

# **A Review of the 2015 Diavik Diamond Mine Wildlife Monitoring Report**

Prepared for

**Environmental Monitoring Advisory Board**

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Prepared by



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## Executive Summary

### Summary and Recommendations

In this review on behalf of The Environmental Monitoring Advisory Board (EMAB or the Board), Management and Solutions in Environmental Science (MSES) assesses the procedures and results of the 2015 Wildlife Monitoring Report (WMR; Golder 2015). The annual data collection is mandated to follow a Wildlife Monitoring Program (WMP), developed in 2002, which determined the testable questions and the objectives that need to be addressed through the life of the project. In the course of the past 13 years, MSES reviewed the WMRs to evaluate how the WMP was and is adhered to. In the course of 2010, MSES participated in several communications with Diavik Diamond Mine Inc. (DDMI) and other parties where a number of recommendations were discussed in workshops and other venues to adapt the data collection in light of the information available at the time (Handley 2010). These recommendations, in part, altered the objectives of the 2002 WMP which are now reflected in the WMRs since 2011. Below we have summarized our key review findings for the 2015 WMR for each of key wildlife species considered in this report. This report also takes into consideration additional wildlife monitoring material, received in June 2016, which was produced by various parties involved in regional wildlife monitoring initiatives.

Direct loss of caribou habitat is still in line with the original predictions. However, the Project may be contributing to indirect loss of caribou habitat through changes in vegetation next to the mine site. Indirect habitat loss for caribou was not specifically addressed in the 2015 WMR.

Aerial surveys for caribou were not completed in 2014 or 2015. Based on previous detailed analyses, the general findings for caribou remain relatively unchanged, namely that there appears to be a zone of influence (ZOI) for caribou occurrence; where caribou are more likely to occur at about 14 km from the mine than closer to the mine. A Government of the Northwest Territories (GNWT) Caribou Zone of Influence (ZOI) Technical Task Group was led by ENR in 2014 to discuss conditions under which aerial surveys should be resumed. A ZOI Draft Guidance Document was developed in March 2015 that outlines the conditions under which monitoring ZOI is technically appropriate. Once finalized, this ZOI Guidance Document may provide direction on when or if aerial surveys should be resumed or if other studies would better address the caribou ZOI issue. DDMI is currently waiting for recommendations and direction from this technical task group regarding aerial surveys. The ZOI Guidance Document is expected to be finalized in fall of 2016.

Caribou behaviour data were collected but not analyzed in the 2015 WMR. DDMI will undertake additional analyses of ground-based behavioural data when sufficient data are available. Behaviour data have been insufficient since at least 2012 at which time a program was proposed to more closely examine the mechanisms by which caribou avoid the vicinity of mines. ENR is working to standardize protocols for caribou behavioural monitoring and various mines have agreed to collaborate and provide historical behavioural data. No schedule for this work has been established.

In 2015, male and female caribou distribution followed the predicted pattern for the northern (spring) migration; caribou mostly deflected west of East Island. However, for the southern migration, male and

female collared caribou travelled west around Lac de Gras, which does not support the prediction in the Environmental Effects Report (EER). In addition, caribou remained well north of the mine site much longer than seen historically. DDMI offered some discussion on potential causes for these new distributions, but in general, a constructive discussion, taking the most recent data and analyses into account, would be useful for future project-specific and regional management of impacts to caribou. Discussions regarding regional wildlife monitoring initiatives and caribou movement resulted in the recommendation that ENR look into caribou collars that provide finer scale information on caribou movement. No timeline was provided on when this additional information might be available.

For grizzly bears, little new information was provided. Both mortality and habitat loss remain at or below the levels predicted. The 2015 incidental data seem to suggest that the occurrence of grizzly bears near the mine is increasing over time. The grizzly bear hair-snagging program providing DNA data could address a regional scale question about the bear population; however, the future schedule of Grizzly bear hair snagging data collection and analysis is unknown.

For wolverine, mortality remains at or below the levels predicted. Wolverine track density information was presented but no discussion was provided regarding how wolverine presence may have changed over time. Based on previous detailed analyses (Golder 2014), the attraction of wolverine to the mine seems to have decreased; however, incidental observations for wolverine were unusually high in 2015. The wolverine hair snagging program was not completed in 2015.

There do not appear to be any new findings or changes of note regarding the presence and productivity of falcons. No falcon or bird mortalities were recorded on the mine site in 2015. We concur with DDMI's recommendation to continue Pit Wall/Mine Infrastructure monitoring for nesting raptors.

Attractants at the Waste Transfer Area (WTA) and Landfill area in 2015 are more or less consistent with 2014 levels. In 2015, the number of fox observations appears to have decreased since 2014. Trends should be evaluated and confirmed with continued monitoring.

As expected, there was no new information regarding the abundance and species composition of waterfowl and shorebirds in the 2015 WMR. It was agreed that the waterfowl monitoring program would be discontinued in December 2013, but CVS did recommend that DDMI consider re-starting the waterbird/shorebird monitoring program at the mine reclamation stage.

As expected, no wind farm associated bird mortality information was presented in the 2015 WMR. Given the low likelihood of avian-turbine strikes, due to location and size of the wind farm, and the absence of bird mortalities in 2013, we agreed with DDMI's recommendation to discontinue monitoring the wind farm using 2013 methods and to instead monitor for bird mortalities as part of the overall site compliance monitoring program.

Overall, the measurements adequately address the predictions at hand and the analysis of the data yields a great deal of credible information about the effectiveness of mitigation measures. We generally agree with DDMI's recommendations submitted in their 2015 WMR. There are, however, some highlights for the Boards' consideration; several are re-stated here from previous yearly reviews as they await future detailed data analyses. We recommend that the following issues be addressed:

1. Please consider how the information gained from various caribou datasets could be used in terms of mitigation and adaptive management for the Diavik mine in particular and for other future projects in the region in general. The Cumulative Impacts Monitoring Program (CIMP) indicated that they had proposed a project for 2015 that would “look at the mechanisms of ZOI and what mitigation methods could be used”; however, no further details on adaptive management were found.
2. Please give careful consideration to the interpretation of the 14 km ZOI presented in Boulanger et al. (2012). The 14 km distance may actually demonstrate an aggregation of caribou that would not exist without the mines.
3. Please provide detailed explanation and justification as to why aerial surveys have been postponed “in favour of other studies”. Please provide details on what “other studies” would examine regarding mechanisms that may cause caribou to avoid the mine. Once finalized (expected in fall of 2016), a ZOI Guidance Document may provide direction on when or if aerial surveys should be resumed or if other studies would better address the caribou ZOI issue.
4. Please address the following in future detailed analysis of caribou occurrence and behavioural data:
  - a. Please justify the pooling of caribou behavioural data across years and any assumptions made in future analyses.
  - b. Why does occurrence of caribou appear to be lower at distances farther than 14 km?
  - c. Why is there the same effect before Diavik was built (given that the years 1998/99 show the same ZOI “effect” as the years after the mine was built)?
  - d. Clarify if “probability of occurrence” indicates caribou densities, as opposed to simply the number of caribou in each distance category.
  - e. Testing changes in caribou behaviour over time. This will require an increased sample size of behavioural observations to allow for an analysis of behavioural changes over time.
5. Please justify the use of maximum average number of employees to reflect level of mining activity, possibly through correlation analyses with noise, construction, vehicle, and aircraft variables.
6. Please consider an analysis of the indirect (in addition to the currently presented direct) footprint effect on caribou habitat for understanding the true effects on caribou and for determining future mitigation measures. This is particularly relevant given the effects of dust deposition on local plant species composition and elevated metal concentrations in lichen near the mine.
7. Please provide a discussion of the potential response actions to the departure from the prediction regarding the southern migration of caribou and changes to the timing of the migration.
8. Please consider maintaining a schedule for surveying the mine site, roads, rock piles, and Processed Kimberlite for caribou presence.

