Rio Tinto

Diavik Diamond Mine

Health, Safety and Environment Department

Wildlife Monitoring Program Report - 2008

30 April 2009

Executive Summary

As a requirement of the Environmental Agreement, Diavik Diamond Mines Inc. (DDMI) conducts a Wildlife Monitoring Program (WMP). The objective of the WMP is to collect information that will assist in determining if there are effects on wildlife in the study area and if these effects were accurately predicted in the Environmental Assessment. The WMP also permits the collection of data to determine the effectiveness of site-specific mitigation practices and the need for any modifications. The following report documents results collected for the 2008 Wildlife Monitoring Program for the Diavik Diamond Mine located at Lac de Gras, Northwest Territories. The data were collected according to procedures outlined in departmental Standard Operating Procedures (SOPs – Appendix II), as derived from the Wildlife Monitoring Program document. Wherever possible, comparisons to the information gathered during the previous monitoring years (2000 to 2007) and the pre-construction baseline (June 1995 to August 1997) have been included.

General observations and recommendations for possible improvement in each program are as follows:

Vegetation/Habitat Loss

- Direct vegetation/habitat loss in 2008 due to the mine footprint was 0.26 km^2, which is within expected values. Total habitat loss to date from mining activities is 9.66 km^2.
- At the end of 2008, actual habitat loss for Riparian Shrub (0.03 km^2) and Esker Complex (0.16 km^2) were equal to that predicted in the EA.
- The fourth year of the re-vegetation study being conducted with the University of Alberta was completed during the summer of 2008.
- As scheduled, permanent vegetation plots (PVPs) were reassessed in 2008 with no ecologically significant difference in vegetation and ground cover between mine and reference plots for each of the three plant communities assessed.

Barren-ground Caribou

- Direct summer habitat loss in 2008 from the mine footprint was 0.13 habitat units (HU's), for a total of 2.42 HU's to date, which is within the expected amount.
- No caribou mortalities occurred due to the mine during 2008.

- The level of caribou advisory monitoring remained at “no concern” (no or fewer than 100 caribou) for 365 days during 2008.
- In 2008, no caribou were observed within 3 km of the mine site during aerial surveys.
- DDMI will be conducting aerial caribou surveys in cooperation with BHP-Billiton for the 2009 season. Surveys will be conducted from July to October. Distance between transects will be 8 km.
- More effort is required to collect data on ground-based caribou behavioural observations in 2009. Data collection and training will be coordinated with BHP-Billiton and data will be pooled for analysis.

Grizzly Bear

- Direct terrestrial habitat loss in 2008 from the mine footprint was within the expected amount at 0.26 km^2. Total, direct grizzly bear habitat loss to date is 7.06 km^2.
- Grizzly bears are still present in the Diavik wildlife study area.
- A total of 5 incidental sightings were recorded for the mine site during 2008.
- No mining-related bear mortalities, injuries or relocations occurred during 2008.
- DDMI plans to suspend the grizzly bear monitoring program for the 2009 season due to safety concerns. Efforts to develop a new study methodology that obtains similar data are being undertaken.

Wolverine

- Wolverines were present on East Island in 2008.
- One mining-related wolverine mortalities occurred during 2008 due to a wolverine denning under the south camp accommodation complex.
- The snow track survey was conducted in the spring following the revised survey methodology of randomly-selected 4 kilometer transects.

Waste Management

- Regular inspections were conducted at the Waste Transfer Area (WTA) and Inert Landfill in 2008.
- Food and food packaging were found during 19% and 26% of inspections, respectively, at the WTA.

- Food and food packaging were found during 11% and 26% of inspections, respectively, at the inert landfill.

Raptors

- Raptor monitoring was performed in June and July 2008, with this being the fourth year DDMI conducted spring monitoring.
- During 2008, two raptor nests (peregrine falcons) were productive within the Diavik study area.
- No project-related mortalities occurred during 2008.

Waterfowl

- There was no direct habitat loss in 2008 for shallow or deep water habitats. The total area of water habitat loss to date remains at 2.54 km^2.
- Waterfowl were present at East Island Shallow Bays.
- Waterfowl are utilizing mine-altered wetlands, particularly the North Inlet.

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Introduction

Diavik Diamond Mines Inc. (DDMI) conducted wildlife baseline studies from 1995 to 1997. Information gathered was used to describe ecological conditions found in the Lac de Gras area in support of the Project Description and Environmental Assessment (DDMI, March 1998a, 1998b). Information was used by DDMI throughout the project design to identify mitigation practices to minimize impacts on wildlife species and to formulate predictions of the effects on wildlife due to mining activities. This information was used to develop a Wildlife Monitoring Program (WMP) for the Diavik Diamond Mine. Documents that were utilized in developing the WMP include:

- Comprehensive Study Report, The Canadian Environmental Assessment Act June 1999;
- Environmental Assessment Overview, Diavik Diamonds Project, September 1998;
- Environmental Effects Report, Wildlife, Diavik Diamonds Project, September 1998; and
- Wildlife Baseline Report, Diavik Diamonds Project, Penner and Associates, July 1998.

A Wildlife Monitoring Program (DDMI, 2002) was designed specifically to monitor and manage wildlife issues of concern identified by communities and regulatory agencies. The year, 2008, was the ninth year of monitoring, and the sixth year that the complete revised WMP was initiated. Revisions to the WMP took place during meetings with the Environmental Monitoring Advisory Board (EMAB) and Environment and Natural Resources (ENR), and in correspondence with communities. Recommendations from the interested parties included a joint effort with BHP-Billiton (BHPB) in conducting caribou and raptor monitoring. John Virgl of Golder Associates was contracted to assist in the development of the WMP and has provided expertise in data collection methods for the majority of programs to ensure similarity to other wildlife effects monitoring programs in the NWT.

The current objectives of the monitoring program are to:

- Collect information that will assist DDMI in determining if there are effects on wildlife and if these effects were accurately predicted in the Environmental Assessment (EA);
- Assist in determining the effectiveness of mitigation practices intended to minimize project-related effects on wildlife and whether or not these measures require modification; and
- Determine if new effects are found that were not predicted in the Environmental Assessment.

DDMI is proposing to continue updating the Wildlife Monitoring Program during 2009, as changes to various programs have occurred over the past few years. The same agencies and individuals identified above will be involved in this process, including representatives from BHP-Billiton's EKATI™ mine. This has been an on-going process throughout 2008, and DDMI is working towards developing options for various programs that focus on assessing program objectives to ensure monitoring is relevant to operations and provides the feedback necessary to make management decisions. Additionally, we are looking at ways to increase efficiency in our monitoring programs through cooperative efforts with other mining companies and ENR. Community consultation will continue to occur for any proposed revisions to the program.

The wildlife study area (Figure 1-1) encompasses approximately 1,200 square kilometers. Its boundaries are roughly: west - the southwest arm of Lac de Gras, east - Thonokeid Lake, north - the BHPB wildlife survey area and south - the north shore of MacKay Lake. An extension to the northwest was made to include the Lac du Sauvage narrows. The local study area during baseline studies (Penner, 1998) covered an area of approximately 805 square kilometers and the rationale for increasing the study area during current and future monitoring was to take into account the eastern portion of Lac du Sauvage, as this area was identified in the Wildlife Baseline Report (Penner, 1998) as an important movement corridor for caribou.

Figure 1-1 Diavik's Wildlife Study Area

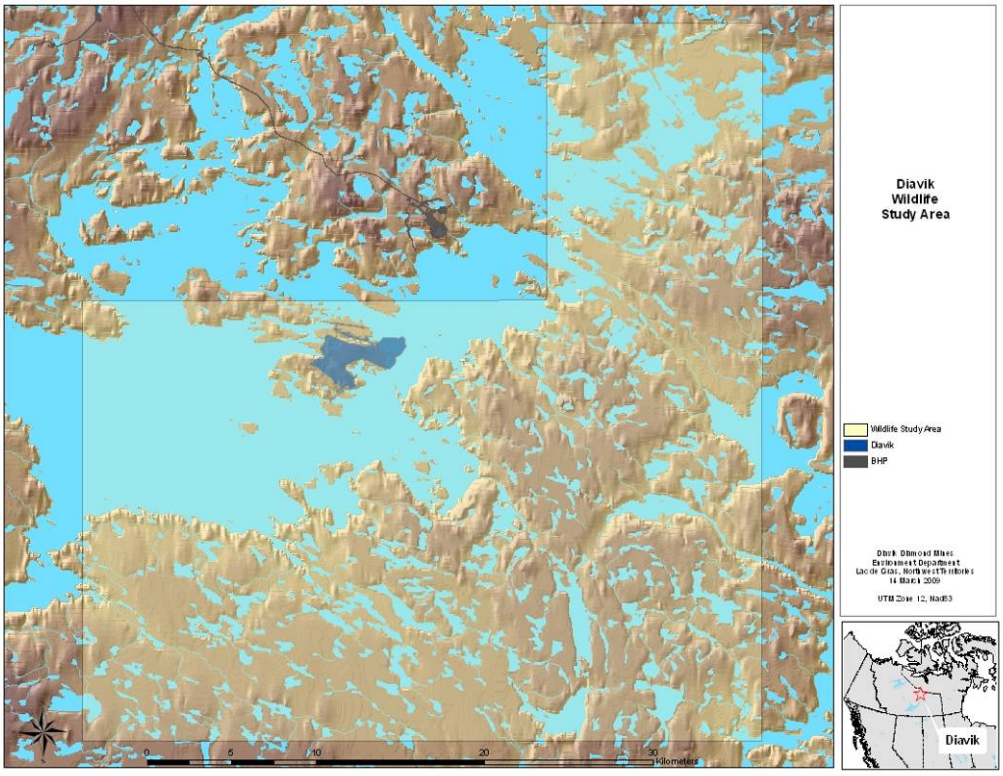


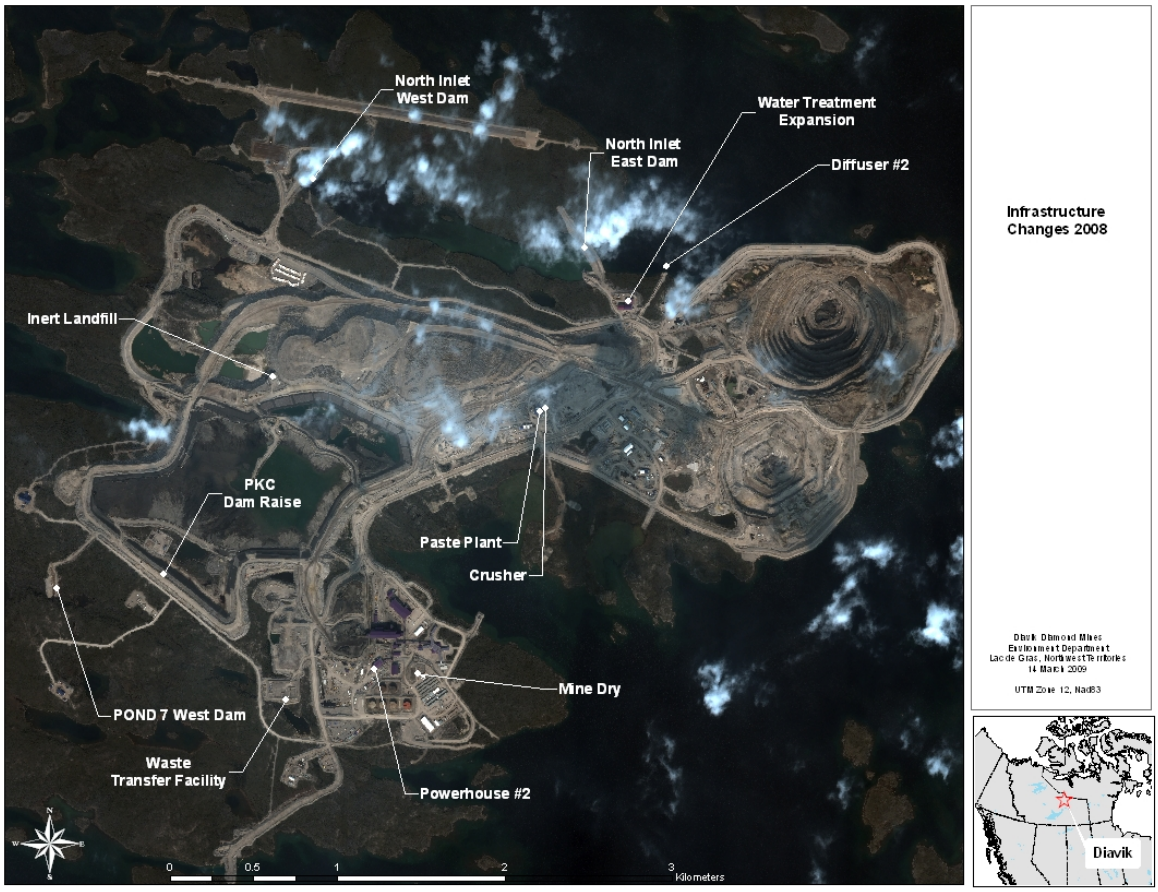
Figure 1-2 Satellite Image of East Island – 2008

The mine footprint is restricted to East Island and consists of haul roads, an airstrip, country rock piles, A154 pit, A418 pit and all mine infrastructure (Figure 1-2).

During 2008, infrastructure was erected to support the future underground mine that is currently being constructed for the A154 and A418 kimberlite deposits. All haul roads required for mining activities to date are complete (Figure 1-3).

Development of the underground mine at the A154/418 decline commenced during 2008, with 6,363 meters (m) completed by year end. Due to these activities, the number of people present on East Island increased from 2007, equalling an annual average of 979 people. The average population of the main camp accommodation was 342 people while the average for south camp accommodation was 637 people. The month of October saw East Island reach a peak population of 1,044 people.

Figure 1-3 Changes to Infrastructure Present on East Island in 2008



This report is divided into nine sections that make up the core monitoring program:

- Vegetation
- Caribou
- Caribou Advisory
- Caribou Mitigation Effectiveness
- Grizzly Bear
- Wolverine
- Waste Management
- Raptors
- Waterfowl

Within each section of the report, data analysis is presented that will be tracked over the life of the mine. Recommendations for enhancement to the WMP are presented at the end of each section for consideration. Based on technical experience gained throughout the baseline period and the ongoing monitoring program (in this case the 2008 program), key recommendations are described in this report and will be incorporated into the Wildlife Monitoring Program for subsequent years. The DDMI WMP will be an evolving program that will reflect recommendations during previous years, as well as advances in project development.

Vegetation

Vegetation Loss

East Island's vegetation cover is predominantly characterized by heath tundra, heath tundra with boulders and/or bedrock and tussock/hummock habitat types. The main effect on vegetation during operations is the reduction in the geographic extent of all vegetation/land cover types due to disturbance caused by the mine and the mine infrastructure. The recovery of vegetation would be slow, which is characteristic of arctic environments (Burt, 1997). The direct loss of vegetation/wildlife habitat due to mining activities is important as it decreases the biodiversity at the landscape, community and species level (DDMI, 1998a). This would be a direct loss of habitat utilization for wildlife, but also altered landscapes may attract certain wildlife species such as caribou that could make use of the airstrip and hauls roads for insect relief (Mueller and Gunn, 1996).

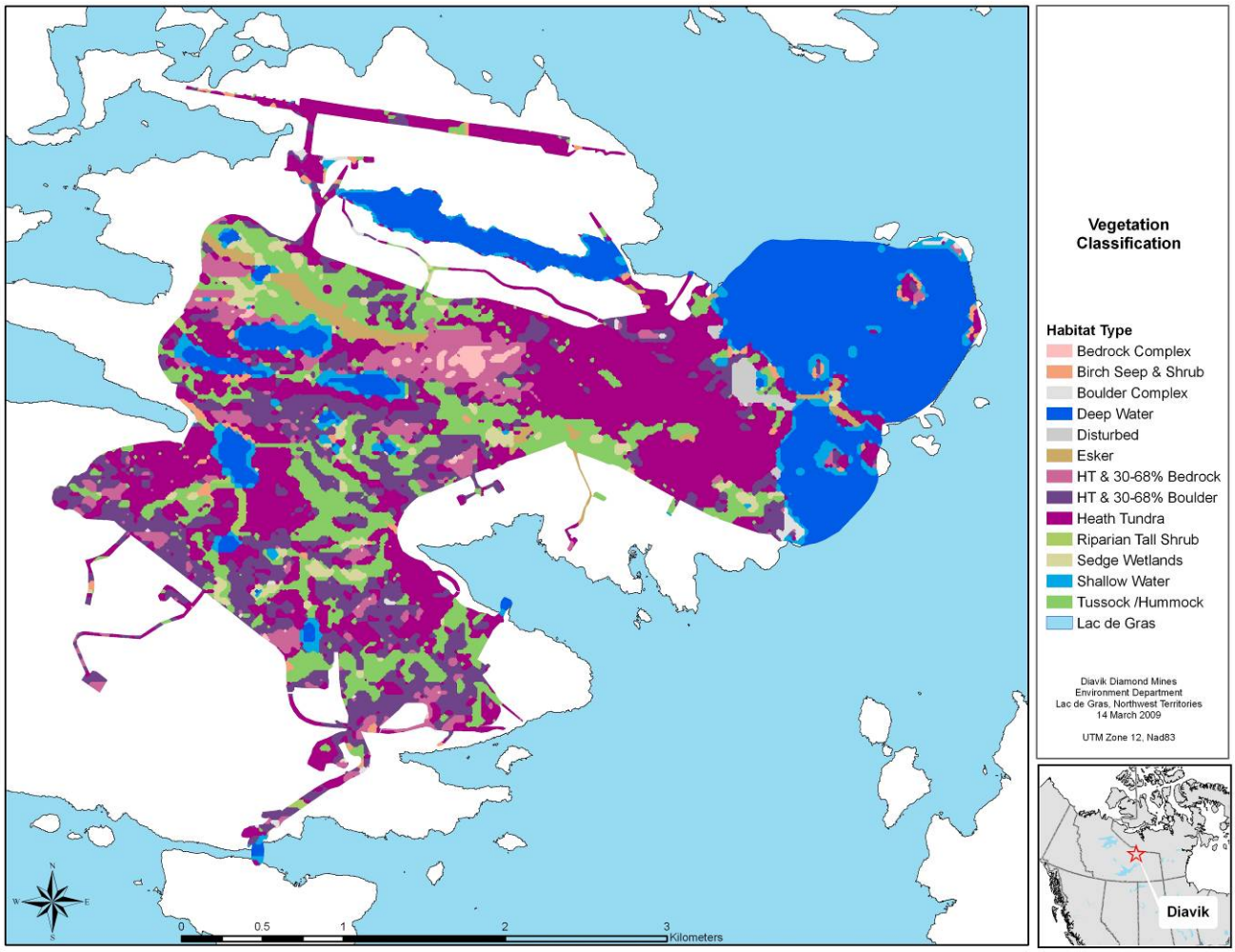
The intent for this program is to determine if vegetation loss is within the extent predicted in the Environmental Effects Report (DDMI, 1998b). The objective is:

> ***To determine if direct vegetation/habitat loss due to the mine footprint exceeds the prediction of 12.67 km^2.***

Methods

A map showing the final mine footprint (12.67 km^2) has been superimposed on the vegetation classification map used in the vegetation/land cover section of the Environmental Effects Report (DDMI, 1998b). This analysis estimated the absolute and relative area of each habitat type within the final footprint. The vegetation classification map from the EER was used because the map used in the wildlife section of the EER report was created at a coarser scale (lower resolution). The vegetation map with the higher resolution allowed for a more precise estimate of the relative areas of each habitat type and is consistent with both the vegetation maps used in this report and the habitat analyses conducted since 1998.

Figure 2-1 Reconciliation of Predicted Total Habitat Loss on East Island, 2008



For 2000 through 2005, an Ikonos satellite image of the mine site area was obtained and used to update the area of the current mine footprint. Since 2006, the same process was used; however, a higher resolution Quickbird satellite image was used to derive the mine footprint (Figure 1-2). This dataset was then laid over the vegetation baseline image, which shows each vegetation/habitat type based on the Ecological Landscape Classification developed by ENR (Matthews *et. al* 2001). Each vegetation/habitat type that has been replaced by the mine footprint was selected and area calculations made to determine how many square kilometers of each habitat type have been replaced by the mine footprint (Figure 2-1).

Results

The mine footprint is restricted to East Island and consists of haul roads, an airstrip, country rock piles, A154 pit, A418 pit and all mine infrastructures (Figure 1-2). As of December 2008, a total of

9.66 km^2 of habitat has been altered due to mine footprint expansion, with construction beginning in 2000. This represents a total loss of 76.2% of the predicted mine disturbance (Figure 2-2). Direct habitat loss in 2008 was 0.26 km^2. Heath tundra represents the largest cumulative loss on East Island over the years (Table 2-1), and represents the largest predicted vegetation habitat type loss due to mining activities.

Figure 2-2 Type of Habitat Loss on East Island – 2000-2008

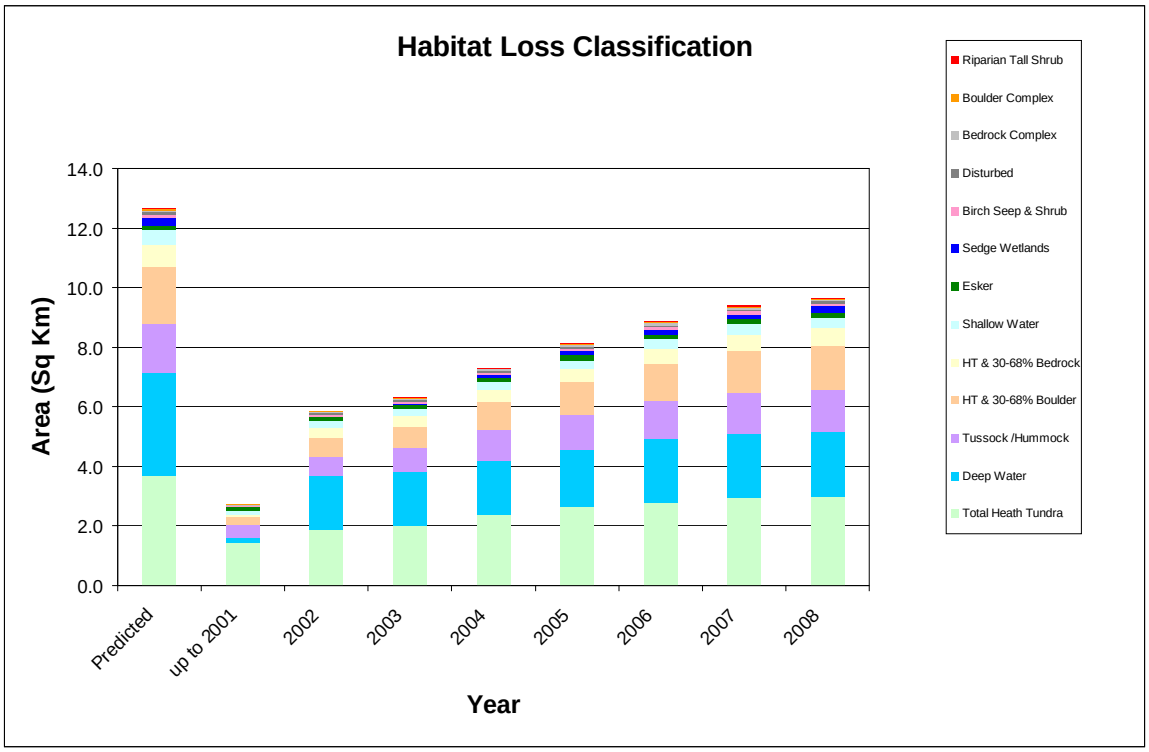


Table 2-1 Predicted Mine Disturbance versus Cumulative Actual Mine Disturbance for All Years (2000-2008)

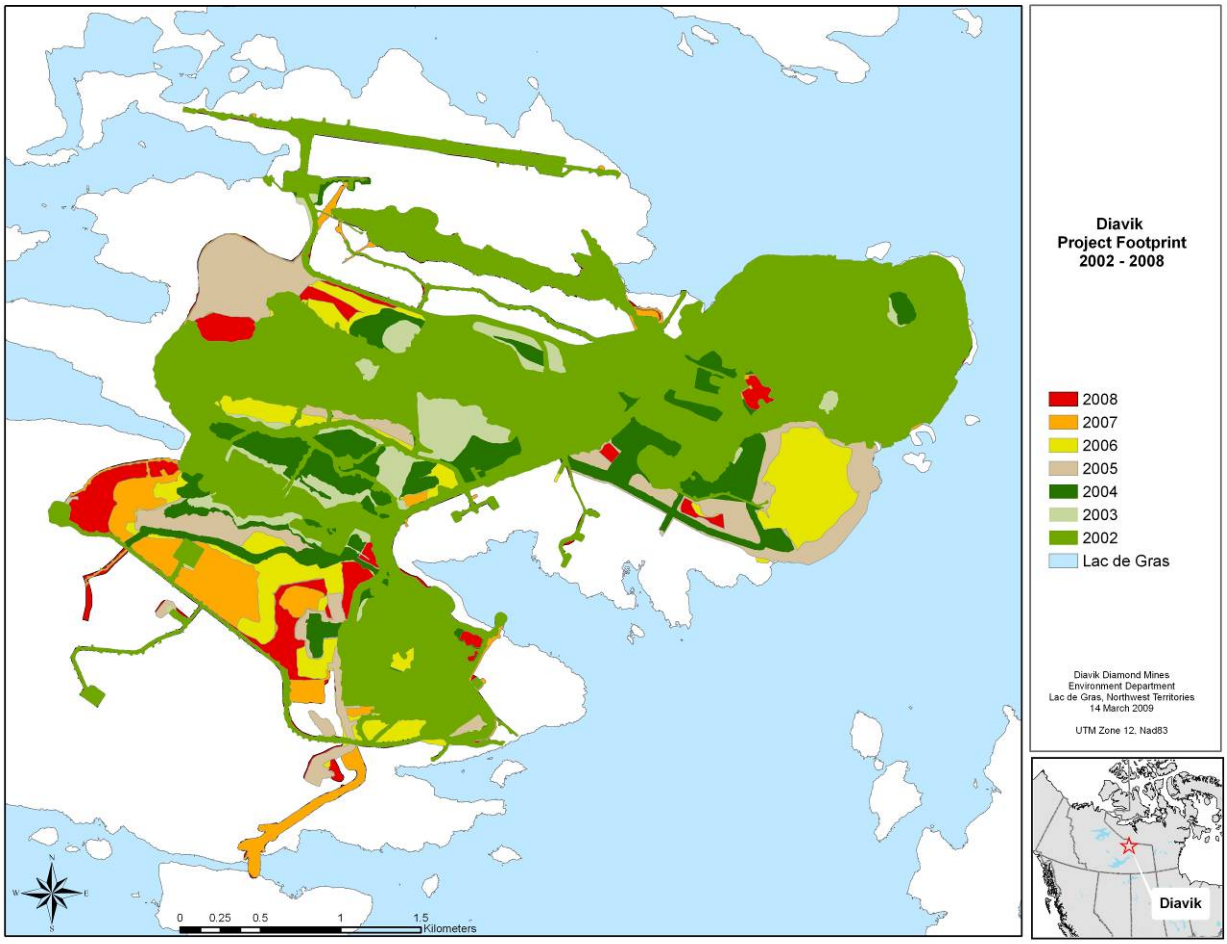
Habitat Classification	Total Area (km²)								
	up to 2001	2002	2003	2004	2005	2006	2007	2008	Predicted
Heath Tundra	1.45	1.89	2.02	2.38	2.62	2.76	2.93	**2.97**	*3.68*
HT & 30-68% Bedrock	0.08	0.34	0.36	0.4	0.45	0.49	0.53	**0.58**	*0.78*
HT & 30-68% Boulder	0.26	0.64	0.73	0.96	1.07	1.24	1.43	**1.49**	*1.89*
Tussock/Hummock	0.45	0.63	0.79	1.01	1.19	1.27	1.35	**1.42**	*1.64*
Sedge Wetlands	0.02	0.03	0.04	0.09	0.16	0.16	0.17	**0.21**	*0.26*
Riparian Shrub	0.01	0.02	0.02	0.02	0.03	0.03	0.03	**0.03**	*0.03*

Habitat Classification	Total Area (km²)								
	up to 2001	2002	2003	2004	2005	2006	2007	2008	Predicted
Birch Seep & Shrub	0.03	0.05	0.06	0.08	0.08	0.09	0.09	**0.09**	*0.11*
Boulder Complex	0.01	0.02	0.02	0.03	0.03	0.04	0.04	**0.04**	*0.05*
Bedrock Complex	0.05	0.05	0.05	0.05	0.05	0.06	0.06	**0.06**	*0.07*
Shallow Water	0.11	0.23	0.23	0.26	0.29	0.34	0.35	**0.35**	*0.48*
Deep Water	0.15	1.8	1.81	1.82	1.93	2.17	2.19	**2.19**	*3.46*
Disturbed	0.06	0.05	0.05	0.05	0.05	0.05	0.06	**0.06**	*0.06*
Esker	0.13	0.14	0.14	0.15	0.16	0.17	0.17	**0.17**	*0.16*
Total	**3.12**	**5.88**	**6.32**	**7.3**	**8.15**	**8.86**	**9.40**	**9.66**	**12.67**

** Any discrepancies in totals across the rows results from the rounding of numbers in annual columns for presentation purposes*
***Values in red represent actual habitat loss equal to or exceeding that predicted*

In 2008, very few construction projects occurred outside the existing mine footprint. Tussock/ Hummock habitat experienced the greatest loss in 2008 (0.07 km^2). A progression of habitat loss from the mine footprint can be seen in Figure 2-3.

Figure 2-3 Progression of Habitat Loss on East Island, 2002 – 2008



Two habitat types reached their predicted maximum for mine disturbance during 2005; riparian shrub (0.03 km^2) and esker complex (0.16 km^2). Vegetation loss has previously been calculated cumulatively, adding loss from the previous year to that of the current year. Since 2006, vegetation loss values are calculated using the total area of each habitat lost, up to and including the end of the current year. By eliminating cumulatively calculated values, variance associated with rounding those individual losses is reduced. While a minor discrepancy in value for eskers occurred as a result of this calculation, this value more accurately reflects total habitat loss within the predicted mine footprint. To this end, re-calculation of esker complex loss resulted in a slight exceedence of the predicted loss of 0.16 km^2 (Table 2-1).

Three land cover types that were approaching their maximums by the end of 2005 have still not met or exceeded their predicted maximums. Boulder and bedrock complexes reached a loss of 0.04 km^2 and 0.06 km^2, compared with their predicted values of 0.05 km^2 and 0.07 km^2,

respectively. Riparian shrub and disturbed habitats (areas of previous human disturbance) have reached the predicted values of 0.03 km^2 and 0.06 km^2, respectively.

Values provided for habitat loss are estimates based on the predicted mine footprint, satellite imagery and the ecological classification map. These same tools, each with varying degrees of accuracy, are used to track habitat loss over time. It is expected that variability from the predicted amounts will remain low and within accuracy levels associated with map and imagery resolution, assuming development continues within the areas originally assessed. DDMI will continue to monitor habitat loss as the mine expands and will identify any exceedences that may occur during this time.

Diavik's exploration camp is found on the north eastern shore of Lac du Sauvage. Although vegetation loss due to Diavik's exploration camp was not a component of the EA, it was included in the 2003 Wildlife Monitoring Program Report at the request of reviewers. The area of the camp previously reported (0.00051 km^2) did not change during 2008.

A re-vegetation study was undertaken in 2004 (Phase I) to determine which substrates are most effective for enhancing soil properties and native plant growth, which soil amendments are most effective at enhancing substrate properties, native plant and community development, and which groups or individual native species are able to establish and survive on different substrates and amendments. Test plots were established and soil amendments added in previous years of the study; soil data collection, seed collection and seeding of some species also took place in the past.

Soil samples were not obtained for 2008. Vegetation assessments of the plots were undertaken in late July and early August 2008, at the peak of plant productivity. Total vegetation cover, plant density and health by species were measured and presence of florets or flowers, as well as evidence of grazing was recorded. Soil water and temperature readings continued to be obtained on an hourly basis throughout 2008. The following preliminary conclusions can be drawn from the analysis to date:

- In 2008, vegetation growth was considerably greater than observed in previous years, and cover was influenced by treatment substrate and soil amendment;
- Processed Kimberlite (PK) continues to be a poor substrate for plant growth, regardless of soil amendment or species sown;
- The addition of salvaged top soil, north inlet water treatment plant sludge or sewage sludge is consistently a component of the top three (3) performing treatments for any given substrate;
- Spring seeding resulted in greater plant cover than fall seeding across all soil treatments; and

- Grass dominated seed mixes consistently performed better than those dominated by forbs or shrubs.

During 2007, nine additional research plots were established at an old magazine storage area directly east of the current research site (Phase II). These plots were established to build on the results of Phase I and to determine more detailed options for successful re-vegetation of disturbed sites at the mine. Microtopography treatments were applied in June 2008 and included soil mounds, depressions and boulders. Topsoil treatments were added to required sites, as were cuttings and seed, in June 2008. Additional greenhouse studies are being conducted as a part of this research to determine if shrub species can establish from cuttings under ideal conditions.

Preliminary field site assessments for shrub cuttings were conducted in September 2008 and resulted in low health ratings for most species. A few plants had established from seed at this time. Health ratings were similarly conducted for species in the greenhouse and results were variable depending on the species planted.

Work to be undertaken to complete Phase I during 2009 will focus on continued monitoring at the original research site, including detailed soil sampling to determine if changes in soil physical or chemical properties and build up of litter and soil organic matter have occurred since 2004. For Phase II, cuttings and seeded species will be monitored in late July 2009. Health will be rated and presence of flowers or seed determined and density of seeded species will be counted. Substrate and topsoil samples will be collected during the vegetation assessment. A complete report summarizing the results of the re-vegetation study will be issued after the 2009 field season and will be included as an appendix to next years Wildlife Monitoring Program report.

Habitat Assessment (Permanent Vegetation Plots)

A habitat assessment on East Island vegetation is performed to observe vegetation conditions, providing plant species identification and percent coverage in a given plot and habitat type. The analysis will be used to determine if any change is occurring in habitat communities in areas of dust deposition due to mining activities.

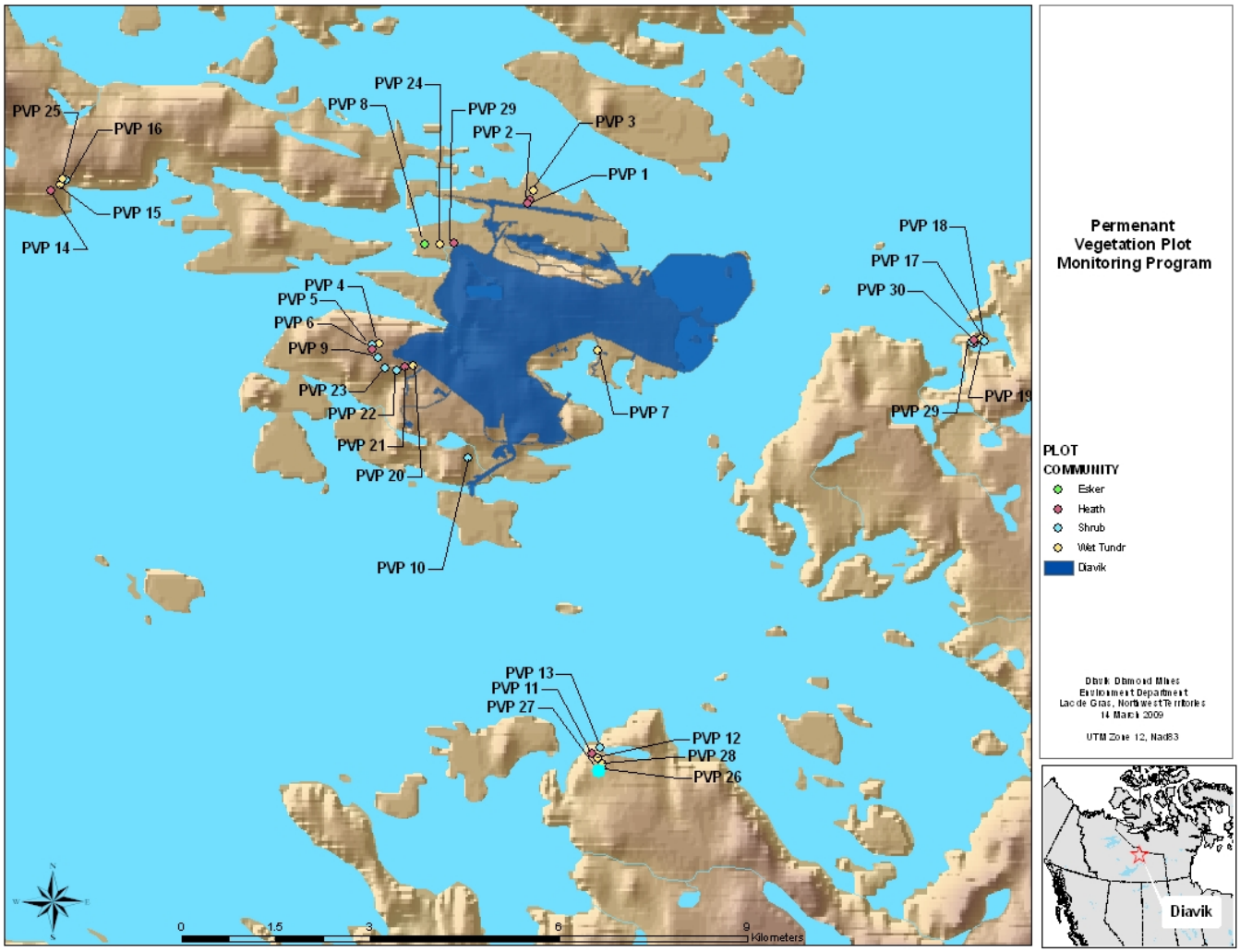
Methods

In 2001, ten permanent vegetation plots (PVPs) were established by DDMI for habitat analysis. Nine PVPs were established on East Island; five were within heath tundra, three within wet tundra (tussock-hummock), and one on an esker. The tenth PVP was a reference (control) located on the adjacent mainland within heath tundra. The PVPs were assessed in 2001 and 2004. Following the 2004 assessment by the University of Alberta, recommendations were made to enhance data collection and analyses. The recommendations included biannual monitoring, permanent marking of plots, and the addition of reference plots in specific vegetation communities to balance the monitoring design. The majority of recommendations were accepted by DDMI and implemented for the 2006 assessment.

