

A Review of the 2012 Diavik Diamond Mine Wildlife Monitoring Program 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 Wildlife Monitoring Program Report 2012 (WMPR). 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 ten years, MSES reviewed the WMPRs 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 current information (Handley 2010). These recommendations, in part, altered the objectives of the 2002 WMP which are now reflected in the 2012 WMPR.

The overall disturbance of vegetation types remained at or below predicted levels in 2012, with three ELC types, riparian shrub, esker complex and bedrock complex, at or slightly exceeding the predicted loss. The bedrock complex exceedence occurred in 2012, while the other vegetation losses existed from previous years.

Weekly aerial surveys were jointly completed by DDMI and Ekati in 2012 and will be conducted for three continuous years followed by two years off. This schedule is designed to test whether or not caribou occurrence (zone of influence) changes with changes in mine activity. Results of the detailed analyses completed in 2011 were discussed (Golder 2011), but no new analyses were presented.

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. DDMI continued ground-based behavioural observations in 2012; however, the Ekati mine did not. DDMI will undertake analyses of ground-based behavioural data when sufficient data are available or when three years of consecutive aerial surveys have been completed.

In 2012, caribou distribution followed the predicted pattern for the northern (spring) migration; caribou deflected west of East Island. However, caribou were present in roughly equal numbers on the east and west of the mine for the southern migration rather than largely on the east side of Lac de Gras.

As far as grizzly bear habitat loss and mortality is concerned, there were no surprises in the 2012 WMPR; both effects remain at or below predicted levels. The methods applied for this part of monitoring are adequate. However, data from 2012 indicate the highest number of bear observations yet on East Island.

Wolverine snow tracking data from past years may indicate potential attraction by wolverine to the mine site. The wolverine snow tracking program reported a track index of 0.25 tracks/km within 10 km of the mine and a track index of 0.09 tracks/km outside the 10 km zone. Data from Table 5-1 seem to

indicate an increasing trend in the wolverine track index over time. DDMI will continue to participate in the DNA program next scheduled for data collection in 2014.

The attractants on the Waste Transfer Area (WTA) were at lower levels in 2012 compared to 2011. However, there seem to be new trends showing that grizzly bear and wolverine occurrences near the mine are higher than farther away. Fox sightings have also been steadily increasing in the WTA since 2009. Fox observations were some of the highest ever in 2012. DDMI may need to explore the reasons for this in light of possible attractants.

We concur with the new objectives adopted by DDMI for falcons which reflect the discussions of the 2009 workshop. The new focus on contributing data to the Canadian Peregrine Falcon Survey (CPFS), in particular, is a good initiative.

Effects of habitat alterations for waterfowl and shorebirds are at or below predicted levels. Regarding species composition and presence, no formal analyses were presented so it is difficult to determine if shifts in species composition are significant.

Overall, the measurements taken adequately address the predictions at hand. 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 2012 WMPR. There are, however, some highlights for the Boards' consideration; several are re-stated here 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 for the Diavik mine in particular and for other future projects in the region in general.
2. 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. Reconcile behaviour 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 14-40 km?
 - c. Why do the results show such a large range (i.e. 14-40 km)?
 - d. Why does occurrence of caribou appear to be lower past that distance?
 - e. 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)?
 - f. Clarify if "probability of occurrence" indicates caribou densities, as opposed to simply the number of caribou in each distance category.
 - g. 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.

3. 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.
4. 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.
5. In future detailed data analyses, please relate caribou and wolverine track densities to the land area in each distance category.
6. 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. Please provide a detailed analysis of grizzly bear data.
7. Please consider possible mitigation measures to address the increase in fox observations in the WTA.
8. 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.
9. Please provide details of future monitoring plans for lichen, such as frequency and timing of monitoring, and integrate with the results provided here to form a comprehensive vegetation monitoring program.
10. Please provide responses to the detailed questions and comments (presented in bold font) in the body of this review report.
11. Except for our recommendations listed above, we are in agreement with the recommendations listed in the 2012 WMPR and do not recommend any actions additional to providing the information requested above.
12. We recommend that the Board accept the 2012 WMPR with the understanding that the above listed questions and recommendations will be addressed in communications and workshops by DDMI in the coming year. 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.

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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 2012 Wildlife Monitoring Program Report (WMPR). The WMPR communicates the findings of surveys conducted during 2012 as well as DDMI's recommendations for future activities.

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 ten years, MSES reviewed the WMPRs 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 current information (Handley 2010). These recommendations, in part, altered the objectives of the 2002 WMP which are now reflected in the 2011 and 2012 WMPRs.

Based on its annual reviews of past WMPRs 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 2012 WMPR.