9. In future detailed data analyses, please relate caribou track densities to the land area in each distance category.
10. Please give careful consideration to the possibility that grizzly bears may be becoming habituated and their presence on the site may be on the rise. We recommend that DDMI provide clarity on their specific plans (i.e., schedule) for future grizzly bear data collection and analyses that would allow for adequate testing of the GNWT (2013) grizzly bear monitoring objective.
11. Please evaluate whether the decrease in fox observations in the WTA in 2015 persists in future years.
12. Please discuss the results showing an effect of the mine on vegetation structure in reclamation and revegetation studies and discuss the implications for wildlife recolonization in terms of the likelihood for re-establishment of natural or pre-disturbance vegetation and wildlife communities.
13. Please provide details of future monitoring plans for lichen, such as frequency and timing of monitoring.
14. Please provide responses to the detailed questions and comments (presented in bold font) in the body of this review report.
15. Except for our recommendations listed above, we are in agreement with the recommendations listed in the 2015 WMR and do not recommend any actions additional to providing the information requested above.
16. We recommend that the Board accept the 2015 WMR with the understanding that the above listed questions and recommendations will be addressed in communications and workshops by DDMI in the coming year. The responses to our questions and recommendations are necessary to maintain and improve the understanding of the effects of the mine on wildlife. Furthermore, we understand that detailed data analyses are required, as identified in our review, and that these analyses will be conducted in the near future.

## TABLE OF CONTENTS

	<b>PAGE</b>
SUMMARY AND RECOMMENDATIONS.....	<b>II</b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
<b>2.0 GENERAL OBSERVATIONS .....</b>	<b>2</b>
2.1 Objectives of the Wildlife Monitoring Program.....	2
2.2 The State of Current Information .....	2
<b>3.0 SPECIFIC OBSERVATIONS.....</b>	<b>9</b>
3.1 Vegetation and Wildlife Habitat.....	9
3.2 Barren-Ground Caribou .....	9
3.3 Grizzly Bears.....	12
3.4 Wolverine.....	14
3.5 Falcons.....	15
3.6 Waste Management.....	16
3.7 Waterfowl .....	16
3.8 Windfarm.....	16
<b>4.0 CLOSURE .....</b>	<b>17</b>
<b>5.0 REFERENCES.....</b>	<b>17</b>

## LIST OF TABLES

Table I: Actions by DDMI in Response to 2014 Recommendations.....	3
Table A-I: Actions by DDMI in Response to 2011 Recommendations on the dust deposition to lichen study.....	A-I

## LIST OF FIGURES

Figure I: A) Grizzly bear observations related to observation year. B) Days with bear visitations to East Island related to observation year. C) Days deterrent actions were utilized related to observation year (data from Tables 5 & 6 of the WMR 2015). .....	14
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## 1.0 Introduction

The Environmental Monitoring Advisory Board (EMAB or the Board) for the Diavik Diamond Mine Inc. (DDMI) Project requested that Management and Solutions in Environmental Science Inc. (MSES) review and assess the procedures and results of the 2015 Wildlife Monitoring Report (WMR; Golder 2015). The WMR communicates the findings of surveys conducted during 2015 as well as DDMI's recommendations for future activities. In June 2016, MSES received additional wildlife monitoring material and was asked to integrate this information into this report. The additional material included the following:

- March 5<sup>th</sup> to 8<sup>th</sup> 2013 wildlife workshop – overview (McCutchen 2013)
- Draft Summary Report: Slave Geological Province Regional Wildlife Monitoring Workshop. November 26-28, 2013 (GNWT-ENR 2013a).
- Discussion Paper: Guidance for developing a multi-scale cumulative effects monitoring program for wildlife in the Slave Geological Province. Presented for discussion at the SGP Regional Wildlife Monitoring Workshop. November 26-28, 2013 (GNWT-ENR 2013b).
- Draft guidance for monitoring the zone of influence (ZOI) of anthropogenic disturbance on barren-ground caribou. Presented at: Slave Geological Province Regional Wildlife Workshop. March 10, 2015 (Caribou ZOI TTG 2015).
- Slave Geological Province Wildlife Monitoring Workshop: Draft Workshop Report. March 9-10, 2015 (Dillon 2015).
- Ekati and Diavik Diamond Mines: 2014 Final Lac de Gras Regional Grizzly Bear DNA Report. Prepared for Dominion Diamond Ekati Corporation and Diavik Diamond Mines (2012) Inc. by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories (ERM Rescan 2014).
- Maps of: grizzly bear monitoring on Bathurst range 20Sep13, mines on Bathurst range 20Sep13, and wolverine monitoring on Bathurst range 20Sep13.

The annual data collection is mandated to follow a Wildlife Monitoring Program (WMP), developed in 2002, which determined the testable questions and the objectives that need to be addressed through the life of the project. In the course of the past 12 years, MSES reviewed the WMRs to evaluate how the WMP was and is adhered to. In the course of 2010, MSES participated in several communications with DDMI and other parties where a number of recommendations were discussed in workshops and other venues to adapt the data collection in light of the information available at the time (Handley 2010). These recommendations, in part, altered the objectives of the 2002 WMP which are now reflected in the WMRs since 2011.

Based on its annual reviews of past WMRs and detailed data analyses, MSES submitted numerous recommendations for EMAB and DDMI to consider. The present report takes past recommendations and discussions as well as the altered WMP objectives into account. Here, we review how DDMI addressed the above discussions and previous recommendations in the 2015 WMR. We also take into consideration any additional information from the reports listed above (supplied June 2016), if relevant to the recommendations and requests regarding the DDMI wildlife monitoring program.



In our review below, for the ease of identifying our recommendations and requests, we highlight the **text in bold** where we specifically request actions from DDMI.

## 2.0 General Observations

### 2.1 Objectives of the Wildlife Monitoring Program

The objectives of the WMP v.2 were developed in 2002 and DDMI has anchored its monitoring reports on these objectives. For more clarity, below we re-state the objectives set forth in the WMP v. 2 of 2002 to emphasize that these objectives are the foundation and focus of our review, and that the methods and results in the 2015 WMR, are reviewed in light of these objectives, as amended in 2010.

*“The objectives of the wildlife monitoring program are to:*

- a. Verify the accuracy of the predicted effects determined in the Environmental Effects Report (Wildlife 1998) and the Comprehensive Study Report (June 1999); and*
- b. Ensure that management and mitigation measures for wildlife and wildlife habitat are effective in preventing significant adverse impacts to wildlife.”*

These objectives are the foundation and focus of our past and current reviews, relating the methods and results in the 2015 WMR to what we believe is the ultimate goal of monitoring, namely the understanding and alleviating of effects of the project. However, a number of specific questions that have been tested in the course of the years of monitoring have been found to be either largely answered or ineffective for the testing of mitigation effectiveness, prompting discussions about adapting the objectives of data collection in light of current information (Handley 2010). Specific to grizzly bear, the monitoring objective was revised once again at a March 2013 Wildlife Monitoring Workshop hosted by the GNWT (GNWT 2013). The new barren ground caribou monitoring program objectives are to determine whether the zone of influence changes in relation to changes in Mine activity and whether caribou behaviour changes with distance from the mines. The new grizzly bear and wolverine objectives are to provide estimates of grizzly bear and wolverine abundance and distribution in the Diavik Wildlife Study Area over time. The new objectives of the falcon monitoring program are to contribute data to the Canadian Peregrine Falcon Survey (CPFS), identify any pit wall or infrastructure nesting sites, determine nest success and deterrent effectiveness, and determine cause of any mine-related raptor mortalities.