Between 2004 and 2006, four PVPs on East Island (Numbers 4, 5, 6 and 9) were lost to new mine development; three were heath plots and one was wet tundra. In 2006, five new PVPs were established on the island to replace these plots and included equal representation of dominant vegetation communities. Shrub communities were added to the habitat assessment as they were one of the dominant vegetation types on East Island. New PVPs were located on the west side of the island outside of areas included in Diavik's long term mine development plan. Of the original ten PVPs, only one reference was located within heath tundra. For appropriate comparison of mine and undisturbed plots, eight new reference PVPs were established at three locations off East Island. The three reference locations will be referred to as CBM Camp Reference, South Reference and West Island Reference. At each of these locations, one PVP was established in heath tundra, one in wet tundra and one in a shrub community.

After the 2006 sampling session, further recommendations were made to increase the number of plots per vegetation community in order to reduce within site variability of plant communities (which was high) and increase the likelihood of capturing true change in plant abundance between mine and reference areas over time. For the 2008 assessment, the number of plots per vegetation type was increased from three to five.

Figure 2-4 Permanent Vegetation Plots Assessed for the Diavik Mine Site – 2008



All PVPs assessed in 2006 were assessed in 2008. For each vegetation type, two new PVPs were added for a total of five PVPs per community. New PVPs on the mine site were located on the west side of the island, outside of current development plans. New reference PVPs were located within the three already-established reference sites: CBM Camp, South Reference and West Island. At all newly established PVPs, UTM coordinates were recorded and wooden stakes were placed in the NW and SE corners; two marked corners are sufficient to locate plots during future monitoring. Tops of stakes were spray painted pink to increase ease of plot identification (Table 2-2). Three plots (one from each community reference) were missing sufficient stakes in 2008 making it difficult to delineate the original plot; plots were estimated from 2006 data and photos.

Table 2-2 Coordinates and Location Descriptions for PVPs

Plot No.	Community	Location	Easting	Northing
Plot 1	Heath Tundra	East Island	533933	7144275
Plot 2	Heath Tundra	East Island	533953	7154320
Plot 3	Tussock-hummock	East Island	534018	7154475
Plot 4	Tussock-hummock	East Island	531569	7152036
Plot 5	Shrub	East Island	531456	7152013
Plot 6	Heath Tundra	East Island	531451	7151948
Plot 7	Tussock-hummock	East Island	535039	7151919
Plot 8	Esker	East Island	532280	7153613
Plot 9	Shrub	East Island	531549	7151822
Plot 10	Shrub	East Island	532985	7150216
Plot 11	Heath Tundra	South Control	534939	7145517
Plot 12	Tussock-hummock	South Control	535036	7145450
Plot 13	Shrub	South Control	535079	7145615
Plot 14	Heath Tundra	West Island Control	526340	7154474
Plot 15	Tussock-hummock	West Island Control	526482	7154560
Plot 16	Shrub	West Island Control	526590	7154634
Plot 17	Heath Tundra	CBM Camp Control	541033	7152048
Plot 18	Tussock-hummock	CBM Camp Control	541140	7152118
Plot 19	Shrub	CBM Camp Control	541192	7152078
Plot 20	Tussock-hummock	East Island	532097	7151689
Plot 21	Heath Tundra	East Island	531969	7151660
Plot 22	Shrub	East Island	531841	7151613
Plot 23	Shrub	East Island	531665	7151647
Plot 24	Tussock-hummock	East Island	532530	7153614
Plot 25	Tussock-hummock	West Island Control	526525	7154654
Plot 26	Heath Tundra	South Control	535117	7145273
Plot 27	Shrub	South Control	535067	7145243

Plot No.	Community	Location	Easting	Northing
Plot 28	Tussock-hummock	South Control	535112	7145347
Plot 29	Shrub	CBM Camp Control	540978	7152063
Plot 30	Heath Tundra	CBM Camp Control	541026	7152091
Plot 31	Heath Tundra	East Island	532744	7153642

Plots were assessed between 29 July and 7 August 2008. The Standard Operating Procedure developed in 2001 and modified in 2006 was followed. Each established 2 x 2 m PVP was located by GPS and divided into four 1 m^2 quadrats with string. A 1 m^2 quadrat divided into 100, 10 cm^2 sections was placed in the NW position. Starting with this NW quadrat and working clockwise, percent cover by plant species was visually assessed by researchers from the University of Alberta. Only those plants rooted in the PVPs were counted. Total vegetation cover could add to greater than 100% due to overlap in vegetation layers (e.g., shrub layer, herbaceous layer, prostrate or creeping vegetation layer). Within a vegetation layer, cover does not add to more than 100%. Samples of unidentifiable plant species were taken from outside the PVPs and stored in individually labeled plastic bags under cool conditions until a more detailed identification could be conducted. Density of non-rhizomatous or mat-forming species was recorded. In 2008, sample plants of each species were collected and labelled so that the Diavik Environment Department can start a reference plant collection for internal use.

Ground cover was measured and included lichen, moss, bare ground, rock, litter and animal pellets. Lichen and moss species were grouped for cover measurements; however, presence and absence data for individual lichen and moss species were recorded. Ground cover does not add to more than 100%. A digital photograph was taken of each quadrat and clearly labeled with the plot number, quadrat direction, vegetation type and year.

Data were tested for normality and homogeneity of variance prior to statistical analyses. Only a few species, mainly those with very low abundance (less than 1 % cover), did not meet the requirements of Levene's Test and therefore, parametric tests that were robust for heterogeneous variance were employed. Independent t-tests were performed on 2008 data to compare mine and reference plots. To compare plant composition and abundance between years, one way analysis of variance (ANOVA) was conducted. All analyses were conducted in SPSS 16.0 (SPSS Inc. 2005) using a significance level of 0.05.

Results

In heath communities, a total of 19 species were identified within mine plots and 13 species within reference plots, with an average number of species per plot of 10 and 8, respectively. Mean cover data are presented in Appendix I, Tables 1, 2 and 3. Canopy cover in both mine and reference plots was dominated by *Ledum decumbens* (northern laborador tea), *Vaccinium vitis*

idaea (mountain or bog cranberry) and *Empetrum nigrum* (crow berry). Terricolous (soil) lichens dominated the ground cover in reference sites while litter dominated ground cover on the mine site; percent cover of terricolous lichen and litter between sites was statistically different (P = 0.045 and P = 0.046, respectively). The dominant lichens at both mine and reference sites were *Flavocetraria nivalis*, *Flavocetraria cucullata* and *Cladina* species. Lichen diversity was similar between sites and ranged from 6 to 10 species per plot for mine and reference sites. There were no other cover differences between sites.

In tussock-hummock (wet tundra), 23 species were found on the mine site and 21 species in reference sites, with average plot values of 11 species in both sampling locations. Canopy cover was dominated by *Eriophorum vaginatum* (cotton grass) and *Ledum decumbens* on the mine site while reference site canopy cover was dominated by *Eriophorum vaginatum* only. Mine tussock-hummock sites had significantly greater *Betula glandulosa* (bog birch) cover than reference sites (P = 0.023), although at both locations cover was less than 5 %. Ground cover at both locations was dominated by moss and litter; *Sphagnum* species and *Aulacomnium turgidum* were the most abundant mosses.

In shrub communities, 16 species were found on both the mine site and in reference site communities, with average plot values of 11 species and 8 species, respectively. Canopy cover was dominated by *Betula glandulosa*, *Vaccinium vitis idaea* and *Ledum decumbens*, while litter was the dominant ground cover. *Betula glandulosa* and *Arctostaphylos rubra* comprised the majority of the litter layer. There were no significant differences in canopy or ground cover between mine and reference sites for shrub communities.

The esker community on the mine site contained a total of 3 species and was dominated by *Empetrum nigrum*. Ground cover was dominated by litter. Only one plot was established on the mine site as this vegetation type is not common. The esker community had the highest amount of bare ground and the lowest species richness when compared to heath, tussock-hummock and shrub communities sampled at mine and reference sites. This is not unexpected as eskers have little soil, and therefore moisture and nutrients, to facilitate plant establishment.

Density data were collected for *Betula* (birch) and *Salix* (willow) shrub species. There was no statistically significant difference in shrub densities between the mine and reference sites. *Betula* density was greatest in reference shrub communities and in tussock-hummock mine sites. Densities in other communities within references and mine sites were similar. *Salix* cover and densities were low in all plant community types.

Summary

Between year analysis of heath and tussock-hummock data from the mine site indicate differences in ground and plant canopy cover (Appendix I, Table 4). No new species were reported in 2008 even though additional plots were added, thus confirming that the increase in sampling intensity was sufficient to capture within-community variability. Bare ground was

significantly greater in 2001 in heath communities compared to all other years (P = 0.003). Litter, however, was significantly greater in 2008 in heath and tussock-hummock communities compared to all other years (P = 0.000 and P = 0.046, respectively). Starting in 2006, ground cover was partitioned further to include litter but previously this was included with bare ground. In heath, terricolous lichen cover was significantly greater in 2008 than other years (P = 0.050). In tussock-hummock, *Betula glandulosa* and *Empetrum nigrum* were more abundant in 2001 and 2004 than in 2008 (P = 0.046 and 0.033, respectively) and *Salix planifolia* was more abundant in 2001 (P = 0.024) than all other years. The addition of plots in 2006 and 2008 may explain these changes; continued monitoring of a consistent set of plots will assist in drawing any conclusions. These species differences were not observed when comparing the reference communities between years.

Recommendations

Continue calculating total vegetation loss based on total area of each habitat lost, up to and including the end of the current year.

Stake plots with more durable material such as PVC piping or rebar. Staking one corner and then noting compass direction for orientation of PVP would be sufficient.

Continued bi-annual monitoring of a consistent set of permanent vegetation plots to assist in obtaining more data over multiple years to better determine changes in vegetation community measures over time and between reference and mine sites.

Lichen monitoring program to determine suitability of lichen as bioindicators of dust distribution is to be conducted in 2010.

Caribou

Caribou are ranked as 'sensitive' in the Northwest Territories (GNWT, 2006). New estimates of the Bathurst herd suggest this herd has been in decline for the last decade at approximately five percent per year. The latest population estimate suggests that the number of females in the herd has declined from approximately 151,000 to 55,500 between 1996 and 2006 (Nishi *et al.*, 2008).

The Bathurst caribou utilize a migration corridor that passes through the Lac de Gras area on their way to and from their calving grounds at Bathurst Inlet (Gunn *et. al* 2002). A portion of the herd frequently forages and moves through the Lac de Gras area during the summer and fall periods, sometimes following shorelines along the lake and onto the west and east islands (DDMI, 1998b).

The Ahiak herd was confirmed as distinct from the Bathurst herd based on movements and range use by satellite-collared caribou (ENR 2008, website). The Ahiak calving grounds are near the Queen Maud Gulf, Nunavut but can range as far south as the Thelon Game Sanctuary, and can pass through the Lac de Gras area. It was estimated that the Ahiak herd was the third largest in the Northwest Territories (NWT) with approximately 200,000 animals as of 1996 (ENR 2008, website).

These barren-ground caribou herds are some of the most heavily harvested of any in the Northwest Territories. They are an important food source for hunters of both western Nunavut and the communities of the Northwest Territories. The barren-ground caribou was selected as one of the key indicator species for impact assessment because of its cultural and economic value to northern residents, ecological importance, management status, and biological vulnerability (DDMI, 1998b).

Habitat Loss

Habitat change on East Island has resulted from physical alteration of the landscape due to mine infrastructure. Infrastructure includes country rock piles, PKC and supporting infrastructure (i.e., camp, roads and the airstrip). The physical alteration of the landscape can have an influence on caribou as the vegetation can no longer be exploitable as a source of life basics (DDMI, 1998b).

Habitat loss on East Island is expressed in habitat units (HUs) for caribou summer habitat. A habitat unit is the product of surface area and suitability of the habitat in that area to supply food for caribou and cover for predators (DDMI, 1998b). To address how the change of habitat may affect caribou on East Island, a habitat suitability index (HSI) model was developed for DDMI during the EA by Rowell and Van Egmond (1998). The HSI model was used to determine the value of each habitat type based on the presence of important forage species for caribou and cover concealment for predators (DDMI, 1998b). Important foraging species were determined from the analysis of plant fragments found within caribou pellet samples collected in 13 randomly selected plots in the Lac de Gras area (Van Egmond and Rowell, 1997b). The results of the caribou pellet analysis were used to rank caribou food availability during the summer within each habitat type; willow (*Salix)*, lichens (*Cladonia and Cetraria*), Labrador tea (*Ledum)* and sedges (*Carex)* represented approximately 94.8% of the major plant groups identified during the pellet analysis. Therefore, habitats that contained these plant types scored the highest HSI value (DDMI, 1998b). Habitats were rated on a scale of 0 to 1 for their capability to support use for caribou, with values >0.30 regarded as highly suitable habitat and values <0.25 rated as low suitability for caribou. The area of each habitat type on East Island was multiplied by its HSI value to determine the number of foraging habitat units available to caribou.

One objective of the caribou monitoring program is to determine if direct summer habitat loss (in habitat units [HUs]) is greater than predicted. The following section summarizes methods used and results obtained. The impact prediction in the Environmental Effects Report (DDMI, 1998b) is:

> ***At full development, direct summer habitat loss from the project is predicted to equal 2.965 habitat units (HU's).***

Methods

The vegetation classification map used in the vegetation/land cover section of the Environmental Effects Report (DDMI, 1998b) was used to determine the loss of caribou summer habitat. This approach is similar to methods used in the Vegetation section of this report. The area (km^2) of vegetation type lost was multiplied by its habitat suitability index value (Table 3-1; DDMI, 1998b) to determine habitat units lost (HUs).

Results

Direct summer habitat loss to date from the mine totaled 2.42 habitat units (Table 3-1). Heath tundra, which has the highest habitat suitability rating, represents 2.97 km^2 of lost vegetation since construction began. Caribou summer habitat loss was greatest in 2001, when the majority of haul roads and laydown areas for mine infrastructure were constructed. Habitat units lost due to mining activities this past year is similar to that lost in 2003 and 2006. The loss of habitat in 2008 was associated with expansion of mine infrastructure to support underground mine development. Overall, total direct losses for all summer habitat suitability classes for caribou are currently below that predicted in the EER.

Table 3-1 Predicted area of summer caribou habitat – disturbed vs. actual area of summer caribou habitat on East Island

Vegetation Cover Type	Habitat Suitability Value	Area of Habitat Lost in 2008	Habitat Suitability Class	Predicted Habitat Units Lost	Actual Habitat Units Lost									Total Habitat Units Lost to Date*
					2000	2001	2002	2003	2004	2005	2006	2007	2008	
Heath Tundra	**0.37**	0.17	High	**2.13**	0.3	0.42	0.19	0.09	0.23	0.14	0.12	0.14	0.09	**1.72**
Heath Boulder	**0.4**	0.06												
Tall Shrub	**0.46**	0.00												
Bedrock	**0.27**	0.00	Moderate	**0.63**	0.07	0.12	0.07	0.05	0.08	0.08	0.02	0.03	0.03	**0.55**
Tussock / Hummock	**0.3**	0.07												
Sedge Meadow	**0.28**	0.04												
Esker	**0.3**	0.00												
Birch Seep	**0.11**	0.00	Low	**0.2**	0.02	0.05	0.02	0.01	0.01	0.01	0.01	0.01	0.01	**0.15**
Boulder Field	**0.21**	0.00												
Heath Bedrock	**0.23**	0.05												

**Totals may vary slightly due to rounding of values for reporting purposes.*

Zone of Influence

Mining activities have the potential to decrease the use of habitat adjacent to human developments for caribou due to behavioural disturbance (Diavik Diamond Mines Inc. [DDMI], 1998b). Miller and Gunn (1979) explained the expression of disturbance in relation to wildlife as "the phenomenon, which resulted from the introduction of unfamiliar stimuli into an animal's environment brought about by the presence of human activities". Zones of Influence (ZOI) were established during Diavik's Wildlife Environmental Effects Report (EER) to ensure a conservative approach in the assessment of the possible impacts from human activity on caribou. The ZOI were based on literature and the experience of barren-ground caribou biologists.

Information collected on the activity of caribou, as part of DDMI's Wildlife Monitoring Program, is used to determine whether a change in behaviour is detected in relation to distance from mining activities. Aerial surveys provide a quick "snap-shot" of caribou behaviour. In addition, scan sampling is conducted on East Island where the foraging behaviour of animals may be influenced by mining activities. Observations are also made on the mainland ("control site"), to determine whether or not "changes in behaviour were a response to human activity" (Gunn, 1983).

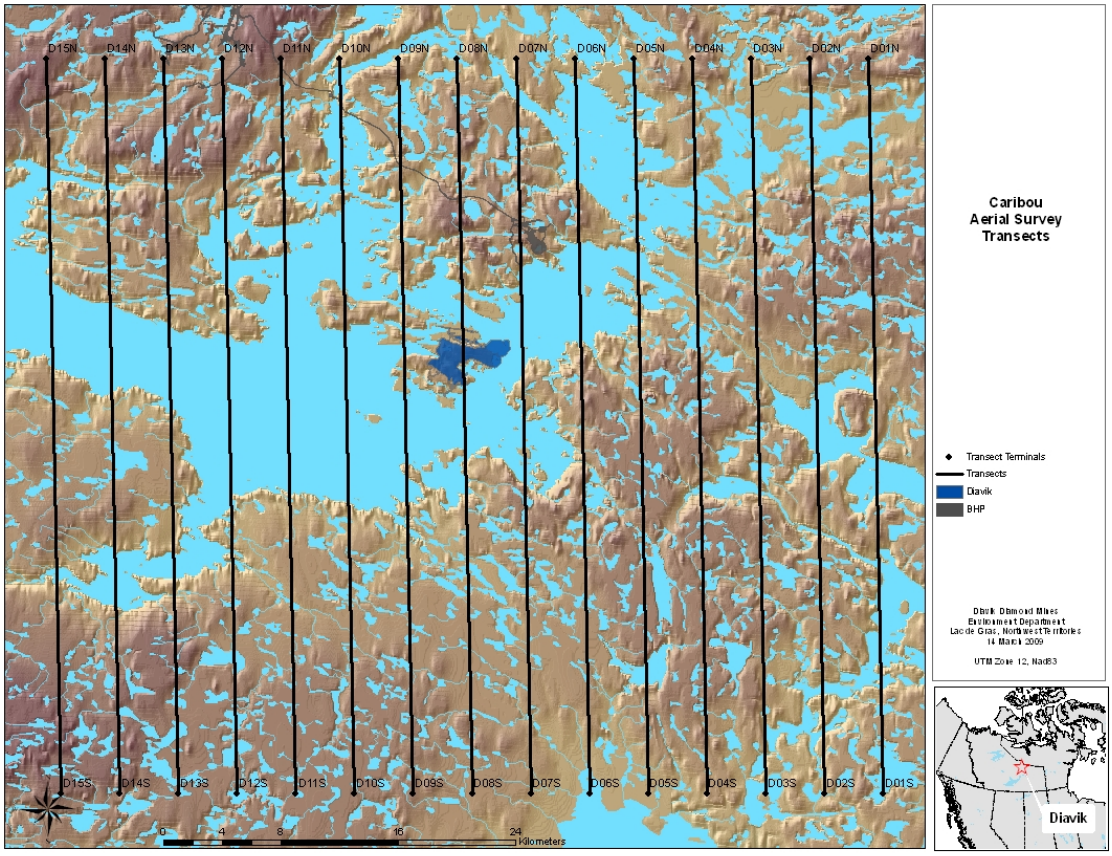
The objective for this program is to determine if the ZOI from mining activities is greater or less than predicted. The following section summarizes the methods used and results obtained from aerial surveys. The impact prediction found in the EER (Wildlife, 1998) is:

> ***The zone of influence from project-related activities would be within 3 km to 7 km.***

Methods

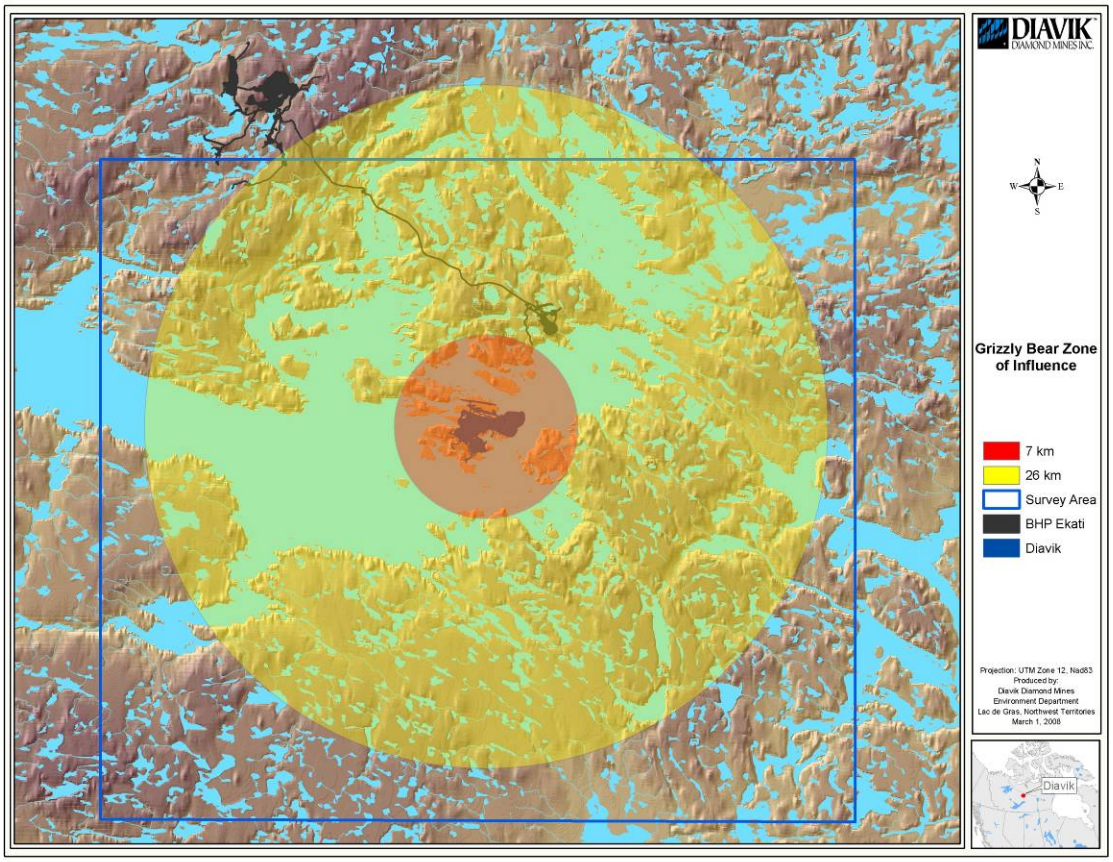
From 2002 through 2008, DDMI has completed weekly aerial surveys, when weather permitted, within a study area that surrounds the mine site (Figure 3-1). Surveys were typically completed from late April through October to collect information on caribou numbers, habitat type associated with the caribou groups, and the dominant activity of caribou with respect to distance from the Diavik mine site. Observations were separated into the northern (spring) and southern (post-calving) migration periods. The northern migration includes all observations before June 30, and the southern migration includes observations following June 30. All transects were surveyed, except for mid-June to mid-July, when every second transect was flown to coincide with fewer numbers of caribou within the study area. A helicopter was used and all surveys were completed at 120 m to 180 m above ground level (agl) at a speed of 145 km to 160 km per hour.

Figure 3-1 Aerial survey transects - 2008



In response to a statistical analysis conducted in 2005 (Golder), the aerial survey area has expanded and now covers over 2867 square kilometres (km^2). Fifteen transects were spaced 4 km apart, and the observation width along transects was 1200 m, which generated 31% coverage (901 km^2) of the study area (Figure 3-1). The purpose of this change was to expand observations a distance of 30 kilometres in each direction from the mine (with the exception of the north due to BHP-Billiton's operation), in order to account for the possibility of a ZOI that was greater than originally predicted (26 km vs 7 km) (Figure 3-2).

Figure 3-2 Aerial survey area showing 7 km and 26 km zone of influence overlay



Diavik's caribou aerial surveys are normally conducted for both the northern and southern migrations, beginning in May. In 2008 surveys began on 3 May and were flown once per week until 25 October, as weather permitted (n = 23 surveys). Surveys of every second transect were completed from 14 June through 5 July 2008 (n = 4 surveys).

Habitat type associated with the caribou groups was recorded. During the northern migration, habitat was classified as heath tundra/snow-covered tundra, frozen lakes, sedge wetland and other (esker, disturbed, boulders, and bedrock). During the southern migration, habitat classifications included heath tundra, esker, sedge wetland, riparian shrub and other (water, bedrock, disturbed, and boulder).

Analysis of point observations of caribou behaviour was classified as feeding/resting (bedded, feeding, or standing) or moving (running, walking, or trotting) for the northern and southern migration period, and all observations were classified based on location relative to the mine site (≤3 km and >3 km). Data collected for observations of caribou behaviour greater than 3 km from site only include observations made within the Diavik wildlife study area.

Results

For information on historical trends during the northern migration, please refer to the report titled, "Analysis of Environmental Effects from the Diavik Diamond Mine on Wildlife in the Lac de Gras Region" (Golder, 2008).

Northern Migration

Similar to previous years, no caribou were observed within the 3 km area around the DDMI site during the 2008 northern migration aerial surveys (Figure 3-3). Since 2002, five groups of caribou have been observed within 3 km of site; three groups in 2002, one group in 2003, and one group in 2004. None of these groups were recorded as moving, thus 100% of the groups observed within 3 km of the mine between 2002 and 2004 were feeding, standing, or bedded (Figure 3-4).

The number of caribou groups observed at distances greater than 3 km from site in 2008 was 100 (Figure 3-4). Of these, 78 groups were feeding and resting, and 22 groups were moving. Since 2002, the average (calculated as geometric mean) proportion of caribou groups observed feeding and resting greater than 3 km from the mine was 66.7% (n = 347), and has ranged from 50% to 78%. In contrast, about 33% of caribou groups were walking, trotting, or running when initially observed from the helicopter.

Figure 3-3 Distribution of Caribou within the DDMI Study Area Based on Aerial Survey Data - 2008 Northern Migration

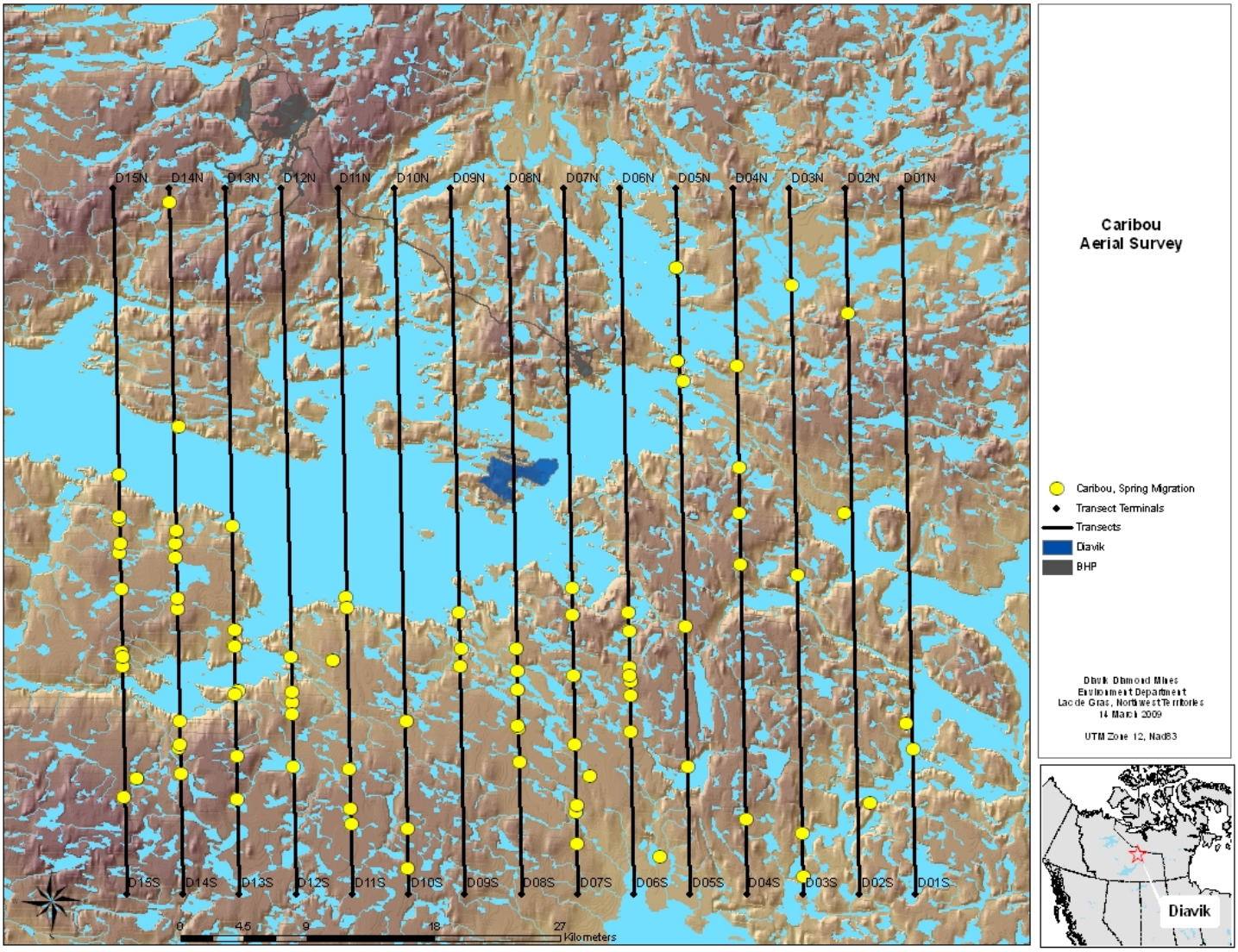
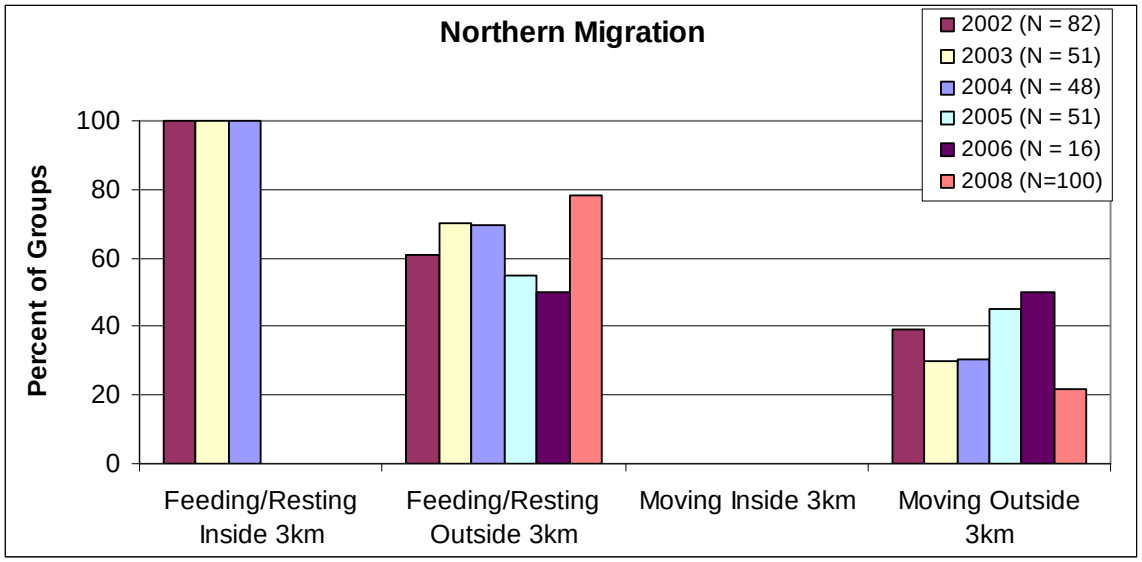


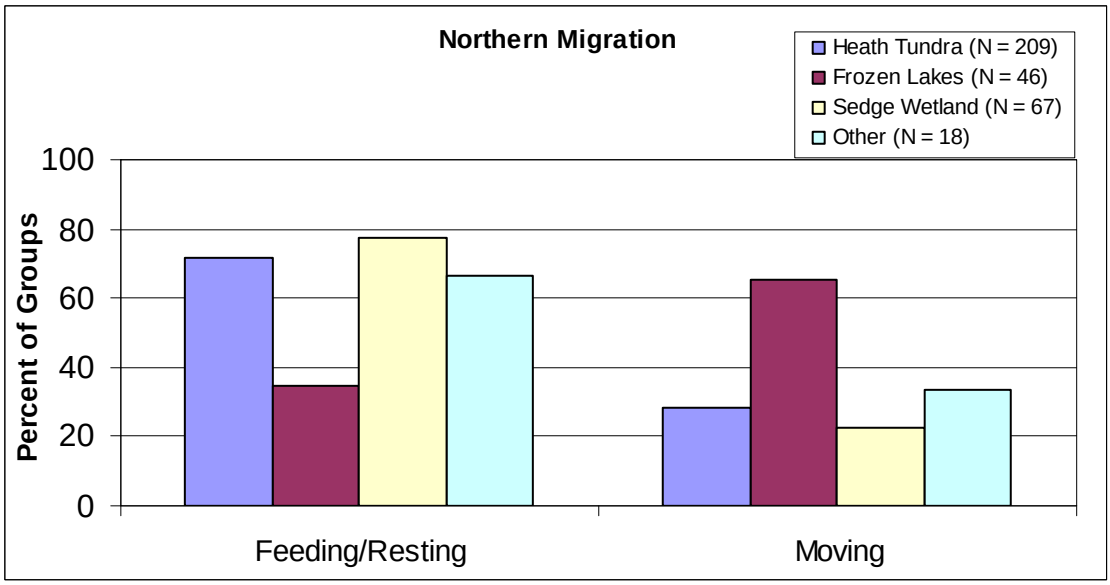
Figure 3-4 Behaviour of Caribou Based on Aerial Survey Data Within and Greater than 3 kilometres of the Diavik Site - 2002 to 2008 Northern Migration



**No data available for 2007 due to issues with wildlife permit*

After pooling the data from 2002 through 2008, point observations of caribou behaviour appeared to be influenced by habitat during the northern migration. For example, 65% of caribou groups observed on frozen lakes were moving, while 66% to 78% of groups located on heath tundra, sedge wetland or other terrestrial habitat were feeding, standing, or bedded (Figure 3-5).

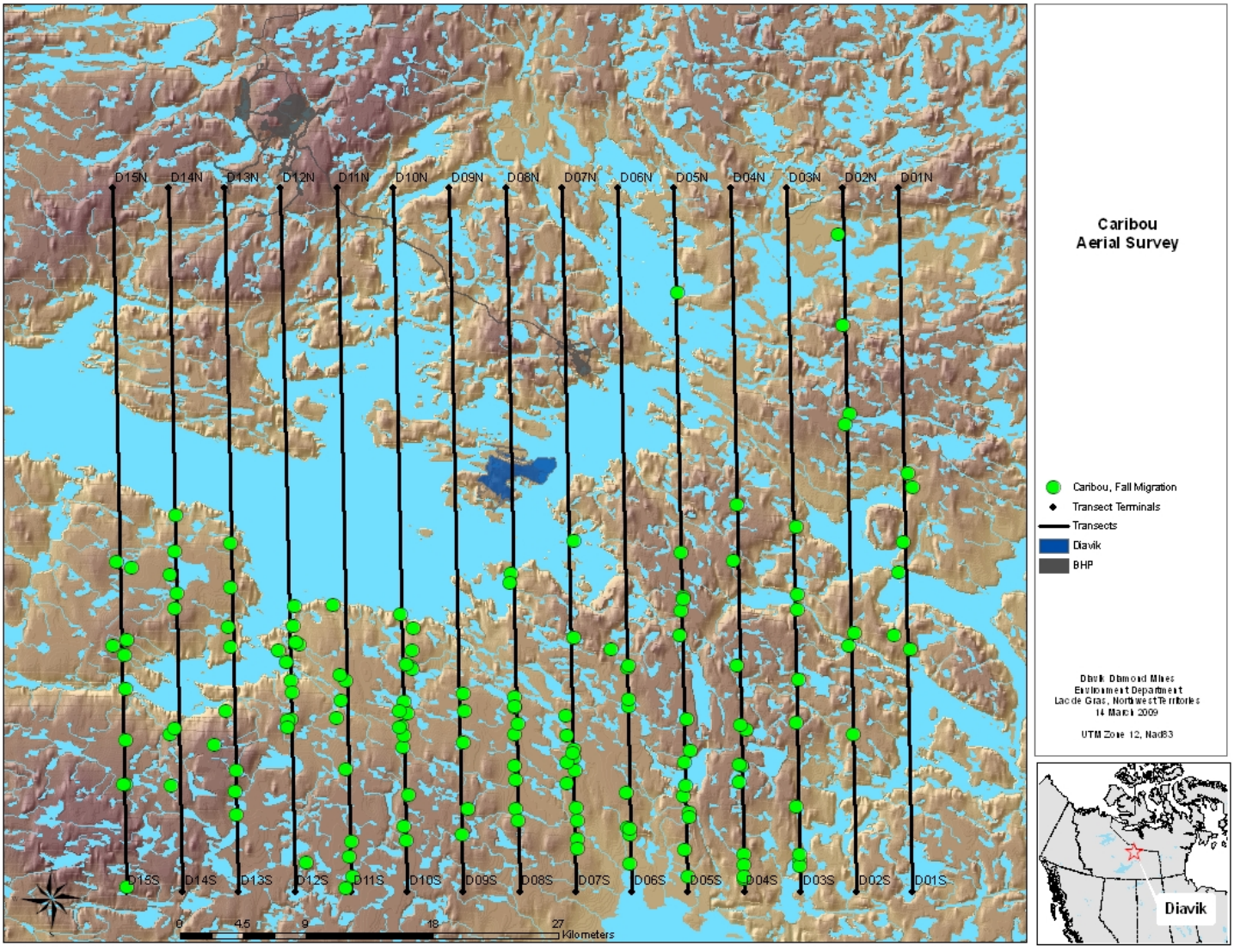
Figure 3-5 Behaviour of Caribou among Habitats Within the Diavik Study Area - Northern Migration, 2002 to 2008



Southern Migration

No caribou were observed within 3 km of the mine site during the southern migration aerial surveys (Figure 3-6). Since 2002, ten groups of caribou have been observed within the 3 km of the mine; one in 2007, three in 2004, one in 2003, and five in 2002. Of these ten groups, 40% were recorded as moving, and 60% were recorded as feeding or resting.

