/6/2020	14:35	15:08	NA	NA	NA	NA	NA	NA	NA
48	7/6/2020	12:20	12:23	NA	NA	NA	NA	NA	NA	NA
49	7/6/2020	11:41	12:13	NA	NA	NA	NA	NA	NA	NA
50	7/6/2020	10:37	11:07	NA	NA	NA	NA	NA	NA	NA
51	7/6/2020	8:44	9:21	NA	NA	NA	NA	NA	NA	NA
52	7/5/2020	14:30	15:07	NA	NA	NA	ATV	NA	NA	NA
53	7/5/2020	12:01	12:28	NA	ATV	Atvs resumed running	NA	NA	NA	NA
54	7/5/2020	10:44	11:16	NA	NA	NA	NA	NA	NA	NA
55	7/5/2020	13:10	13:43	NA	NA	NA	NA	NA	NA	NA
56	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Disturbance 15	Dist Comments 15	Disturbance 18	Dist Comments 18	Disturbance 21	Dist Comments 21
1	7/4/2020	10:43	11:13	NA	NA	NA	NA	NA	NA
2	7/4/2020	12:00	12:30	NA	NA	NA	NA	NA	NA
3	7/5/2020	16:45	17:15	Waterline	NA	Waterline	NA	Waterline	NA
4	7/4/2020	9:13	9:43	NA	NA	NA	NA	NA	NA
5	7/4/2020	11:56	12:26	NA	NA	NA	NA	NA	NA
6	7/4/2020	16:35	17:05	NA	NA	NA	NA	NA	NA
7	7/4/2020	17:35	18:04	NA	NA	NA	NA	NA	NA
8	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA
9	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA
10	7/6/2020	8:48	9:18	NA	NA	NA	NA	NA	NA
11	7/6/2020	10:34	11:05	NA	NA	NA	NA	NA	NA
12	7/6/2020	11:44	11:47	NA	NA	NA	NA	NA	NA
13	7/6/2020	9:04	9:34	NA	NA	NA	NA	NA	NA
14	7/6/2020	10:40	11:10	NA	NA	NA	NA	NA	NA
15	7/6/2020	11:51	12:28	NA	NA	NA	NA	Convoy	NA
16	7/5/2020	15:30	16:00	NA	NA	NA	NA	Hunter	3 gunshots from south
17	7/2/2020	14:15	17:35	NA	NA	NA	NA	NA	NA
18	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA
19	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA
20	7/5/2020	10:45	11:15	NA	NA	NA	NA	NA	NA
21	7/5/2020	12:00	12:30	NA	NA	Hunter	NA	Hunter	NA
22	7/5/2020	13:10	13:40	NA	NA	NA	NA	NA	NA
23	7/5/2020	14:25	14:55	NA	NA	NA	NA	NA	NA
24	7/5/2020	14:55	15:25	NA	NA	NA	NA	NA	NA
25	7/5/2020	15:30	16:00	NA	NA	Hunter	shooting	NA	NA
26	7/1/2020	18:45	17:15	Blast	surface blast	NA	NA	NA	NA
27	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA
28	7/4/2020	17:34	18:05	NA	NA	NA	NA	NA	NA
29	7/4/2020	16:35	17:06	NA	NA	NA	NA	NA	NA
30	7/4/2020	12:00	12:31	NA	NA	NA	NA	NA	NA
31	7/4/2020	10:30	11:03	NA	NA	NA	NA	ATV	2 ATVs on AWAR
32	7/4/2020	8:56	9:27	NA	NA	NA	NA	NA	NA
33	7/5/2020	12:42	12:43	NA	NA	NA	NA	NA	NA
34	7/17/2020	7:32	7:59	NA	NA	NA	NA	Light Truck	NA
35	7/15/2020	12:58	13:08	NA	NA	NA	NA	NA	NA
36	7/15/2020	10:33	11:00	NA	NA	Light Truck	Beacons are on, going more than 15 km/h	NA	NA
37	7/14/2020	14:12	14:46	NA	NA	NA	NA	NA	NA
38	7/12/2020	9:06	9:32	NA	NA	NA	NA	NA	NA
39	7/10/2020	7:39	8:09	NA	NA	NA	NA	NA	NA
40	7/9/2020	13:48	14:20	NA	NA	NA	NA	NA	NA
41	7/9/2020	12:14	12:42	NA	NA	NA	NA	NA	NA
42	7/9/2020	11:30	12:09	NA	NA	NA	NA	NA	NA
43	7/9/2020	10:51	11:20	NA	NA	NA	NA	NA	NA
44	7/9/2020	9:43	10:10	NA	NA	NA	NA	NA	NA
45	7/9/2020	8:39	9:12	NA	NA	NA	NA	NA	NA
46	7/8/2020	8:52	NA	NA	NA	NA	NA	NA	NA
47	7/6/2020	14:35	15:08	NA	NA	NA	NA	NA	NA
48	7/6/2020	12:20	12:23	NA	NA	NA	NA	NA	NA
49	7/6/2020	11:41	12:13	NA	NA	NA	NA	NA	NA
50	7/6/2020	10:37	11:07	NA	NA	NA	NA	NA	NA
51	7/6/2020	8:44	9:21	NA	NA	NA	NA	NA	NA
52	7/5/2020	14:30	15:07	NA	NA	NA	NA	NA	NA
53	7/5/2020	12:01	12:28	ATV	Southbound atv	NA	NA	NA	NA
54	7/5/2020	10:44	11:16	NA	NA	NA	NA	NA	NA