### 2.2 The State of Current Information

The WMR 2015 did not present any new detailed wildlife data analyses. Detailed analyses for barren-ground caribou and wolverine were completed in 2014 (Wildlife Comprehensive Analysis Report (WCAR) - Golder 2014) and other analyses are awaiting the availability of sufficient data to perform the appropriate analyses (e.g., caribou behaviour). Grizzly bear DNA analyses for the 2012 and 2013 hair snagging program were conducted outside of the WMR (see ERM Rescan 2014).

For the reader of this review, however, we re-state some of the highlights in the previous years' reviews (MSES 2014 and MSES 2015), in addition to results from the current review, as this is the currently best available information on trends and data quality:

- The detailed analyses conducted in past years were generally well presented and informative. We would like to note that some of the recommendations made in previous years have been incorporated into past analyses. We would like to commend the authors for including more detail in the analytical results when sufficient data are available.
- Based on previous detailed analyses, the general findings for caribou remain relatively unchanged, namely that there appears to be a ZOI for caribou occurrence where caribou are more likely to occur at about 14 km from the mine than closer to the mine. A potentially important finding was that caribou groups with calves spend less time feeding and resting within 5 km of the mine than farther away. This suggests that caribou behaviour and potentially the energy balance of young caribou is affected within that distance. DDMI will undertake additional analyses of ground-based behavioural data when sufficient data are available.
- For grizzly bears, both mortality and habitat loss remain at or below the levels predicted. Incidental observations suggest there may be an increasing number of incidental grizzly bear observations, number of days with bear visitations, and number of days with deterrent actions over time. The grizzly bear hair-snagging program DNA results could address a regional scale question about the bear population; however, the future schedule of Grizzly bear hair snagging data collection and analysis is unknown.
- For wolverine, mortality remains at or below the levels predicted. Wolverine track data were presented but no discussion was provided about changes in wolverine track density and distribution over time. The wolverine hair snagging program was not completed in 2015. The most recent monitoring data (Golder 2014) seem to suggest that the relationship between wolverine occurrence and distance to the mines has become weaker, indicating that mitigation measures (on site management of food and waste to minimize attractants) have likely been effective in more recent years. However, based on 2015 incidental observations, there were 83 days, the highest number since 2000, with wolverine visitations on East Island.
- Past monitoring data seemed to indicate that fox presence at the WTA may be levelling off at a higher occurrence than has been recorded in early years. However, in 2014 and 2015, the number of fox observations appears to have decreased compared to 2013. This should be confirmed with continued monitoring and analysis.
- For falcons the new objectives seem reasonable as they potentially contribute to a better regional understanding of falcon populations. However, the CPFS was discontinued in the NWT in 2015; therefore, DDMI will no longer be providing nest site occupancy and productivity data to the Canadian Wildlife Service (CWS).

While DDMI has incorporated some of our recommendations or questions from previous years, others remain unaddressed. Table 1 summarizes the current status of our 2015 recommendations.

**Table 1: Actions by DDMI in Response to 2015 Recommendations**

Recommendations/Questions in 2015	Action by DDMI
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<b>Vegetation and Wildlife Habitat</b>	
Discuss the revegetation program in light of the current findings [initially high plant productivity of some plots in which productivity did not seem to lead to the highest plant density and cover; the majority of shrub cuttings died]. Will it be possible to reclaim disturbed areas as expected (or desired), or does the information of lower than expected vegetation performance imply that vegetation may not return as expected?	The 2011 revegetation report provided some very useful information. The experimental set and data analyses are adequate and provide credible results. DDMI should take the recommendations in the revegetation report as guidance in reclamation planning. There is no 2015 update regarding revegetation.
The issues investigated in the Dust Deposition to Lichen study should be integrated with the WMR lichen study. We recommend that details of future monitoring plans for lichen be provided, such as frequency and timing of monitoring, and integrated with the results provided in the WMR to form a comprehensive vegetation monitoring program.	A 2013 Comprehensive Vegetation and Lichen Monitoring Program report was provided in Appendix A of the 2013 WMR, which appears to address this recommendation.  While the report recommends that monitoring of permanent vegetation plots continue and that methods for the lichen sampling remain consistent, some concerns remain outstanding. Please see Appendix A of this report for a high-level summary of the current status of issues and concerns (raised in 2011) with the dust deposition to lichen study.
The 2013 Comprehensive Vegetation and Lichen Monitoring Program report concludes that “ <i>the Mine may be having local-scale effects on plant species composition</i> ”. The report does not suggest any strategies that could mitigate these effects. Please consider if and how these potential project effects could be mitigated.	A comprehensive analysis of vegetation and lichen data is completed every 3 years and was last completed in 2014. As such, no discussion was provided in 2015.
The 2013 Comprehensive Vegetation and Lichen Monitoring Program report stated that mercury concentrations were statistically lower near the mine than farther away in both 2010 and 2014. No discussion on this finding was presented. Please discuss possible causes of this pattern in mercury concentrations and what effects this may have on caribou ingesting lichen far from the mine.	A comprehensive analysis of vegetation and lichen data is completed every 3 years and was last completed in 2014. As such, no discussion was provided in 2015.
<b>Barren-Ground Caribou</b>	
Discuss the implications of a larger than expected effect on caribou for future environmental management.	No discussion was provided in the 2015 WMR. During the Slave Geological Province Wildlife Monitoring Workshop (Dillon 2015), a meeting participant noted that monitoring ZOI has not changed how the mines operate. ENR responded that “ZOI monitoring will be used to assess the cumulative impacts of disturbance at a landscape scale”. Unfortunately, this does not address the concern that a larger than expected effect on caribou was found and, presumably, remains unmitigated. In this workshop, the Cumulative Impacts Monitoring Program (CIMP) indicated that they had proposed a project for 2015 that would “look at the mechanisms of ZOI and what mitigation methods could be used”; however, no further details on adaptive management were found. The discussion of potential adaptive management measures is still open.
What is the actual size of the larger caribou ZOI, 14 or	Boulanger et al. (2012) conclude a zone of influence of