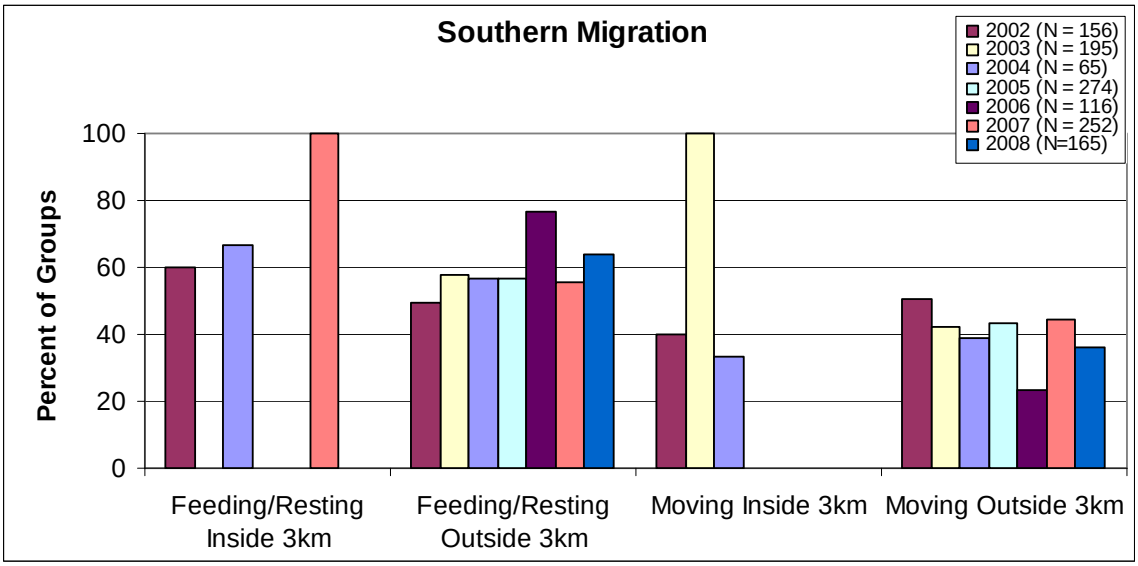
Figure 3-6 Distribution of caribou within the DDMI study area based on aerial survey data – 2008 southern migration



In 2008, the number of caribou groups observed greater than 3 km from the mine (n = 165 groups) was comparable to most other years. Since 2002, the mean proportion of groups

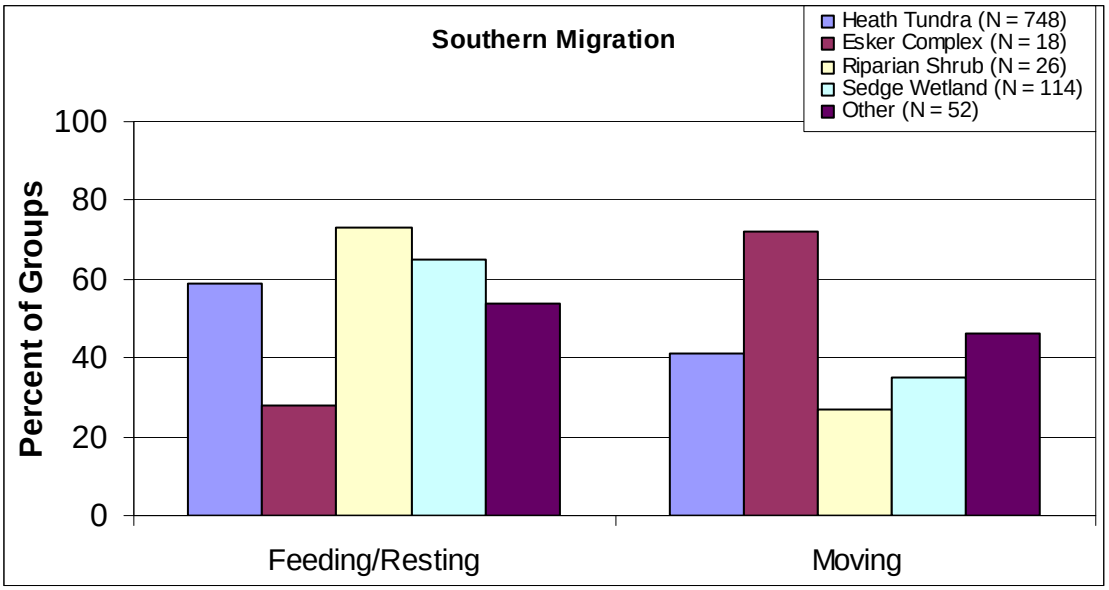
exhibiting feeding and resting behaviour, greater than 3 km from the mine, was 55% (n = 1,220) and has ranged from 50% to 77% (Figure 3-7).

Figure 3-7 Behaviour of caribou based on aerial survey data within and greater than 3 km of the Diavik site – 2002 to 2008, southern migration



After pooling data across years, point observations of caribou group behaviour also were strongly associated with habitat during the southern migration. For example, 74% and 73% of groups observed in sedge wetland and riparian shrub habitat were feeding or resting, respectively, while 28% of caribou groups on eskers were feeding or resting (Figure 3-8). Similarly, the proportion of groups feeding and resting in heath tundra was higher than the fraction of groups observed walking, trotting, or running. In the other habitats, the chances of observing groups resting or moving were similar.

Figure 3-8 Behaviour of caribou among habitats within the Diavik study area – 2002 to 2008, southern migration



Summary

In summary, 15 caribou groups have been located within 3 km of the mine site during aerial surveys from 2002 through 2008. Five groups were observed during the northern migration and ten during the southern migration. The small number of groups observed within 3 km of the mine prevents statistical comparisons of point observations of caribou behaviour with groups greater than 3 km from the mine. This 3 km buffer zone around the mine was previously assessed as the predicted ZOI. Impact predictions relating to the ZOI have been more fully tested through a comprehensive analysis of regional caribou data (Golder 2008). This analysis suggests an increased ZOI for the mine, ranging from 22 to 29 km.

Since 2002, the average proportion of caribou groups observed feeding or resting greater than 3 km from the mine was 66% (range = 50% to 70%) during the northern migration and 58% (range = 50% to 77%) during the southern migration. Although these values largely ignore the influence of habitat, weather, and mine-related factors on caribou behaviour, the data do show that, on average, approximately 60% of caribou observed during aerial surveys were feeding or resting at the time of detection. More information relating to the influence of factors such as habitat, weather, and insect activity levels on caribou behaviour is provided using regional data every third year (Golder 2008).

During the past five years, DDMI has had limited opportunities to study caribou behaviour on the ground through scanning observations. During 2003, 2004, 2005, 2006 and 2007, ground observations of caribou behaviour were successfully completed for 12, 14, 5, 8 and 24 caribou groups, respectively. During 2008, DDMI was able to successfully complete only 7 behavioural observations. All of these observations were completed away from the mine site, as the number

of caribou on East Island was low. DDMI acknowledges that more effort must be expended at obtaining ground-based behavioural observations of caribou at various distances from the mine site in order to effectively analyze the data. Diavik is currently assessing options for improving this aspect of our monitoring program for 2009 by working with BHP-Billiton to obtain more representative samples throughout the study area. Incorporation of group composition data collection is being considered for inclusion in this program.

Distribution of Movement

Due to construction and operations of mining areas, infrastructure, roads and an airstrip, a deflection of caribou movements may be associated with mining activities (DDMI, 1998b). Information collected from aerial surveys and caribou collar locations is used to examine the distribution of caribou within the wildlife study area. These observations are then compared with predicted trends in movement.

The following section describes the methods used and results obtained from aerial surveys and information provided by caribou collar locations supplied by Environment and Natural Resources (ENR). The impact prediction found in the EER (DDMI, 1998) is:

> ***During the northern (spring) migration, caribou would be deflected west of East Island and during the southern migration (fall), caribou would move around the east side of Lac de Gras.***

Methods

Aerial survey areas and methods are described in Section 3.2 and Appendix II. BHPB revised their caribou survey in 2006, and no longer conducted joint surveys with DDMI. As a result, the survey area for Diavik's caribou aerial surveys was expanded in 2007. Previously, the BHPB survey area was separated into two sectors (A and B), as it was apparent that these were natural geographic areas of caribou movement within the Lac de Gras area (Golder, 2004). Sector C previously consisted of the Diavik wildlife study area and sector D contains East Island where the Diavik mine is located. For 2007, the area surveyed in sector C has increased again from 2006 (681.4 km^2 vs 332.9 km^2) and includes areas outside the wildlife study area (Figure 3-1), except for East Island which remains as sector D.

Information was evaluated to provide metrics such as first and last date observed, maximum number, total number, and density of caribou within each of the sectors. Density of caribou was calculated as the number of caribou per survey per survey area. An important reminder while reading this section is that total number of caribou observed (actual caribou counted) will be reported throughout this portion of the report.

Table 3-1 Areas (km^2) surveyed during the northern and southern migration, 2008

Sector	Northern Migration (km^2)	Southern Migration (km^2)
C	681.4	269.3
D	6.5	6.5

For the southern migration, deep water (412.1 km^2) was excluded from the estimated survey area (Table 3-1), and density was compared to annual estimates from sector C for 2002 through 2006 (surveyed area for sector C = 221.0 km^2; DDMI, 2006).

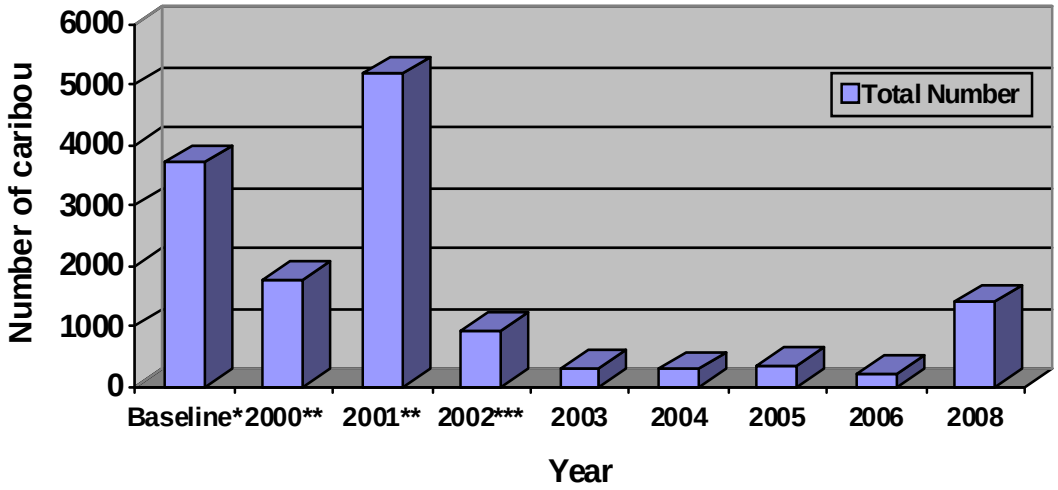
ENR provided weekly data on the geographic location of collared cows and this information was used to show general locations of the Bathurst caribou herd during migration periods (Gunn *et al.*, 2002). Movements of collared Bathurst caribou during the 2008 northern and southern migrations are included in this report. Historical data for 2002 to 2007 caribou collar locations can be found in Golder (2005, 2008).

Results

Northern Migration

Although differences exist in aerial survey methods used throughout baseline (Penner, 1998), construction and post-construction, general observations can be made. In 2008, 1,393 caribou were observed in the Diavik wildlife study area during the northern migration, similar to numbers observed in 1997 (1,400 caribou), 2000 (1,700 animals) and 2002 (979 caribou). In contrast, approximately 6,000 animals were observed during the northern migration in 1996, and an estimated 5,000 caribou were counted in 2001 (Figure 3-9). No caribou were observed on the East Island during the northern migration period in 2008, or in 2001, 2004, 2005 and 2006.

Figure 3-9 Total Number of Caribou in the DDMI Wildlife Study Area - Northern Migration



**Baseline observations, 1996-1997. Consists of mean numbers on east and west islands (Penner, 1998).*
***Caribou numbers based on East Island ground counts and aerial survey observations.*
****Caribou numbers based on weekly aerial surveys of Diavik's wildlife study area (2002-present).*

The total number and average density of caribou during the northern migration in 2008 is provided in Table 3-2. The total number of caribou observed in Sector C during 2008 is the highest recorded from 2002 to present. The average number of caribou per survey was similar to that of 2002, but with a lower standard deviation. The date that caribou were first sighted during 2008 (8 May) was similar to 2005 and within 1 week of most other years; the exceptions being 2002 and 2004 with caribou noted on 18 & 23 April, respectively. No caribou were observed in sector D (East Island) during the northern migration.

Table 3-2 Caribou Observations in Sector C, Northern Migration, 2002-2008

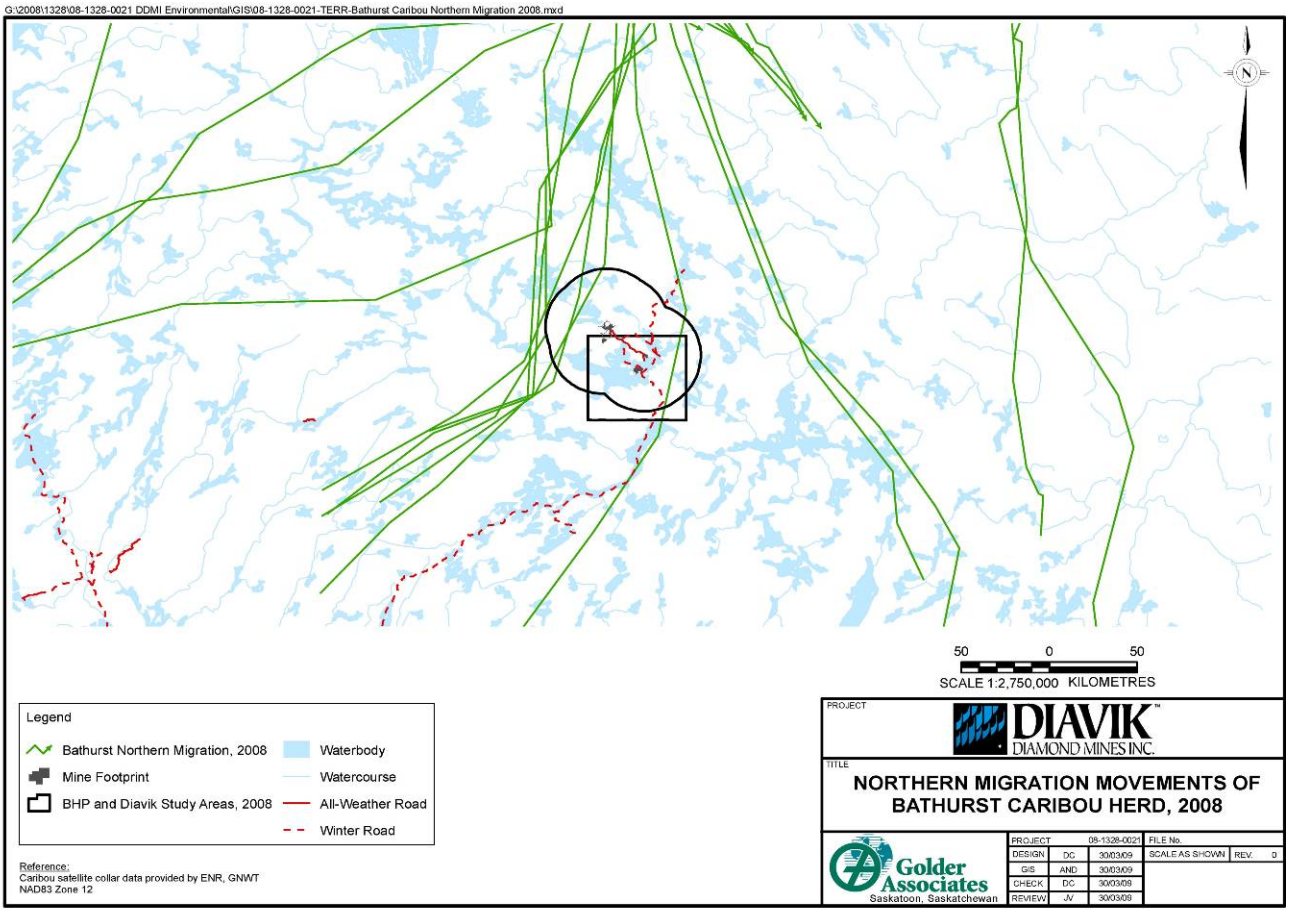
	2002 (n = 10)	2003 (n = 10)	2004 (n = 11)	2005 (n = 10)	2006 (n =5)	2008 (n=8)
Survey Date Caribou First Observed	18 April	2 May	23 April	7 May	14 May	8 May
Survey Date Caribou Last Observed	14 June	13 June	19 June	11 June	27 May	14 June
Maximum Caribou Observed in Single Survey (survey date)	606 (24 May)	114 (30 May)	83 (6 June)	60 (14 May)	49 (27 May)	90 (10 May)

	2002 (n = 10)	2003 (n = 10)	2004 (n = 11)	2005 (n = 10)	2006 (n =5)	2008 (n=8)
Total Caribou Observed in Sector	921	302	295	361	74	1393
Number of Surveys Caribou were Observed	6	7	8	7	2	6
Mean ± 1SD Caribou / Survey / km^2	0.28 ± 0.56	0.13 ± 0.22	0.10 ± 0.09	0.12 ± 0.13	0.02 ± 0.05	0.26 ± 0.28

n = number of surveys; no data is available for 2007 due to permitting issues

Data from satellite-collared caribou suggested that females in the Bathurst herd traveled west of the mine during the 2008 northern migration (Figure 3-10).

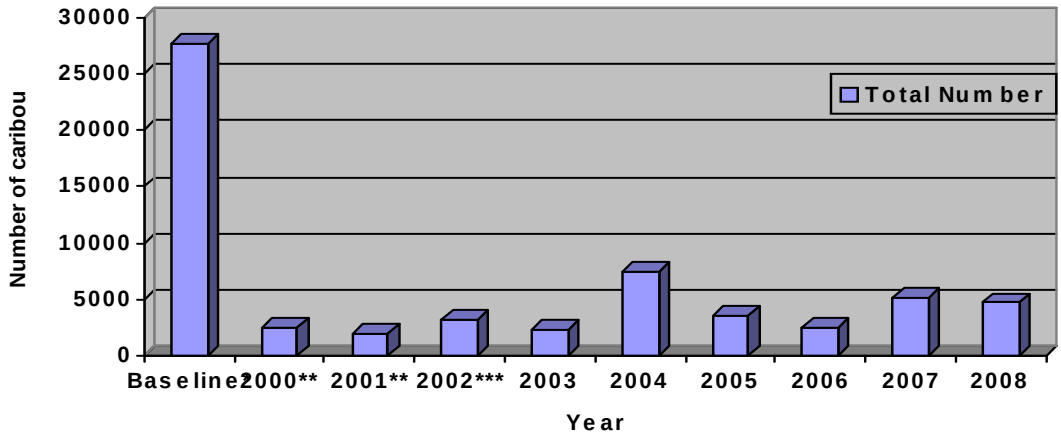
Figure 3-10 Caribou Collar Locations during the Northern Migration - 2008



Southern Migration

In 2008, 4,718 caribou were observed in the Diavik wildlife study area during the southern migration. This is similar to the number observed during 2007 (5160 animals), while it slightly exceeds the average number of caribou observed from 2000 – 2003, 2005 and 2006 (Figure 3-11). The average number of caribou observed during those years was 2,650, and ranged between 1,916 (2001) and 3,507 (2005) animals. Caribou numbers throughout the 2008 season were consistently distributed among groups of 1 to 1,000 individuals, with only one observation of a larger group of 1,000 animals on 27 September.

Figure 3-11 Total number of caribou in the Diavik wildlife study area – southern migration



**Baseline observations (1995-1997). Consists of mean numbers on the east and west islands of Lac de Gras (Penner, 1998)*
***Caribou numbers based on East Island ground counts and aerial survey observations.*
****Caribou numbers based on weekly aerial surveys of Diavik's wildlife study area (2002–present).*

The date that caribou were first sighted in the Diavik study area (sector C) was similar to previous years (Table 3-3). With the exception of 2004 and 2006, the number and density of caribou in the study area during the southern migration has been similar among years. Caribou surveys are continued in the fall until no caribou are observed during the survey. In previous years, this typically occurred at the end of September. During 2008, caribou surveys were conducted up to 25 October, and caribou were last observed on this date. Additional surveys were attempted but weather conditions did not allow for travel in the helicopter. Data for the past 3 survey years (2006 - 2008) include approximately three or four additional surveys relative to 2002 through 2005. During 2008, four surveys were completed after 30 September, and these accounted for 2,154 caribou.

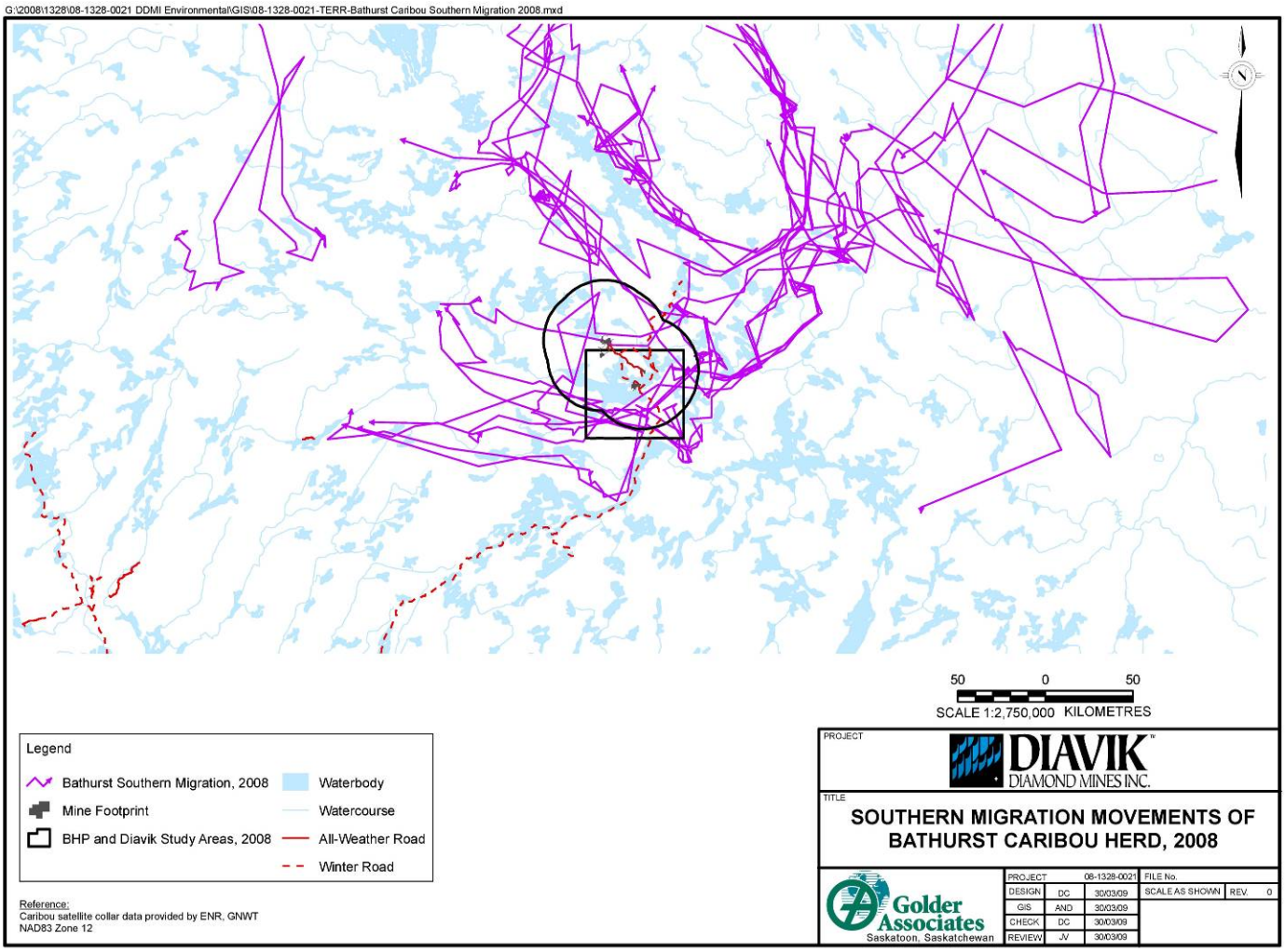
Table 3-3 Caribou Observations in Sector C, Northern Migration, 2002-2008

	2002 (n = 11)	2003 (n = 12)	2004 (n = 14)	2005 (n = 14)	2006 (n =17)	2007 (n=16)	2008 (n=15)
Survey Date Caribou First Observed	26 July	25 July	18 July	2 July	8 July	28 July	19 July
Survey Date Caribou Last Observed	23 Sept	19 Sept	25 Sept	24 Sept	04 Nov	6 Oct	25 Oct
Maximum Caribou Observed in Single Survey (survey date)	2340 (26 July)	1660 (01 Aug)	7000 (23 July)	500 (30 July)	1351 (16 Sept)	3094 (8 Sept)	1000 (27 Sept)
Total Caribou Observed in Sector	3088	2280	7399	3507	2120	5160	4718
Number of Surveys Caribou were Observed	8	9	9	11	12	11	14
Mean $\pm$ 1SD Caribou / Survey / km^2	1.3 ± 3.1	0.86 ± 2.15	3.04 ± 9.51	1.13 ± 1.73	0.41 ± 1.06	0.69 $\pm$ 1.35	1.09 $\pm$ 2.01

n = number of surveys

Collar maps for the southern migration suggest that cows travelled east and through the southern portion of the study area during the fall migration period (Figure 3-12). The distribution of caribou groups observed during aerial surveys also indicated groups were recorded east and south of Lac de Gras (Figure 3-6). A comprehensive analysis also showed that from 2002 to 2007, with the exception of 2006, the majority of collared caribou traveled adjacent to or through the southeast corner of the study area (Golder, 2008). Data collected for the southern migration appears to agree with the impact prediction found in the EER (DDMI, 1998), stating that caribou would travel east of the mine site during the southern migration.

Figure 3-12 Caribou collar locations during the southern migration - 2008



Summary

The number of caribou observed within the Diavik wildlife study area was higher during baseline (1996 to 1997) than from 2000 through 2008, most notably during the southern migration. However, data from 2002 to 2006 (aerial surveys) show relatively constant numbers, with the exception of 2004, 2007 and 2008. The particular factors associated with this pattern are not known, but are likely associated with changes in aerial survey methods, variables influencing the geographic distribution of caribou within their annual home range and changes in population size. For example, recent information collected by ENR (2006) suggests that the number of females in the Bathurst herd has decreased by approximately 63% since 1996. Some studies have shown that long-term changes in habitat condition, and caribou foraging and movement patterns can be associated with periodic range shifts and large fluctuations in population size (Messier *et al.*, 1988; Ferguson *et al.*, 2001). Thus, there are a number of factors that can affect the annual

distribution and movement of caribou across their home range, which can create year-to-year changes in the abundance of animals in the study area, and other local areas (*e.g.*, communities) within the Slave Geological Province.

ENR noted concerns relating to the reduced use of habitat around the mine site, as it may relate to either dust or noise. DDMI is currently conducting noise monitoring to determine levels near the mine, as well as background levels away from the mine. While there are no noise guidelines for wildlife, this information can assist in determining relative differences in caribou occurrence and density at various distances from the mine. DDMI undertakes dust control procedures during the summer months. Dust control practices include watering of roads, use of EK-35 (an approved dust suppressant) on the helipad, apron, taxiway and parking lot at the airport and mat blasts for smaller construction blasts. Our current crusher operates using a wet-system for dust suppression and the new crusher building currently being commissioned is enclosed within a building to further reduce fugitive dust from processing rock.

Relative to 2002 through 2007, the timing of the first caribou sighted in the study area during the northern migration in 2008 (8 May) was similar to other years; the earliest sighting for a caribou across all years occurred in 2002 on 18 April. For the southern migration, timing in 2008 was similar to previous years, and was approximately two to three weeks later than in 2005 and 2006. Explanations for this pattern are not currently known. Temporal changes in occurrence of caribou in the study area may be related to food quality and quantity on the calving grounds and summer range, or random variation in the timing of herd movements and distribution.

During southern migrations from 2002 to 2005, the number and mean density of caribou was highest in sector C. In particular, the location of caribou groups observed during aerial surveys showed that most of the largest groups were observed in the southeast corner (sector C) of the regional study area (DDMI, 2006). These data are supported by the migration paths of collared caribou, which showed that from 2002 to 2005, the majority of collared animals traveled through or adjacent to the eastern portion of the regional study area during the early part of the southern migration (Golder, 2005). Results from 2006 to 2008 also showed a correlation between the distribution of caribou observed in the study area and the movement of satellite-collared animals. This information supports the prediction that caribou would travel east of the mine site during the southern migration (DDMI, 1998).

Golder (2005) completed a comprehensive analysis of the caribou data from 1998 through 2004 within the regional study area for the Diavik and Ekati mines. The results indicated that the estimated ZOI on the probability of caribou occurrence around the Diavik mine ranged from 22 km to 26 km for the northern and southern migration periods. A similar analysis was conducted in 2008 to incorporate data from 2005 through 2007. The range identified for an estimated ZOI remains relatively consistent for the Diavik mine.

Mortality

Mineral development in the Bathurst caribou herd range has caused concerns about increased mortality, which include: ground-vehicle collisions, collisions with aircraft and accidental losses associated with caribou moving in hazardous areas around mining activities (DDMI, 1998b). Mitigation practices and policies have been developed and implemented to reduce the potential for mortalities such as, wildlife have the "right of way" on all haul roads, suspension of blasts when caribou are within the "safe zone" of the blast, and the caribou traffic advisory. The objective for this program is to determine if the number of caribou deaths or injuries associated with DDMI mining activities is greater than predicted. The following section summarizes methods applied and the results produced from incident reporting and road observations. The impact prediction in the Environmental Effects Report (DDMI, 1998b) is:

Project-related mortality is expected to be low.

Methods

Project-related caribou mortalities are monitored in a number of ways. All personnel undergo environmental orientation where it is stipulated that should a wildlife incident occur, an incident report is to be completed. Numerous environmental data collection programs occur on East Island such as water quality sampling and dust and vegetation monitoring programs; any caribou mortalities located during these sampling events are investigated by Environment personnel. Weekly caribou aerial surveys also provide information on observed mortalities.

Results

No project-related caribou mortalities or injuries occurred on East Island in 2008. A summary of natural and mine-related caribou mortalities from baseline through 2008 is provided in Table 3-4.

Table 3-4 Caribou mortalities on East Island

	Baseline*	2000	2001	2002	2003	2004	2005	2006	2007	2008
Natural Caribou Mortalities on East Island	8	7	1	1	0	2	0	0	1	0
Project-related Mortalities	0	0	0	0	0	1	0	0	0	0

**Includes data from 1995-1997*

Recommendations

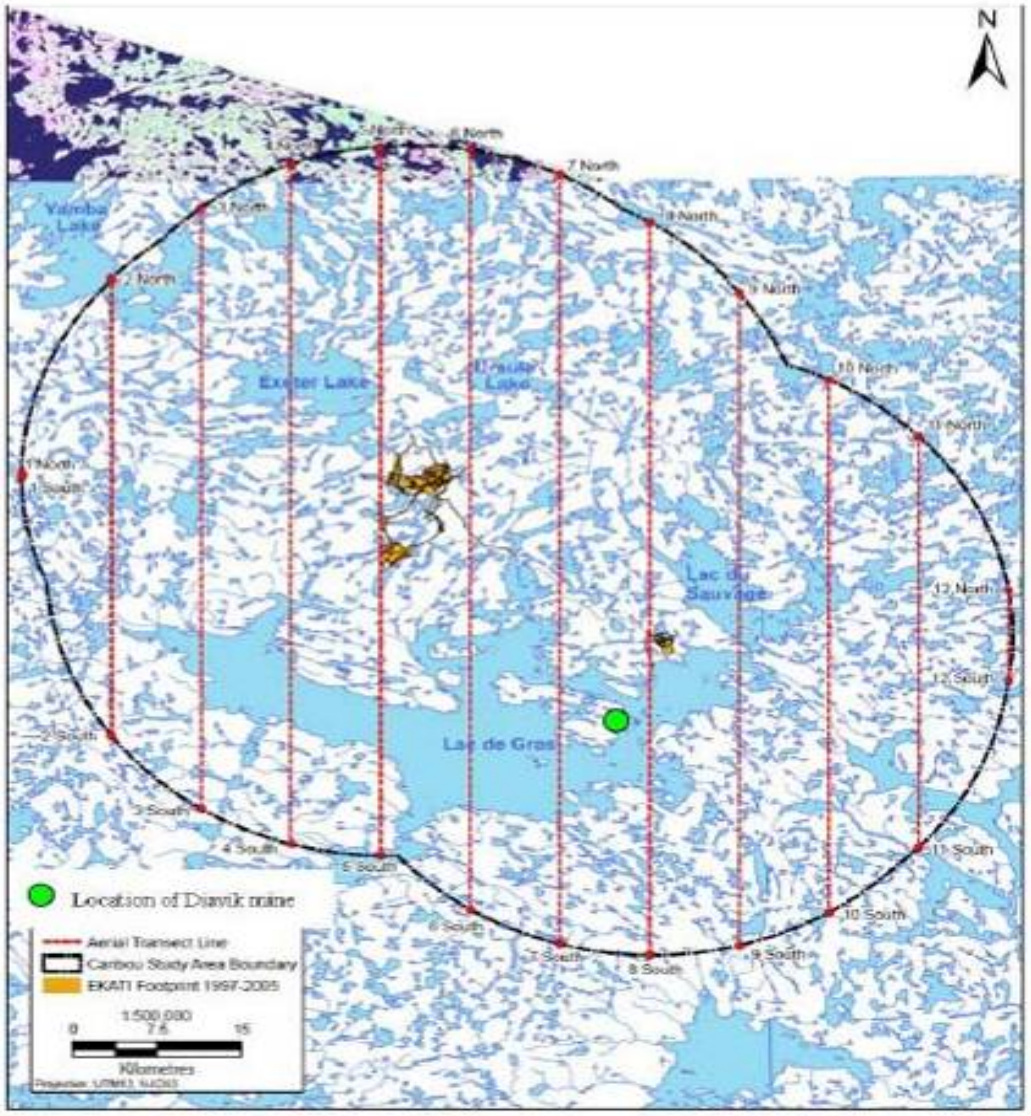
DDMI will continue to conduct aerial surveys during 2009. DDMI is proposing to conduct the aerial survey in conjunction with BHP-Billiton for the 2009 season. This aerial survey program

involves weekly surveys conducted from July through to October (or whenever caribou are no longer present in the study area), and the distance between transects is 8 km (Figure 3-13).

More effort is required to collect data on ground-based caribou behavioural observations in 2009. Diavik and BHP-Billiton are planning to work cooperatively to collect data from areas surrounding the mine and farther away from the mine. This data will be pooled in order to obtain a more thorough representation of caribou behaviour as it relates to distance from the mines.

DDMI plans to explore other opportunities for improving their existing caribou monitoring programs. Government is currently coordinating a review of the results from the caribou surveys conducted at the mines, and it is expected that this review will lead to further discussions around improved methodologies for caribou monitoring. DDMI will continue to ensure that the Environmental Monitoring Advisory Board (EMAB), communities and ENR are kept informed of any proposed changes to the existing programs.

Figure 3-13: 2009 Caribou Aerial Survey Area



Caribou Advisory

The objective of the Caribou Advisory Monitoring program is to make certain that workers are aware of the approximate numbers of caribou on or near East Island. This raises general awareness and ensures employees are alert to the likelihood that mitigation could be triggered. The number of animals on the island and in specific areas dictates which mitigation practices are to be undertaken (e.g. haul road closure, speed reduction).