55	7/5/2020	13:10	13:43	NA	NA	NA	NA	NA	NA
56	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	Disturbance 24	Dist Comments 24	Disturbance 27	Dist Comments 27	Disturbance 30	Dist Comments 30
1	7/4/2020	10:43	11:13	NA	NA	NA	NA	NA	NA
2	7/4/2020	12:00	12:30	NA	NA	NA	NA	NA	NA
3	7/5/2020	16:45	17:15	Waterline	NA	Waterline	NA	Waterline	NA
4	7/4/2020	9:13	9:43	NA	NA	NA	NA	NA	NA
5	7/4/2020	11:56	12:26	NA	NA	NA	NA	NA	NA
6	7/4/2020	16:35	17:05	NA	NA	NA	NA	NA	NA
7	7/4/2020	17:35	18:04	NA	NA	NA	NA	NA	NA
8	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA
9	7/6/2020	14:38	13:08	NA	NA	NA	NA	NA	NA
10	7/6/2020	8:48	9:18	NA	NA	NA	NA	NA	NA
11	7/6/2020	10:34	11:05	NA	NA	NA	NA	NA	NA
12	7/6/2020	11:44	11:47	NA	NA	NA	NA	Convoy	2 light trucks, 3 tractor trailers, 2 school busses - slightly after end of survey
13	7/6/2020	9:04	9:34	NA	NA	NA	NA	NA	NA
14	7/6/2020	10:40	11:10	NA	NA	NA	NA	NA	NA
15	7/6/2020	11:51	12:28	NA	NA	NA	NA	NA	NA
16	7/5/2020	15:30	16:00	NA	NA	NA	NA	NA	NA
17	7/2/2020	14:15	17:35	NA	NA	NA	NA	NA	NA
18	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA
19	7/5/2020	9:52	10:24	NA	NA	NA	NA	NA	NA
20	7/5/2020	10:45	11:15	NA	NA	NA	NA	NA	NA
21	7/5/2020	12:00	12:30	NA	NA	NA	NA	NA	NA
22	7/5/2020	13:10	13:40	NA	NA	NA	NA	NA	NA
23	7/5/2020	14:25	14:55	NA	NA	NA	NA	NA	NA
24	7/5/2020	14:55	15:25	NA	NA	NA	NA	NA	NA
25	7/5/2020	15:30	16:00	NA	NA	NA	NA	NA	NA
26	7/1/2020	18:45	17:15	NA	NA	NA	NA	NA	NA
27	7/5/2020	8:47	9:15	NA	NA	NA	NA	NA	NA
28	7/4/2020	17:34	18:05	NA	NA	NA	NA	NA	NA
29	7/4/2020	16:35	17:06	NA	NA	NA	NA	NA	NA
30	7/4/2020	12:00	12:31	NA	NA	NA	NA	NA	NA
31	7/4/2020	10:30	11:03	NA	NA	NA	NA	ATV	Two atvs on AWAR
32	7/4/2020	8:56	9:27	NA	NA	NA	NA	NA	NA
33	7/5/2020	12:42	12:43	NA	NA	NA	NA	NA	NA
34	7/17/2020	7:32	7:59	Light Truck	NA	NA	NA	NA	NA
35	7/15/2020	12:58	13:08	NA	NA	NA	NA	NA	NA
36	7/15/2020	10:33	11:00	Light Truck	NA	NA	NA	NA	NA
37	7/14/2020	14:12	14:46	NA	NA	NA	NA	NA	NA
38	7/12/2020	9:06	9:32	NA	NA	NA	NA	NA	NA
39	7/10/2020	7:39	8:09	NA	NA	NA	NA	NA	NA
40	7/9/2020	13:48	14:20	NA	NA	NA	NA	Convoy	4 buses, 2 flatbeds & hino
41	7/9/2020	12:14	12:42	NA	NA	NA	NA	NA	NA
42	7/9/2020	11:30	12:09	NA	NA	NA	NA	NA	NA
43	7/9/2020	10:51	11:20	NA	NA	NA	NA	NA	NA
44	7/9/2020	9:43	10:10	NA	NA	NA	NA	NA	NA
45	7/9/2020	8:39	9:12	NA	NA	NA	NA	NA	NA
46	7/8/2020	8:52	NA	ATV	NA	NA	NA	NA	NA
47	7/6/2020	14:35	15:08	NA	NA	NA	NA	NA	NA
48	7/6/2020	12:20	12:23	NA	NA	NA	NA	NA	NA
49	7/6/2020	11:41	12:13	NA	NA	NA	NA	NA	NA
50	7/6/2020	10:37	11:07	NA	NA	NA	NA	NA	NA
51	7/6/2020	8:44	9:21	NA	NA	NA	NA	NA	NA
52	7/5/2020	14:30	15:07	NA	NA	NA	NA	NA	NA
53	7/5/2020	12:01	12:28	NA	NA	Hunter	NA	Hunter	Hunters
54	7/5/2020	10:44	11:16	NA	NA	NA	NA	NA	NA
55	7/5/2020	13:10	13:43	Light Truck	NA	NA	NA	Light Truck	Atv drove by but pickup still stopped
56	7/5/2020	9:52	10:24	Light Truck	NA	NA	NA	NA	NA

Appendix B: Data from Caribou Behaviour Surveys

Survey ID	Date	Start Time	End Time	General Comments
1	7/4/2020	10:43	11:13	NA
2	7/4/2020	12:00	12:30	Haul truck noise in background