<p>28 km?</p>	<p>14 km. We do not criticise the analysis completed by Boulanger et al. (2012) in terms of the validity of the 14 km ZOI. However, we question the interpretation of the “zone of influence”. We think the 14 km distance actually demonstrates an aggregation of caribou that would not exist without the mines. No further discussion provided in 2015.</p>
<p>What is the effect of mine closure on caribou range re-establishment? Are data collected to date sufficient to show a change of caribou distribution in light of the uncertainty of the size of the large ZOI? Also current baseline (pre-disturbance) information is poor, rendering conclusions on changes from pre- to post-disturbance inconclusive. Does DDMI believe that the current data quality is sufficient to show a potential reversal of the effects after closure?</p>	<p>A ZOI of 14 km has been established, as presented in Boulanger et al. (2012). The issue was discussed verbally in 2013 and DDMI admitted that it is possible that the currently observed ZOIs may have always existed. DDMI confirmed that true baselines do not exist. Using TK instead was suggested for discussion. No further discussion provided in the 2015 WMR.</p>
<p>Testing the changes in caribou behaviour will be critical for the new approach to testing the effects within the ZOI that was predicted in the EER (3-7 km). Please provide an analysis of the behavioural data and comment on whether or not behavioural data collected previously can be used. How can the information on behaviour be used to adapt management actions at the mine and in the region? A detailed technical side-bar discussion may be useful for us to better understand the assumptions and expectations by DDMI.</p>	<p>Analysis of caribou behavioural data was undertaken in 2010 using data from all years. Caribou with young feed and rest less with 5 km of the mine. Analyses or discussion supporting the combination of all years of caribou behavioural data were not provided. Assumptions were not provided. A discussion on “How can the information on behaviour be used to adapt management actions at the mine” was not provided. There was no 2013, 2014, or 2015 update regarding caribou behaviour. Data were insufficient for analysis. During the Slave Geological Province Wildlife Monitoring Workshop (Dillon 2015), ENR was tasked with identifying broad monitoring objectives and a terms of reference for a caribou behaviour monitoring task group. This group could potentially pursue regional collaboration on behavioural data and analyses. However, it was later decided that an official task group is not being pursued; rather ENR is working to standardize protocols for caribou behavioural monitoring and various mines have agreed to provide historical behavioural data (EMAB Meeting Minutes, 24 June 2016). No schedule for this work has been established.</p>
<p>We recommend DDMI provide a more detailed explanation and justification as to why they propose postponement of aerial surveys “in favour of other studies”. DDMI should also indicate what “other studies” would examine regarding mechanisms that may cause caribou to avoid the mine.</p>	<p>The WCAR (Golder 2014) makes reference to a GNWT Caribou ZOI Technical Task Group that will determine the best approaches to ZOI monitoring with recommendations due in 2015. We have requested clarification on whether these approaches will be relevant to the Diavik mine specifically. In the 2015 WMR, DDMI indicated that it is still waiting for the recommendations and direction regarding caribou aerial surveys from the ZOI Technical Task Group. A ZOI Draft guidance document was developed in March 2015 that outlines the conditions under which</p>

	<p>monitoring ZOI is technically appropriate. Once finalized, this ZOI Guidance Document may provide direction on when or if aerial surveys should be resumed or if other studies would better address the caribou ZOI issue. The ZOI Guidance Document is expected to be finalized in fall of 2016.</p>
<p>We recommend that the ideas to evaluate caribou health and to ask traditional knowledge holders about the behaviours that should be included in the observation protocol should be carefully considered, particularly from the point of view that the health of wide ranging animals are a result of many factors that occur in the region through which they range. Future discussions about these ideas could be fruitful.</p>	<p>No discussion was provided.</p>
<p>Is group composition data not collected anymore?</p>	<p>Group composition data were collected in 2014 and 2015. Further analysis will be undertaken when sufficient data are available. Data were insufficient within 5 km of mining activities. Diavik should continue to collect data on caribou within 5 km of the mine.</p>
<p>Testing the distribution and abundance of caribou with careful consideration of the confounding factors of land area and land pattern in each of the zones would be beneficial. A useful number to interpret the caribou abundance results may be a density of caribou on the land area. Is DDMI willing to present such numbers during the next presentation of results?</p>	<p>Caribou density does not appear to have been used in any of the analyses in 2014 or 2015, particularly in relation to land area.</p> <p>The issue was discussed verbally in 2013 and DDMI had agreed to provide density numbers for caribou. We have not seen these numbers yet.</p> <p>During the Slave Geological Province Wildlife Monitoring Workshop (Dillon 2015), a participant proposed that density dependent use of habitat as populations decline may be an explanation for changes in caribou distribution. No further discussion of this density dependence was provided.</p>
<p>DDMI concludes that 2,549 caribou were observed in the Diavik wildlife study area (in 2009). Please clarify if this number is based on the 15 % coverage. If so, then wouldn't this mean that there was a higher density of caribou observed in 2009 compared to previous years because in previous years a larger area was surveyed (having used a 4 km interval between transects before 2009)?</p>	<p>DDMI acknowledge verbally (phone conversation in Summer 2010) that this may be the case but no discussion of this potential confounding issue was presented in the 2015 WMR.</p>
<p>We suggest that an analysis of the indirect (in addition to the currently presented direct) footprint effect on caribou habitat may be useful for understanding the true effects on caribou and for determining future mitigation measures.</p>	<p>The WCAR (Golder 2014) objective was to complete a comprehensive analysis of radio-collared caribou data to examine indirect Mine-related effects. Consideration of caribou habitat (resource selection function (RSF) values) was guided heavily by previous research on caribou. As we have not had the opportunity to review these documents, we cannot determine whether or how indirect habitat loss from the Mine was addressed.</p>
<p>DDMI should justify the use of maximum average number of employees to reflect level of mining activity, possibly through correlation analyses with noise, construction, vehicle, and aircraft variables.</p>	<p>Caribou aerial surveys were not completed in 2014 and 2015; therefore, the prediction regarding a ZOI in relation to Mine activity was not evaluated and no discussion was provided.</p> <p>The ZOI Technical Task Group is working on some re-</p>

	wording of the caribou objective: Determine whether ZOI changes in relation to mine activity (Dillon 2015). It is unclear how the wording might change and what consequences that would have for data collection and analysis.
DDMI should discuss potential causes and response action, if necessary, for a slight departure from predictions regarding caribou migration patterns.	In the 2015 WMR, they have suggested that there may be a heightened sensitivity of caribou during the post-calving period because calves are maturing and still dependent on maternal cows. Therefore, the northern shift during this period may be a result of avoidance of industrial activities. DDMI did not address the second part of our request regarding response actions.
DDMI recommended a reduced survey frequency for the assessment of caribou occurrence relative to the mine site, roads, rock piles, and Processed Kimberlite Containment (PKC). We suggest that these surveys continue at least bi-weekly to ensure no caribou are present in areas that are visually obstructed to on-site staff.	DDMI recommended reducing survey frequency because of the ineffectiveness of the surveys at detecting caribou at the Mine that were not already detected by other employees and pilots. In 2014 and 2015, DDMI did not conduct road, PKC, and rock pile surveys on a scheduled basis because of their apparent ineffectiveness. We re-iterate our recommendation.
Regarding the 2014 WCAR (Golder 2014): A common concern with GPS collar data is that multiple samples from the same individual may not be statistically independent of each other. That is, one response from an individual affects the probability of another response from that same individual. Clarification is needed on how caribou GPS data independence was achieved.	No new information is presented in the 2015 WMR on changes to caribou movement.
Regarding the 2014 WCAR (Golder 2014): Clarification is needed on whether the Government of the Northwest Territories (GNWT) Caribou Zone of Influence (ZOI) Technical Task Group is tasked with developing new studies examining mechanisms that may cause caribou to avoid the mine. If so, we recommend EMAB review the proposed approaches to ZOI monitoring to determine if and how they might be relevant to ongoing caribou monitoring for the Diavik mine, specifically.	In the 2015 WMR, DDMI indicated that it is still waiting for the recommendations and direction regarding caribou aerial surveys from the ZOI Technical Task Group. A ZOI Draft Guidance Document was developed in March 2015 that outlines the conditions under which monitoring ZOI is technically appropriate. It is currently under review by ENR. Once finalized, this ZOI Guidance Document may provide direction on when or if aerial surveys should be resumed or if other studies would better address the caribou ZOI issue. The ZOI Guidance Document is expected to be finalized in fall of 2016.
Regarding the 2014 WCAR (Golder 2014): Please give careful consideration to the interpretation of the 14 km ZOI presented in Boulanger et al. (2012). The 14 km distance may actually demonstrate an aggregation of caribou that would not exist without the mines.	No further discussion provided.
<b>Grizzly Bear</b>	
We recommend that the hair sampling program be continued, even if other mines do not commit to it.	The 2014 WMR indicated that the long-term duration and frequency of this program would be determined through review and discussion of program objectives and results at a wildlife monitoring workshop hosted by ENR and proposed for November 2015. The 2015 WMR indicates that decisions regarding program frequency are to be determined collaboratively