Methods

Various methods were used to determine whether or not animals were present in the vicinity of East Island; these included reports from pilots and workers, Environment department road surveys on East Island and utilizing the satellite collar locations provided by Environment and Natural Resources (ENR). If animals were reported in the general area, ground surveys were initiated. Ground based surveys are completed by Environment personnel travelling in vehicles along the haul roads twice per day and documenting approximate caribou numbers.

Results

During 2008, the caribou traffic advisory remained at “No Concern” for 365 days, as caribou numbers on the island did not exceed 100 at any given time.

When small numbers of caribou were noted within the vicinity of haul roads, an announcement was made on radio Channel 7 to notify all users of the haul road as to their presence and location.

Recommendations

There are no recommendations for this program.

Caribou Mitigation Effectiveness

Caribou mitigation effectiveness monitoring allows DDMI to evaluate whether or not mitigation designs, policies and practices are effective in preventing adverse impacts to wildlife. Mitigation monitoring allows DDMI to confirm their effectiveness and identify where adjustments in operating strategies are required. Monitoring investigations will determine if herding procedures are successful, if winter road alignment diverts caribou away from East Island, and if there is preferential use of areas impacted by dust (DDMI, 2002). A number of monitoring tasks were conducted in 2008, but few produced results as caribou were not in the vicinity of project infrastructure such as country rockpile ramps and dike landing areas.

Caribou Herding

While on the island, caribou movements were monitored so that project personnel were aware of their presence and relative location. Of particular importance from a safety perspective (both human and animal), caribou movements in the vicinity of the airstrip and blast areas were tracked. When caribou are sighted adjacent to potentially hazardous locations in association with the airstrip and blast areas, DDMI implements its standard operating procedure (SOP) for caribou herding (Appendix II).

Methods

The method used to move caribou away from hazardous areas consisted of the slow advancement of personnel behind the caribou, encouraging the movement of the animals in a safe direction.

Results

DDMI's Caribou Herding SOP was not employed during 2008 as caribou did not frequent the project area.

Use of Dust Deposition Areas

Dust deposition can influence vegetation vigour, snowmelt rates, and changes in vegetation community structure. As a result, caribou may be attracted to these areas (Gunn, 1998). Dust from Diavik's mining activities is monitored and information on this year's program can be found in the Dust Deposition Monitoring Program 2008 Annual Report (DDMI, 2008).

Methods

Road observations were conducted twice a week from the beginning of May to the end of October to determine if caribou were utilizing areas adjacent to haul roads. These roads are chosen to represent the greatest degree of dust deposition. Information collected includes number of

caribou encountered at various distances (on road, <50 m of road, 50-200 m of road and greater than 200 m from the road), dominant behaviour of group, group size and group composition (Appendix II). East Island was divided up into four haul road sections (Figure 5-1) for a total of 9.8 kilometers of roads surveyed.

At the same time that road surveys are conducted, the Processed Kimberlite Containment (PKC) area and rock piles are also monitored. The purpose is to determine if caribou use the PKC and rock piles for insect relief or as a water supply. In addition to worker observations, this program would also help in detecting caribou if they were to become trapped in the PKC.

Figure 5-1 Caribou road observation locations

Results

Caribou road surveys and PKC and rock pile monitoring were conducted on 29 occasions between 5 May and 27 October 2008. No caribou were observed during these surveys. Results are attached to this report as Appendix III.

Recommendations

Observations for mitigation effectiveness will continue to be conducted.

Grizzly Bear

The barren-ground grizzly bear ranges throughout most of the Northwest Territories. Under Federal SARA legislation, it is considered a 'Species of Special Concern' under Schedule 3, as assessed by the Committee on the Status of Endangered Species (COSEWIC, 2002).

Grizzly bears have low population densities, low reproductive rates and are sensitive to human activity (DDMI, 1998b). The barren-ground grizzly bears of the NWT are unique, as they "have not been subjected to the exploitation and habitat changes" and "have remained relatively undisturbed from human activity" (McLoughlin et al. 1999). As such, the grizzly bear is considered 'sensitive' in the Northwest Territories (RWED, 2000).

Impacts to grizzly bears from mining may occur through direct mortality, habitat suitability reduction and direct habitat loss. The focus of the monitoring program is to determine direct habitat loss, level of grizzly bear activity, zone of influence of mining activities and if project related mortalities have occurred.

Habitat loss

Grizzly bears use a wide variety of vegetation and habitats types. Studies of grizzly bears in the Northwest Territories have led to an understanding of their seasonal habitat preferences (McLoughlin et al. 2002a). Loss of habitat may result in negative effects on grizzly bears; for that reason habitat loss is calculated to determine if it is different from the prediction (DDMI 1998b), which is:

> ***At full development, direct terrestrial habitat loss from the project is predicted to be 8.67 km^2.***

Methods

Methods used to determine grizzly bear habitat loss are similar to that described in the Vegetation section.

Results

Cumulative grizzly bear habitat loss on East Island due to mining related activities was 7.06 km^2 (Table 6-1). This loss represents a value up to December 2008 and includes losses prior to 2000 (Figure 2-1). The wildlife study area is approximately 1,200 km^2 (including shallow and deep water) and a loss of 7.06 km^2 represents a loss of 0.59% of habitat available in the wildlife study area. Grizzly bear home ranges, as determined by McLoughlin et al. (2003), are 2,100 km^2 for

females and 7,245 km^2 for males. Within the context of these home range sizes, this represents a loss of 0.34% and 0.10% of an individual female or male home range, respectively. East Island encompasses approximately 20 km^2 of terrestrial habitat; a loss of 7.06 km^2 indicates a loss of 35% of available habitat. Based on McLouhglin et al. (2002b), 23 of 56 grizzly bear dens were located in heath tundra habitat and, currently, the Diavik mine footprint has altered 2.97 km^2 of this habitat type.

During review of the 2007 WMP report, the GNWT requested that all of East Island be considered loss of habitat to grizzly bears due to deterrent actions to move bears on site away from the mine. The figure below (6-1) highlights the area of the mine footprint, including a 500 m buffer around the mine footprint, as the extent to which habitat is unavailable to grizzly bears due to deterrent actions.

Figure 6-1 Habitat loss with 500 m deterrent buffer limiting grizzly bear use

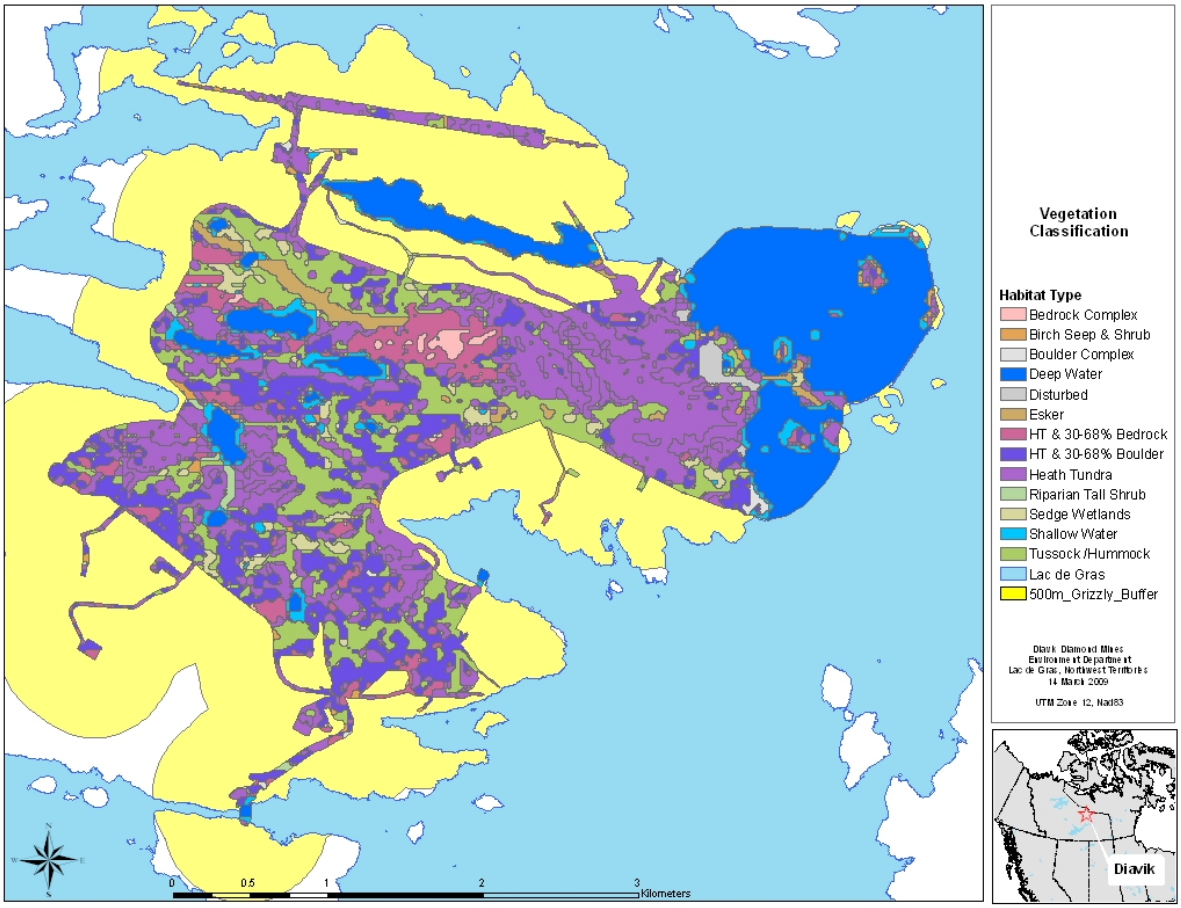


Table 6-1 Predicted versus Actual Grizzly Bear Habitat Loss on East Island

Vegetation / Land Cover Type	Predicted Area Lost (km^2)	Area Lost (km^2) 2000	Area Lost (km^2) 2001	Area Lost (km^2) 2002	Area Lost (km^2) 2003	Area Lost (km^2) 2004	Area Lost (km^2) 2005	Area Lost (km^2) 2006	Area Lost (km^2) 2007	Area Lost (km^2) 2008	Total Area Lost (km^2)
Heath Tundra	**3.68**	0.65	0.80	0.41	0.14	0.37	0.24	0.14	0.20	**0.04**	**2.97**
Heath Boulder	**1.89**	0.15	0.30	0.19	0.08	0.23	0.11	0.17	0.20	**0.06**	**1.49**
Tall Shrub	**0.03**	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	**0.00**	**0.03**
Bedrock	**0.07**	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.06**
Tussock/Hummock	**1.64**	0.19	0.26	0.19	0.15	0.22	0.18	0.08	0.10	**0.07**	**1.42**
Sedge Wetland	**0.26**	0.02	0.00	0.02	0.01	0.04	0.07	0.00	0.00	**0.04**	**0.21**
Esker	**0.16**	0.13	0.00	0.00	0.00	0.00	0.03	0.00	0.00	**0.00**	**0.17**
Birch Seep	**0.11**	0.01	0.02	0.02	0.01	0.02	0.00	0.00	0.00	**0.00**	**0.09**
Boulder Field	**0.05**	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	**0.00**	**0.04**
Heath Bedrock	**0.78**	0.06	0.20	0.08	0.03	0.04	0.05	0.04	0.00	**0.05**	**0.58**
Total	**8.67**	**1.25**	**1.62**	**0.94**	**0.42**	**0.93**	**0.00**	**0.43**	**0.50**	**0.26**	**7.06**

**Totals Area Lost includes data up to 2001 - discrepancies across the rows results from the rounding of numbers in annual columns for presentation purposes*
***Values in red represent actual habitat loss equal to or exceeding that predicted*

Presence

Mining activities can impact the presence of grizzly bears due to disturbance and habitat loss (DDMI, 1998b). Vegetation loss and changes to caribou distribution from mining activities may also impact the presence of grizzly bears (Gau and Case, 1999). Consequently, monitoring was conducted to determine if mining activities influence the presence of grizzly bears in the study area. The predicted effect is:

> ***Mine development is not predicted to influence the presence of grizzly bears in the area.***

Methods

Based on diet selection (Gau et al. 2002) and seasonally preferred habitats (McLoughlin et al. 2002a), the presence of bear sign within and adjacent to seasonal high quality habitats (sedge wetland in June and riparian shrub in August) was used as an index of habitat utilization by grizzly bears within the Diavik study area (Golder 2008).

A total of 36 plots were randomly selected within the study area, consisting of a 500 m by 500 m area and comprised of at least 25% of either sedge wetland or riparian shrub habitats (Figure 6-2). Sedge wetland plots were surveyed in early July, while riparian shrub plots were surveyed in early August. Each plot was searched for bear sign for approximately one hour by two observers. All bear sign (dens, diggings, tracks, scat, hair and kill sites) were documented. Only sign determined to have been left in this year (i.e. since spring den emergence) were included in the analysis. Plots with a bear present were considered to contain fresh sign, but not surveyed. This represented the sixth full year of data collection, as only a limited number of plots were surveyed in 2002.

In addition, incidental observations of grizzly bears on East Island and within the DDMI wildlife study area were recorded and used as a measure of grizzly bear presence within the study area.

Results

Habitat Plots

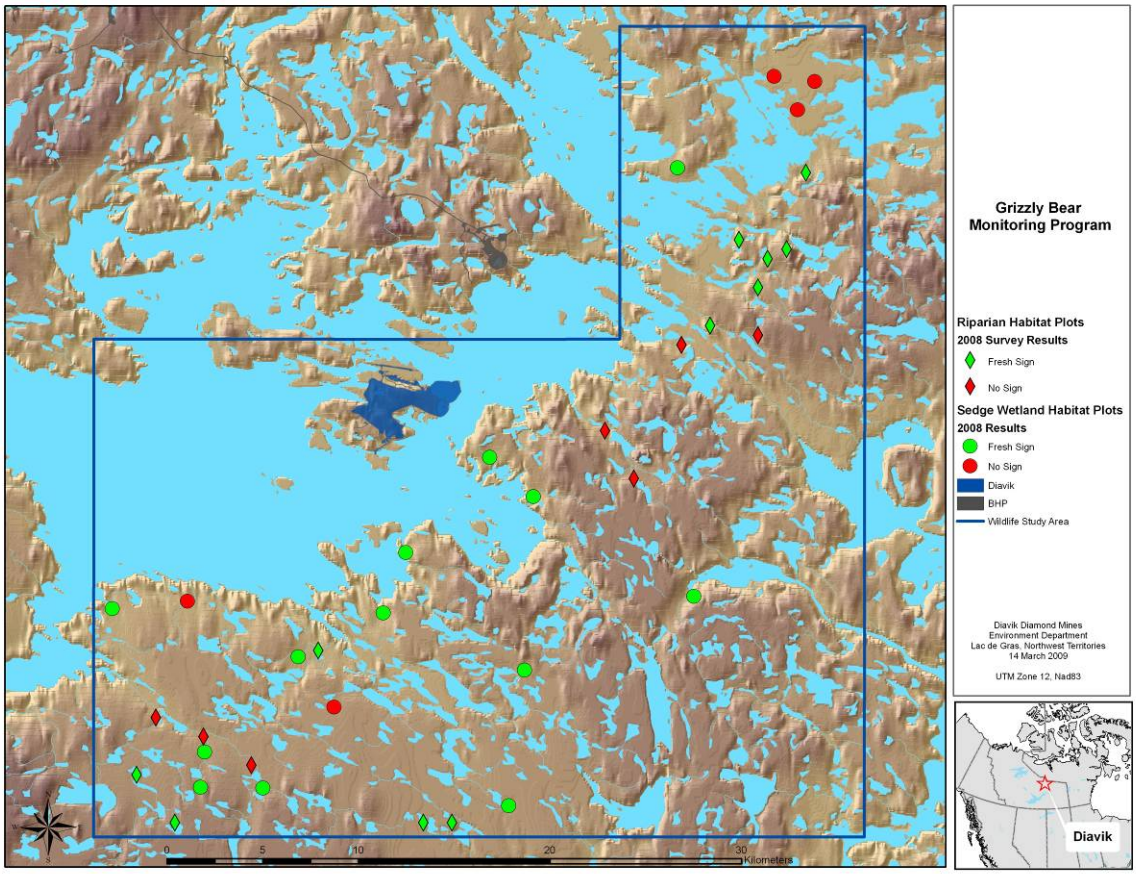
Eighteen sedge wetland habitat plots were surveyed for sign of grizzly bear presence from 3 to 5 July 2008. Thirteen sedge wetland plots contained sign, primarily digs and tracks (Table 6-2), indicating bears had been present in 72% of sedge wetland plots surveyed this year (Figure 6-2).

Surveys in eighteen riparian shrub habitat plots were conducted from 5 to 19 August 2008. Grizzly bear use was confirmed in 61%, or 11 of 18 plots surveyed this year (Figure 6-2). Confirmation was obtained through the presence of numerous fresh digs, some tracks and scat (Table 6-2). One (1) kill site and one (1) bear sighting (sow and cub) were also recorded.

Table 6-2 Grizzly Bear Sign Observations in Survey Plots, 2002 to 2008

	2002	2003		2004		2005		2006		2007		2008	
	Riparian	Riparian	Sedge	Riparian	Sedge	Riparian	Sedge	Riparian	Sedge	Riparian	Sedge	Riparian	Sedge
# Plots Surveyed	8	18	17	18	18	17	18	18	18	18	18	**18**	**18**
Bed	0	3	2	0	0	0	0	0	0	0	0	**0**	**0**
Den	0	0	0	0	0	0	1	0	0	0	0	**0**	**0**
Dig	2	11	6	3	8	1	1	11	1	7	5	**15**	**22**
Track	0	6	3	0	3	1	1	0	1	1	1	**1**	**10**
Scat	0	2	0	3	1	8	0	9	0	5	2	**1**	**0**
Hair	0	2	0	0	0	0	0	0	0	0	0	**0**	**0**
Kill Site	0	1	0	2	1	2	0	0	0	0	0	**1**	**0**
Bears Present	1	1	1	1	0	0	3	3	0	0	0	**1**	**0**
Total	**3**	**26**	**12**	**9**	**13**	**12**	**6**	**23**	**2**	**13**	**8**	**13**	**32**

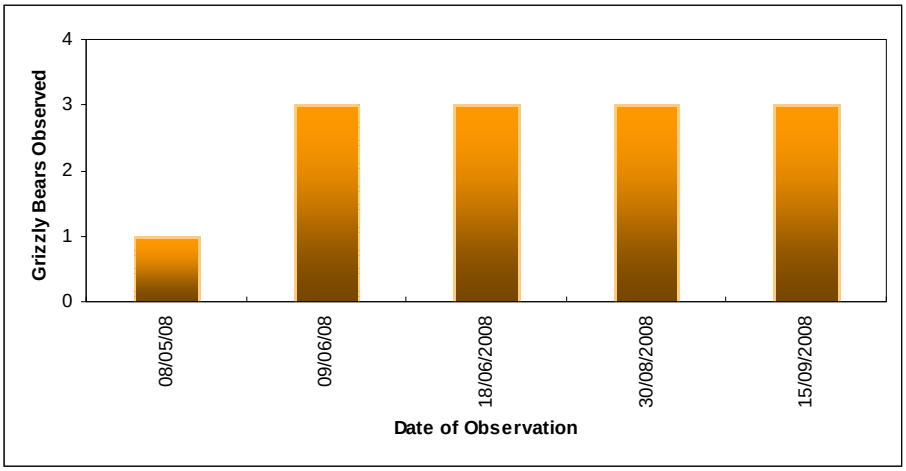
Figure 6-2 Grizzly Bear Plot Locations Indicating Results – 2008



Incidental Observations

Grizzly bear incidental observations on East Island in 2008 totalled 5 sightings over 5 days (Figure 6-3), with 13 individuals recorded by Environment personnel (Appendix IV). It is important to note however that the actual number of bears on site is unknown, as the same bear(s) may be observed on multiple occasions.

Figure 6-3 Frequency of Incidental Observations – Grizzly Bears



The first bear sighting occurred on 8 May off site at an Exploration drill site, and on 9 June on site. The last recorded observation was on 15 September (Figure 6-3). As with previous years, the number of bear observations on site was greatest during the early spring, May and June, when bears have emerged from their dens, and can easily access the mine site across the lake ice prior to the open water season. In general Diavik attempts to reduce residency time of any one bear on the mine site through the use of deterrents.

Sow and cub bear tracks – 09 June 2008

Summary

The results generated by conducting grizzly bear sedge wetland and riparian shrub habitat surveys in 2008 provide evidence to suggest that grizzly bears continue to be present and maintain active home ranges within the DDMI wildlife study area. Results for sedge wetland areas exceeded those of previous years, where 72% of plots contained fresh sign. This is the first year in which sedge wetland observations outnumbered those of riparian shrub habitat. Results from this year's riparian plots were equal to those of 2007, with 61% of plots containing sign. Results from previous years were similar for this type of habitat. Based on an analysis conducted on pooled data from the EKATI™ mine and Diavik site, there is evidence of a behavioural displacement of grizzly bears from habitat areas nearer the mine. However, the consequences of displacement are likely far less than that of mortalities that generally occur when bears are drawn into sites where they may interact with humans.

Safety concerns relating to grizzly bear habitat surveys have been raised. DDMI is currently assessing alternative methods that would allow for similar information to be collected in a safer and more reliable manner. The use of hair snagging mechanisms allows for positive identification of fresh sign and reduces exposure of field staff to grizzly bear encounters during field work.

Additionally, DDMI recognizes that the current monitoring program design is biased toward the east and south shores, due to the presence of BHP-Billiton's EKATI mine to the north and the water of Lac de Gras to the west. As such, DDMI is also exploring options to work cooperatively with BHP-Billiton in order to better test for changes in the presence of grizzly bears in the areas surrounding the mine.

Incidental observations of grizzly bears in the area decreased in 2008, and were equal to the number recorded in 2002. While there was a decrease in the amount of observations, these incidental visits provide evidence that supports continued activity of grizzly bears on East Island, within and adjacent to mining activities. ENR had questioned whether the number of bear sightings on East Island was related to increased manpower on site. Based on camp populations that averaged 979 people on site during 2008, the results from this year indicate that there is annual variability in bear visits to the island, and appears to be independent of employee numbers on site (Table 6-3). DDMI recognizes that it would be beneficial to improve identification of individual animals visiting site and continue to try and improve information collected during bear sightings and deterrent events.

Table 6-3 Average camp population and number of incidental grizzly bear observations by year, 2002-2008

	2002	2003	2004	2005	2006	2007	2008
Average Camp Population	1100	470	397	646	716	747	979
# Grizzly Bear Observations	5	19	24	43	21	41	5

Zone of Influence

Mining activities may cause behavioural disturbances, which could result in the spatial and temporal displacement of an animal from otherwise useful habitat (DDMI, 1998b). The effects of disturbance may cause bears to become displaced or habituated to industrial activities. Information is limited on the zone of influence (ZOI) for bears in response to mining activities, but Harding and Nagy (1980) reported disrupted bear foraging activities up to 4 km from industrial sites. The predicted effect is:

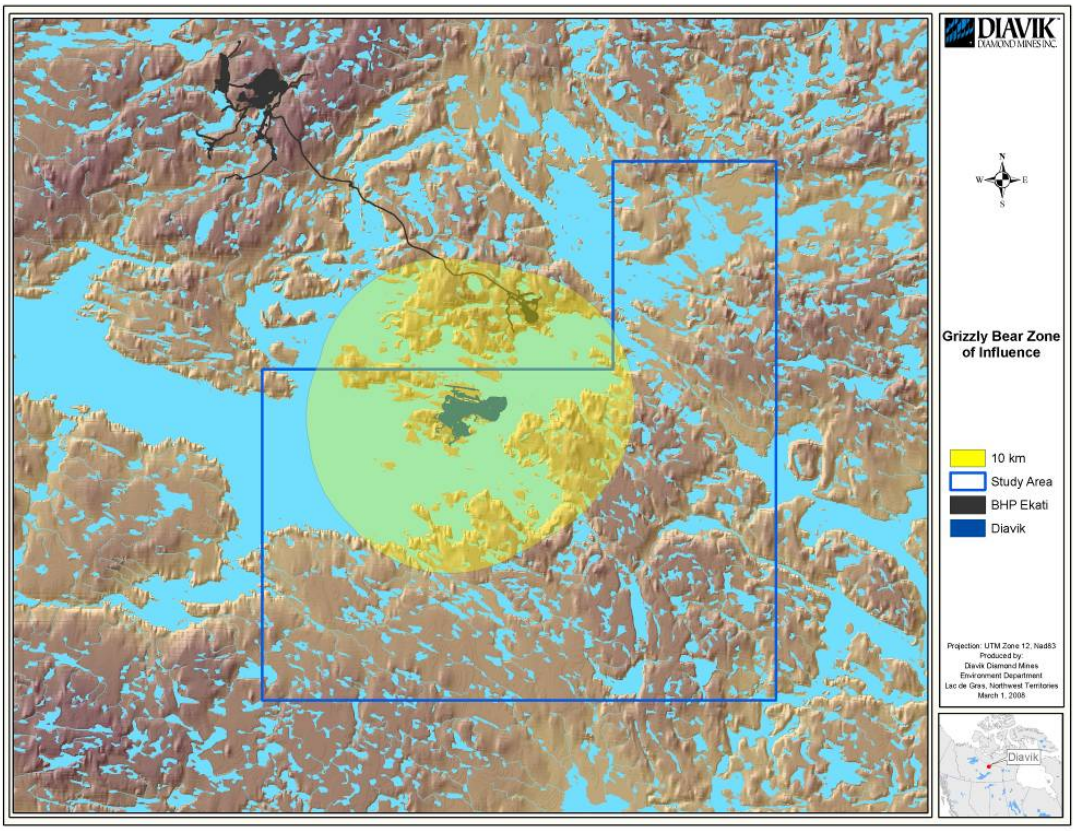
> ***The maximum zone of influence from mining activities is predicted to be 10 km.***

Methods

The presence of grizzly bears surrounding the Diavik site was monitored at 36 plots, described above.

While conducting weekly caribou aerial surveys, all observations of grizzly bears within the predicted zone of influence (<10 km) and outside of the predicted zone of influence (>10 km) were documented. The number of bears per transect area surveyed were determined for the Diavik wildlife study area (Figure 6-4). Density of grizzly bears within the predicted zone of influence was calculated using the sum of the length of transects multiplied by the area surveyed (1.2 kilometer observation width during aerial surveys) within the highlighted area in Figure 6-4, which extends into the BHPB wildlife study area. Determining the density of bears outside the zone of influence was calculated using survey transects present within the Diavik aerial caribou monitoring area; these transects extend north toward EKATI^{TM} mine (Figure 6.5). The area surveyed within 10 kilometers is 166.2 km^2 where the area surveyed greater than 10 kilometers is 226.1 km^2.

Figure 6-4 Predicted Maximum Zone of Influence for Grizzly Bears

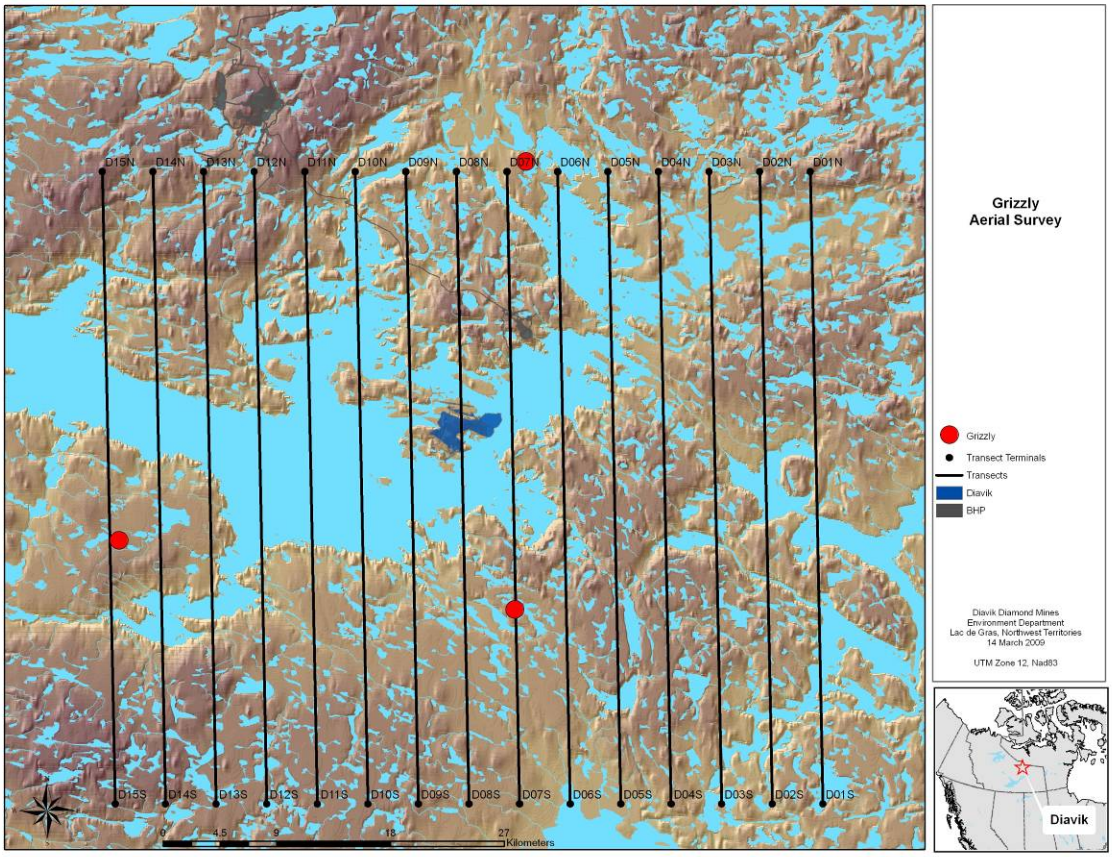


Results

Based on recent statistical analysis of bear sign data amond sedge wetland and riparian plots (Golder, 2008), a ZOI could not be estimated for grizzly bears within the study area. Habitat surveys have indicated that grizzly bears show a slight avoidance of areas near the mine during operations. There are many factors that likely contribute to this pattern of use, some relating to mine operations (e.g. waste management practices) and others to natural variables (e.g. caribou distribution).

During the caribou aerial surveys for 2008, three grizzly bears were observed (Figure 6-5). One bear was observed within the DDMI wildlife study area, one was located north of Misery camp and the other was located southwest of Diavik.

Figure 6-5 Grizzly bears observed within and outside the Diavik zone of influence, 2008



In 2008, densities of bears within the predicted zone of influence and outside the ZOI, but within the Diavik caribou aerial survey area were calculated as 0.000 and 0.013, respectively. Density of incidental observations of grizzly bears within and outside the predicted ZOI from 2002 through 2008 are presented in Table 6-3. Conducting surveys with BHP-Billiton for the 2009 caribou aerial survey program will allow for coverage of a greater area to monitor incidental observations of grizzly bears.

Table 6-3 Aerial Survey Observations of Grizzly Bears in the DDMI Wildlife Study Area

Within the DDMI Wildlife Study Area	2002		2003		2004		2005		2006		2007		2008	
	Inside ZOI	Outside ZOI	Inside ZOI	Outside ZOI	Inside ZOI	Outside ZOI	Inside ZOI	Outside ZOI	Inside ZOI	Outside ZOI	Inside ZOI	Outside ZOI	Inside ZOI	Outside ZOI
# of Observations	1	6	2	11	4	7	**1**	**3**	6	4	0	5	**0**	**3**
Transect Area Surveyed (km2)	166.2	226.1	166.2	226.1	166.2	226.1	**166.2**	**226.1**	166.2	226.1	166.2	226.1	**166.2**	**226.1**
# Observations / Area Surveyed	0.006	0.027	0.012	0.049	0.024	0.031	**0.006**	**0.013**	0.036	0.018	0	0.022	**0**	**0.013**

**ZOI is 10 km; inside ZOI is <10km and outside ZOI is >10km.*
***Values represent only those observations within the DDMI study area.*

Mortality

Despite mitigation, mine activities may lead to grizzly bear mortalities, injuries or relocations from year to year. The specific impact prediction in the Environmental Effects Report (DDMI, 1998b) is:

> ***Mortalities associated with mining activities are predicted to be 0.12 to 0.24 bears per year.***

Methods

Project related incidents and mortalities are reported to environment staff for documentation.

Results

No grizzly bear injuries, mortalities or relocations occurred during 2008 (Table 6-4).

Table 6-4 Grizzly Bear Statistics for all Monitoring Years

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Days with Bear Visitation on East Island	15	14	5	15	24	34	20	34	5
Days Deterrent Actions were Utilized	10	8	2	6	20	23	8	20	3
Grizzly Relocations	0	1	0	1	0	0	0	0	0
Mine-related Grizzly Mortalities	0	0	0	0	1	0	0	0	0

A total of 4 observations of grizzly bears (12 bears) were made on East Island in 2008. An additional sighting and deterrent event occurred at a drill site off-island, but these results have been included in Table 6-4. These observations occurred on 5 separate days between 8 May and 15 September. Deterrent actions, primarily consisting of pen launched bear bangers and vehicles, were utilized on 3 occasions to ensure the protection of people and property by moving the bears off to a safe distance (Appendix IV). During two of the deterrent events, a helicopter was utilized to assist with moving bears away from infrastructure, or to a safer water crossing.

Although there is some interaction between the Diavik Diamond Mine and grizzly bears, every effort is made to immediately report and deter any animals that come into contact with the mine site. Bear awareness sessions continue to help raise employees awareness and response, and contributed to the timely reporting of bears approaching site. This, in turn, minimizes unwanted interactions.

Construction began at the Diavik Diamond Mine site in the year 2000. The calculated mine mortality rate over the past nine years is 0.11, which falls below the range predicted during the environmental assessment.

Recommendations

It is recommended that the DDMI Environment Department continue to facilitate bear awareness training sessions, for all site employees and contractors.

Due to safety concerns associated with conducting the bear plot surveys, DDMI recommends that surveys be postponed for 2009. Discussions on alternative methods for obtaining similar information in a safer manner have begun with ENR, other mining companies and the Environmental Monitoring Advisory Board (EMAB). Discussions around alternative methods recognize the area limitations inherent in DDMI's current study design and are looking to address those limitations through working cooperatively with BHP-Billiton.

All parties will be kept informed of any proposed changes to the existing program.

Wolverine

Wolverines are year round residents in the Lac de Gras area (DDMI, 1998b). The western population is listed as a species of 'Special Concern' under Schedule 3 of Species at Risk legislation (SARA) and by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2003).

The Government of the Northwest Territories (GNWT) is in the process of approving a SARA for the NWT that would specifically account for species within the territory. Should this be established, it would supersede the federal legislation. The GNWT lists the status of wolverines as secure (RWED, 2000), and it is believed that populations within the Slave Geological Province (SGP) are healthy (Mulders, 2000).

Wolverine home ranges have been estimated at 126 km^2 for adult females and 404 km^2 for adult males (Mulders, 2000). The feeding behaviour of wolverine may result in their attraction to camps, and habituation if they receive a food reward (Penner, 1998). This potential has been demonstrated during baseline and construction monitoring years in the Diavik area.

Presence

The objective for this program is to determine if mining activities are influencing the presence of wolverines in the study area, and the impact prediction is stated as:

> ***The mine is not predicted to cause a measurable shift in the presence of wolverines in the study area.***

Methods

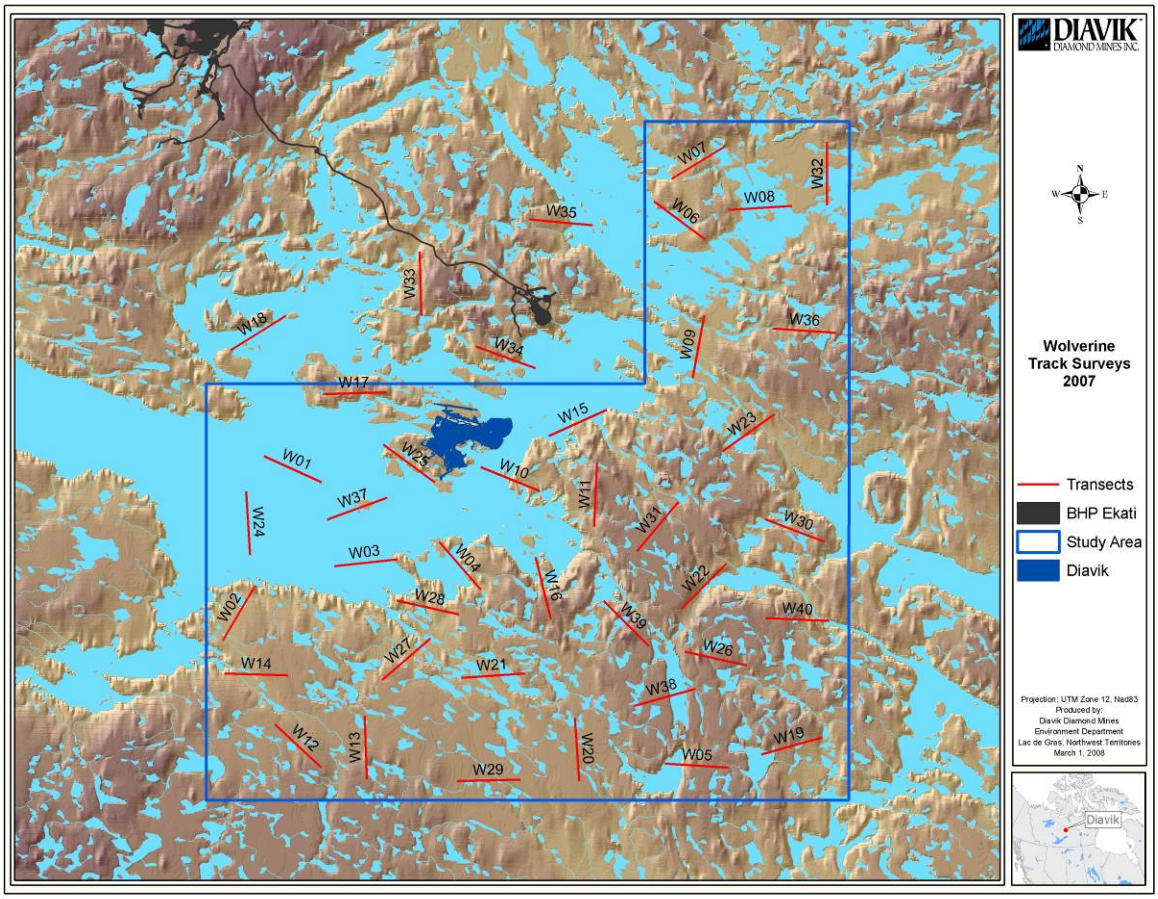
Wolverine presence around the Diavik Diamond Mine is monitored in three ways: snow track surveys, incidental observations at site, and sightings during caribou aerial surveys.