3	7/5/2020	16:45	17:15	Entire group passed over pipeline at the Atv ramp, except for 2 individuals that jumped the pipeline - the last of the group crossed at 17:58
4	7/4/2020	9:13	9:43	larger herd approximately 5km from road
5	7/4/2020	11:56	12:26	NA
6	7/4/2020	16:35	17:05	not road survey, surveying herd on E side
7	7/4/2020	17:35	18:04	group on opposite side of water
8	7/6/2020	14:38	13:08	NA
9	7/6/2020	14:38	13:08	NA
10	7/6/2020	8:48	9:18	NA
11	7/6/2020	10:34	11:05	NA
12	7/6/2020	11:44	11:47	Convoy = 2 light trucks, 3 tractor trailers, 2 school busses - noted that most caribou got up from laying down and began walking, definitely some disturbance - photos 9211, 9212
13	7/6/2020	9:04	9:34	NA
14	7/6/2020	10:40	11:10	NA
15	7/6/2020	11:51	12:28	time recorded for convay was 12:20 so I calculated the interval based on the end time of the survey
16	7/5/2020	15:30	16:00	3 gunshots from south
17	7/2/2020	14:15	17:35	NA
18	7/5/2020	8:47	9:15	NA
19	7/5/2020	9:52	10:24	NA
20	7/5/2020	10:45	11:15	NA
21	7/5/2020	12:00	12:30	NA
22	7/5/2020	13:10	13:40	NA
23	7/5/2020	14:25	14:55	NA
24	7/5/2020	14:55	15:25	NA
25	7/5/2020	15:30	16:00	shooting
26	7/1/2020	18:45	17:15	surface blast occurred at 19:00 at pit 2km south of survey location. Video DSC_0011.MOV
27	7/5/2020	8:47	9:15	NA
28	7/4/2020	17:34	18:05	Blast reaction survey
29	7/4/2020	16:35	17:06	Members changing fluidly, part of larger group
30	7/4/2020	12:00	12:31	Heat haze, distance
31	7/4/2020	10:30	11:03	Heat haze, caribou sometimes obscured by slopes, extreme distance.
32	7/4/2020	8:56	9:27	Group approximately 2 km from AWAR, heatwaves making observations difficult.
33	7/5/2020	12:42	12:43	Group ran out of sight almost immediately. Was about to cross the road but turned around and ran. No distyrbance identified but recent gunshots may have the group on edge
34	7/17/2020	7:32	7:59	Heading SW
35	7/15/2020	12:58	13:08	Two cows and two calves
36	7/15/2020	10:33	11:00	NA
37	7/14/2020	14:12	14:46	NA
38	7/12/2020	9:06	9:32	Lots of mosquitoes
39	7/10/2020	7:39	8:09	Lots of bugs, appeared to bother them caribou
40	7/9/2020	13:48	14:20	A lot of mosquitoes and almost no wind, there a loads of mosquitoes after us They ran along the road and crossed several times
41	7/9/2020	12:14	12:42	NA
42	7/9/2020	11:30	12:09	NA
43	7/9/2020	10:51	11:20	NA
44	7/9/2020	9:43	10:10	Fog rolled in half way
45	7/9/2020	8:39	9:12	Group spread out in a line heading south, suspect mostly males, a few calves
46	7/8/2020	8:52	NA	Stopped on side of road behind tractor trailer convoy, female running around and calf sleeping under tractor trailer. As it turns out it was the mother looking for tye calf
47	7/6/2020	14:35	15:08	NA
48	7/6/2020	12:20	12:23	Disturbance convoy observation
49	7/6/2020	11:41	12:13	NA
50	7/6/2020	10:37	11:07	Watching subset and now have merged
51	7/6/2020	8:44	9:21	NA
52	7/5/2020	14:30	15:07	NA
53	7/5/2020	12:01	12:28	Crossing the quarry, running out of sight
54	7/5/2020	10:44	11:16	Generally part of large herd
55	7/5/2020	13:10	13:43	NA
56	7/5/2020	9:52	10:24	Group in and out of site on ridge

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