	<p>during wildlife monitoring workshops hosted by ENR in 2016.</p> <p>The program was not completed in 2014 or 2015.</p>
<p>Please give careful consideration to the possibility that bears may be becoming habituated and their presence on the site may be on the rise.</p>	<p>There still appears to be an increasing trend in the number of incidental grizzly bear observations over time, the number of days with bear visitations to East Island over time, and the number of days deterrent actions were utilized over time (see Section 3.3 of this report for more details). No discussion regarding the effectiveness of the deterrent system was provided. We reiterate our recommendation.</p>
<p>Given the increase in grizzly bear observations near the mine, DDMI should increase vigilance and future years of data collection should be used to evaluate whether the re-instated deterrent system is effective at reducing grizzly bear presence near the mine.</p>	
<p>Preliminary results on the number of hair samples collected in the 2013 season are presented and we await the results of the DNA fingerprinting exercise which would presumably test the revised impact prediction regarding relative abundance and distribution of grizzly bears in the study area over time. We recommend EMAB review the DNA fingerprinting results of the grizzly bear hair snagging program once available.</p>	<p>The grizzly bear hair snagging program was not undertaken in 2014 or 2015, though results of the 2012 and 2013 hair snagging program can be found in ERM Rescan (2014). This document was provided for review in June 2016. The document presents the results of the 2 year hair-snagging program which are intended to function as a baseline for long-term monitoring. This satisfied the request, but also raises the concern that no schedule (frequency or duration) for future grizzly bear DNA data collection was provided.</p>
<b>Wolverine</b>	
<p>We do not believe that the data have been analyzed rigorously enough to draw any conclusions on whether or not track density is lower near the mine than farther away. As we noted above for caribou, densities need to be related to the land area in each distance category. We recommend that such an analysis be done in the next report on the comprehensive data analysis.</p>	<p>A comprehensive analysis of wolverine snow track data was completed in 2014 (Golder 2014) that examined the relationship between wolverine track occurrence and explanatory variables including year, distance to the mine, habitat, and weather.</p> <p>The 2014 WCAR assigns a habitat index to each transect with explanations for the approach based on peer-reviewed literature. This appears to address the issue.</p>
<p>Please give careful consideration to the possibility that wolverine may be becoming habituated and their presence on the site may be on the rise.</p>	<p>The 2014 WCAR (Golder 2014) presented detailed analyses that concluded that in more recent years the relationship between wolverine occurrence and distance to the mines has become weaker.</p> <p>However, in the 2015 WMR, there were 83 days, the highest number since 2000, with wolverine visitations on East Island.</p>
<p>Regarding the 2014 WCAR (Golder 2014), it was not clear why caribou herd size was related to wolverine occurrence and how this specifically relates to objective of the WCAR “to examine indirect Mine-related effects”. We recommend a brief explanation be provided.</p>	<p>No discussion was provided.</p>
<p>Regarding the 2014 WCAR (Golder 2014), we asked that DDMI justify the use of maximum average number of employees to reflect level of mining activity, possibly through correlation analyses with noise, construction, vehicle, and aircraft variables.</p>	<p>The 2014 WCAR continued to use average number of employees to reflect level of mining activity without providing supporting justification.</p>
<b>Waste Monitoring</b>	

<p>While fox observations looked to be steadily increasing in the WTA since 2009, they appear to have levelled off in 2013 (the tabular presentation of data in the 2013 WMR makes it difficult to confirm). We recommend DDMI evaluate whether this levelling-off of fox observations in the WTA persists in future years.</p>	<p>In 2014 and 2015, fox observations appear to have decreased in the WTA and landfill, but data are only presented in tabular form. The trend in the number of foxes should be confirmed with continued monitoring. We reiterate our recommendation.</p>
<p><b>Waterfowl</b></p>	
<p>We have noted that the data collected on waterfowl diversity, abundance, and pond use is very detailed and could potentially be used for adequate effects monitoring, if control sites existed.</p>	<p>In 2013, it was agreed between DDMI and the Canadian Wildlife Service (CWS) that the waterfowl monitoring program would be discontinued. CWS recommended that DDMI consider re-starting the waterfowl monitoring program at the mine reclamation stage.</p>

### 3.0 Specific Observations

#### 3.1 Vegetation and Wildlife Habitat

There was an increase in the Project footprint in 2015 of 0.40 square kilometres (km<sup>2</sup>), resulting in a total footprint area of 10.55 km<sup>2</sup>. The additional disturbance occurred at the extreme south end of the project footprint. The overall disturbance of vegetation types remained at or below predicted levels in 2015, with three ELC types, riparian shrub, esker complex and bedrock complex, at or slightly exceeding the predicted loss. There appears to be a discrepancy between the ELC types listed as disturbed in 2015 in the text (Section 2.2 of WMR) versus the values presented in Table I for 2015. **DDMI confirmed that this was a data entry error and has corrected the table.**

A comprehensive analysis of vegetation and lichen data is completed every 3 years and was last completed in 2014. As such, no new information is presented in the 2015 WMR regarding dust deposition from the Mine, although dust fall monitoring was conducted in 2015.

#### 3.2 Barren-Ground Caribou

The 2015 WMR indicates that direct summer caribou habitat loss remains at or below predicted levels. With respect to indirect caribou habitat loss, dust fall monitoring data were collected in 2015. A comprehensive analysis of vegetation and lichen data is completed every 3 years and was last completed in 2014. As such, no new information is presented in the 2015 WMR regarding indirect loss of caribou habitat.

The aerial survey schedule, three continuous years followed by two years off, was designed to test whether or not caribou occurrence (zone of influence) changes with changes in mine activity. Ekati and Diavik requested to omit the ZOI requirement for caribou monitoring in 2013. The request was approved by ENR and aerial surveys were last conducted in 2012. No new information is presented in the 2015 WMR on changes to caribou movement. A comprehensive analysis of caribou data was last completed in 2014 (2014 WCAR - Golder 2014) and DDMI presented results relating to caribou GPS collaring data with a focus on movement patterns. Please see Table I for a summary of previous



recommendations that relate to caribou based on our review of the WCAR<sup>1</sup> (Golder 2014). DDMI indicated that it is still waiting for the recommendations and direction from the ENR led ZOI Technical Task Group (TTG) regarding caribou aerial surveys. A ZOI Draft Guidance Document was developed in March 2015 that outlines the conditions under which monitoring ZOI is technically appropriate (Caribou ZOI TTG 2015). The guidance document indicated that “further analyses will be conducted to refine recommendations on sample sizes” before report finalization. Once finalized, this ZOI Guidance Document may provide direction for when or if aerial surveys should be resumed or if other studies would better address the caribou ZOI issue. The guidance document is expected to be finalized in the fall of 2016 (EMAB Meeting Minutes, 24 June 2016). **DDMI should ask the ZOI TTG when they expect to provide direction regarding when or if aerial surveys should be resumed.**