In 2007, Diavik revised the previous wolverine track survey in favour of an increased number of transects of standard length (Figure 7-1). Transects were also more randomly distributed throughout the study area to better account for presence on ice, however, some bias was still placed on tundra areas previously identified as preferred habitat for wolverine based on Traditional Knowledge. Use of transects of standard length allows more accurate analysis of proximity to the mine site and results in Diavik's program resembling those of the other diamond mines.

Wolverine snow track surveys are conducted by snowmobile along 40 transects. Each transect is 4 kilometres (km) in length, totalling 160 kilometres for the study (Figure 7-1). Each route is driven once by snowmobile in both April and December, and all wolverine tracks and other sign (digs and dens) are recorded. The snow track surveys began in 2003, and have been conducted with the assistance of community members from Kugluktuk, as available.

Representatives of DDMI record all sightings of wolverines on East Island, and summarize observations of wolverine during caribou aerial surveys.

Figure 7-1 Revised Wolverine Snow Track Survey



Results

The spring wolverine snow track survey was conducted from 30 April to 2 May 2008. A total of 15 sets of wolverine tracks, including what appeared to be a travelling pair, were encountered on 14 of the transects (Figure 7-2). This resulted in a track index of 0.09 wolverine tracks per kilometre (Table 7-1). No incidental observations of wolverine were made during the spring survey.

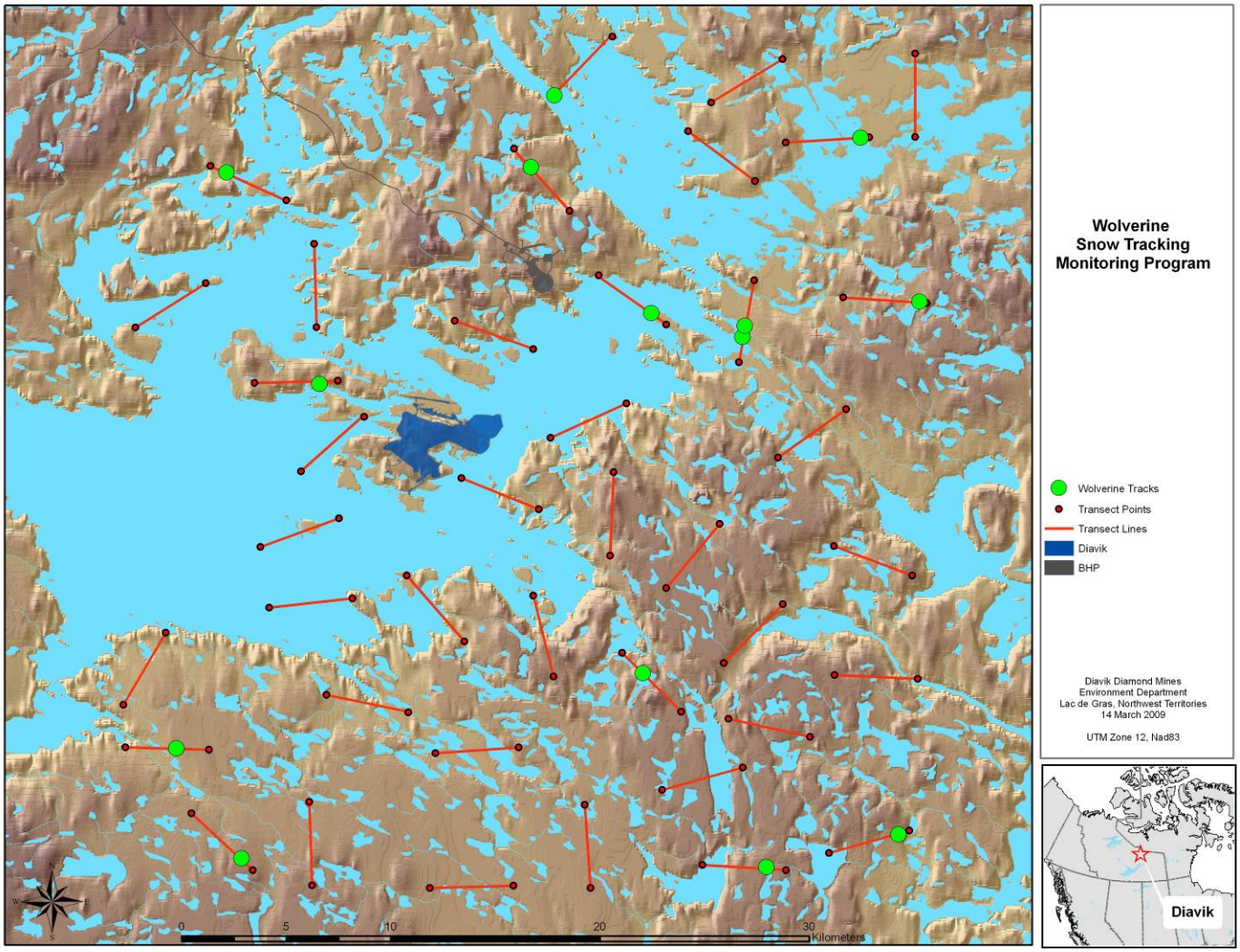
Winter wolverine snow track surveys (December) were not conducted for 2008. Snow tracking conditions were poor, due to a lack of snow on the open lakes and tundra. Bare ice and exposed tundra made snowmobile travel and track recognition very difficult. Temperature extremes also led to concern for personnel and equipment safety, which ultimately resulted in the cancellation of the winter snow tracking survey.

Table 7-1 Wolverine Track Index and Mean days Since Snow, 2003 to 2008

	Spring 2003	Spring 2004	Winter 2004	Spring 2005	Winter 2005	Spring 2006	Spring 2008
Tracks Encountered	13	16	12	7	16	5	15
Track Index (Tracks/km)	0.09	0.11	0.08	0.05	0.11	0.03	0.09*
Mean Days Since Snow	2	4	4	7.5	2	1	2

**New survey design resulting in greater distance travelled (160 km vs 148 km)*
+No surveys were undertaken during 2007 due to unfavourable tracking conditions (December) and wildlife permit issues (April)

Figure 7-2 Results of Spring Snow Track Survey for 2008



Using a 10 km zone around the Diavik mine site, a proximity analysis of total wolverine track densities for 2008 show an index of 0.04 tracks per kilometre for all transects located within 10 km and an index of 0.11 tracks/km for those transects outside the 10 km zone (Table 7-2).

All incidental observations of wolverines on East Island during 2008 were recorded by Diavik staff (Appendix V). From 1 January to 31 December 2008, 46 wolverine sightings occurred on East Island, 17 of which involved Environment and/or Site Services personnel implementing deterrent actions (Table 7-3). Wolverine sightings on East Island increased in January and February, as well as November due to the presence of a single animal denning under the South Camp accommodations facility.

Table 7-3 Wolverine Sightings on East Island

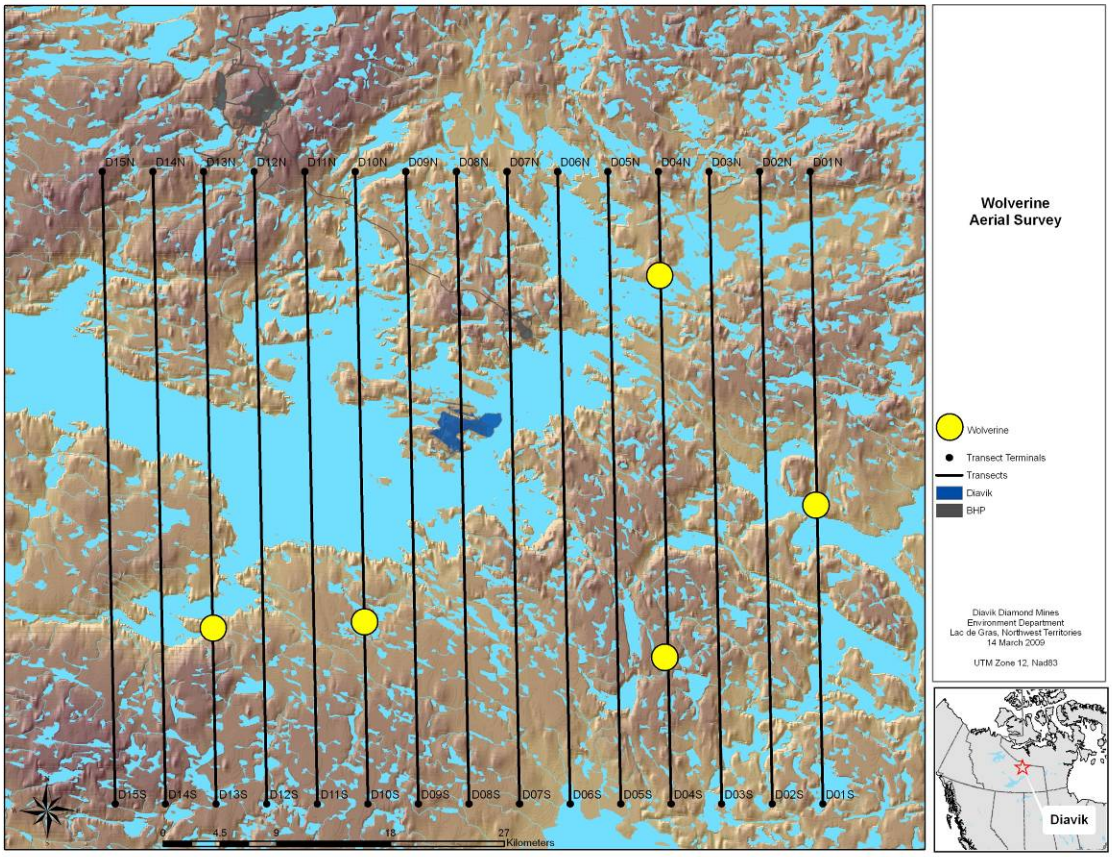
	Baseline*	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of days with wolverine visitations on East Island	27/year Total = 82	25	36	4	38	14	43	31	19	46
Number of days deterrent actions were used	Unknown	9	10	0	1	1	5	2	1	17
Relocations	1	0	2	0	0	0	0	0	0	0
Mine-related Mortalities	1	0	1	0	0	0	0	0	0	1

**Includes Wolverine occurrences recorded at three different camps (i.e. Diavik, Kennecott, and/or Echo Bay Road camps). Yearly numbers are not available for baseline investigations.*

The number of occurrences of wolverine on East Island in 2008 was higher compared to most years (Table 7-3); however it is important to realize that many of the sightings were of a single male animal that was denning under Diavik's secondary accommodation building, South Camp. Many of the other sightings were also of another individual that had a snow den on the west side of the island during January and February 2008.

In addition to the incidental observations of wolverine at the Diavik site, 5 wolverine were observed during the caribou aerial surveys in 2008, 3 of which were located within the Diavik wildlife study area (Figure 7- 3).

Figure 7-3 Wolverine sightings during aerial caribou surveys, 2008



Summary

Overall tracking conditions were favourable, and the survey was conducted after a fresh snowfall. The survey was conducted slightly later in the season than preferred, and this could potentially have resulted in track distortion due to melting from increased daylight hours. However it did not appear to hamper track identification (Table 7-1). It was anticipated that a greater number of tracks would have been identified within the 10 km radius of the mine, given that an individual was denning under south camp and using the area around the Diavik site more frequently. However, sightings of the animal and its use of the camp facilities had diminished by mid-February (Appendix V).

Mortality

Mortalities can occur if wolverines become habituated to mining activities resulting from efforts to locate food or shelter (DDMI, 1998b). Diligent waste management, strictly enforced speed limits, and immediate reporting of wildlife sightings on East Island have limited the mortality of wolverine during the operational period of the Diavik mine. The prediction made during the environmental assessment was:

Mining related mortalities, if they occur, are not expected to alter wolverine population parameters in the Lac de Gras area.

To date, efforts have been focused on minimizing mining related mortalities to prevent any changes to wolverine population parameters.

Methods

Project related incidents that may occur are reported to Environment personnel through incident reports submitted by mine staff. The Environment department follows up on any incident and completes the necessary documentation. This information is tabulated and provided for annual comparisons.

Results

One wolverine mortality occurred as a result of mining activities on East Island in 2008 (Table 7-3). A Code 1 (Emergency) was called 23 January 2008 due to presence of smoke from the crawl space of South Camp. Upon further inspection, it was determined that some piping and heat trace under the camp had been destroyed by an adult male wolverine that was accessing the crawl space of the building. The Government of Northwest Territories (GNWT) department of Environment and Natural Resources (ENR) Wildlife Officers were contacted to determine the preferred course of action. DDMI repeatedly attempted to repair the skirting and prevent further access of the animal, but to no avail. While DDMI would have preferred to attempt to relocate the wolverine, ENR felt it would be better to destroy the wolverine given the time of year and likelihood that relocation efforts would not be successful. Due to safety concerns, DDMI was unable to destroy the wolverine during January/February 2008 as the animal spent the bulk of its time near the accommodation complex and the waste transfer area; both of these areas are located next to high-volume storage of fuel and explosives. The wolverine moved off in the spring (March).

During the summer of 2008, extensive repairs had been made to the skirting due to issues with the wolverine accessing this area. A strip of material was connected to the existing skirting and run horizontally along the ground and covered with crushed rock. Repairs were initiated on the previously damaged pipes in the crawl space and the skirting replaced around the building. In the fall, more work was required under South Camp and some sections of skirting were removed for worker access. Upon completion of the work, skirting was put back into place, and hatch doors were installed for future access. While these hatches were solidly constructed, they were made of wood and resulted in the wolverine again gaining access to the crawl space under South Camp in November 2008, by chewing through the hatch door. Efforts were undertaken to change out the hatches to a metal design and ENR was again contacted to determine if it would be possible to relocate the animal. Initially, ENR was planning to assist DDMI in a short-distance relocation to allow DDMI time to safely access the crawl space under the building, without the animal present, to complete the required repairs. In the end, ENR decided it best to destroy the animal and assisted DDMI with the destruction of this animal on 26 November 2008.

Wolverine destroyed after denning under camp facilities – 26 November 2008

Since 2000, two wolverines have been relocated and two mortalities have occurred at the DDMI mine site.

Recommendations

Wolverine snow track surveys will continue to include community involvement for the survey and input on the movements and approximate numbers of wolverines within the study area.

Snow track surveys to be conducted during April only. Tracking conditions during December are generally not favourable to performing valuable surveys as there is little snow accumulation at this time and limited daylight to complete the surveys.

DDMI is planning to meet with the GNWT and other mining companies during 2009 to discuss the possibility of implementing the wolverine DNA monitoring program in 2010.

Waste

Diavik Diamond Mines Inc. is committed to taking all the necessary steps to ensure that the collection, storage, transportation and disposal of all wastes generated by the project are being conducted in a safe, efficient and environmentally compliant manner. The DDMI Waste Management Plan, an integral part of Diavik Diamond Mines' Environmental Management System, focuses on minimizing the generation of wastes at points of use, optimizing the usage of materials before disposal and facilitating the collection and processing of wastes with the least adverse effects on the physical and biological conditions at site.

Along with the ideals of the four R's embodied in the Waste Management Plan (Appendix VI), namely reduction, recovery, reuse and recycling, there are several mitigation practices to prevent and reduce adverse impacts on wildlife. These practices include, but are not limited to, incineration of all food wastes, categorical segregation of all non-food waste for storage and subsequent removal from site, and on-site disposal. All of these methods are designed to minimize wildlife attraction.

Incineration, segregation and storage of waste takes place at the DDMI Waste Transfer Area (WTA) which was established to ensure proper handling and storage of waste on site. The facility operated on the south side of the Processed Kimberlite Containment (PKC) area for the first half of the year and was then transferred to a new facility in September 2008. The new WTA is approximately 100 X 165 meters (m), and is surrounded by a gated, 3 meter high chain link fence erected to control wind transportation of any litter and minimize wildlife intrusion. Contained within the WTA are two incinerators for food waste, a burn pit for non-toxic/non-food contaminated burnable material, a contaminated soils containment area, a treated sewage containment area, as well as sea cans, sheds, and storage areas for drums, crates, bins and totes. The majority of wastes are inventoried and stored at the WTA while awaiting backhaul on the winter ice road.

On-site disposal of non-burnable wastes such as steel, plastics and glass currently occurs at the inert landfill located within the Type 3 waste rock pile. These materials are covered with waste rock on a regular basis to prevent wildlife attraction.

Waste inspections are conducted to ensure all waste segregation, storage and disposal procedures set out in the DDMI Waste Management Plan are being followed, thereby preventing the attraction of wildlife and protecting environmental integrity. Environment personnel record all occurrences of improperly disposed waste materials which attract wildlife, as well as all wildlife sign and observations. Any infractions are reported to waste management personnel for immediate rectification.

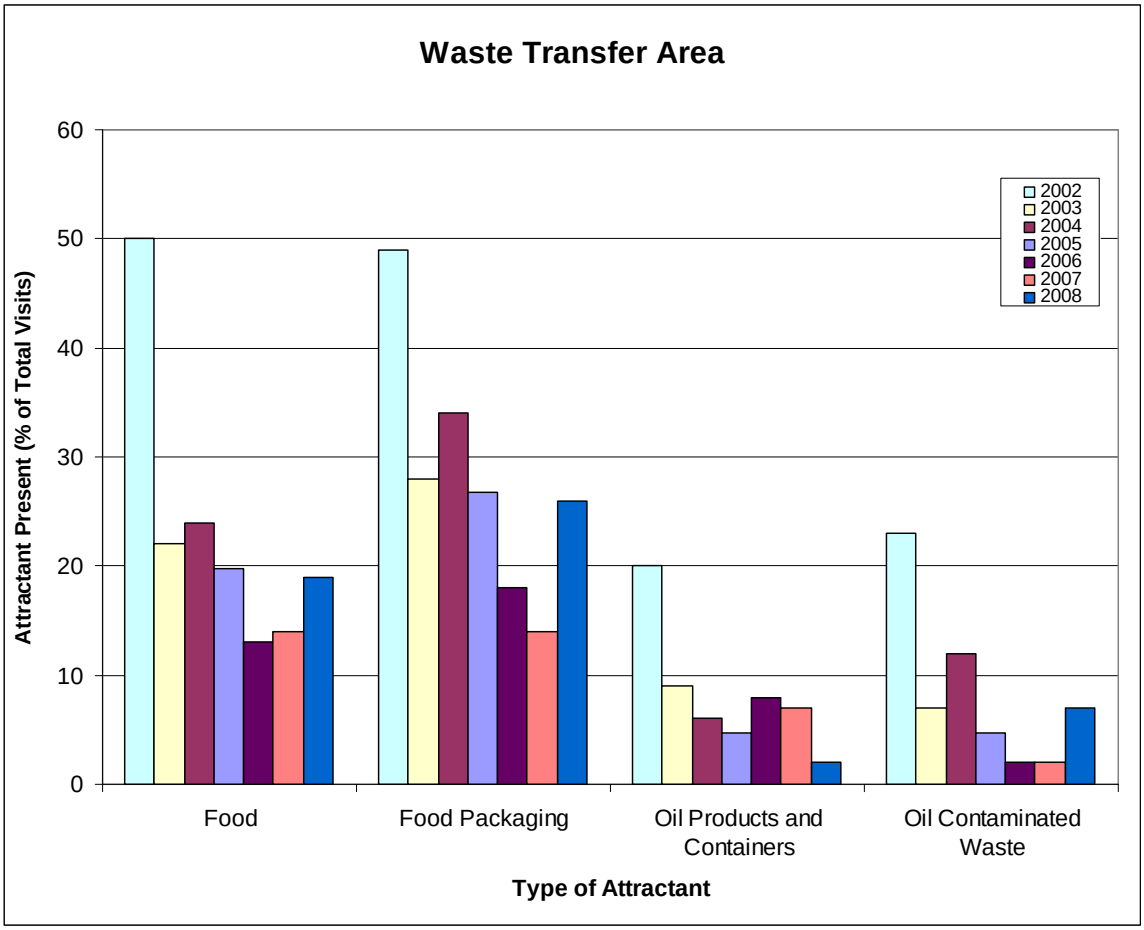
Methods

In 2008, inspections of the Waste Transfer Area and landfill were conducted every two days beginning 1 January and ending 31 December. Inspections consisted of Environment personnel walking the area of the waste transfer and landfill, where safe to do so, and documenting the type and number of attractants found, as well as wildlife species or fresh sign that were present during the survey.

Results

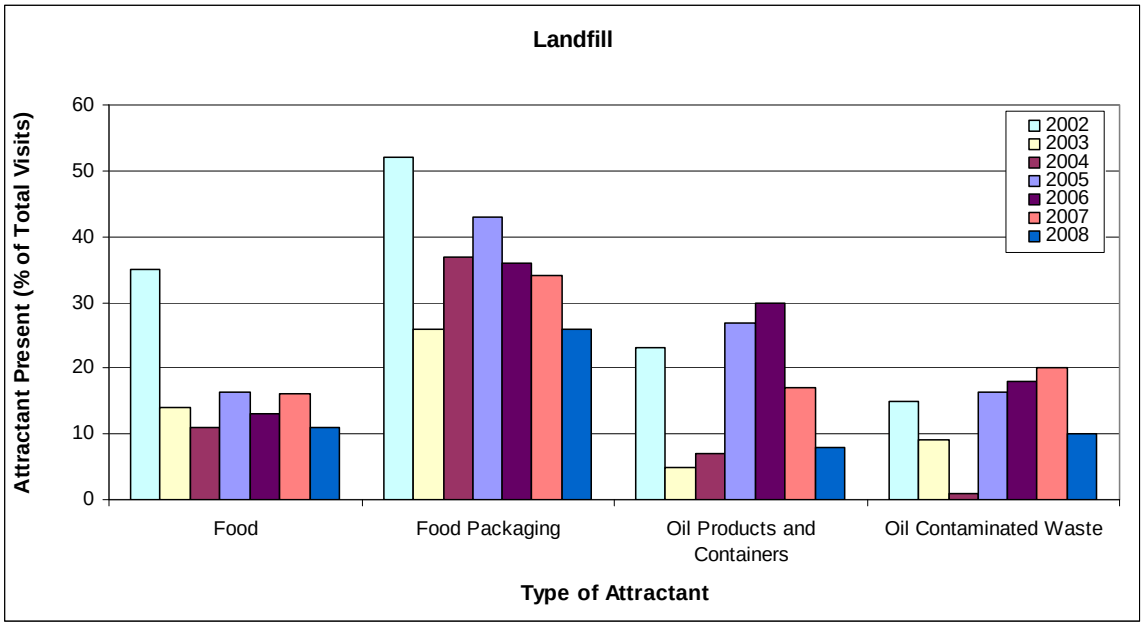
Potential wildlife attractants such as food and oil were found at the Waste Transfer Area on 54% of the 182 inspections during 2008. Food packaging and food were the most commonly observed attractants, with findings for each occurring in 26% and 19% of all inspections, respectively (Figure 8-1).

Figure 8-1 Percentage of Total Inspections Identifying Attractants at the Waste Transfer Area 2002-2008



Attractants were found on 56% of 182 inspections of the inert landfill. Again, food packaging was the most commonly found attractant, having been observed during 26% of all inspections (Figure 8-2). However, the occurrence of oil-contaminated waste and oil products and containers dropped in 2008 to 10% and 8%, respectively. This is an improvement over the last three years where oil-based wastes were higher.

Figure 8-2 Percentage of Total Inspections Identifying Attractants at the Inert Landfill 2002-2008



Wildlife was observed on 54% of the inspections of the waste transfer area, and on 16% of the inspections at the landfill. Similar to previous years, foxes were the most frequently observed wildlife in the waste transfer area, followed by gulls and ravens (Table 8-1). Ravens were the most frequent at the landfill, followed by gulls and foxes.

Wildlife sign was found on 39% of visits to the waste transfer area, and 32% of visits to the landfill. The most commonly observed sign, as with previous years, belonged to foxes (Table 8-1).

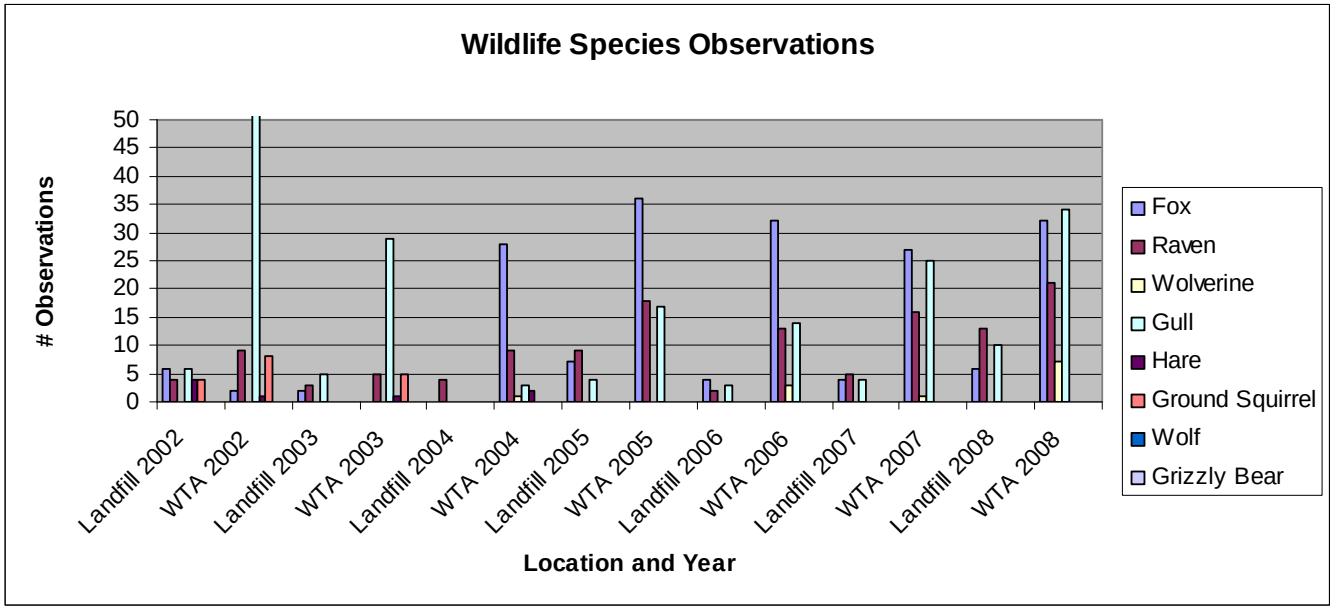
Table 8-1 Occurrences of Wildlife or Wildlife Sign during Waste Inspections

	WTA (182 visits)		Landfill (182 visits)	
	Wildlife	**Wildlife Sign**	**Wildlife**	**Wildlife Sign**
Gull	34	2 tracks	10	0
Raven	21	9 tracks, 2 chews	13	6 tracks
Fox	32	40 tracks, 4 scat, 1 hair	6	45 tracks, 2 chews
Hare	0	0	0	0
Ground Squirrel	0	0	0	0
Wolverine	7	11 tracks, 1* scat	0	3 tracks
Wolf	0	0	0	0
Grizzly Bear	0	0	0	0

**outside WTA*

Presence of wildlife and wildlife sign at the landfill and Waste Transfer Area are summarized in Figures 8-3 and 8-4, respectively.

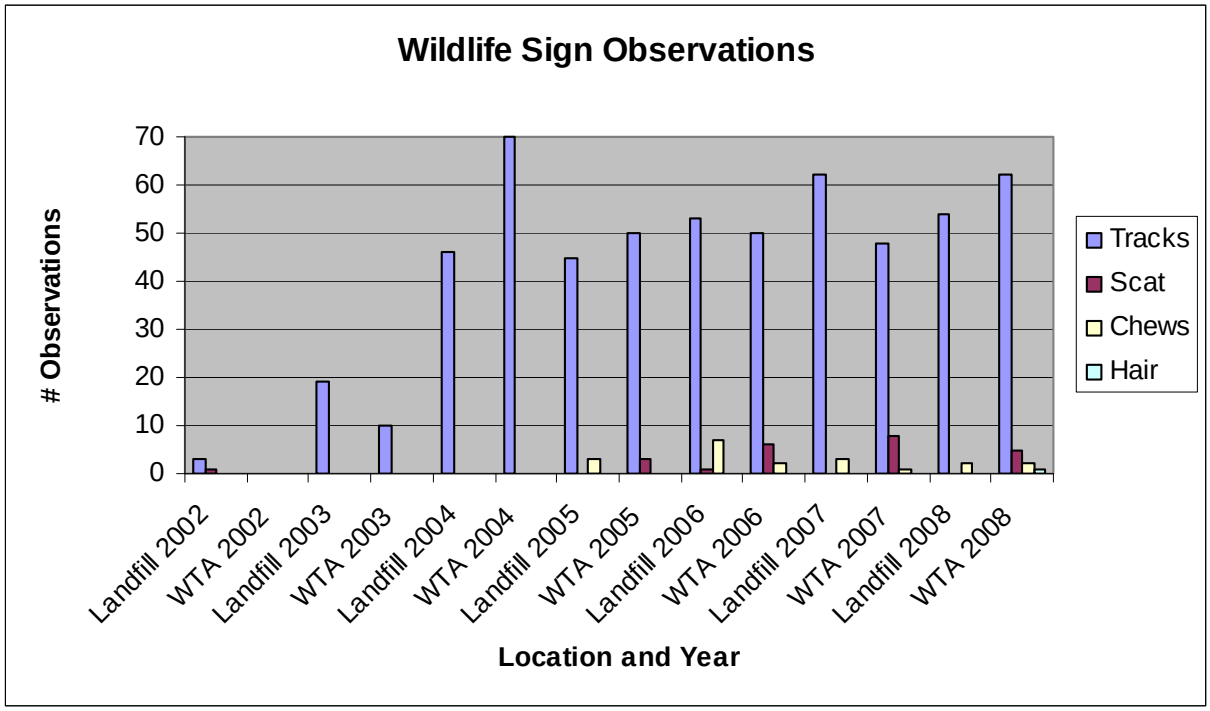
Figure 8-3 Presence of wildlife (sightings) at the Diavik landfill and WTA, 2002-2008



Wildlife sightings within the landfill have remained similar across all years. Ground squirrel and and hare sightings were more common during 2002, and likely decreased due to increased infrastructure (rock pile and crusher) in the area of the landfill. There was a slight increase in bird observations at the landfill in 2008. Wildlife sightings at the Waste Transfer Area have also

remained similar across all years since 2004. Prior to 2004, few foxes were present but larger numbers of gulls were observed, with a maximum of 97 gull sightings during 2002. The number of wolverine observations at the WTA during 2008 increased, which coincided with the presence of two animals denning on the island; one under south camp and one snow den on the west side of the island.

Figure 8-4 Presence of wildlife sign at the Diavik landfill and WTA, 2002-2008



Tracks are the predominant sign of wildlife in each of the waste disposal areas on site. The number of tracks at the landfill increased from 2002 to 2004. From 2004 onward, the number of tracks observed at the landfill showed little variation between years. The highest number of sign observations occurred during 2007 (62 observations). Within the WTA, observations of wildlife sign peaked during 2004 at 70 observations. Observations of sign remained consistent from 2005 to 2007 and increased slightly during 2008. The cause of the increase during 2008 is likely related to re-location of the WTA as most of the office facilities were removed prior to transferring operations, so there was an associated reduction in staff and equipment presence in the area. The lack of activity in the area provided increased opportunities for wildlife to access the WTA undisturbed and make use of available shelter within the area.

Summary

The DDMI Waste Management Plan outlines the practices in place to ensure that materials which may act as wildlife attractants are routed toward the Waste Transfer Area for incineration or storage. To this end, occasional observations identifying attractants can be expected and should not present a problem if incineration is prompt.

The continued occurrence of wildlife and wildlife sign at the Waste Transfer Area indicated that mitigation designs and practices, such as fencing, require improvement. Efforts undertaken to reduce the occurrence of wildlife in the WTA included patching damaged fence, as well as repairing the gate assembly, and reviewing waste handling and storage procedures with WTA personnel. The new waste transfer area was constructed with some of the maintenance issues from the previous area in mind. The gate was reinforced with heavy rubber mats to prevent openings for wildlife access. The perimeter fence also had a road constructed around the berm in order to allow access for fence repairs and snow removal that assist in keeping wildlife out of the WTA. The fence was again buried within the gravel berm to help prevent animal access by burrowing.

The total number of observations for each type of waste occurring within the WTA has shown an overall decreasing trend since 2002 when data collection began. However, incorrect waste such as food, food packaging and oil contaminated wastes increased this year at the Waste Transfer Area. This increase is likely due to the enlarged workforce and level of activity on site over the past year. This demonstrates that improvements in employee education in relation to waste handling are required, especially as it relates to temporary construction staff who are less familiar with waste segregation requirements.

A new landfill was established in 2008, in consultation with the INAC Inspector, and is still located within the rock pile. A gate was installed at the new inert landfill in 2008 in an effort to limit uncontrolled dumping in this area. A noticeable decrease in all attractants, most notably oil products, containers and oil contaminated waste, occurred at the landfill this year. This is likely associated with the restricted access, as construction activities did not change markedly during the year. The location of the landfill within the rock pile and traffic in the area will continue to discourage wildlife access to the landfill, thereby limiting the availability of food and food packaging to animals.

Working in conjunction with waste management staff, we continue to identify problem areas and work with all contractors and DDMI employees to resolve any issues. Numbering and inspection of waste collection bins prior to pick up has continued to be effective at facilitating communication between waste management staff and Environment, and to address issues within various departments. Unfortunately it can be difficult to identify all improper waste in the large waste collection bins prior to collection, which results in some inappropriate wastes ending up in either the landfill or the burn pit.

A change in site orientation procedures that occurred in the latter part of 2008 has improved the Environment department's ability to educate new staff in waste management procedures at the start of their employment. Used in conjunction with department specific awareness training, this should assist with increasing awareness of proper waste segregation procedures.

Overall, procedures and mitigation strategies currently in place have been relatively successful at minimizing wildlife interactions. While foxes, ravens and gulls appear to be frequenting the WTA and landfill areas, these animals are natural scavengers.

Recommendations

The increase of attractants in the waste transfer area indicates a need for additional environmental awareness sessions. Environment personnel will continue to provide a dynamic workforce with information on ramifications due to improper waste management, such as human safety issues related to carnivore problems. New site orientation procedures implemented in the latter part of 2008 will also assist with this.

Regular inspections (every second day) at the WTA and landfill will continue, as this has proven successful in the prompt discovery and resolution of potential concerns.

Falcons

The peregrine falcon and gyrfalcon were selected as key species because of their special management status, biological vulnerability to disturbance and that they are known to nest regularly in the Lac de Gras area (DDMI, 1998b). The peregrine falcon (*Falco peregrinus tundrius*) is listed under Schedule 3 of the Species at Risk Act as a "Species of Special Concern", as designated by the Committee of the Status of Endangered Wildlife in Canada (COSEWIC, 2007). A Species of Special Concern is defined as a wildlife species that may become a threatened or endangered species because of a combination of biological characteristics and identified threats.

Presence and Distribution

Habitat loss, sensory disturbance, and impacts to prey populations may influence raptors nesting in the Lac de Gras area. The impact predictions for raptors are that:

> ***Disturbance from the mine and the associated zone of influence is not predicted to result in measurable impacts to the distribution of raptors in the study area.***
>
> ***The mine is not predicted to cause a measurable change in raptor presence in the study area.***

Other raptors present in the study area include rough-legged hawks, snowy owls, and short-eared owls. However, these species are not common, and their presence from year to year is unpredictable. Falcons are thereby used to monitor impacts to raptors; peregrine falcons are used specifically for DDMI's wildlife monitoring program.

Methods

Falcon nesting sites were visited on 4 June and 28 July 2008, in cooperation with ENR and BHP-Billiton Diamonds Inc., and included nest sites near the Daring Lake Tundra Research Station (July only), Ekati™ Diamond Mine, and Diavik Diamond Mine wildlife study areas. The falcon monitoring results from Daring Lake are presented here as control data for productivity from an undisturbed area. Previously identified potential nesting sites were visited by helicopter in June to determine if nesting sites were occupied, and again in July to count any young in the nest (Figure 9-1). Minimal time was spent in the vicinity of the sites to reduce disturbance.