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 2012 WMPR, 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 2012 WMPR 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). DDMI addressed the new objectives of the program in the WMPR 2012, where appropriate. Specifically, the new barren ground caribou and grizzly bear monitoring program objectives are to test whether or not caribou occurrence and grizzly bear presence change with changes in mine activity. The new objective of the falcon monitoring program is to contribute data to the Canadian Peregrine Falcon Survey (CPFS).

2.2 The State of Current Information

The WMPR 2012 did not present any new detailed data analyses. This is reasonable as such analyses have been provided in 2010 and it was agreed that DDMI would now focus on the collection of additional trend data and data for the new objectives (Handley 2010) before further detailed statistical analyses would be required.

For the reader of this review, however, we re-state some of the highlights in previous years reviews (MSES 2012) as this is the current best available information on trends and data quality:

- The detailed analyses conducted in past years are 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 than in previous years.
- The previous permanent vegetation plot analysis suggests that indeed vegetation composition, in particular lichen cover, is altered near the mine. There are fewer lichen but more grasses, forbs and vegetation litter near the mine.
- 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 to 40 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 or when three years of consecutive aerial surveys have been completed.
- For grizzly bears and wolverine, no particular new information was found compared to previous years. Both mortality and habitat loss remain at or below the levels predicted. The most recent monitoring data seem to suggest that the occurrence of both grizzly bears and wolverine are higher near the mine than farther away. Future detailed data analyses should test whether these observations indicate a real trend.
- Recent monitoring data seem to indicate that foxes are on the increase in the WTA.
- For falcons the new objectives seem reasonable as they potentially contribute to a better regional understanding of falcon populations.
- There are no new findings regarding the abundance and species composition of waterfowl and shorebirds.

While DDMI has incorporated some of our recommendations or questions from previous years, others remain unaddressed. Table 1 summarizes the current status of our 2012 recommendations.

Table 1: Actions by DDMI in Response to 2012 Recommendations

2012 Recommendation/Question	Action by DDMI
Vegetation and Wildlife Habitat	
<p>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?</p>	<p>The revegetation report provided some very useful information. The experimental set and data analyses are adequate and proved credible results. DDMI should take the recommendations in the revegetation report as guidance in reclamation planning.</p>
<p>The issues investigated in the Dust Deposition to Lichen study should be integrated with the WMPR 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.</p>	<p>No discussion was provided.</p>
Barren-Ground Caribou	
<p>Discuss the implications of a larger than expected effect on caribou for future environmental management.</p>	<p>No discussion was provided.</p>
<p>What is the actual size of the larger caribou ZOI, 14 or 28 km?</p>	<p>The detailed analysis of occurrence showed similar results as in earlier years. A zone of influence is suggested to be at 15 km to 40 km. Interpretation of results is debatable. The large range of possible effect size points to a great deal of uncertainty in the data.</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>No discussion was provided.</p>
<p>Testing the changes in caribou behaviour will be critical for the new approach to testing the effects within the small (3-7 km) ZOI. 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 using data from all years. Caribou with young changed 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.</p>

Can DDMI elaborate on why it no longer believes that behavioural data from aircraft are useful?	No discussion was provided.
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.	No discussion was provided.
Is group composition data not collected anymore?	Group composition data was collected in 2012. Further analysis will be undertaken when sufficient data is available or when three years of aerial surveys have been completed.
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?	Caribou density does not appear to have been used in any of the analyses, particularly in relation to land area.
DDMI concludes that 2,549 caribou were observed in the Diavik wildlife study area. 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)?	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 2012 WMPR.
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.	No discussion was provided in the 2012 WMPR. However, DDMI indicates that information on dust can be found in the Dust Deposition Monitoring Program 2012 Annual Report. This should be reviewed.
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.	No discussion was provided.
Grizzly Bear	
We recommend that the hair sampling program be continued, even if other mines do not commit to it.	Preliminary results from the initial 2012 grizzly bear hair snagging season are expected to be available in April 2013.
Please give careful consideration to the possibility that bears may be becoming habituated and their presence on the site may be on the rise.	Data from 2012 indicate the highest number of bear observations yet on East Island. No discussion was provided.
Wolverine	
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	Wolverine density does not appear to have been used in any of the analyses, particularly in relation to land area.