In accordance with recommendations from a workshop in 2009 with ENR and other mines and monitoring boards (Handley 2010), DDMI adapted its monitoring program for caribou in 2010 by coordinating with BHP-Billiton’s Ekati mine and implementing ground observations of caribou behaviour for 2010. Ground-based behavioural observations were conducted in 2015 in cooperation with the Ekati Mine. Observations were collected on 38 caribou groups, all >30 km from the Mine. Insufficient data are currently available within 5 km of the mine. DDMI will undertake analyses of ground-based behavioural data, to assess how caribou behaviour changes with distance from the mine, when sufficient data are available. A summary of the number of caribou groups observed at different distances from the Mine and the size, composition, and location of each caribou group were provided for 2015 (Appendix A of WMR). DDMI will continue to focus caribou behavioural monitoring at distances between 2 and 30 km of the mine site. According to the 2015 wildlife workshop (Dillon 2015), Diavik has also involved Traditional Knowledge holders to “help validate their monitoring techniques and classification”. We agree with this approach and emphasize the importance of these data in understanding the influence of the mine on caribou. A key discussion point brought up during the 2015 wildlife workshop (Dillon 2015) included the possibility of establishing a working group, championed by CIMP, to focus on caribou behaviour monitoring. This working group could potentially pursue sharing of and collaboration regarding behavior data. It was concluded during the 2015 wildlife workshop that ENR needs to identify broad monitoring objectives and a terms of reference for a behavior monitoring task group. However, it was later decided that an official task group is not being pursued; rather ENR is working to standardize protocols for caribou behavioural monitoring and various mines have agreed to provide historical behavioural data (EMAB Meeting Minutes, 24 June 2016). No schedule for this work has been established. **We recommend that DDMI request guidance from ENR on when the behaviour monitoring protocol will be finalized and how long it might take to achieve multi-party collaboration on caribou behaviour data.** Given that analyses of change in behaviour with distance are still planned for the future, we re-state, for the record, that analyses of data should address the following:

- **Justify any pooling of data across years, or use year as a variable in the analysis, and identify what, if any, assumptions were made.**
- **Reconcile behavioural observations with the occurrence of caribou: does behaviour change with distance as occurrence does, i.e. is behaviour “normalized” past the zone of influence of 14 km?**
- **Why does occurrence of caribou appear to be lower past that distance?**

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<sup>1</sup> Please see MSES 2014 for a complete review of this material.

- **Why is there the same effect before Diavik was built (given that the years 1998/99 show the same ZOI “effect” as the years after the mine was built)?**
- **Clarify if “probability of occurrence” indicates caribou densities, as opposed to simply the number of caribou in each distance category.**
- **How can the information gained from the various caribou analyses be used to adjust or develop mitigation measures if there is a larger than predicted effect of the mine on caribou?**
- **DDMI should justify the use of maximum average number of employees to reflect level of mining activity, possibly through correlation analyses with noise, construction, vehicle, and aircraft variables.**

To evaluate changes in caribou distribution, DDMI used daily data on the geographic location of collared males and females as provided by ENR. Collars on male caribou were added in 2015; prior to this, only female caribou were collared. In 2015, collared caribou distribution followed the predicted pattern for the northern (spring) migration; caribou deflected west of East Island. However, for the 2015 southern migration (and 2014 for female caribou), collared caribou travelled west around Lac de Gras, which does not support the prediction in the EER. However, DDMI suggested that overall, between 2002 and 2014, the majority of caribou travelled through the southeast corner of the study area, providing general support for the south migration prediction. Caribou also remained well north of the study area from July to November in 2015 even though they are typically expected to return from the calving ground between July and October. In addition, the most recent comprehensive report (WCAR; Golder 2014) found that for the southern migration from 2009 to 2013, collared caribou females remained further north than previously recorded and remained north of the mine site through March 31<sup>st</sup>, 2014 (see MSES 2014 for complete review of this material). Last year, we requested that DDMI discuss potential causes for this departure from predictions. In the 2015 WMR, they have suggested that there may be a heightened sensitivity of caribou during the post-calving period because calves are maturing and still dependent on maternal cows. Therefore, the northern shift during this period may be a result of avoidance of industrial activities. DDMI did not address the second part of our request regarding response actions. As such, **we reiterate that DDMI discuss whether or not any response action is warranted for this unanticipated, potential effect of the Project.** Although response actions were not discussed, a key discussion point brought up during the 2015 wildlife workshop (Dillon 2015) included the recommendations that ENR look into caribou collars that provide finer scale information on caribou movement. No schedule for this work has been established.

As far as caribou mortality is concerned, the effect remains at or below predicted levels. The methods applied for this part of monitoring are adequate. Overall, the mean population size of the Bathurst caribou herd has decreased between 1996 (349,000) and 2015 (16,000 to 22,000). To support recovery of all barren-ground caribou herds, the 2011 to 2015 NWT Barren-ground Caribou Management Strategy was developed. As a component of this strategy, Diavik has provided in-kind support (2014) and will continue to explore opportunities that support the NWT Barren-ground Caribou Management Strategy.

The caribou advisory level remained at “No Concern” in 2015. Caribou on East Island did not exceed 100 individuals at any given time. Ten incidental observations of caribou (totalling 47 individuals) were reported from February to July, and one caribou was observed in the Processed Kimberlite

Containment (PKC) on May 10. It is not clear if the caribou observation in the PKC was an incidental observation or recorded during a formal ground-based survey. The presence of a caribou in the PKC reinforces our previously-raised concerns with the discontinuation of caribou road surveys, and PKC and rock pile monitoring surveys on scheduled basis. In 2012, DDMI recommended that alternative survey methods and survey frequency for future assessment of caribou occurrence relative to the mine site, roads, rock piles, and Processed Kimberlite Containment (PKC) be evaluated, and in 2013, DDMI recommended a reduced survey frequency dependent on incidental caribou observations near the mine site. Reasons for the recommendations included: to enable surveyors to visually observe areas with no obstructions and the ineffectiveness of surveys at detecting caribou at the Mine that were not already detected by other employees and pilots, respectively. In 2014, DDMI did not conduct road, PKC, and rock pile surveys on a scheduled basis because of their apparent ineffectiveness. **We reiterate our previous recommendation that these surveys continue at least bi-weekly to ensure no caribou are present in areas that are visually obstructed to on-site staff.**

### 3.3 Grizzly Bears

As far as grizzly bear habitat loss and mortality is concerned, both effects remain at or below predicted levels. The methods applied for this part of monitoring are adequate.

The monitoring objective for grizzly bear was revised from:

*To determine if Mine-related activities influence the relative abundance and distribution of grizzly bears in the study area over time (Handley 2010),*

to:

*To provide estimates of grizzly bear abundance and distribution in the study area over time (GNWT 2013).*

A grizzly bear hair snagging program is jointly completed by Ekati, Snap Lake, Gahcho Kue and Diavik mines to address this new objective. Decisions regarding program frequency are to be determined collaboratively during wildlife monitoring workshops hosted by ENR in 2016. The program was not undertaken in 2015 (or 2014), though results of the 2012 and 2013 hair snagging program can be found in ERM Rescan (2014). This report was provided for review in June 2016. The objectives of the DNA program are to:

- “Generate a superpopulation<sup>2</sup> estimate of grizzly bears for the DNA Study Area as baseline data for trend monitoring;
- Describe the spatial and temporal distribution of grizzly bears in the DNA Study Area;
- Identify overlap with grizzly bears that were sampled in areas outside of the DNA Study Area by other surveys; and,