This was the fifth year an occupancy survey of falcon sites was incorporated into the monitoring program. The purpose is to document those nests which are occupied in spring but fail before the July chick count. The reasoning for this is that following arrival at the breeding grounds,

falcons must locate and defend a suitable cliff for nesting, attract a mate, contend with unpredictable weather and occasional storms, and assess the availability of prey in that year. Any one of these may influence the choice, or the option, of breeding in that year. As such, this is also the most vulnerable period for falcons, and the time when breeding attempts are most likely to fail. Spring surveys also assist in identifying occupied nest sites that may pose a problem for mining operations and allow mitigation actions before birds begin to lay eggs. DDMI therefore added a spring survey to account for this sensitive time of year.

Results

Six known nesting sites in the Diavik wildlife study area were each surveyed during 2008. During the spring occupancy survey conducted on 4 June by BHP-Billiton and ENR, five of the six sites surveyed were occupied (7, 11, 14, 19 and 20), with two occupied nests found at site 19 (referred to as 19 and 19-1). Three of the nests (7, 19-1 and 20) contained a breeding pair of peregrines, while the remainder contained a single peregrine falcon. Eggs were noted in three of the nest sites (7, 11 and 19).

The productivity survey was completed on 28 July, and found five of the six nest sites occupied (7, 11, 14, 19 and 20). Two nest areas were confirmed productive. Site 7 had a peregrine falcon nest that was productive with 1 chick. Nest site 11 was also productive with 2 chicks observed. Nest site 19, considered unproductive, contained 2 eggs that had not hatched (Table 9-1).

Productivity and occupancy showed an increase over the range recorded in the Diavik wildlife study area since 2000. Historically, this is only the second year where all six nests have been occupied during either the occupancy or productivity surveys (Table 9-1). Chick production in the past has ranged from zero to seven. During 2007, a total of 7 chicks were recorded; this is equal to the number produced in 2006 and ranks as one of the most successful years for chick production recorded since data collection began in 2000. The observations made in 2008 are similar to those of the control site at Daring Lake for productivity (Table 9-1).

Figure 9-1 Falcon Nest Site Locations and Results for 2008

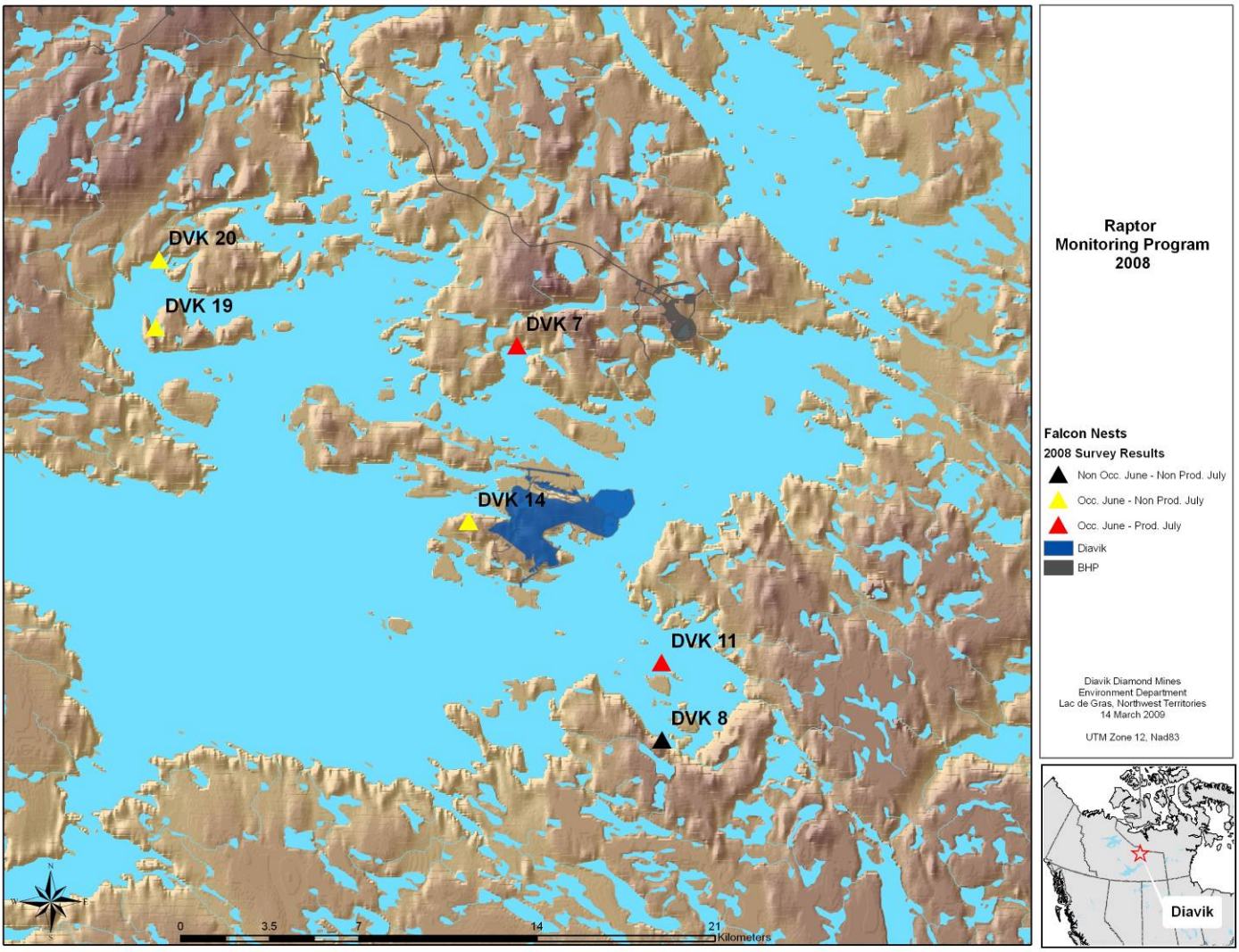


Table 9-1 Falcon nest occupancy and production at Diavik and Daring Lake, 2000 to 2008

	2000		2001		2002		2003		2004*		2005*		2006*		2007*		2008*	
	Diavik	Daring	Diavik	Daring	Diavik	Daring	Diavik	Daring	Diavik	Daring	Diavik	Daring	Diavik	Daring	Diavik	Daring	Diavik	Daring
Total Sites	6	-	6	13	6	18	6	10	6	12	6	10	6	10	6	10	6	12
Occupied	2	-	2	3	4	10	1	5	5	6	3	5	3	4	3**	1	5***	6
Productive	2	-	0	1	1	9	0	3	4	1	1	1	0	1	2	2	2	3
Total Young	5	-	0	3	3	15	0	4	7	2	2	1	0	3	7	8	3	4

Daring Lake data originates from the Daring Lake research station (S. Matthews, personal communication, ENR).
** Diavik data includes spring (occupancy only) and summer (productivity only) monitoring data. Previous occupancy values based on productivity survey only.*
***Occupancy data for May provided by BHP-B and GNWT – Site 11 not checked*
****Does not include additional site (19-1) found occupied during the June survey*

The occupancy of falcon nest sites has changed little since studies began in 1995 (Table 9-2). Sites 11, 14 and 20 have been the most commonly used sites since monitoring began in 1995. While site 7 has now been in use on five occasions, it previously had not been occupied until the spring of 2004; this site proved to be productive this year. Site 8 has been the least occupied site for the duration of these surveys, and remained unoccupied and unproductive in 2008. The cliffs around Site 19 contained two successful nest sites that were proximate this year; while neither was productive, the presence of 2 eggs at site 19 is encouraging.

Table 9-2 History of Activity at Falcon Nests Surrounding Diavik, 1995 to 2008

Nest Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
7	No	No	No	-	-	No	No	No	No	Yes	Yes	Yes (July only)	Yes	Yes
8	No	No	No	-	-	No	No	No	No	Yes (June only)	No	No	Yes (July only)	No
11	Yes	Yes	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes (July only)	No	Yes* (July only)	Yes
14	No	No	Yes	-	-	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
19	Yes	No	No	-	-	No	No	Yes	No	Yes (July only)	No	Yes	Yes (July only)	Yes
20	Yes	No	No	-	-	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes

**Site was not checked in May*

Falcon production is known to be variable across years and highly dependent upon small mammal and bird populations, availability of suitable nesting habitat and weather events. As such, annual changes in falcon occupancy or productivity are unlikely to be sensitive indicators of disturbance. Rather, impacts from mining would probably manifest in a gradual decline in falcon occupancy or productivity over several years, or with proximity to the mine. An alternative scenario is that falcon productivity and occupancy are only affected by human disturbance in years when natural environmental factors are limiting the falcon's ability to breed.

In 2008, falcon productivity and occupancy was similar to previous years for the Diavik study area, despite increased construction activities on site. The total number of young produced in 2008 was similar to that of 2002 and 2005 within the Diavik study area. Nest success in the Diavik study area was also similar to that of Daring Lake.

Since May 2005, Diavik experienced peregrine falcons nesting on the highwall of the A154 pit in some years. No raptors were confirmed to be nesting in the A154 pit during 2008, but frequent sightings of these birds were reported, indicating their continued use of the study area this past year.

Mortality

The objective for this program is to determine the number of raptors killed or injured due to DDMI mining-related activities. The following section summarizes methods used and results produced from incident reporting. The impact prediction in the Environmental Effects Report (DDMI, 1998b) is:

> ***The mine is not predicted to cause a measurable change in raptor presence in the study area.***

Methods

Project related incidents that may occur are reported to Environment personnel through incident reports submitted by mine staff. The Environment department follows up on any incident and completes the necessary documentation. This information is tabulated and provided for annual comparisons.

Results

There were no falcon injuries or mortalities at the Diavik site during 2008.

Recommendations

There are no new recommendations for this program.

Waterfowl

The Diavik site lies along the western arctic feeding ground for migratory birds known as the central flyway (Penner, 1998). Migratory birds often stop or "stage" to feed in the Lac de Gras area before moving on to their nesting grounds in the high arctic. Diavik's surveys include both natural (shallow bays) and man-made (mine-altered) wetlands in an effort to provide a clear picture of potential impacts of mining activities on waterfowl.

In the East Island area, shallow bays, melt-water ponds and shoreline leads have been identified as important areas for migrant waterfowl (DDMI, 1998b) as they provide habitat requisites such as open water. The shallow bays consist of a combination of mudflats and sedge bands, which are proximate to open water and upland vegetation, providing ideal habitat for shorebirds (Van Egmond *et al*. 1997a). The shallow bays near the Diavik site are unique to the region surrounding the mine, and may therefore attract waterfowl during the spring migration when open water in other areas may be limited. Mining activities may artificially produce early open water due to dust deposition and the associated increased rate of snowmelt. This, in turn, may also attract migrating waterfowl. DDMI monitors the shallow bays of East Island to determine if there is a change in the number and species of waterfowl present.

Artificially created water habitat is also monitored to ascertain the level of use by waterfowl in those created habitats. Habitat loss (shallow and deep water) due to mining activities is also monitored to determine if more or less habitat is lost than predicted.

Habitat Loss

The objective is to determine if direct habitat loss is greater than predicted. The following section summarizes the methods used and results obtained from satellite imagery. As a result of mining activities, habitat loss will occur and it has been predicted that:

> ***At full development, direct aquatic habitat loss from the project is predicted to be 3.94 km^2.***

Methods

The vegetation classification map used in the vegetation/land cover section of the Environmental Effects Report (DDMI, 1998b) was used to determine the loss of waterfowl habitat.

Results

Habitat loss is defined as the loss of habitat utilized by waterfowl in the East Island area. In 2008 the amount of shallow and deep water that was disturbed remained the same as for 2007, and equalled 0.35 and 2.19 km^2, respectively. It was predicted that a total of 3.94 km^2 of shallow and deep water would be lost as a result of mine operations over the course of the mine life (DDMI, 1998b). To date, a total of 2.54 km^2 of waterfowl habitat has been lost to mine development (Table 10-1).

Table 10-1 Predicted Versus Actual Direct Waterfowl Habitat Loss on East Island - 2008

Wetland Type	Predicted Area lost (km^2)	Actual Area Lost (km^2)								Total Area Lost (km^2)
		up to 2001	2002	2003	2004	2005	2006	2007	2008	
Shallow water: <2 m	0.48	0.11	0.12	0.01	0.03	0.03	0.04	0.01	0.00	0.35
Deep water: >2 m	3.46	0.15	1.66	0.01	0.01	0.12	0.24	0.02	0.00	2.19
Total area	3.94	0.26	1.78	0.02	0.04	0.15	0.28	0.03	0.00	2.54

**Discrepancies in totals across the rows results from the rounding of numbers in annual columns for presentation purposes.*

Presence

The objective for this component is to determine if disturbance from the mine is impacting the presence of waterfowl species. Disturbance may result from habitat loss, altered drainage patterns, dust fall, noise from mining activities and human presence (DDMI, 1998b). The following section summarizes the methods used and results obtained from yearly surveys of East Island shallow bays and mine altered water bodies. This monitoring program will determine if conditions are different than the predicted impact:

> ***The mine is not predicted to cause a measurable change in waterfowl presence in the study area.***

Methods

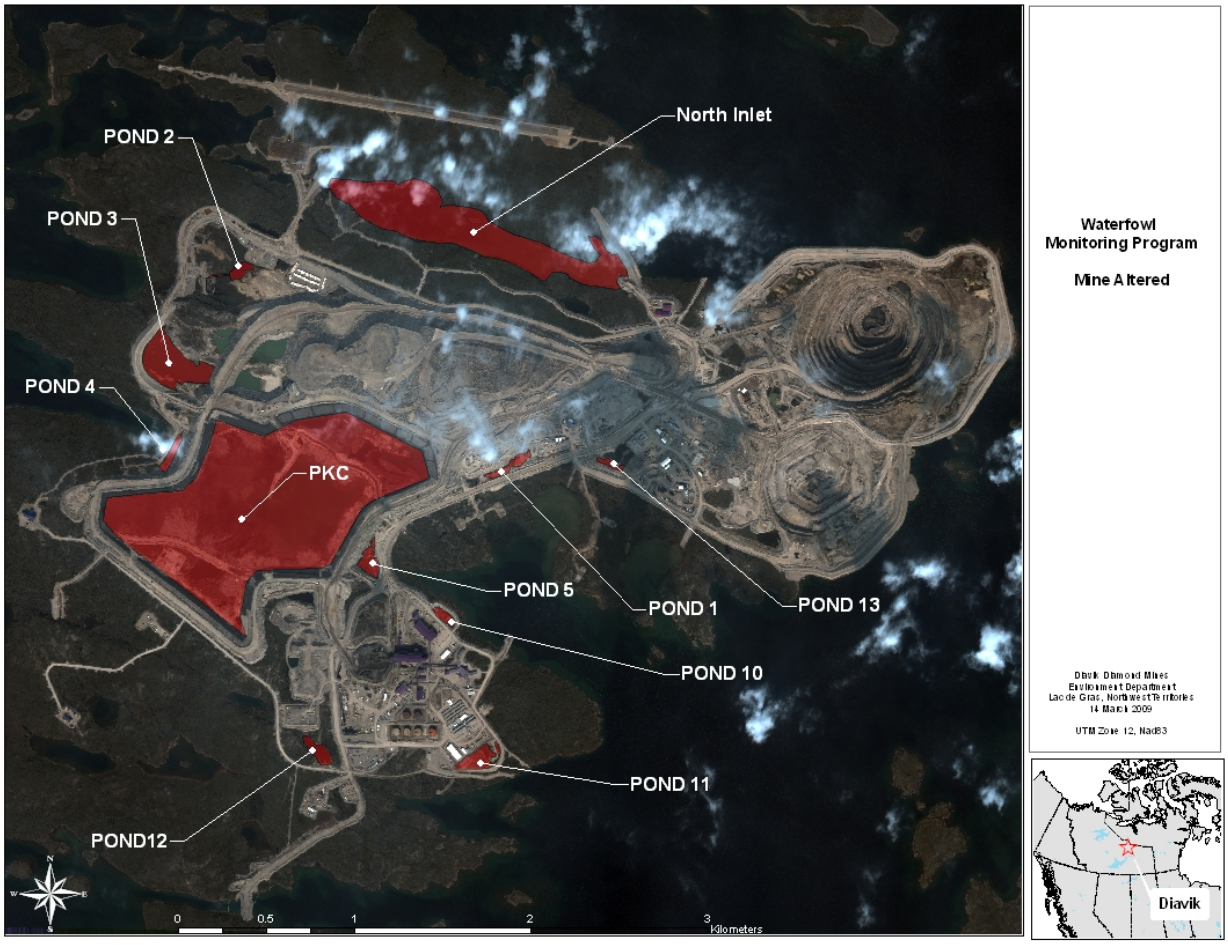
East Island shallow bays (Figure 10-1) and mine-altered water bodies (Figure 10-2) were surveyed for waterfowl presence daily from 25 May to 20 June 2008 and then weekly from 25

June to 9 October 2008. Shallow bay surveys continued to be conducted by Environment personnel walking the perimeter of the bays. Given the unique nature of the shallow bays in the region around the mine, no control site has been identified or monitored since initiation of this monitoring program.

Figure 10-1 East Island Shallow Bay Monitoring Locations 2008

All birds observed were identified in accordance with specific characteristics outlined in Petersons Field Guide to Western Birds (3rd Edition, 1990) and, counted and recorded. For analytical simplicity, species observations were categorized into groups, based upon easily identifiable characteristics and similarities, such as fowl-like birds and dabbling ducks. The waterfowl presence section of this report summarizes staging waterfowl groups; specifically, shorebird, geese, dabbling and diving ducks from both the shallow bays and mine-altered water bodies. A complete species list by category is included in Appendix II.

Figure 10-2 Mine Altered Waters on East Island 2008



Results

Shorebirds

In 2008, 12 species of shorebird were recorded during waterfowl monitoring surveys (Table 10-2). The Semipalmated Plover, Semipalmated Sandpiper and Least Sandpiper are the only shorebird species present during all years of monitoring. Two species of shorebirds, the Sanderling and Common Snipe observed during baseline were not recorded in 2008. For the first time, including baseline, a Lesser Yellowleg was observed on site in 2008.

Table 10-2 Shorebird Species Present (√) or Absent (χ) on East Island for All Monitoring Years

Species	Baseline (1995-1997)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Semipalmated Plover	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Black-bellied Plover	×	×	×	×	×	✓	✓	×	×	×
Lesser Golden Plover	✓	✓	✓	✓	×	×	✓	×	×	✓
Semipalmated Sandpiper	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Least Sandpiper	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
White-rumped Sandpiper	✓	✓	✓	✓	×	✓	✓	✓	✓	✓
Baird's Sandpiper	✓	✓	✓	✓	✓	✓	✓	✓	×	✓
Pectoral Sandpiper	✓	✓	×	✓	×	×	×	×	×	✓
Stilted Sandpiper	✓	✓	✓	✓	×	×	✓	×	×	✓
Dunlin	✓	✓	×	✓	×	✓	×	✓	×	✓
Sandhill Crane	×	×	×	×	×	✓	✓	✓	×	×
Sanderling	✓	✓	✓	×	×	×	×	×	×	×
Red-necked Phalarope	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
Common Snipe	✓	✓	×	×	×	×	×	×	×	×
Ruddy Turnstone	×	✓	×	✓	×	×	✓	✓	×	×
Long billed Dowitcher	×	×	✓	×	×	×	×	✓	×	×
Spotted Sandpiper	×	×	×	×	×	×	×	✓	×	✓
Lesser Yellowlegs	×	×	×	×	×	×	×	×	×	✓

In 2008, a total of 337 observations of shorebirds were made during waterfowl and mine-altered water body surveys, 29 of which were recorded as unidentifiable plover species, 7 were recorded as unidentifiable shorebird species, and two were recorded as an unidentifiable sandpiper species (Table 10-3).

The Semipalmated Plover was the most common species of shorebird observed in 2008 comprising 25% of total shorebird observations. The White-rumped Sandpiper and Dunlin were the least commonly observed shorebird species in 2008 with only one observation made for each species. (Table 10-2).

Table 10-3 Waterfowl Survey Shorebird Observations - 2008

Species	Observations
Lesser Golden Plover	18
Baird's Sandpiper	55
Dunlin	1
Least Sandpiper	71
Lesser Yellowlegs	3
Pectoral Sandpiper	13
Red Necked Phalarope	8
Semipalmated Plover	83
Semipalmated Sandpiper	19
Spotted Sandpiper	2
Stilted Sandpiper	25
White-rumped Sandpiper	1
Plovers spp.	29
Unidentified Sandpiper	2
Shorebird spp.	7
Total	**337**

Geese

The Greater White-fronted Goose, Canada Goose and Tundra Swan were all identified and confirmed present on site for the 2008 monitoring season (Table 10-4). No observations of Snow Geese were made although they were observed during baseline studies. The total number of geese observations made during 2008 was 95.

Table 10-4 Geese Species Present (√) or Absent (χ) on East Island for All Monitoring Years

Species	Baseline (1995-1997)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Canada Goose	✓	✓	✓	✓	✓	✓	✓	✓	×	✓
Greater White-fronted Goose	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Snow goose	✓	×	✓	✓	×	✓	✓	×	×	×
Tundra Swan	✓	✓	×	×	×	×	✓	×	×	✓

The Greater White-fronted Goose comprised 91% of observations made of goose species (Table 10-5). The remaining observations were of Canada Goose (5) and Tundra Swan (3). One sighting of an unidentifiable species also was recorded.

Table 10-5 Waterfowl Survey Goose Observations

Species	Observations
Canada Goose	5
Greater White-fronted Goose	86
Tundra Swan	3
Goose spp.	1
Total	**95**

Dabbling Ducks

Four species of dabbling ducks were confirmed present during the 2008 waterfowl monitoring surveys (Table 10-6). Northern Pintail have been observed consistently since baseline, while the American Green-winged Teal, which were absent from 2002 to 2004, were recorded again for the fourth straight year. There were seven sightings of Mallard's. This is the second subsequent year the Mallard has been present. The American Wigeon was observed on site this year after being absent in 2007.

Table 10-6 Dabbling Duck Species Present (√) or Absent (χ) on East Island for All Monitoring Years

Species	Baseline (1995-1997)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Northern Pintail	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mallard	✓	×	×	✓	×	×	×	×	✓	✓
American Wigeon	✓	×	✓	×	×	×	×	✓	×	✓
American Green-winged Teal	✓	✓	✓	×	×	×	✓	✓	✓	✓

Northern Pintail continue to be the most abundant dabbling duck observed with 84% of all observations in 2008. The American Green-winged Teal accounted for 8% and Mallards comprised 6% of observations (Table 10-7). The American Wigeon accounted for 3% of all observations (Table 10-7). A total of 116 dabbling ducks were recorded in 2008.

All unidentified duck observations were grouped with diving ducks, as has been done consistently since baseline.

Table 10-7 Waterfowl Survey Dabbling Duck Observations – 2008

Species	Observations
Northern Pintail	97
American Green-winged Teal	9
Mallard	7
American Wigeon	3
Total	116

Diving Ducks

Nine bird species categorized as diving ducks were observed during the 2008 shallow bay and mine-altered water body monitoring programs (Table 10-8). To date, the Long Tailed Duck is the only species to be observed during baseline and all subsequent monitoring years. Three species not seen in 2007 appeared at the site in 2008. These species were the Black Scoter, Common Loon, and the Lesser Scaup.

Table 10-8 Diving Duck Species Present (√) or Absent (χ) on East Island for All Monitoring Years

Species	Baseline (1995-1997)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Long Tailed Duck (Oldsquaw)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Greater Scaup	✓	✓	✓	×	✓	×	✓	✓	✓	✓
Black Scoter	✓	×	×	×	×	×	✓	×	×	✓
Surf Scoter	×	×	×	×	×	✓	×	×	×	×
Red-breasted Merganser	✓	✓	✓	×	✓	×	✓	✓	✓	✓
Common Loon	✓	×	×	✓	✓	×	✓	✓	×	✓
Red-throated Loon	✓	✓	✓	×	×	×	✓	✓	✓	✓
Pacific Loon	×	×	×	×	×	×	×	✓	✓	✓
Yellow Billed Loon	×	×	×	×	×	×	×	✓	×	×
Lesser Scaup	×	×	×	×	×	×	×	✓	×	✓
Common Merganser	×	×	×	×	×	×	×	✓	✓	✓
Hooded Merganser	×	×	×	×	×	×	×	×	✓	×

In total, 222 observations were made from the diving duck category, including those duck–like birds that were unidentified (Table 10-9). The Long Tailed Duck and Greater Scaup were the most common diving ducks, with 56% and 20% of the observations, respectively.

Table 10-9 Waterfowl Survey Diving Duck Observations - 2008

Species	Observations
Black Scoter	2
Common Loon	3
Common Merganser	4
Greater Scaup	44
Lesser Scaup	1
Long Tailed Duck	124

Species	Observations
Pacific Loon	2
Red Breasted Merganser	2
Red Throated Loon	14
Duck spp.	23
Loon spp.	3
Total	222

Habitat Utilization

The water management system for the Diavik mine includes several engineered, lined ponds to collect site run off water. There are 11 mine-altered water bodies to date, each of which has the potential to provide suitable habitat for migratory birds. Specific water bodies included in surveys are the North Inlet, Processed Kimberlite Containment (PKC) area, and collection ponds 1, 2, 3 (formerly the Clarification Pond), 4, 5, 10, 11, 12 and 13 (Figure 10-2). Former collection pond 14 was drained of water and ceased operation in the spring of 2008; this pond was only required during construction of the A418 dike and pit. The area previously designated as the Sedimentation Pond was removed from the monitoring program in 2006 as it was reclaimed by the waste rock pile.

As part of the water management system, the water within the North Inlet was lowered and exposed “new” shoreline habitat that may potentially be used by waterfowl and shorebirds. The Processed Kimberlite Containment (PKC) area was constructed in 2002, and waters that could potentially be used by waterfowl are stored in this area for use within the diamond process plant. Use of these areas will be monitored by DDMI to determine the extent to which early open water or vegetation growth may attract waterfowl. This data can then be compared to that of East Island’s shallow bays, which have not been substantially altered by mine activities.

The objective is to determine if waterfowl are using mine-altered waters, thereby determining if:

> ***Early open water or early vegetation growth might attract waterfowl during spring migration.***

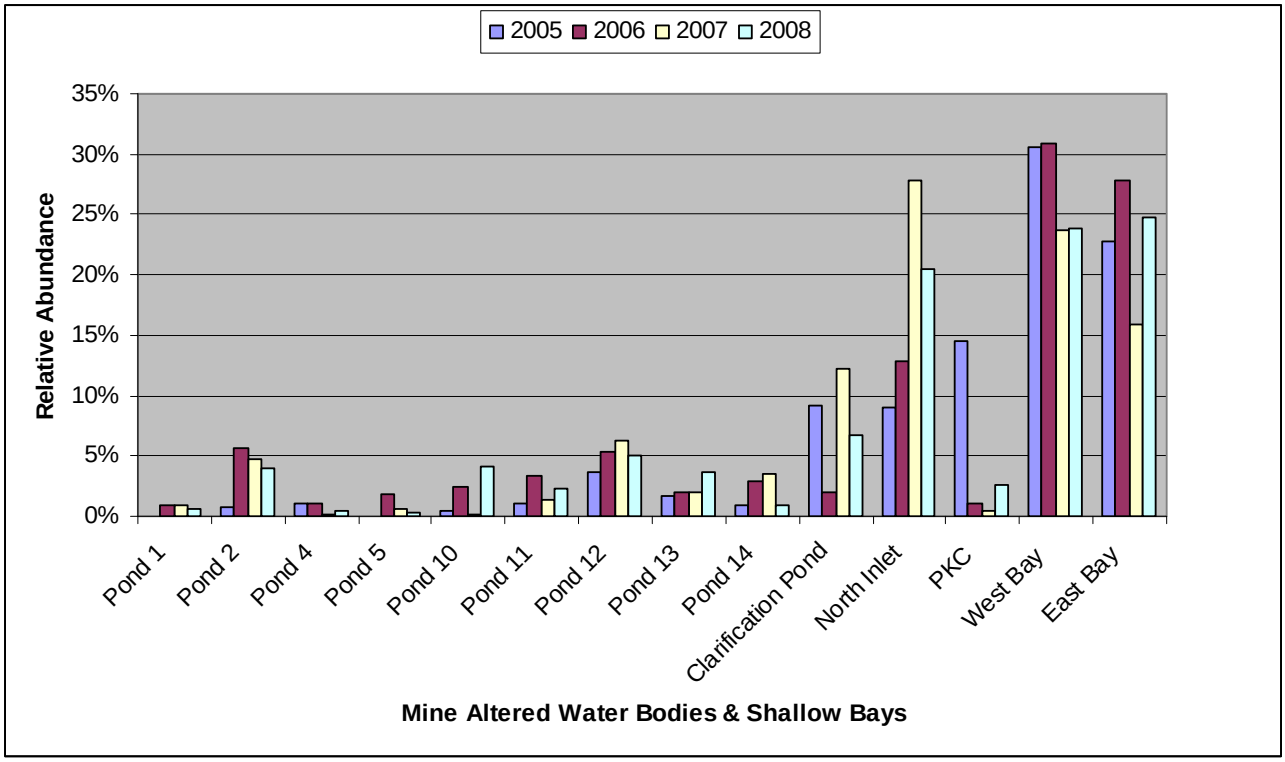
Methods

Mine-altered water bodies and East Island shallow bays were surveyed daily from 25 May to 20 June 2008 and then weekly from 25 June to 9 October 2008. In accordance with the 2008 DDMI waterfowl survey methods (Appendix II), Environment personnel walked the perimeters of the shallow bays and scanned mine-altered water bodies and shoreline perimeters with binoculars, to identify and record all bird observations.

Results

Monitoring surveys conducted on the shallow bays and mine-altered water bodies of the Diavik mine site resulted in a total of 935 bird observations and 6,135 individuals recorded including all passerines, birds of prey and seabirds. The west and east shallow bays each accounted for 24% (223) and 25% (232) of all observations, respectively. Mine-altered water bodies combined accounted for the remaining 51% (480) of observations (Figure 10-3).

Figure 10-3: Relative abundance of observations by habitat area

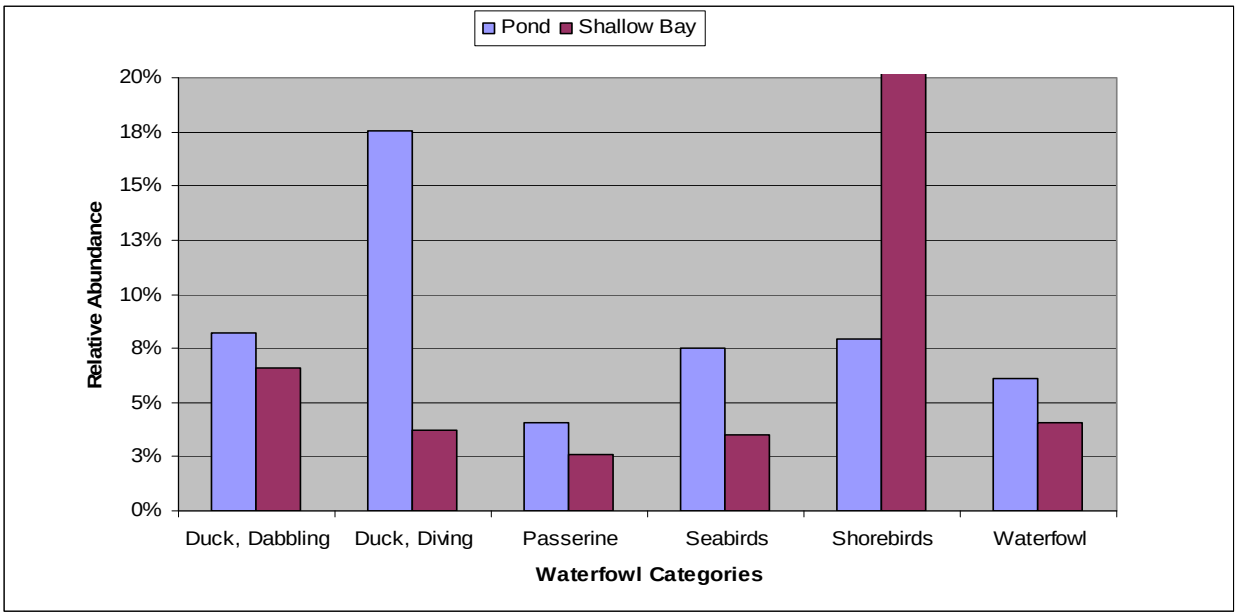


In 2008, as with previous years, the majority of observations in mine-altered water bodies occurred at the North Inlet (Figure 10-3). Overall distribution has remained fairly constant, in that the majority of observations continue to occur in the larger water bodies, possibly indicating habitat preference. Construction activities were taking place at both the North Inlet and PKC area water bodies during the summer of 2008; dike construction on the east and west sides of the North Inlet and a dam raise around the PKC. Additionally, pumping activities at many of the collection ponds increased during 2008, due to required maintenance activities or seepage concerns. This resulted in many of the ponds having very low water levels throughout the spring and summer months. Each of these activities likely contributed to the overall decrease in waterfowl presence and activity.

When comparing relative abundance of waterfowl monitoring categories between shallow bays and mine-altered water bodies a noticeable habitat preference seems to be apparent for shorebirds and diving ducks (Figure 10-4). Shorebirds appear to favour the shallow bays,

which have extensive areas suitable for feeding and nesting. Diving ducks tend to prefer the mine-altered water bodies such as the North Inlet, which have deeper water and a shoreline of rock outcrops suitable for nesting ducks. The data for 2008 also show an affinity for seabirds to mine-altered ponds.

Figure 10-4: Relative abundance of Waterfowl – Shallow Bays vs. Mine-altered water bodies, 2008.



Recommendations

Observations at the shallow bays and mine-altered water bodies should only be done for 5 weeks during the peak migration in order to capture presence of bird species using the area.

Red-breasted Mergansers

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Appendix I

Permanent Vegetation Plot Data Tables

Table 1. Mean percent cover of species in mine site permanent vegetation plots, Diavik Diamond Mine, 2008.

PVP Number	1	2	3	4	5	6	7	8	9	10	20	21	22	23	24	31
Plant Community[1]	H	H	T-H	T-H	S	H	T-H	E	S	S	T-H	H	S	S	T-H	H
Vegetation Canopy Cover																
Andromeda polifolia	0	0	0	0[2]	0[2]	0	3	0	0[2]	0	0[2]	0	0	0	0[2]	0
Arctostaphylos rubra	4	1	1	0	0	0	0	0	5	4	3	1	2	0[2]	0	5
Astragalus agrestis	0	0[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragalus alpinus	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula glandulosa	2	9	5	2	6	0	2	0	5	13	4	6	13	26	7	1
Calamagrostis inexpansa	0	0	0	0	0[2]	0	0	0	0	0	0	0	0	0[2]	0	0
Calamagrostis sp.	0	0	0[2]	0	0	0	0[2]	0	0	0	0	0	0	0	0	0
Carex aqualtius var. *aquatilus*	0	0	0[2]	0[2]	0	0	0	0	0	0	0	0	0	0[2]	0	0
Carex aquatilus var. *stans*	1	0[2]	0	0	0[2]	0	16	0	0	0[2]	0	1	0[2]	0	0	0[2]
Carex saxatilis	0	0[2]	0	0[2]	0	0[2]	6	0	0	0	0	0	0	0	0	0
Carex sp.	0	0	0	0[2]	0	0	0	0	0	0	0	0	0	0	0	0
Empetrum nigrum	3	3	0[2]	0[2]	0[2]	0[2]	0[2]	19	1	4	0[2]	3	7	6	0	8
Eriophorum angustifolium	0	0	0	0[2]	0	0	0	0	0	0	0	0	0[2]	0	0	0
Eriophorum vaginatum	0	0	9	5	0	1	0	0	0	0	3	0	0	0	7	0[2]
Hierochloe alpina	0[2]	0[2]	0[2]	0	0[2]	0	0	0	0[2]	0[2]	0	0	0[2]	1	0	0[2]
Ledum decumbens	3	5	10	0[2]	14	17	1[2]	0	3	2	7	2	3	4	6	6
Loiseleuria procumbens	9	2	0	0	0[2]	0	0	0	0	0[2]	0	2	1	0[2]	0	0
Oxycoccus microcarpus	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Pedicularis lapponica	0	0	0[2]	0	0	0	0	0	0	0	0[2]	0[2]	0	0	0[2]	0
Purple grass	0	0	0	0	0	0	0[2]	0	0	0	0	0	0	0	0	0
Rubus chamaemorus	0	0	0	2	3	2	0	0	2	0	0	0[2]	0	1	1	0
Salix fruscescens	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0[2]	0
Salix glauca	1	2	0	0[2]	0	0	0	0	0	0	0	0	0	0[2]	0	0
Salix planifolia	0[2]	0	0	0	0	0	0	0	0	0	0	0[2]	0[2]	2	0	0
Tofieldia pusilla	0[2]	0	0	0	0	0	0[2]	0	0	0	0	0	0	0	0	0
Vaccinium uliginosum	0[2]	0[2]	0	0	4	1	1	0[2]	4	3	1	4	0[2]	10	0[2]	0[2]
Vaccinium vitis idaea	5	3	3	3	15	3	0[2]	0[2]	9	1	5	3	9	5	4	4

Table 1. Mean percent cover of species in mine site permanent vegetation plots, Diavik Diamond Mine, 2008 (continued).