<p>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>Waste Monitoring</p>	
<p>The only puzzling finding of the food attractant monitoring is the apparent increase of ravens and foxes on site. Can DDMI discuss the possible causes for this increase, recognizing that the causes may be complex and may include effects from increased nesting opportunities or increases in regional raven populations?</p>	<p>The issue was discussed verbally, but no resolution appears to exist at present. In 2012, raven observations have decreased compared to 2011. However, in 2012, fox observations have increased again in the Waste Transfer Area, but stabilized in the landfill. No discussion of potential causes for the fox increase was provided.</p>
<p>Falcons</p>	
<p>In the course of 2009 there were some discussions, which included Environment and Natural Resources (ENR) staff, regarding a change of the effort in raptor monitoring so as to decrease the effort in nest productivity monitoring and to contribute instead to a periodically occurring falcon data base update. Could DDMI discuss whether or not it intends to consider the suggestions by ENR?</p>	<p>It appears that DDMI is working with ENR on coordinating the required data collection.</p>

3.0 Specific Observations

3.1 Vegetation and Wildlife Habitat

There was a minor change to the Project footprint in 2012. The change was largely associated with the creation of access for a new wind farm. The overall disturbance of vegetation types remained at or below predicted levels in 2012, with three ELC types, riparian shrub, esker complex and bedrock complex, at or slightly exceeding the predicted loss. The bedrock complex exceedence occurred in 2012, while the other vegetation losses existed from previous years. DDMI will continue to monitor habitat loss.

We recommended last year that the results of the Permanent Vegetation Plot study showing an effect of the mine be clearly addressed in reclamation and revegetation studies and be discussed with regards to implications for wildlife recolonization and the likelihood for re-establishment of natural communities. We do not know if re-vegetation studies have been continued in 2012 or if any new results were analyzed, but whenever the opportunity arises, the above recommendation should be considered.

In late 2011 we had the opportunity to review the study addressing Dust Deposition to Lichen (MSES 2011). We cross-reference our review of the Dust Deposition to Lichen study here because the issues investigated in that study are relevant for vegetation health and should be integrated with the WMPR 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 here to form a comprehensive vegetation monitoring program.**

3.2 Barren-Ground Caribou

The 2012 WMPR indicates that direct caribou habitat loss remains at or below predicted levels. The study on Dust Deposition to Lichen (Risk Assessment Report) submitted by DDMI in late 2011 indicates that lichen are affected through the absorption of metals for a considerable distance from the mine (MSES 2011). Although the Dust Deposition report concluded that there is no significant health risk to caribou, we raised some methodological issues which may potentially change the conclusions. Moreover, the WMPR Permanent Vegetation Plot study from previous years indicated that vegetation composition, most notably, lichen abundance, is changed beyond the footprint of the mine. Consequently, caribou habitat is changed through both abundance and quality of forage. While the 2012 WMPR focuses on the loss of habitat from the direct footprint of the mine (this focus reflects the prediction in the Environmental Effects Report of 1998), the lichen studies indicate that the effects on habitat loss go beyond just the footprint. As in 2012, **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.** DDMI indicates that information on dust can be found in the Dust Deposition Monitoring Program 2012 Annual Report. **We recommend EMAB review the results of this report which may inform the interpretation of future analyses on caribou habitat.**

Weekly aerial surveys were jointly completed by DDMI and Ekati in 2012 and will be conducted for three continuous years followed by two years off. This schedule is designed to test whether or not caribou occurrence (zone of influence) changes with changes in mine activity. Results of the detailed analyses completed in 2011 were discussed (Golder 2011), but no new analyses were presented. **We recommend that, as with behavioural data, DDMI undertake further analyses when sufficient data are available or when three years of consecutive aerial surveys have been completed.**

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. DDMI continued ground-based behavioural observations in 2012; however, the Ekati mine did not. DDMI will undertake analyses of ground-based behavioural data when sufficient data are available or when three years of consecutive aerial surveys have been completed. Given that such analyses are still planned for the future, we re-state, for the future record, that analyses of data should address the following:

- **Justify any pooling of data across years and 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 14-40 km?**
- **Why do the results show such a large range (i.e. 14-40 km)?**
- **Why does occurrence of caribou appear to be lower past that distance?**
- **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 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.**

In 2012, caribou distribution followed the predicted pattern for the northern (spring) migration; caribou deflected west of East Island. However, caribou were present in roughly equal numbers on the east and west of the mine for the southern migration rather than largely on the east side of Lac de Gras. **DDMI should discuss potential causes and if any response action is warranted for this minor departure from predictions.**

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.

We concur with the recommendations DDMI submitted in the 2012 WMPR (Section 3.9) regarding caribou. We particularly appreciate the recommendations to evaluate alternative survey methods for future assessment of caribou occurrence relative to the mine site, roads, rock piles, and Processed Kimberlite Containment (PKC). These recommendations are a nice example for adaptive management which should be employed when results indicate that the mitigation to date may not be satisfactory.