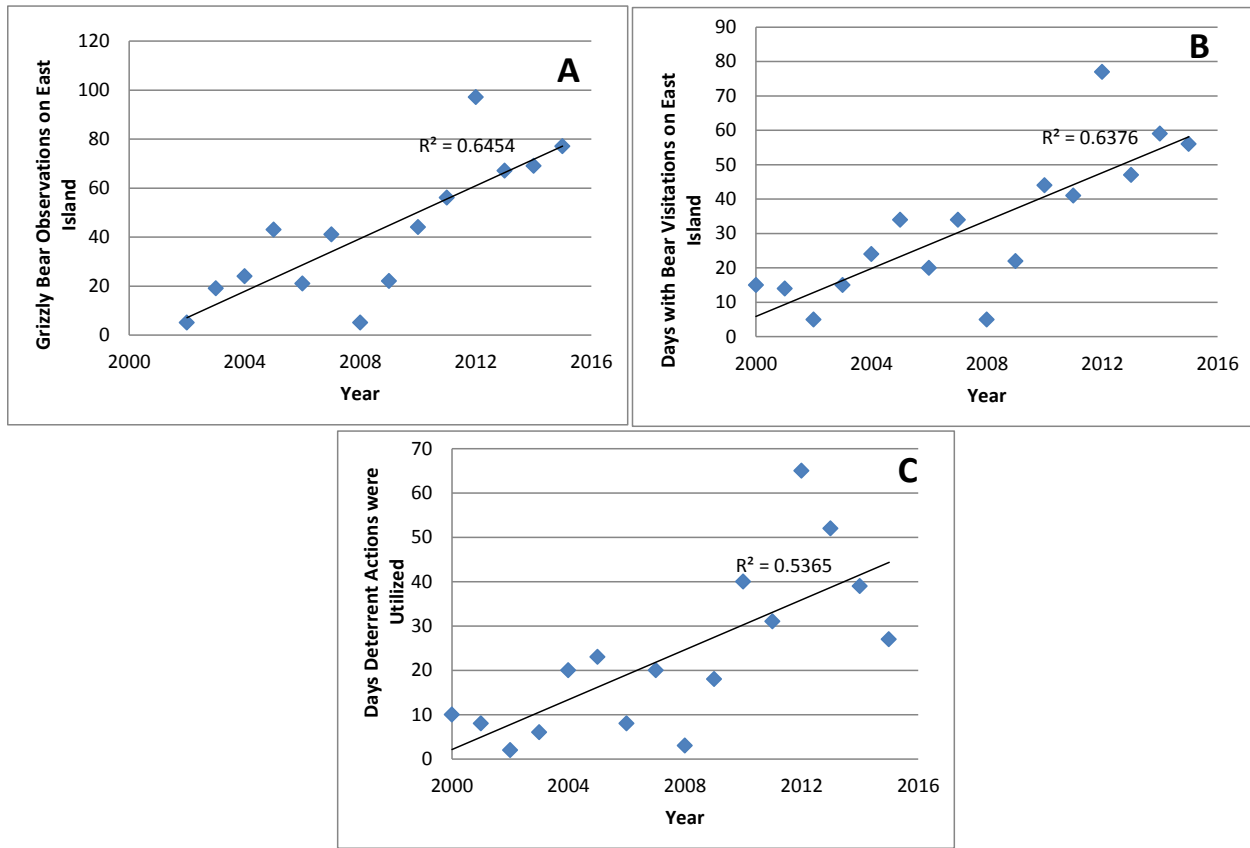
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<sup>2</sup> In the context of mark-recapture DNA studies, the superpopulation is defined as the number of animals that inhabit the sampling grid and surrounding area (as opposed to the grid alone; Boulanger et al. 2004)(ERM Rescan 2014).

- Provide recommendations regarding a standard grizzly bear monitoring protocol for the NWT.” (ERM Rescan 2014).

Essentially, the 2012-2013 hair snagging program is intended to provide a baseline against which future results would be compared. However, ERM Rescan (2014) did not specify or recommend a future DNA data collection schedule for trend monitoring; nor did the 2015 WMR. In addition, it should be noted that the baseline grizzly bear data is sampled from a disturbed landscape and that this may hinder data interpretation if information on the impact of mining activity on grizzly bear abundance and distribution is wanted. According to a summary report from a March 2015 SGP Wildlife Monitoring Workshop (Dillon 2015), Ekati’s next round of grizzly bear DNA monitoring is proposed for 2016 and DeBeers representatives indicated that research “in the southern portion of the regional study grid” is being conducted for Grizzly bear, but did not elaborate further. Dillon (2015) confirms that protocol for carnivore monitoring will be discussed at a dedicated carnivore monitoring workshop to be held in early 2016. The summary report indicated that there is some possibility that data may be shared among industry to produce a combined data set. **We recommend that DDMI provide clarity on their specific plans (i.e., schedule) for future grizzly bear data collection and analyses that would allow for adequate testing of the GNWT (2013) grizzly bear monitoring objective.** We support DDMI’s continued involvement in the grizzly bear hair-snagging program which is designed to address the new, regional scale question about the bear population.

There appears to be an increasing trend in the number of incidental grizzly bear observations over time (Figure 1A), the number of days with bear visitations to East Island over time (Figure 1B), and the number of days deterrent actions were utilized over time (Figure 1C). DDMI has indicated that the number of incidental observations of grizzly bears does not appear to be influenced by the number of people on site (Section 4.2.2.2). According to the numbers in Table 5, we agree. We reiterate our previous recommendations that, **given the increase in grizzly bear observations near the mine over time, DDMI should increase vigilance and future years of data collection should be used to evaluate whether the current deterrent system is effective at reducing grizzly bear presence near the mine.** Further to this point, according to Appendix D, the comments indicate that there have been several occasions where grizzly bears did not respond to deterrent actions as expected. Data on the abundance and distribution of grizzly bear (hair snagging program) would help inform this potential issue of increasing grizzly bear observations over time. Unfortunately, the future schedule of grizzly bear DNA data collection for the Diavik mine is unknown.



**Figure 1: A) Grizzly bear observations related to observation year. B) Days with bear visitations to East Island related to observation year. C) Days deterrent actions were utilized related to observation year (data from Tables 5 & 6 of the WMR 2015).**

### 3.4 Wolverine

The most recent objective of the WMP related to wolverine is:

*To provide estimates of wolverine abundance and distribution in the study area over time (Handley 2010).*

Wolverine presence around the mine is monitored using snow track surveys, hair-snagging, and incidental observations.

Snow track surveys for wolverine were completed in 2015 and DDML implemented a new survey protocol that involved surveying each winter track transect twice instead of only once, as in past years. Future years of data collected in this manner will be used to help identify whether snow track detection rates vary through time. No clear trends in wolverine Track Index (tracks/km) or Mean Track Density Index (tracks/km/# days since snowfall/wind event) over time are evident, though generally it appears that these values may be increasing over time. A comprehensive analysis of wolverine snow track data

was completed in 2014 (Golder 2014) that examined the relationship between wolverine track occurrence and explanatory variables including year, distance to the mine, habitat, and weather. The analyses from the WCAR (Golder 2014) indicated that wolverine seem to be attracted to the mine in some years; however, in more recent years the relationship between distance to the mines has become weaker. **DDMI should indicate when they expect to complete the next comprehensive data analysis for wolverine.**

The wolverine hair snagging program was not completed in 2015. It was last completed in 2014. DDMI anticipates that the next wolverine hair snagging survey will occur in 2017, though the long-term frequency of this program has not been determined. Decisions regarding program frequency are to be determined collaboratively during wildlife monitoring workshops hosted by ENR in 2016. We support DDMI's continued involvement in the wolverine hair-snagging program which is designed to address the new, regional scale question about the wolverine population.

No mortality, one relocation, and four deterrent actions for wolverine were reported on-site in 2015. There were 83 days, the highest number since 2000, with wolverine visitations on East Island. DDMI believes that many of the incidental observations of wolverine reported were of the same individual that was relocated in March 2015. The apparent increase in wolverine presence may be an anomaly due to one habituated individual. **This should be verified with data from 2016. We recommend that DDMI evaluate potential attractants for wolverine on-site to determine where mitigation measures are not as successful as anticipated and, if necessary, any potential corrective actions.** Given that no mortalities were reported, there appears to be support for the prediction that mining related mortalities are not expected to alter wolverine population parameters in the Lac de Gras area.

We concur with DDMI's recommendation to continue with two rounds of surveys to determine whether detection rates of wolverine snow tracks vary through time.