PVP Number	1	2	3	4	5	6	7	8	9	10	20	21	22	23	24	31
Plant Community	**H**	**H**	**T-H**	**T-H**	**S**	**H**	**T-H**	**E**	**S**	**S**	**T-H**	**H**	**S**	**S**	**T-H**	**H**
Ground Cover																
Vegetation	25	20	22	10	17	18	26	16	11	9	15	17	20	15	17	13
Moss	5	16	15	57	12	9	22	2	12	2	20	4	2	1	55	0[2]
Fungus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terricolous (soil) lichen	9	8	0[2]	2	4	19	0[2]	14	0[2]	1	0[2]	33	4	0[2]	3	18
Saxicolous (rock) lichen	0[2]	0[2]	0	5	0[2]	0	0	1	3	0	0	4	2	0	0	0
Litter	59	56	63	24	68	51	52	13	72	89	65	41	73	83	26	70
Rock	2	1	0	1	0[2]	0	0	6	2	0	0	1	1	1	0	0
Animal pellets	0[2]	0[2]	0[2]	0[2]	0	0[2]	0[2]	0[2]	0	0[2]	0[2]	0[2]	0[2]	0	0[2]	0[2]
Bare ground	0[2]	0[2]	0	2	0	3	0[2]	49	0	0[2]	0	0[2]	0[2]	0	0	0[2]

[1] H = Heath, T-H = Tussock-Hummock, S = Shrub and E = Esker community

[2] Species present but in low abundance

Table 2. Mean percent cover by species in reference permanent vegetation plots, Diavik Diamond Mine, 2008.

PVP Number	11	14	17	26	30	12	15	18	25	28	13	16	19	27	29
Plant Community[1]	**H**	**H**	**H**	**H**	**H**	**T-H**	**T-H**	**T-H**	**T-H**	**T-H**	**S**	**S**	**S**	**S**	**S**
Vegetation Cover															
Andromeda polifolia	0	0[2]	0	0	0	2	0[2]	0[2]	0[2]	0	0[2]	0	0	0	0
Arctostaphylos rubra	7	0	3	0[2]	6	4	0	0	5	0	0	1	9	0	4
Astragalus agrestis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragalus alpinus	0	0	0	0	0	0	0	0	0	0	0	0	0[2]	0	0
Betula glandulosa	0	1	2	6	2	3	0[2]	0[2]	0[2]	2	7	26	16	19	25
Betula sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis inexpansa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex sp.	0	0	0	0	0	0	0	0	0[2]	0	0	0	0	0[2]	0
Carex aqualtius var. *aquatilus*	0	0[2]	0	0[2]	0	0	0	0[2]	0	0	0	0	0	0	0
Carex aquatilus var. *stans*	0	0	0	0	0	0	0[2]	0[2]	0	0	0	0	0	0	0
Carex saxatilis	0	0	0	0	0	0	0[2]	0	0	0	0	0	0	0	0
Empetrum nigrum	4	5	6	5	6	2	0[2]	1	8	0	1	5	3	0	2
Eriophorum vaginatum	0	0	0	0	0	0[2]	7	4	8	5	0[2]	0	0	0	0
Hierochloe alpina	0	0	0	0	0	0	0	0	0[2]	0	0[2]	0[2]	0[2]	0[2]	0
Ledum decumbens	1	11	5	1	13	4	0[2]	1	4	2	12	3	0[2]	2	1
Loiseleuria procumbens	0	0[2]	4	1	1	0	0	0	0	0[2]	0	0	0[2]	0	0
Oxycoccus microcarpus	0	0	0	0	0	0	0[2]	0	0	0	1	0	0	0	0
Pedicularis lapponica	0	0	0	0	0	0[2]	0	0[2]	0	0	0	0	0	0	0
Purple grass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubus chamaemorus	0	0[2]	0	0	0	6	1	1	1	2	0[2]	0	0	0	0
Salix fruscescens	0	0	0	0[2]	0	0[2]	0	0	0	0	0	0	0	0	0
Salix glauca	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0[2]
Salix planifolia	0	0	0	0[2]	0	0	0[2]	0	0	0	0[2]	0	0	0	0
Tofieldia pusilla	0	0	0	0	0	0	0	0	0[2]	0	0	0	0	0	0
Vaccinium uliginosum	0[2]	4	1	0[2]	1	2	2	0[2]	4	0[2]	1	1	0[2]	1	1
Vaccinium vitis idaea	7	13	1	2	3	6	0[2]	0[2]	5	1	3	12	6	1	8
Ground Cover															
Vegetation	16	26	12	3	12	25	6	5	30	7	13	23	17	6	14
Moss	0[2]	10	0[2]	2	0[2]	40	86	78	25	30	23	0[2]	10	5	6
Fungus	0[2]	0	0	0	0	0	0[2]	0	0	0	0	0	0	0	0[2]
Terricolous (soil) lichen	20	35	69	92	36	3	0	10	4	33	3	0[2]	2	25	2
Saxicolous (rock) lichen	9	2	3	0[2]	0	0	0	0	0	0	0	0	0	1	0
Litter	53	26	15	4	52	33	8	7	42	31	61	77	72	64	78
Rock	2	1	0[2]	0[2]	0	0	0	0	0	0	0	0	0	1	0
Animal pellets	0[2]	1	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0	0[2]	0	0[2]	0	0[2]
Bare ground	4	0	2	0	0	0	0	0	0	0	0[2]	0	0[2]	0[2]	0

[1] H = Heath, T-H = Tussock-Hummock, S = Shrub and E = Esker community
[2] Species present but in low abundance

Table 3. Mean percent cover on mine and reference sites, Diavik Diamond Mine, 2008.

	Mine Heath	Reference Heath	Mine Tussock-Hummock	Reference Tussock-Hummock	Mine Shrub	Reference Shrub
Canopy Cover						
Andromeda polifolia	0 (0)	0 (0)[1]	1 (0)	1 (0)	0 (0)[1]	0 (0)[1]
Arctostaphylos rubra	2 (1)	3 (1)	1 (0)	2 (1)	2 (1)	3 (1)
Astragalus agrestis	0 (0)[1]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Astragalus alpinus	0 (0)[1]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)[1]
Betula glandulosa	3 (1)	2 (1)	**4 (1)**	**1 (0)**	13 (3)	18 (2)
Calamagrostis inexpansa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)[1]	0 (0)
Calamagrostis sp.	0 (0)	0 (0)	0 (0)[1]	0 (0)	0 (0)	0 (0)
Carex aqualtius var. *aquatilus*	0 (0)	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]
Carex aquatilus var. *stans*	0 (0)[1]	0 (0)[1]	3 (1)	0 (0)[1]	0 (0)[1]	0 (0)
Carex saxatilis	0 (0)[1]	0 (0)	1 (1)	0 (0)[1]	0 (0)	0 (0)
Carex sp.	0 (0)	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)
Empetrum nigrum	4 (1)	5 (1)	0 (0)[1]	2 (1)	4 (1)	2 (1)
Eriophorum vaginatum	0 (0)[1]	0 (0)	5 (1)	5 (1)	0 (0)	0 (0)[1]
Eriophorum angustifolium	0 (0)	0 (0)	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)
Hierochloe alpina	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]
Ledum decumbens	7 (1)	4 (1)	5 (1)	2 (0)	5 (1)	4 (1)
Loiseleuria procumbens	2 (1)	1 (0)	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)[1]
Oxycoccus microcarpus	0 (0)	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)[1]
Pedicularis lapponica	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)
Purple grass	0 (0)	0 (0)	0 (0)[1]	0 (0)	0 (0)	0 (0)
Rubus chamaemorus	0 (0)[1]	0 (0)[1]	1 (0)	2 (1)	1 (0)	0 (0)[1]
Salix fruscescens	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)
Salix glauca	1 (0)	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]
Salix planifolia	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)[1]
Tofieldia pusilla	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)
Vaccinium uliginosum	1 (0)	1 (1)	0 (0)[1]	2 (0)	4 (1)	1 (0)
Vaccinium vitis idaea	4 (1)	5 (1)	3 (1)	3 (1)	8 (1)	6 (1)
Ground Cover						
Vegetation	19 (1)	14 (2)	18 (2)	14 (3)	14 (1)	14 (2)
Moss	7 (2)	2 (1)	34 (5)	52 (6)	6 (2)	9 (3)
Fungus	0 (0)	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)	0 (0)[1]
Terricolous (soil) lichen	**17 (2)**	**50 (6)**	1 (0)	10 (4)	2 (1)	6 (2)
Saxicolous (rock) lichen	1 (0)	3 (1)	1 (1)	0 (0)	1 (1)	0 (0)[1]
Litter	**55 (2)**	**30 (5)**	46 (5)	24 (4)	77 (3)	70 (3)
Rock	1 (0)	1 (0)	0 (0)[1]	0 (0)	1 (0)	0 (0)[1]
Animal pellets	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]
Bare ground	1 (0)	1 (0)	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)[1]

SE is in brackets after the means

Significant differences at $p = 0.05$ are in bold type

Means and SE are rounded to the nearest whole number

[1] Species present but in low abundance

Table 4. Mean percent cover in mine heath and tussock-hummock, Diavik Diamond Mine, 2001, 2004, 2006 and 2008.

	Heath 2001	Heath 2004	Heath 2006	Heath 2008	Tussock-Hummock 2001	Tussock-Hummock 2004	Tussock-Hummock 2006	Tussock-Hummock 2008
Vegetation Cover								
Betula glandulosa	13 (6)	10 (4)	4 (3)	3 (1)	**12 (4)**	**13 (3)**	**4 (2)**	**4(1)**
Salix glauca	0 (0)	3 (1)	1 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)[1]
Salix planifolia	2 (1)	1 (1)	0 (0)[1]	0 (0)	**1 (1)**	**0 (0)**	**0 (0)[1]**	**0 (0)**
Salix herbecea	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)	0 (0)	0 (0)[1]	0 (0)	0 (0)
Salix fruscescens	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)	4 (4)	0 (0)[1]	0 (0)
Andromeda polifolia	3 (3)	2 (2)	0 (0)	0 (0)	2 (1)	3 (2)	4 (3)	1 (0)
Arctostaphylos rubra	5 (2)	6 (2)	2 (1)	2 (1)	1 (0)	1 (0)	0 (0)[1]	1 (0)
Empetrum nigrum	5 (1)	6 (2)	4 (2)	4 (1)	**2 (1)**	**2 (1)**	**0 (0)[1]**	**0 (0)[1]**
Kalmia polifolia	0 (0)[1]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Ledum decumbens	10 (4)	9 (3)	12 (5)	7 (1)	8 (4)	11 (6)	6 (5)	5 (1)
Loiseleuria procumbens	6 (4)	7 (5)	6 (5)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Oxycoccus microcarpus	0 (0)	0 (0)[1]	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)[1]
Vaccinium uliginosum	2 (1)	2 (0)	1 (1)	1 (0)	1 (0)	1 (0)	1 (1)	0 (0)[1]
Vaccinium vitis idaea	13 (3)	10 (3)	9 (3)	4 (1)	9 (3)	8 (3)	4 (2)	3 (1)
Astragalus agrestis	0 (0)	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)	0 (0)	0 (0)
Astragalus alpinus	1 (1)	1 (1)	1 (1)	0 (0)[1]	0 (0)	0 (0)	0 (0)	0 (0)
Pedicularis lapponica	0 (0)	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]	0 (0)[1]
Rubus chamaemorus	0 (0)[1]	0 (0)[1]	1 (1)	0 (0)[1]	4 (2)	2 (2)	1 (1)	1 (0)
Tofieldia pusilla	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)	0 (0)[1]	0 (0)[1]
Hieodorata alpina	0 (0)	0 (0)	0 (0)	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)	0 (0)[1]
Calamagrostis inexpansa	0 (0)	0 (0)	0 (0)[1]	0 (0)	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)
Eriophorum angustifolium	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)[1]	0 (0)
Eriophorum vaginatum	0 (0)	0 (0)	1 (1)	0 (0)[1]	17 (14)	8 (5)	7 (4)	5 (1)
Carex aquatilus[2]	3 (2)	3 (2)	0 (0)[1]	0 (0)[1]	2 (2)	7 (6)	6 (6)	3 (2)
Carex rotundata[3]	0 (0)	0 (0)	0 (0)	0 (0)	4 (2)	3 (3)[3]	0 (0)	0 (0)
Carex saxatilis	0 (0)[1]	0 (0)	0 (0)	0 (0)[1]	0 (0)[1]	0 (0)	0 (0)[1]	1 (1)
Carex sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)[1]	0 (0)[1]
Ground Cover								
Moss	17 (13)	31 (14)	9 (6)	7 (2)	33 (14)	47 (12)	64 (11)	34 (5)
Fungus	0 (0)[1]	0 (0)	0 (0)[1]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Terricolous (soil) lichen	**8 (2)**	**6 (2)**	**6 (3)**	**17 (2)**	2 (2)	1 (1)	2 (1)	1 (0)
Saxicolous (rock) lichen	nm	nm	0 (0)[1]	1 (0)	nm	nm	1 (1)	1 (1)
Litter	nm	nm	**4 (2)**	**55 (2)**	nm	nm	**1 (1)**	**46 (5)**
Rock	2 (1)	1 (0)	1 (1)	1 (0)	0 (0)	0 (0)	3 (3)	0 (0)[1]
Animal pellets	nm	0 (0)[1]	0 (0)[1]	0 (0)[1]	nm	0 (0)[1]	0 (0)[1]	0 (0)[1]
Bare ground	**11 (3)**	**2 (0)**	**4 (2)**	**1 (0)**	2 (2)	1 (1)	1 (1)	0 (0)[1]

SE are in brackets after the means; Significant differences at $p = 0.05$ are in bold type

[1] Species present but in low abundance

[2] *Carex aquatilis* var. *stans* and *Carex aquatilis* var. *aquatilis* combined.

[3] Listed as *Carex* #1 in 2004 but included in *Carex rotundata* for analysis as only *Carex* in plot and similar abundance.

nm = not measured

Appendix II

Standard Operating Procedures

1 OBJECTIVE/PURPOSE

This Standard Operating Procedure (SOP) provides guidelines on procedures to follow when conducting aerial surveys for caribou to determine the relative abundance, distribution, dominant behaviours, group composition and activity of caribou with respect to the mine site. It also allows for collection of incidental observations of other wildlife.

2 RESPONSIBILITIES

It is the Senior Environmental Coordinator's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP).

It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 Field Procedures

Surveys will be flown once per week from late April through to early October, with only the even-numbered transects being flown between 5 June and 10 July when caribou are at the calving grounds. The first survey should occur prior to caribou moving through the study area while the last should occur during the post-migration period. Initial dates for northern migration and final dates for the post-southern migration surveys will remain flexible in response to current data from satellite-collared caribou delivered by the department of Environment & Natural Resources (ENR) and local observations of caribou in the area.

Systematic surveys with a transect width of 1.2 km (600m/2000 feet on each side of helicopter) will be used to estimate the number of animals in the study area. To ensure that observations are restricted to within the 600-metre boundary, marks must be made on the side windows of the helicopter. Before the survey begins, the pilot is asked to fly to 110-130 meters (360-430 ft) (AGL) and hover with the helicopter perpendicular to the runway with two one thousand foot markers on either side of the helicopter. The observers then mark the side windows with a horizontal line, which lines up with the second one thousand foot marker. The mark is then used as an observation boundary. Only caribou observed beneath the line will be recorded as on transect. The distance between transects will be 4km.

A helicopter will be used for all surveys. In addition to the pilot, a navigator in the front seat will use a 1:250,000 scale map to plot and follow a predetermined flight path, and record all observations of wildlife by observation number. The navigator will also record all pertinent data including the GPS location, distance & direction of caribou from recorded waypoint, group size

and composition, dominant behavior, direction if moving and habitat type (see descriptor codes on page 3).

To ensure consistency in survey methods two observers will observe from the rear of the helicopter. Neither the pilot nor navigator will be permitted to help observe. When caribou are observed, the observer will call "mark" so the navigator can immediately mark and save a waypoint. Then the observer will call out the number of caribou, composition (male, female, or calf), distance from the helicopter, activity, direction if moving and habitat type. Caribou observed beyond the transect width or outside of the study area during turns at the end of each transect can be noted on the sheet, but no GPS waypoint should be taken. If the pilot is speaking on the radio, the observer may tap the navigator/recorder on the shoulder and s/he will know to mark a waypoint. Details can be gathered once the pilot is off the radio. Never speak over the pilot while s/he is communicating with the airport and/or other aircraft.

Surveys will be conducted from 110-130 meters (360-430 ft) above ground level (AGL), at a speed of 145-160 kilometers per hour (90-99 mph). Surveys range from 4-8 hours and extend slightly beyond the DDMI study area. Please refer to the attached map. Caribou activity budgets are to be performed concurrently with the aerial survey. Once the aerial survey is complete, the pilot will fly back to the area the caribou were seen and drop crews on the ground to conduct activity budgets (SOPENV-WILD-15, Caribou Scanning).

Incidental observations of other species will be made, but there will be no excessive deviation from the flight path in connection with such observations. Incidental observations of grizzly bear (and dens), wolves (and dens), wolverines, black bears, raptors (and nest sites), muskoxen and moose will be recorded on aerial survey datasheets. These observations will later be recorded as 'incidental observations'.

Local weather conditions resulting in poor visibility during surveys may result in temporary deviation from these protocols.

3.2 Data

The following information will be recorded for caribou observations:

- GPS location, using hand held GPS or helicopter GPS
- Distance of location from helicopter
- Habitat type
- Number of caribou
- Dominant composition of caribou (nursery or non-nursery)
- Dominant behavior (activity) of group
- Direction of caribou movement, if moving
- Locations of tracks/trails, direction of travel or orientation of tracks/trails
- Observation of any other wildlife, den locations or raptor nest sites

If surveys detected no caribou, then "0" or "no observations" should be entered on the data sheet and in the database for that date.

A running tally of helicopter hours and fuel use will be kept and reported on the datasheet. Additionally, a signed copy of the helicopter receipt should be kept in the Helicopter Logbook.

3.3 Analysis and Reporting

Data collected will be transferred to the DDMI database. This data will be checked for omissions and/or errors to ensure accurate data entry.

Analyses will take into consideration the relative value of habitat and topography to caribou in addition to distance to mine elements.

For each migration period, a field report of total numbers of caribou and other wildlife seen will be prepared.

3.4 Descriptors & Codes

Vegetation/Habitat Classifications for the Lac de Gras Area
Used for Caribou Survey

Adapted from Matthews, Epp and Smith, 2001

Heath Tundra (*HT*)

Heath Tundra (<30% Rock) This class of heath tundra is a closed mat plant community that grows on moderate to well drained soils, covering most of the upland areas. Plants generally belong to the heath family, the Ericaceae. The vegetation layer forms a mat of low shrubs dominated by dwarf birch and Labrador tea. Other common plant species include lingonberry, blueberry, crowberry, alpine milkvetch (***Astragalus alpinus***) and alpine azalea (***Loiseleuria procumbens***). Herb and moss layers are not well developed. Typical lichens include several species of Cetraria, Cladina, Cladonia and others. As a closed mat community, vegetation covers at least 70 percent of the surface of the ground.

Heath/Bedrock (30-80% Bedrock) Where heath tundra thins and bedrock outcrops are exposed, vegetation is discontinuous and is best described as open mat heath tundra. This class of heath tundra is easily distinguished on satellite imagery due to the presence of bedrock, reduced vegetative cover and therefore a distinctive highly reflective spectral signature. Plant species are typical heath species described above.

Heath/Boulders (30-80% Boulders) Heath with boulder fields is also an open mat plant community class. It can be distinguished from the heath/bedrock class because of the spectral differences between bedrock and boulders. Textural differences between boulders and bedrock are significant from an image analysis perspective. Differences in lichen composition and cover on boulders and bedrock outcrops also contribute to the identification of these separate classes.

Boulder Association (*BO*) (>80% Boulders)

Heath with boulder fields is also an open mat plant community class. It can be distinguished from the heath/bedrock class because of the spectral differences between bedrock and boulders. Textural differences between boulders and bedrock are significant from an image analysis perspective. Differences in lichen composition and cover on boulders and bedrock

outcrops also contribute to the identification of these separate classes.

Large areas of boulder fields exist in the central part of the study area and are found to a lesser extent in other areas. Boulder associations include boulder outcrops, boulder streams and drainages, as well as glacial eratics. This land cover type supports very little plant growth. Boulders, however, support a variety of rock lichens. Crustose lichens which are common include ***Umbilicaria*** spp. (rock tripe), ***Xanthoria elegans*** (orange rock lichen), ***Rizocarpon geographicum*** (green map lichen), ***Parmeliopsis ambigua*** (green starburst lichen), and others.

Bedrock Association (*BE*) (>80% Bedrock)

Exposed bedrock supports very little vegetative cover. These areas are generally wind swept and moisture free. Early colonisers such as crustose lichens are common, but vegetative coverage is highly variable and favours protected areas, crevices and depressions where growth can be initiated. Cover types having discontinuous vegetation, such as described above, may be confused with other cover types because substrate such as bedrock or boulders dominates the reflectances of the vegetation that is present.

Esker Complex (*EC*)

Eskers provide significant topographic relief to a gently rolling tundra landscape. These linear structures of sand and gravel, formed by glacial rivers, can run for hundreds of kilometres and reach 30 m in height. Eskers support a number of plant communities and are important habitat for wildlife. They are used as travel corridors by caribou, grizzly bears, wolves and other wildlife. The ice-free substrate of sand and gravel provides excellent den sites where digging is relatively easy. Eskers, being a complex of plant communities, can be difficult to classify using computer classifiers. Esker tops are wind- swept and, therefore, accumulate very little snow during the winter.

Sedge Wetland (*SW*)

Sedge Wetland Wetland complexes are typically wet sedge meadows and other sedge associations of non-tussock plant species. Sedge species such as ***Carex aquatilis*** and ***C. bigelowii***, and cotton grass (***Eriophorum angustifolium***) are the dominant vegetation types. Plant species occupy wet, low lying sites where standing water is present throughout much of the growing season. The substrate is usually organic or silty soils.

Tussock/Hummock (Sedge Association) Plants belonging to the sedge family (***Cyperaceae***) are also dominant in this vegetation unit. Tussock cotton grasses such as ***Eriophorum vaginatum*** and ***E. russeolum*** are common. These sites are drier and less frequently flooded than sedge wetlands. Tussocks produce hummocks or mounds of 0.4 to 1 m in diameter. Hummocks are typically composed of old tussocks invaded by bog rosemary (***Andromeda polifolia***), cloudberry (***Rubus chamaemorus***), Labrador tea (***Ledum decumbens***), blueberry (***Vaccinium*** spp.), and cranberry (***Vaccinium vitis-idaea***). Sphagnum moss typically occupies the troughs between hummocks. Dwarf birch (***Betula*** spp.) and willow (***Salix*** spp.) tend to become established on the older hummocks (Diavik Diamond Mines Inc. 1998). Sedge wetlands and Tussock/Hummock vegetation provide important foraging areas for barren-ground caribou.

Riparian Shrub (*RS*)

Riparian Tall Shrub This riparian association follows active stream courses, usually with a cobble or boulder substrate. Riparian tall shrub appears as linear plant associations of birch, willow and alder. Tall shrubs such as diamond-leaved willow (Salix planifolia) and green alder (Alnus crispa) can reach heights up to 4 m. Black spruce may also be associated with this community, particularly in some southern parts of the study area. Understory plant species include dwarf raspberry, dwarf marsh violet, cloudberry, grasses, sedges, club mosses and common horsetail. This vegetation unit is one of the most productive in the area.

Birch Seep This vegetation unit occurs in areas of active water seepage through boulder fields and boulder streams. Birch (Betula spp.) is the dominant vegetation, which commonly reaches a height of 1 m. Diamond-leaved willow is also present in smaller amounts. Blue joint (Calamagrostis canadensis) and water sedge (Carex aquatilis) are common plant species occurring in the understory along with crowberry (Empitrum nigrum), Labrador tea (Ledum decumbens), and mosses.

Spruce Forest (*SF*) The treeline lies in an area of transition between the tundra and boreal forest to the south. Boreal forest species become more common with the presence of dwarf white spruce (***Picea glauca***) and black spruce (***Picea mariana***). The northern limit of black spruce generally falls short of white spruce in this part of the Northwest Territories (Porsild and Cody 1980). Both species grow in lowland, sheltered areas such as river valleys, where soil moisture is abundant. The forest in this region is typically clumped with outliers in this predominantly tundra landscape. In some areas, spruce-lichen woodland exists in more favourable habitats.

Disturbed Site (*DS*) A habitat that has been altered by human development. This includes roads, pits airstrips and other portions of the mine footprint

Ice (*IC*) Frozen lakes

Lake (*LA*) Lake

Snow covered Tundra (*ST*) *(NEW in 2005)* This vegetation unit only includes Heath Tundra (HT) and Sedge Wetlands (SW) that may be indistinguishable when covered in snow. This code should not be necessary for other habitat types, such as Boulder (BO) and Bedrock (BE) Associations.

Group Composition

Code	Descriptor
F	**Females:** Have a dark vulva fur patch below tail and anus; cow antlers are relatively small and spindly, 9-20 inches long or 23-50 cm tall; weigh between 150 and 300 pounds; have hard antlers all winter and drop them pre-calving (June) and then start re-growing antlers in June; about 4 ft to shoulder, or 1.2 m; 2 and 3 year old caribou will be hard to distinguish from adult females without seeing vulva patch
M	**Males:** No dark vulva patch; white fur from tail to underside; have a vivid white belly (less visible on females) and a pronounced white-ish to gray main; bull antlers are branched, semi-palmated, and have flattened brow tines 20-62 inches or 52-158 cm tall; weight 275 to 600 pounds; drop antlers late October and re-grow them starting in June; don't have antlers during the spring Northern migration; about 4.5 ft and taller (140-150 cm)
C	**Calves:** brown; very small; shoulder height is less than 70 cm around 2 ft; always with cow in first year
Y	**Yearling:** Smaller than full grown cows but larger than calves; shoulder height is approximately 1 meter or 3 ft.; solid light gray colour - adults have more distinct white and beige colour; yearling's antlers would be stubs (not over 6 inches)
F/C	Females with calf/calves
F/M	Females & males
F/M/C	Females, males, calves

Monthly Patterns

Apr/May: Large bulls will be antlerless (note: "bald" has been used in the past by some to refer to genetically antlerless) in March/April, with new antlers starting to form in May. By late May with thick beams 6-12" long. Younger bulls may carry hard antlers through most of April, then start regrowing antlers in May. Cows will mostly remain antlered. Calves will shed spike antlers in April and will start growing in May. Barren cows will also shed antlers in April and start growing in May. Some calves stay behind when bands head out to calving grounds, but many calves go with the bands.

June: Cow/calf pairs obvious. Larger bulls have up to 30-60 cm of heavy-beamed antlers. Pregnant cows will have nubs by mid-June, non-pregnant cows, yearlings and young bulls will all have some (10-30 cm) antler growth.

July: Large bulls will have obvious large antlers – big beams and points developing. Young bulls less so. Cows have antlers in velvet as well. Calves obvious (small, reddish). Yearlings will appear small bodied with relatively short faces.

Aug/Sept: Mature bulls will have large mature antlers, cow antlers will be fully formed. Calves usually have spikes only. Yearlings small bodied with shorter faces, with less developed antlers. Need to see vulva patch to ID yearlings to sex (yes – can use the angle of the antlers to help if viewing from the front, but really should see vulva patch to be sure.)

Activity

Code	Descriptor
A	Alert
B	Bedded
F	Feeding
B/F	Bedded/Feeding
R	Running
S	Standing
Sw	Swimming
T	Trotting
W	Walking

4 EQUIPMENT

- Binoculars
- GPS unit & spare batteries
- Maps
- Datasheet, including codes
- Survival gear

5 RELATED FORMS/DOCUMENTS

- Aircraft SOP (SOPENV-EQUIP-01)
- Caribou Scanning SOP (SOPENV-WILD-15)
- Caribou Aerial Survey Form (FORM-ENV-WILD-04)
- Caribou Scanning Observations (Activity Budget) Form (FORM-ENV-WILD-05)

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		March 2003
01	Updated	R. Eskelson/ S. Oystryk	March 2005
02	Updated	C. English	11 February 2006
03	Updated – omitted BHP-B's role, added caribou scan requirements	C. English	12 October 2006
04	Updated – corrected hover level over runway markers	S. Morrison	16 May 2008

1 OBJECTIVE/PURPOSE

This Standard Operating Procedure (SOP) provides the procedures to follow when environment staff are recording the number of times individual caribou or groups of caribou are encountered during weekly monitoring. The objective of this component of the monitoring program is to determine if caribou are attracted to dust deposition sites.

2 RESPONSIBILITIES

It is the Environment Superintendent's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP).

It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 Field Procedures

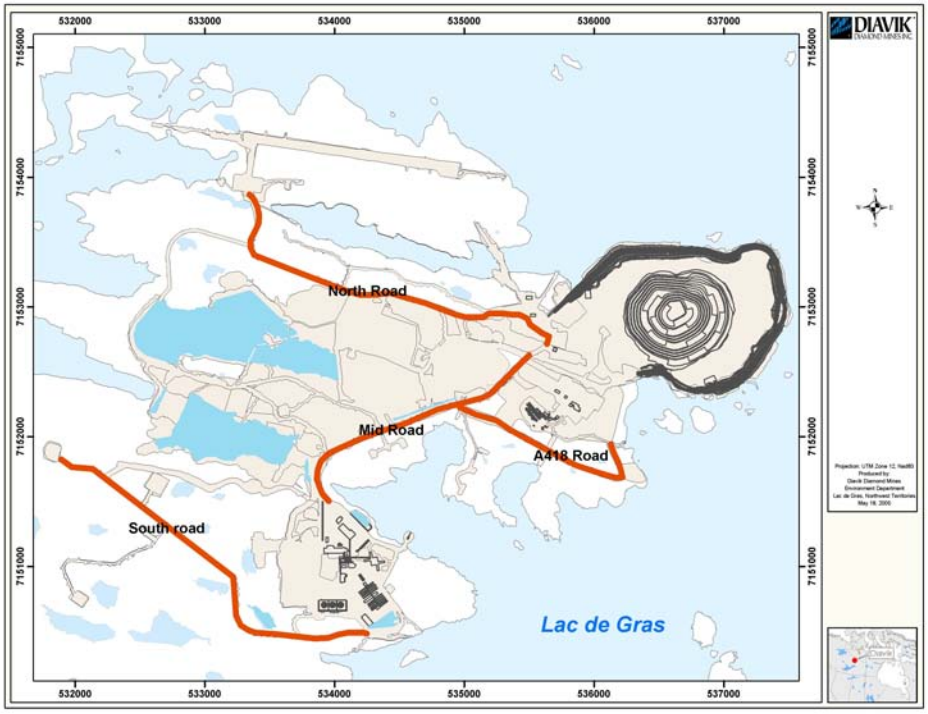
This monitoring is carried out between April 15 and October 15 or until caribou are no longer within the area.

Caribou road observations are performed twice each week. Data sheets should accompany personnel during the monitoring. Four roads are surveyed during the work: the south haul road, airport road, the road to A418 and the road to the waste transfer area. Field staff will set the odometer to zero at the start of each road, as indicated on the attached map. Staff will drive the entire distance of the road while scanning for caribou, and mark the total distance travelled (as indicated on the odometer) on the field sheet.

Field staff will record the number of groups of caribou encountered within different distance categories (i.e., on the road, within 50 m of the edge of the road, 50 – 200 m from the edge of the road and >200 m from the side of the road). Other information recorded will include: group size, dominant behaviour of the group and group composition (see codes in the next section).

If no caribou are encountered during the trip, then enter a “0” (or no caribou) under the heading “group size”, still recording the distance travelled and date. The survey will be conducted on one leg of the trip only, i.e. caribou will only be counted once while driving in one direction along each road.

Figure 1: Map of Roads for Caribou Observations



3.2 Descriptor Codes

Composition Codes	
F	females
M	males
C	calf
Y	yearling
F/C	females and calves
F/M	females and males
F/M/C	females, males, calves

Activity Codes	
A	Alert
B	Bedded
F	Feeding
R	Running
S	Standing
T	Trotting
W	Walking

3.3 Analysis and Reporting

Data sheets will be checked for omissions and/or errors on the same day as the survey. A report on the number of caribou encountered per distance traveled must be prepared.

4 EQUIPMENT

- Binoculars
- Data sheets
- Map

5 RELATED DOCUMENTS

- Caribou Road Observations-Vehicle Encounters – FORM-ENV-WILD-03

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		March 2003
01	Updated	R. Eskelson/ S. Oystryk	March 2005
02	Updated	C. English	June 2005
03	Updated – Related documents, review date, purpose	C. English	October 2006
04	Biennial update	C. English	January 2009

1 OBJECTIVE/PURPOSE

This Standard Operating Procedure (SOP) provides guidelines on procedures to follow when processed kimberlite containment areas (PKC) and rock piles are monitored for caribou. The purpose of this procedure is to determine if caribou utilize the PKC and rock piles. This information can help to determine if caribou drink from or get trapped in the PKC, or use the rock piles for insect relief.

2 RESPONSIBILITIES

It is the Senior Environmental Coordinator's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP).

It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 Field Procedures

Monitoring will be conducted twice per week from May to October.

A truck with Diavik environmental personnel will travel the roads adjacent to the PKC area and the road up to the rock piles while scanning for caribou. Fixed observation points that provide a clear view of the PKC area and tops of the rock piles can be used. Observations of caribou behaviour will be recorded, including group size, location, route travelled (if observed), and behaviour. Specific observations of caribou drinking from or becoming stuck in the PKC should be noted.

If caribou are detected, a rough drawing of the area and the animals location should be included on the data sheet. If caribou are found to be drinking from or stuck within the PKC, herding or rescue attempts may be required; notify the Senior Environmental Coordinator immediately on the radio.

If surveys detected no caribou, then "no observations" should be entered on the data sheet and in the database for that date.

3.2 Follow-up Actions

If any caribou are noted within the PKC, environment staff would continue to observe the animals and notify the Senior Environmental Coordinator. Depending on the time of year and area where the caribou are located (e.g. active spigot area), it may not be an issue. Please adhere to the following guidelines, but always seek advice prior to executing any action.

- If the caribou are not yet within the PKC and there is an opportunity to safely herd them away from the area, contact your Supervisor. The GNWT (ENR) should ideally be notified of the situation prior to herding efforts commencing. If it is necessary to begin herding immediately (due to proximity of the animals to the PKC), do so. The supervisor will notify ENR.
- If it is not possible to herd the animals, continue to observe them. There is a possibility that they will move through the area on their own. If you notice that the caribou become stuck, contact your Supervisor. The GNWT should also be notified if this occurs (24-h Wildlife Emergency line: 867-873-7181), as they are responsible to determine the course of action. Provide detailed information to the Wildlife Officers and adhere to their decision.
- If the animal is stuck in an area of active spigotting, inform your supervisor so that the Process Plant can be notified to cease or relocate their discharge.
- If the decision is made to euthanize the animal, verify what ENR would like done with the carcass. Follow all procedures outlined in Wildlife Reporting (SOPENV-WILD-22).

3.3 Analysis and Reporting

Data sheets will be transferred to a database on the same day when possible. Data sheets and the database will also be checked for omissions and/or errors at the end of shift by an alternate to ensure accurate data entry.

Observations will be summarized in the annual report and if it is discovered that the PKC or rock piles pose a risk for caribou, possible mitigation strategies will be presented and discussed.

4 EQUIPMENT

- Data sheets
- Binoculars

5 RELATED DOCUMENTS

- Caribou-PKC/Rock Pile Interaction Datasheet – FORM-ENV-WILD-09
- Wildlife Reporting - SOPENV-WILD-22

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		March 2003
01	Updated	R. Eskelson/ S. Oystryk	March 2005
02	Updated	C. English	June 2006
03	Updated – title, review date, related documents	C. English	October 2006
04	Updated – more specific procedures to follow if caribou are in PKC	C. English	January 2008

1 OBJECTIVE/PURPOSE

This Standard Operating Procedure (SOP) provides guidelines on procedures to follow when gathering information regarding activity budgets/caribou scans (i.e. time spent feeding, resting, walking, running) of caribou exposed to the mine site and on control sites.

2 RESPONSIBILITIES

It is the Environment Superintendent's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP).

It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 Field Procedures

Scan Sampling of Caribou Groups

Scan sampling of caribou groups or individuals will be used to monitor caribou behaviour as a function of distance from the mine. The method to be used is adapted from Curatolo and Murphy (1983), and will involve two observers. Individual caribou activities will be recorded as feeding, bedded, standing, alert, walking, trotting, or running. Individuals will be classified as feeding when they are actually foraging or searching for food (i.e., walking with head down).

GPS location will be recorded, and observations will be conducted during the spring, summer, and autumn. Group composition will be classified (see descriptor codes below), and the number of animals in the group will be recorded. Thus, the response variable is caribou behaviour, while the potential stressors include distance from mine, season, and group composition. In order to control for the effects of habitat and insect harassment, all observations will be performed within one habitat type (tundra with < 30% bedrock or boulders) and the level of insect harassment will be recorded.

The group will be scanned every 8 minutes for a minimum of 4 observations and a maximum of 8. For each scan, the number of animals exhibiting each type of behaviour will be recorded. Here, the unit of replication is the individual group. We anticipate obtaining 10 - 15 replicates for each level within the treatment effects. Given that there are a total of 12 levels within treatments (2 sites, 3 seasons, and 2 group composition categories), the maximum number of hours required to obtain 15 full replicates (i.e., 64 minutes for each group) is 192 hrs.

Surveys should be evenly distributed between island and mainland locations.