3.3 Grizzly Bears

As far as grizzly bear habitat loss and mortality is concerned, there were no surprises in the 2012 WMPR; both effects remain at or below predicted levels. The methods applied for this part of monitoring are adequate.

The number of grizzly bear observations has been increasing over the last five years and 2012 has the greatest number of observations since the start of the monitoring program. DDMI suspects that a sow and two cubs wintered on East Island during the winter of 2011/2012. **This may account for the higher number of observations in 2011 and 2012 but future years of data collection should be used to confirm this supposition.** The increase in bear sightings may also be a function of DDMI’s change in management approach to not deter grizzly bears “if they mind their own business” (Annual Board Meeting, May 30, 2012). **Given the increase in grizzly bear observations near the mine, DDMI should increase vigilance and potentially adapt grizzly bear management to, once again, include grizzly bear deterrence.**

The modified impact prediction for the presence of bears relative to mine activities is useful and should be tested in the years to come. This prediction changes the focus from testing the ZOI to testing effects of mine activity. We concur with DDMI’s recommendation to continue with the grizzly bear hair-snagging program. Preliminary results from the initial 2012 season are expected to be available in April

2013. The program would address a new, regional scale question about the bear population and we support a change in favour of a more regional and collaborative study. **We recommend EMAB review the results of the grizzly bear hair snagging program once available.**

3.4 Wolverine

Wolverine snow tracking data from past years may indicate potential attraction by wolverine to the mine site. The wolverine snow tracking program reported a track index of 0.25 tracks/km within 10 km of the mine and a track index of 0.09 tracks/km outside the 10 km zone. Data from Table 5-1 seem to indicate an increasing trend in the wolverine track index over time. **Future analyses should test whether these observations indicate a real trend. We recommend DDMI discuss the potential causes and consequences of possible increases in wolverine near the mine site and over time.**

No relocations or mortality of wolverine were reported on-site. This appears to support the prediction that mining related mortalities are not expected to alter wolverine population parameters in the Lac de Gras area. However, off site from DDMI, two deceased wolverines were found inside a burnable bin at West Island in 2012. **DDMI should clarify who is responsible for these bins. Is DDMI implementing any adaptive management to prevent a similar incident in the future?**

The DNA sampling program was not conducted in 2012. We concur with DDMI's recommendation to continue participation in the DNA program in 2014.

3.5 Waste Monitoring

The attractants on the Waste Transfer Area (WTA) were at lower levels in 2012 compared to 2011. The overall effect of waste management is rather positive. We commend DDMI for its efforts which probably led to the low attraction effect on wolverine and bears in the past. However, there seem to be new trends showing that grizzly bear and wolverine occurrences near the mine are higher than farther away. **DDMI may need to explore the reasons for this in light of possible attractants.**

Although many wildlife sightings have been decreasing over time, fox sightings have been steadily increasing in the WTA since 2009. Fox observations were some of the highest ever in 2012. **We recommend that DDMI discuss the possible causes and consequences of this increase. DDMI should discuss possible mitigation measures.**

3.6 Falcons

We concur with the new objectives adopted by DDMI which reflect the discussions of the 2009 workshop. The new focus on contributing data to the Canadian Peregrine Falcon Survey (CPFS), in particular, is a good initiative. There do not appear to be any new findings or changes of note regarding the presence and productivity of Falcons.

3.7 Waterfowl

Waterfowl habitat loss is below predicted levels. Regarding species composition and presence, some species have not been observed since 2000/2001 (eg. sanderling, common snipe) and other species are present only in later years (eg. kill deer plover). However, no formal analyses were presented so it is difficult to determine if these shifts in composition are significant. **DDMI should clarify why no analyses were completed.** Regarding habitat utilization, as last year, the 2012 WMPR showed that shore birds and diving ducks respond differently to mine affected waters: ducks prefer it and shorebirds seem to avoid these waters, preferring to use the shores of the Shallow Bay. The 2012 WMPR showed overall higher numbers of bird observations than 2011. **We concur with DDMI's recommendation to explore possible improvements to waterfowl data collection and also recommend a more rigorous statistical analysis of waterfowl and shorebird data, data permitting.**

4.0 Closure

The review of the 2012 WMPR reported herein presents the conclusions arrived at by MSES. As last year, we note with satisfaction that the communications we were involved in with DDMI, since our review of the past years, were useful in improving our understanding of the monitoring work conducted by DDMI. We note that several recommendations and requests from previous years were not responded to by DDMI (Table I). 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 2012 WMPR. Our views are submitted to EMAB for its consideration of potential recommendations and actions.

5.0 References

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