### 3.5 Falcons

Monitoring of raptor nest occupancy and success in the study area were removed from the WMP in 2010. However, DDMI contributes nest monitoring data to ENR every five years and collected these data in 2015. DDMI also remains focused on data collection and mitigating effects to raptors nesting in open pits and on mine infrastructure. One active peregrine falcon nest was observed on a sites service building and three peregrine falcon sighting were recorded in 2015. There were no raptor incidents or mortalities reported at the Mine in 2015.

We concur with DDMI's recommendation to continue Pit Wall/Mine Infrastructure monitoring for nesting raptors. DDMI will discuss options with ENR for future monitoring. The Canadian Peregrine Falcon Survey (CPFS) was discontinued in the NWT in 2015; therefore, DDMI will no longer be providing nest site occupancy and productivity data to the Canadian Wildlife Service (CWS).

### 3.6 Waste Management

The attractants (food and food packaging) on the Waste Transfer Area (WTA) and Landfill area in 2015 appear to be more or less consistent with 2014 levels (though the tabular presentation of data in the WMR for the last two years makes it difficult to evaluate any long term trends). The overall effect of waste management appears to be positive. We commend DDMI for its efforts which probably led to the low attraction effect on wildlife in the past. However, more recently, there seems to be an increasing trend in the number of grizzly bear observations and there were an unusually high number of wolverine observations in 2015. **DDMI may need to explore the reasons for this in light of possible other attractants.**

Overall, many wildlife observations and sign have been decreasing over time. We previously noted that while fox observations looked to be steadily increasing in the WTA since 2009, they appear to have levelled off in 2013. The number of fox observations appears to have decreased in 2014 and 2015 (though the tabular presentation of data in the 2014 and 2015 WMRs makes it difficult to evaluate any long term trends). **We recommend DDMI evaluate trends in the number of fox and other wildlife observations to determine whether waste management remains effective at minimizing wildlife attraction, particularly in light of the high number of incidental observations of wolverine in 2015.**

### 3.7 Waterfowl

As expected, no waterfowl information was presented in the 2015 WMR. In past years, DDMI has evaluated predictions relating to waterfowl habitat loss, presence, and habitat utilization. The 2012 WMR recommended a review and evaluation of the current waterfowl program to see if any improvements could be implemented. A meeting was held between DDMI and the Canadian Wildlife Service (CWS) in December 2013 to discuss the waterfowl program. It was agreed that the waterfowl monitoring program would be discontinued at this time, but CWS did recommend that DDMI consider re-starting the waterbird/shorebird monitoring program at the mine reclamation stage.

We are in agreement with the recommendation to discontinue the waterbird/shorebird monitoring program and concur with the CWS recommendation regarding reinstating the waterbird/shorebird monitoring program at the mine reclamation stage.

### 3.8 Windfarm

As expected, no windfarm associated bird mortality information was presented in the 2015 WMR. Given the low likelihood of avian-turbine strikes, due to location and size of the wind farm, and the absence of bird mortalities in 2013, we agreed with DDMI's recommendation to discontinue monitoring the wind farm using 2013 methods and to instead monitor for bird mortalities as part of the overall site compliance monitoring program.



## 4.0 Closure

The review of the 2015 WMR reported herein presents the conclusions arrived at by MSES. While some recommendations and requests were addressed, we note that several from previous years were not responded to by DDMI (Table 1). The responses to our questions and recommendations are necessary to maintain and improve the understanding of the effects of the mine on wildlife. Some of our recommendations may be best addressed during detailed data analyses using multiple years of new data. We hope that future communications will lead to further clarification on several details of the 2015 WMR. Our views are submitted to EMAB for its consideration of potential recommendations and actions.

## 5.0 References

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MSES. 2014. A review of the 2014 Diavik Diamond Mine Wildlife Comprehensive Analysis Report. Prepared for EMAB. September 2014.

## **Appendix A**

**Table A-1: Actions by DDMI in Response to 2011 Recommendations on the dust deposition to lichen study**

<b>Issues and Concerns (MSES 2011)</b>	<b>2015 Status*</b>
<p>The finding that lichens sampled from four locations within 10 km of the EKATI diamond mine had mean metal concentrations greater than others sampled in the far-field suggests that it may be difficult to find locations in the study area that are remote enough to be unaffected by mine emissions. We recommend that cumulative effects of emissions be investigated.</p>	<p>Cumulative effects have not been evaluated.</p>
<p>The study appears to assume that caribou ingest all lichen species at the same rate. Exposure risk values may be affected by caribou ingesting preferentially either high- or low-concentrating lichen species. We recommend that future studies investigate the possibility of selective foraging by caribou and how selective foraging may affect exposure values.</p>	<p>“...the emphasis of the sampling method was to collect lichen that caribou eat, and not necessarily on obtaining the same ratio of species in each sample.” This suggests that the ingestion of different lichen species by caribou was taken into consideration in the sampling methods, to a degree. However, this approach does not allow for a quantitative consideration of caribou ingestion rates for different lichen species. Quantitative data on caribou ingestion rates for lichen should be taken into consideration in the analysis of risk exposure.</p>
<p>We recommend that the rationale be provided for the selection of the far-field sampling area. How was the distance for the far-field sampling area determined? Is the far-field sampling area intended to represent a control area, beyond the limit of Mine dust carried by wind? Are there dustfall monitoring gauges in the far-field sampling area?</p>	<p>No explanation was provided for selection of the far-field sampling area. The 2014 report indicated that the “far-field area is more representative of background conditions”, but it is not clear if this is considered a true control area or not. It does not appear that dustfall monitoring gauges were present in the far-field.</p>
<p>Please discuss the implications of combining different lichen species into a single sample, the effect of the substrate on lichen metal concentrations, and the effect of the removal of lichen during sampling on future sampling/monitoring.</p>	<p>No explanation was provided for how the different species may affect the average metal concentrations in the samples taken. This potentially obscures the exposure risk for caribou.</p>
<p>We recommend that the results of the two-tailed t-tests and Wilcoxon-Mann-Whitney tests be presented in the report. Further discussion regarding the source of variability in the relative percent differences (RPDs) would assist us in understanding whether metal concentrations were measured three times from identical lichen material or from three separate samples with different species mixes.</p>	<p>“At each location, the sample was gently mixed to form a composite, and then split into two separate samples, which were analyzed separately for metals.” Results of statistical analyses for Lichen Chemistry were provided. The methods described confirm the above concern about obscuring exposure risk for caribou.</p>
<p>We recommend that details of future monitoring plans for lichen be provided, such as frequency and timing of monitoring. It is not clear if either the cumulative effects of mine developments in the region or climate change will be assessed in future monitoring.</p>	<p>While the report recommends that monitoring of PVP continue and that methods for the lichen sampling remain consistent, no further details were provided and no indication was given that cumulative effects or climate change will be assessed in the future.</p>
<p>The risk assessment does not include information on any changes in the concentrations of metals present in caribou and humans pre- and post-exposure or how these levels of metals relate to the health of either</p>	<p>This information was not included. The Golder (2014b)** report concluded that “a follow up risk assessment based on 2013 data is not required, as it is expected that metal concentrations are still within safe</p>

caribou or humans. Inclusion of this information would strengthen the report's conclusions.

levels for caribou". The expectation that metal concentrations are within safe levels for caribou (and humans) is opinion and unsupported by data.

\*Based on MSES (2014a) review of 2013 WMR Appendix A.

\*\*Golder. 2014b. 2013 Comprehensive Vegetation and Lichen Monitoring Program. Prepared for Diavik Diamond Mines Inc., Yellowknife, NT. Reference No.: I3-1328-0001. (Appendix A of the 2014 WMR)