Response to Specific Stressors

For all caribou groups, instantaneous observations will be used to assess the response of caribou to different potential stressors as a function of distance. These observations will occur during scan sampling, and consequently, no increase in observation time will be required. In the event that a stressor is introduced during scan sampling, the observers will note the time (in the comments box) and record the response of caribou to stressors will as "no reaction" or "exhibiting a reaction" (i.e., alert posture, walking or running away from disturbance; see data sheet). The reaction of the majority of the group will be used in selecting the category. Estimated distance (m) from the stressor will also be recorded. Stressors include type of aircraft, type of vehicle, and blasts from pits.

The observers will then wait until the animals resume previous behaviour (1 – 2 minutes), and begin scanning observations again.

For the scan observations, weather conditions such as wind speed and direction, temperature, and type of precipitation will be documented. Level of insect harassment will be recorded separately for mosquitoes/black flies and for bot/warble flies. Bot and warble flies will be recorded simply as being present or absent during the observation period, based on observed reaction of caribou (sudden bolting, aberrant running, or rigid standing).

3.2 Analysis and Reporting

A report will should be prepared and provide a summary of the number of replicates for each of the treatments (season, site, group composition) for each of the 2 tasks obtained for each migration period. Data sheets will be transferred to a database on the same day when possible. Data sheets and the database will also be checked for omissions and/or errors at the end of shift by an alternate to ensure accurate data entry.

3.3 Descriptor Codes

Habitat Codes	
BE	Bedrock (>80%)
BO	Boulders (>80%)
EC	Esker Complex
HT	Heath Tundra
RB	Riparian Birch
RS	Riparian Shrub
SW	Sedge Wetland
SF	Spruce Forest
SF/BE	Spruce Forest/Bed Rock
SW/HT	Wetland/Heath Tundra

HT/BE	Heath Tundra/Bedrock
HT/BO	Heath Tundra/Boulders
LA	Lake
IC	Ice

Composition Codes	
F	females
M	males
C	calf
Y	yearling
F/C	females and calves
F/M	females and males
F/M/C	females, males, calves

Activity Codes	
A	Alert
B	Bedded
F	Feeding
R	Running
S	Standing
T	Trotting
W	Walking

4 EQUIPMENT

- Binoculars
- Watches, stopwatches
- Field notebook, datasheets and pencils

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		March 2003
01	Updated	R. Eskelson/ S. Oystryk	March 2005
02	Updated – review date	C. English	October 2006
03	Biennial Review	C. English	January 2009

1 OBJECTIVE/PURPOSE

This Standard Operating Procedure (SOP) provides guidelines to follow when surveying habitat within the Diavik wildlife study area for grizzly bear sign. Presence of bear sign will be used as an index of habitat utilization by grizzly bears. The purpose of this procedure is to determine the potential long-term influence of the mine on habitat use by grizzly bears within the study area.

2 RESPONSIBILITIES

It is the Environment Superintendent's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP).

It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 General

This study is carried out twice per year – once in July and once in August. July surveys are conducted in sedge wetland habitats, whereas August surveys are conducted in riparian shrub habitats. These habitat types are considered high quality bear habitat, based on seasonal grizzly bear preference.

3.2 Field Procedures

Eighteen polygons will be sampled during each of the spring and summer surveys. Sample sites will be uniquely identified, located on a map and GPS co-ordinates will be recorded. This ensures that the same polygons are sampled during subsequent years.

Each polygon will encompass of a 500 m x 500 m area and comprise a minimum of 25% of the preferred habitat type(s).

Safety is of primary importance. Before surveying any polygon, especially riparian shrub habitat, fly over the area closely to check for bears in the area. If a bear is present within the polygon, this will be considered as fresh bear sign and the polygon will not be sampled that day. If a bear is within 5 km of the polygon or a fresh kill is observed in the area, move on to survey another site, and try to return to the previous site before the seasonal program is complete (i.e., do not entirely abandon the site). If the bear persists in the area over the course of several days, record this information on the field sheet and abandon efforts to survey the area.

Observers will initiate the search for bear sign from the centre of each polygon, as provided by pre-determined UTM co-ordinates. If the centre point falls within open water, begin searching from the nearest shoreline.

Field crews will consist of 3 personnel; 2 roving observers with land-based and sign recognition experience, and one stationary patrol that must remain vigilant toward potential bear encounters at all times. Upon landing, a survey route is discussed and each of the 2 observers will begin surveying in opposite directions and meet back toward the center point and patrol.

The polygon represents the initial point of the survey, but searching should not necessarily be restricted to the area of the polygon and should include an approximate 1-km buffer from the initial starting point. The idea is to obtain coarse-scaled information on the presence/absence of grizzly bear activity within and adjacent to each polygon. For example, if an esker is located within 1 km of the polygon, observers should include the esker in their search area.

The duration of each search within and adjacent to the polygon will be standardized to one hour.

Sign includes attributes such as dens, diggings, tracks, scat, hair and kill sites/feeding evidence. If sign is detected, the number of independent sign is to be recorded. A narrative description of the type of sign will be recorded on the data sheet, including age of sign and description of surrounding habitat. One data sheet will be used for each sample polygon and 'no observations' will be recorded where no sign is evident in the survey.

Upon return to the office, field sheets will be checked for omissions and errors that same day.

4 EQUIPMENT

- Maps identifying seasonal polygon locations
- Binoculars
- Field sheets/logbook
- Camera
- Bear spray, bangers and flares
- GPS
- Paper envelopes for hair samples
- Satellite phone
- Radio with fully-charged, spare battery programmed with the helicopter channel
- Summer survival gear

5 RELATED FORMS/DOCUMENTS

- Grizzly Bear Habitat Activity Survey – FORM-ENV-WILD-06
- SOP – Aircraft – SOPENV-EQUIP-01
- SOP – Wildlife Monitoring Programs - SOPENV-WILD-18
- Diavik's Wildlife Monitoring Program

Revision History

Revision	Description	Prepared By	Date
00	Initial Release	C. English	30 June 2005
01	Updated - review date	C. English	October 2006
02	Biennial update	C. English	January 2009

1 OBJECTIVE/PURPOSE

This Standard Operating Procedure provides guidelines on procedures to follow when bears are reported on site. This procedure applies to all DDMI personnel, contractors, and visitors to the site. Occasional visitations by grizzly bears to the project site are anticipated but the bears must be deterred from the area. Worker safety is a priority, and there will be situations when management action will be required.

2 RESPONSIBILITIES

All supervisors and contractors are responsible to manage the risks of the jobs performed during reports of bears on site. If conditions warrant work restrictions, the supervisor is responsible to initiate the appropriate actions.

No supervisor or crew is allowed to or expected to work in conditions where the presence of a bear on site would put them at risk of injury.

Jobs shall proceed appropriately depending on the area and type of work being performed where the bear has been reported. Certain activities may require being placed on hold or re-scheduling.

3 PROCEDURE

3.1 General

The table below outlines the steps to be taken if a bear is observed on site.

STEPS	DESCRIPTION	RESPONSIBLE PARTY
Notify Security & Environment	• Security & Environment Departments are to be notified when a bear is observed on site. • To report to security contact radio channel 2 (24 hrs). To report to Environment contact radio channel 6 (6:30 am to 6:30 pm). The following information will be determined: • Person reporting bear sighting • Contact information for person reporting bear sighting (i.e. radio channel)	Personnel Reporting Bear Sighting

STEPS	DESCRIPTION	RESPONSIBLE PARTY
	• Number of bears • Last known location • Does anyone have a visual of the animal (maintain visual from a safe distance, if possible, until environment arrives) • Are there workers in the area and how many	
Security to Notify Environment	• Security is to contact Environment on channel 6 (6:30 am to 6:30 pm), or in their rooms after 6:30 pm. • Contact order for Environment staff: • Environmental Technician • Environmental Coordinator • Senior Environmental Coordinator • Security will relay all information to Environment. • Further contact with Security will occur on radio channel 2.	Security
Security to Issue Bear Alert	• Security will issue a Bear Alert when a bear is on the island. • Security will notify all personnel of the bears location using the radio.	Security
Controls	• The walkway between south camp and the main accommodations will remain open, unless Environment determines a need for it to be closed. Environment will check with security to see if anyone is using the walkway. Environment will do a sweep of the walkway if there are people using the walkway. Environment will be responsible for arranging closure. o During the day, contact other Environment staff first, and then Ekati front desk at main & south camps, if Environment is not available o During the night, contact alternate Environment staff • If an alert occurs during shift change, Environment, with input from Site Services Surface Works, will	Environment & other departments on site

STEPS	DESCRIPTION	RESPONSIBLE PARTY
	determine the need for buses to move personnel.	
Monitor Radio	• All supervisors are responsible to monitor the radio for changes or updates on the bear's movement on site. • Environment will notify Security as the bear changes locations. Security will be responsible to relay these updates via the radio to all site personnel. • Supervisors are responsible to account for and notify their staff. If necessary, supervisors are responsible to restrict work in certain areas, depending on the bears location.	All Supervisors
Criteria for Lifting Bear Alert	• The alert will stay in effect until the Environment department notifies Security that the bear has left the island, or is a safe distance away from site infrastructure and out of visual contact. • Environment will provide Security with the last known location of the bear, and this is to be included in the stand down message.	Security & Environment Departments
Notification	• Security is responsible to relay the stand down, on the radio, to all site staff. This broadcast is to include the last known location of the bear.	Security Control
Follow-up	• If the event the bear does not leave the island, but is a safe distance away from site and out of visual contact, Environment will conduct bear scans every 2 hours, for a maximum of 6 hours, in the area surrounding that where the bear was last seen. • If the deterrence occurs near the end of the shift, the Environment team will decide who will carry out the follow up scans. • If the deterrence occurs in the middle of the night, Environment staff can request Security to be attentive with their cameras until morning when a scan can be conducted. • In the event there is an unconfirmed bear sighting (i.e. reported by workers but not seen by Environment), the search can be abandoned after 1 hour with no	Environment

STEPS	DESCRIPTION	RESPONSIBLE PARTY
	sighting. At this time, a stand down can be relayed to Security, including the location sighted. Bear scans should then be conducted around the same area every 2 hours, for a maximum of 6 hours.	

3.2 Remedial Action for Problem Bears

Preventing the attraction of bears through proper food storage, garbage disposal and camp maintenance is the most effective way of avoiding problem bears, and problem carnivores in general. Management action will be carried out if bears or other carnivores pose a threat to people and/or property.

Occasional visitations by grizzly bears to the project site are anticipated and must be deterred from the area. Worker safety is a priority, and there will be situations when management action will be required. Procedures for dealing with problem wildlife are listed below.

Diavik Senior Environmental Coordinator and the Environmental Coordinator will work with Wildlife and Fisheries Division, ENR, GNWT to deal with problem grizzly bears at site. There is a hierarchy of options for control of a grizzly bear that poses a nuisance or danger to human safety; the three levels of increased effort to deal with a problem grizzly bear are:

- Level I: Grizzly Bear Deterrence
- Level II: Grizzly Bear Relocation
- Level III: Grizzly Bear Destruction

The Senior Environmental Coordinator and Environmental Coordinator will maintain effective communication with Wildlife and Fisheries Division in reporting problem bears and in evaluating options for problem bear control.

Level I: Grizzly Bear Deterrence

A method or device, either physical or chemical, designed to chase the animal away. This could involve one or a combination of the following approved and recommended methods by ENR:

- Use of vehicles
- Bear Bangers
- Noise crackers and flares
- Rubber bullets
- Aircraft
- Pepper spray

Individuals using methods of deterrence must properly assess the situation that they are in. The following points must be considered:

- Vehicles are an acceptable method of deterring bears; however, ensure that the animal is moved away from project activities and not scared towards camp infrastructure or toward unsuspecting people. This is the preferred method of monitoring bears as they move adjacent to the mine site, and for moving bears off site.
- Increase the level of deterrent accordingly, based on the bears behaviour: vehicles & their horns, air horns, bear bangers, cracker shells/flares, rubber bullets, helicopter.
- No shooting of a bear banger towards buildings or fuel sources
- Ensure that the bear banger is shot between you and the bear so that the animal is not scared towards you. If using an air horn, ensure that it is directed towards the bear.
- If a helicopter is available on or near the project, it may be required to deter the bear off the island if other methods of deterrents are unsuccessful. Ideally, an attempt should be made to move the bear onto the small islands, west of the airstrip - thereby encouraging the bear to move off East Island onto the mainland. **Note:** This method of deterrence can only be conducted by the DDMI Environment department.
- Documentation of all deterrent actions must be completed.

If using a helicopter to deter a bear, one Environment employee should be in the aircraft with the pilot, or on the ground directing the pilot with a visual of the bear. The pilot should:

- Stress the bear as little as possible. A stressed bear running for a distance can overheat and die.
- Keep the helicopter well back from the bear. The minimum distance between the helicopter and the bear is 100 m (320 ft) back and 30 m (100 ft) up from the ground.
- Keep the bear in visual contact. This should be done by taking the helicopter to a higher altitude rather than getting closer than the minimum distance.
- Only get close enough to the bear to make it move, not fly over it. A bear moving at a 'fast walk' can cover a lot of ground quickly and efficiently; there is no need to run the bear.
- DO NOT push a bear for more than 10 minutes or 3 km (2.2 miles).

Level II: Grizzly Bear Relocation

The following outlines procedures and rationale that will be considered if a situation arises where a grizzly bear has to be relocated off East Island:

- When a grizzly bear cannot be deterred off East Island using the methods described above, it may be necessary to relocate the bear from the project site. Relocation of a bear can only be done with recommendation from DDMI Environment department to mine management and ENR wildlife officials.
- ENR wildlife officers will be flown up to the project site to undertake the bear capture. Usually relocation involves capturing a bear using immobilization drugs fired from a

helicopter and transporting the bear by air to an area away from people (i.e. the south mainland).

- A report outlining the actions taken to relocate the bear will be completed by DDMI Environment. This report will be filed for incorporation into the annual wildlife monitoring program report.

Level III: Grizzly Bear Destruction

The destruction of a grizzly bear will only be implemented as a last resort deterrence method if all the above methods have failed. A decision to destroy a bear will come directly from ENR wildlife officials upon recommendation and discussions with designated biologists and DDMI Environment personnel. Wildlife and Fisheries Division, ENR will be consulted and requested to remove a persistent, problem grizzly bear that is not an immediate danger to worker safety. However, if an emergency arises where there is direct danger to an individual then it may be necessary to destroy a bear immediately.

Only Environment personnel with a valid Possession and Acquisition License to handle firearms can destroy a grizzly bear. In order to do this, direct permission must be obtained from ENR using their 24-hr emergency contact phone number: (867) 873-7181.

If this situation occurs, a detailed incident report must be prepared and submitted to ENR officials. This report would also be included as an appendix in the annual wildlife monitoring report.

3.3 Contractor Responsibility

Bear sightings should be reported immediately to DDMI Environment personnel. If a sighting has occurred during night shift hours, the occurrence should be reported to Security. Security will contact Environment personnel in their rooms during the night. Environment personnel will maintain visual monitoring of the bear and take action as necessary to ensure the safety of all workers.

All personnel in the vicinity of the animal will be notified by the Security department. It is also the responsibility of the supervisors of an area to notify their workers and provide a safe shelter for them (i.e. vehicles, trailers etc.) while the bear is present in that location.

In order for the Environment department to successfully deter the animal, it requires full cooperation from all site employees and contractors. Individuals are requested to stay away from the area where the bear is present as well as to stay away from the area that the bear is anticipated being moved to.

4 RELATED FORMS/DOCUMENTS

- Wildlife Deterrent Report Form template (FORM-ENV-WILD-01)
- Aircraft SOP (SOPENV-EQUIP-01)

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		2001
01	Updated	S. Oystryk	February 2005
02	Updated	C. English	June 2006
03	Updated	C. English	May 2007
04	Updated	S. Morrison	August 2007

1 OBJECTIVE/PURPOSE

This Standard Operating Procedure (SOP) provides guidelines on procedures to follow when carrying out wolverine snow track surveys. Monitoring for these surveys generally takes place twice per year.

2 RESPONSIBILITIES

It is the Environment Superintendent's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP).

It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 Field Procedures

Surveys will be conducted two times, once in the early spring (end of March or early April) and once in early winter (late November to early December) by snowmobile. Surveys are best conducted 2 – 6 days after a snowfall. Personnel will follow each transect from start to finish, ensuring to closely follow the GPS waypoints provided for each transect. The snowmobile must be driven slowly to ensure that all wolverine tracks are recorded.

The observer will record the start and end time of each transect. In addition, the distance travelled for each transect will be recorded from the odometer on the snow machine.

For each wolverine track observation, record:

- observation number
- number of wolverines (sex, if possible)
- direction of travel (N, S, E, W)
- UTM coordinates

An elder from Kugluktuk generally comes to site for one (1) week to help out with this survey. This participation is extremely valuable and should be maintained. The Hunters and Trappers Association (HTO) of Kugluktuk may be helpful in determining a suitable assistant for this program.

3.2 Analysis and Reporting

Upon return from the field, technicians will check their data sheets and maps for completeness and accuracy and will submit them for data entry. If an elder from one of the communities helps out on the survey, that person should be interviewed after the survey to obtain the overall number of wolverines they feel are present, based on tracks sighted, and any other key observations that they noticed should be recorded. A summary of the information collected will be completed for inclusion in the annual report.

4 EQUIPMENT

- Binoculars, GPS (and spare batteries)
- Field notebook and pencil
- Compass
- Winter Survival gear and equipment
- Radio and charged, spare batteries

5 RELATED FORMS/DOCUMENTS

- Snowmobile SOP (SOPENV-EQUIP-04)

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		2001
01	Updated	R. Eskelson/ S. Oystryk	March 2005
02	Updated – Aboriginal participation, timing, review date	C. English	October 2006
03	Biennial update	C. English	January 2009

1 OBJECTIVE/PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide direction for monitoring the Waste Transfer Area (WTA) and the Landfill for both attractants to wildlife and wildlife that may visit these sites. Wildlife can potentially be very dangerous by becoming habituated to human activity. This situation can pose a threat to the safety of both the personnel on site and to the animal itself.

2 RESPONSIBILITIES

It is the Environment Superintendent's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP).

It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 General

Monitoring will be conducted every second day during the entire year. Surveys to monitor the landfill site will include a systematic survey on foot of the entire landfill site and waste transfer area. The following information will be recorded on the Waste Transfer Area/Landfill Monitoring Data Sheet (FORM-ENV-WILD-07):

- time of start, finish and duration of survey
- the presence of any possible attractants to the site (i.e. edible items, oil products)
- observations of wildlife at the site (all species including bears, wolves, wolverines, foxes, caribou, hares, and birds)
- any fresh sign of wildlife use of the site (i.e. tracks, scats, etc.)

If surveys detected no sign of wildlife, then "no observations" should be entered on the data sheet and in the database for that date. All applicable fields must be filled out.

3.2 Analysis and Reporting

Constant analysis of the data obtained will be performed to ensure early detection of any problems that may develop with respect to wildlife use of the landfill site.

Data sheets will be checked for omissions and/or errors on the same day as each survey.

Data sheets will be transferred to a data base each week. A report will be prepared and will provide a summary of the information collected.

4 EQUIPMENT

- Data sheets
- Binoculars

5 RELATED DOCUMENTS

- Landfill Monitoring Datasheet (FORM-ENV-WILD-07)

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		March 2003
01	Updated	R. Eskelson/ S. Oystryk	March 2005
02	Updated – related documents, review date	C. English	October 2006
03	Biennial update, frequency amended	C. English	January 2009

1 OBJECTIVE/PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the methods for conducting raptor surveys, in an effort to monitor the nesting success of peregrine falcons and other raptors. Surveys are also undertaken to monitor whether mining activity is disturbing nesting raptors.

2 RESPONSIBILITIES

It is the Environment Superintendent's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP).

It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 Field Procedures

The raptor survey will be conducted once during spring (June) to determine nest occupancy, and once in the summer (usually July) to detect productivity rates of each nest. These surveys are typically done in conjunction with BHPB and ENR, Wildlife and Fisheries Division. During the spring, DDMI and BHPB sites are checked. During the summer, DDMI, BHPB and Daring Lake Tundra Research Stations (the control site) are all surveyed. The survey crew consists of one member each from DDMI, BHPB and ENR.

The methodology for this type of raptor survey involves a "Look-See" method where observers use a helicopter to fly adjacent to the nest site to determine whether or not birds are occupying the area, and to count the number of eggs or young raptors if they are present.

The location of nest sites will be documented using a GPS. Proof of nest success would include finding a nest containing eggs (spring) or young (summer).

For each nest site, one data sheet will be used to record information from each survey.

3.2 Analysis and Reporting

Upon returning to camp, field data will be summarized and transcribed onto the computer in the wildlife database. The information collected will be summarized in the annual wildlife monitoring program report.

4 EQUIPMENT

Binoculars
GPS/Map
Coordinates of known nest sites
Raptor datasheets and pencil
Bird Identification book

5 RELATED FORMS/DOCUMENTS

- Aircraft SOP (SOPENV-EQUIP-01)
- Raptor Survey Datasheet (FORM-ENV-WILD-08)

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		March 2003
01	Updated	S. Oystryk	February 2005
02	Updated – methodology, participants	C. English	October 2006
03	Biennial update	C. English	January 2009

1 OBJECTIVE/PURPOSE

This Standard Operating Procedure (SOP) provides guidelines to follow when monitoring waterfowl, shorebirds and other aquatic birds at the Diavik mine site. The purpose of this monitoring is to document general observations/occurrences of waterfowl, loons and shorebirds during spring migration & breeding season to determine any changes in habitat use. This monitoring is carried out at two shallow bays and all mine-altered water bodies (i.e. PKC, north inlet and drainage ponds).

2 RESPONSIBILITIES

It is the Environment Superintendent's responsibility to ensure that all members of the Environment Team are trained in, and understand, this Standard Operating Procedure (SOP). It is the responsibility of the Environmental Coordinators, Environmental Technicians, contractors, researchers and students, and any other members of the Environment Team to follow this Standard Operating Procedure.

3 PROCEDURE

3.1 General

Shallow Bays (2) are monitored every day in the morning, from May 25th to June 20th, then weekly until October 15th.

Mine altered wetlands are monitored daily from May 15th to June 20th, then weekly until October 15th.

3.2 Field Procedure

Surveys are to be completed in the morning, at approximately the same time every day. The perimeter of each shallow bay is walked each day it is surveyed.

Mine-altered water bodies will be monitored from a single point on shore using binoculars. A minimum of 5 minutes should be spent at each water body in order to determine if waterfowl are present in the area.

Personnel should ensure they have binoculars, a bird book and a camera with them during the work to assist in identifications. Wherever possible, all efforts should be made to identify the species sighted.

For their own safety, personnel should ensure they scan the area for bears prior to & during monitoring. If a bear is seen in the area, the survey will be delayed or cancelled.

Data to be recorded is as follows:

- Dates and times of surveys;
- Survey personnel
- Survey site (i.e. east and west bays, North Inlet, PKC or drainage ponds)
- All bird species, activities and numbers
- Weather
- Percent open water

Incidental observations such as nest locations or habitat use should be documented with coordinates of nest, number of eggs or chicks and habitat type.

Upon return from the field, technicians will check their data sheets for accuracy and will submit them for data entry. Should the individual have had problems identifying any species in the field, a brief discussion should be held with individuals in the office and alternative identification sources should be referenced, such as other bird books and the internet.

4 EQUIPMENT REQUIRED

- Binoculars
- Peterson's Field Guide to Western Birds
- Field sheets/logbook
- Camera
- Bear bangers
- GPS

5 RELATED FORMS/DOCUMENTS

- Diavik's Wildlife Monitoring Program
- Shallow Bay Waterfowl Datasheet - FORM-ENV-WILD-10
- Mine Altered Waterfowl Datasheet - FORM-ENV-WILD-11
- Peterson's Field Guide to Western Birds

Revision History

Revision	Description	Prepared By	Date
00	Initial Release		2001
01	Updated		March 2003
02	Updated	R. Eskelson/ S. Oystryk	May 2005
03	Updated	C. English	February 2006
04	Updated – review date	C. English	October 2006
05	Biennial update	C. English	January 2009

Bird Species of Lac de Gras

Waterfowl	
BLBR	Black Brant
CAGO	Canada Goose
DAGO	Dark Goose
SPGO	Goose spp.
GWFG	Greater White Fronted Goose
BLGO	Lesser Snow Goose (black)
LSGO	Lesser Snow Goose (white)
TUSW	Tundra Swan
TRSW	Trumpeter Swan
Duck-like Birds (dabbling)	
AGWT	American Green Winged Teal
MALD	Mallard
AMWI	American Wigeon
NOPI	Northern Pintail
SPDU	Duck spp.
Duck-like birds (diving)	
BLSC	Black Scoter
COLO	Common Loon
COME	Common Merganser
GRSC	Greater Scaup
LESC	Lesser Scaup
SPLO	Loon spp.
SPME	Merganser spp.
OLDS	Oldsquaw (now called Long-tailed duck)
PALO	Pacific Loon
RBME	Red Breasted Merganser
RNGR	Red Necked Grebe
SUSC	Surf Scoter
YBLO	Yellow Billed Loon
RTLO	Red Throated Loon
WWSC	White-winged Scoter
HOGR	Horned Grebe
Shorebirds (wading)	
BASA	Baird's Sandpiper
BBPL	Black Bellied Plover
COSN	Common Snipe
DUNL	Dunlin
LESA	Least Sandpiper
AMGP	American Golden Plover (formerly called Lesser Golden Plover)
SPPL	Plovers spp.
LEYE	Lesser Yellowlegs
LBDO	Long Billed Dowitcher
PESA	Pectoral Sandpiper
RNPH	Red Necked Phalarope

Seabirds, Gulls etc.(aerialists)	
ARTE	Arctic Tern
GLGU	Glaucus Gull
HERG	Herring Gull
LTJA	Long Tailed Jaeger
PAJA	Parasitic Jaeger
POJA	Pomarine Jaeger
BOGU	Bonapartes Gull
THGU	Thayers Gull
BASW	Barn Swallow
SAGU	Sabines Gull
UNGU	Unidentified Gull
Passerine (perching)	
AMPI	American Pipit
AMRO	American Robin
ATSP	American Tree Sparrow
CORA	Common Raven
CORE	Common Redpoll
GCTH	Gray Cheeked Thrush
HASP	Harris' Sparrow
HORE	Hoary Redpoll
HOLA	Horned Lark
LALO	Lapland Longspur
PASS	Passerimiformes spp.
SPRE	Redpoll spp.
SAVS	Savannah Sparrow
SNBU	Snow Bunting
WCSP	White Crowned Sparrow
YWAR	Yellow Warbler
DEJU	Dark-eyed Junco (state coloured form)
Fowl-like Birds	
SPPT	Ptarmigan spp.
ROPT	Rock Ptarmigan
WIPT	Willow Ptarmigan
Birds of Prey	
BAEA	Bald Eagle
SPFA	Falcon spp.
GOEA	Golden Eagle
GYRI	Gyrfalcon
NOHA	Northern Harrier
PEIA	Peregrine Falcon

SACR	Sandhill Crane
SEPL	Semipalmated Plover
SESA	Semipalmated Sandpiper
UNSA	Unidentified Sandpiper
SPSH	Shorebird spp.
STSA	Stilted Sandpiper
WRSA	White Rumped Sandpiper
RUTU	Ruddy Turnstone
SPSP	Spotted Sandpiper
HDGW	Hudsonian Godwit
SADL	Sanderling
BBSP	Buff-breasted Sandpiper

SPRA	Raptor spp.
RLHA	Rough Legged Hawk
SEOW	Short Eared Owl
SNOW	Snowy Owl
Activity Codes	
Fe	Feeding
Sw	Swimming
Pe	Perched
Fo	Fly-Over
Td	Territorial Display
Fl	Flush
Wa	Walking
Al	Alert
St	Standing
No Obs	No Observations

Appendix III

Caribou Road and PKC/Rockpile Observations

Caribou Road Observations - 2008

DATE	ROAD	NUMBER	COMPOSITION	ENCOUNTER DISTANCE	BEHAVIOUR
2008.05.05	A418 Road	0	No Observations	-	N/A
2008.05.05	Mid Road	0	No Observations	-	N/A
2008.05.05	North Road	0	No Observations	-	N/A
2008.05.05	South Road	0	No Observations	-	N/A
2008.05.08	A418 Road	0	No Observations	-	N/A
2008.05.08	Mid Road	0	No Observations	-	N/A
2008.05.08	North Road	0	No Observations	-	N/A
2008.05.08	South Road	0	No Observations	-	N/A
2008.05.12	A418 Road	0	No Observations	-	N/A
2008.05.12	Mid Road	0	No Observations	-	N/A
2008.05.12	North Road	0	No Observations	-	N/A
2008.05.12	South Road	0	No Observations	-	N/A
2008.05.15	A418 Road	0	No Observations	-	N/A
2008.05.15	Mid Road	0	No Observations	-	N/A
2008.05.15	North Road	0	No Observations	-	N/A
2008.05.15	South Road	0	No Observations	-	N/A
2008.05.19	A418 Road	0	No Observations	-	N/A
2008.05.19	Mid Road	0	No Observations	-	N/A
2008.05.19	North Road	0	No Observations	-	N/A
2008.05.19	South Road	0	No Observations	-	N/A
2008.05.22	A418 Road	0	No Observations	-	N/A
2008.05.22	Mid Road	0	No Observations	-	N/A
2008.05.22	North Road	0	No Observations	-	N/A
2008.05.22	South Road	0	No Observations	-	N/A
2008.05.26	A418 Road	0	No Observations	-	N/A
2008.05.26	Mid Road	0	No Observations	-	N/A
2008.05.26	North Road	0	No Observations	-	N/A
2008.05.26	South Road	0	No Observations	-	N/A
2008.05.29	A418 Road	0	No Observations	-	N/A
2008.05.29	Mid Road	0	No Observations	-	N/A
2008.05.29	North Road	0	No Observations	-	N/A
2008.05.29	South Road	0	No Observations	-	N/A
2008.06.02	A418 Road	0	No Observations	-	N/A
2008.06.02	Mid Road	0	No Observations	-	N/A
2008.06.02	North Road	0	No Observations	-	N/A
2008.06.02	South Road	0	No Observations	-	N/A
2008.06.05	A418 Road	0	No Observations	-	N/A
2008.06.05	Mid Road	0	No Observations	-	N/A
2008.06.05	North Road	0	No Observations	-	N/A
2008.06.05	South Road	0	No Observations	-	N/A
2008.06.09	A418 Road	0	No Observations	-	N/A
2008.06.09	Mid Road	0	No Observations	-	N/A
2008.06.09	North Road	0	No Observations	-	N/A
2008.06.09	South Road	0	No Observations	-	N/A
2008.06.12	A418 Road	0	No Observations	-	N/A
2008.06.12	Mid Road	0	No Observations	-	N/A
2008.06.12	North Road	0	No Observations	-	N/A
2008.06.12	South Road	0	No Observations	-	N/A
2008.06.26	A418 Road	0	No Observations	-	N/A
2008.06.26	Mid Road	0	No Observations	-	N/A
2008.06.26	North Road	0	No Observations	-	N/A
2008.06.26	South Road	0	No Observations	-	N/A
2008.06.30	A418 Road	0	No Observations	-	N/A
2008.06.30	Mid Road	0	No Observations	-	N/A
2008.06.30	North Road	0	No Observations	-	N/A
2008.06.30	South Road	0	No Observations	-	N/A

DATE	ROAD	NUMBER	COMPOSITION	ENCOUNTER DISTANCE	BEHAVIOUR
2008.07.03	A418 Road	0	No Observations	-	N/A
2008.07.03	Mid Road	0	No Observations	-	N/A
2008.07.03	North Road	0	No Observations	-	N/A
2008.07.03	South Road	0	No Observations	-	N/A
2008.07.07	A418 Road	0	No Observations	-	N/A
2008.07.07	Mid Road	0	No Observations	-	N/A
2008.07.07	North Road	0	No Observations	-	N/A
2008.07.07	South Road	0	No Observations	-	N/A
2008.07.10	A418 Road	0	No Observations	-	N/A
2008.07.10	Mid Road	0	No Observations	-	N/A
2008.07.10	North Road	0	No Observations	-	N/A
2008.07.10	South Road	0	No Observations	-	N/A
2008.07.14	A418 Road	0	No Observations	-	N/A
2008.07.14	Mid Road	0	No Observations	-	N/A
2008.07.14	North Road	0	No Observations	-	N/A
2008.07.14	South Road	0	No Observations	-	N/A
2008.07.17	A418 Road	0	No Observations	-	N/A
2008.07.17	Mid Road	0	No Observations	-	N/A
2008.07.17	North Road	0	No Observations	-	N/A
2008.07.17	South Road	0	No Observations	-	N/A
2008.07.21	A418 Road	0	No Observations	-	N/A
2008.07.21	Mid Road	0	No Observations	-	N/A
2008.07.21	North Road	0	No Observations	-	N/A
2008.07.21	South Road	0	No Observations	-	N/A
2008.07.24	A418 Road	0	No Observations	-	N/A
2008.07.24	Mid Road	0	No Observations	-	N/A
2008.07.24	North Road	0	No Observations	-	N/A
2008.07.24	South Road	0	No Observations	-	N/A
2008.07.28	A418 Road	0	No Observations	-	N/A
2008.07.28	Mid Road	0	No Observations	-	N/A
2008.07.28	North Road	0	No Observations	-	N/A
2008.07.28	South Road	0	No Observations	-	N/A
2008.07.31	A418 Road	0	No Observations	-	N/A
2008.07.31	Mid Road	0	No Observations	-	N/A
2008.07.31	North Road	0	No Observations	-	N/A
2008.07.31	South Road	0	No Observations	-	N/A
2008.08.04	A418 Road	0	No Observations	-	N/A
2008.08.04	Mid Road	0	No Observations	-	N/A
2008.08.04	North Road	0	No Observations	-	N/A
2008.08.04	South Road	0	No Observations	-	N/A
2008.08.07	A418 Road	0	No Observations	-	N/A
2008.08.07	Mid Road	0	No Observations	-	N/A
2008.08.07	North Road	0	No Observations	-	N/A
2008.08.07	South Road	0	No Observations	-	N/A
2008.08.11	A418 Road	0	No Observations	-	N/A
2008.08.11	Mid Road	0	No Observations	-	N/A
2008.08.11	North Road	0	No Observations	-	N/A
2008.08.11	South Road	0	No Observations	-	N/A
2008.08.14	A418 Road	0	No Observations	-	N/A
2008.08.14	Mid Road	0	No Observations	-	N/A
2008.08.14	North Road	0	No Observations	-	N/A
2008.08.14	South Road	0	No Observations	-	N/A
2008.08.18	A418 Road	0	No Observations	-	N/A
2008.08.18	Mid Road	0	No Observations	-	N/A
2008.08.18	North Road	0	No Observations	-	N/A
2008.08.18	South Road	0	No Observations	-	N/A
2008.08.21	A418 Road	0	No Observations	-	N/A
2008.08.21	Mid Road	0	No Observations	-	N/A
2008.08.21	North Road	0	No Observations	-	N/A
2008.08.21	South Road	0	No Observations	-	N/A

DATE	ROAD	NUMBER	COMPOSITION	ENCOUNTER DISTANCE	BEHAVIOUR
2008.08.25	A418 Road	0	No Observations	-	N/A
2008.08.25	Mid Road	0	No Observations	-	N/A
2008.08.25	North Road	0	No Observations	-	N/A
2008.08.25	South Road	0	No Observations	-	N/A
2008.08.28	A418 Road	0	No Observations	-	N/A
2008.08.28	Mid Road	0	No Observations	-	N/A
2008.08.28	North Road	0	No Observations	-	N/A
2008.08.28	South Road	0	No Observations	-	N/A
2008.09.02	A418 Road	0	No Observations	-	N/A
2008.09.02	Mid Road	0	No Observations	-	N/A
2008.09.02	North Road	0	No Observations	-	N/A
2008.09.02	South Road	0	No Observations	-	N/A
2008.09.04	A418 Road	0	No Observations	-	N/A
2008.09.04	Mid Road	0	No Observations	-	N/A
2008.09.04	North Road	0	No Observations	-	N/A
2008.09.04	South Road	0	No Observations	-	N/A
2008.09.08	A418 Road	0	No Observations	-	N/A
2008.09.08	Mid Road	0	No Observations	-	N/A
2008.09.08	North Road	0	No Observations	-	N/A
2008.09.08	South Road	0	No Observations	-	N/A
2008.09.25	A418 Road	0	No Observations	-	N/A
2008.09.25	Mid Road	0	No Observations	-	N/A
2008.09.25	North Road	0	No Observations	-	N/A
2008.09.25	South Road	0	No Observations	-	N/A
2008.09.29	A418 Road	0	No Observations	-	N/A
2008.09.29	Mid Road	0	No Observations	-	N/A
2008.09.29	North Road	0	No Observations	-	N/A
2008.09.29	South Road	0	No Observations	-	N/A
2008.10.09	A418 Road	0	No Observations	-	N/A
2008.10.09	Mid Road	0	No Observations	-	N/A
2008.10.09	North Road	0	No Observations	-	N/A
2008.10.09	South Road	0	No Observations	-	N/A
2008.10.13	A418 Road	0	No Observations	-	N/A
2008.10.13	Mid Road	0	No Observations	-	N/A
2008.10.13	North Road	0	No Observations	-	N/A
2008.10.13	South Road	0	No Observations	-	N/A
2008.10.16	A418 Road	0	No Observations	-	N/A
2008.10.16	Mid Road	0	No Observations	-	N/A
2008.10.16	North Road	0	No Observations	-	N/A
2008.10.16	South Road	0	No Observations	-	N/A
2008.10.18	A418 Road	0	No Observations	-	N/A
2008.10.18	Mid Road	0	No Observations	-	N/A
2008.10.18	North Road	0	No Observations	-	N/A
2008.10.18	South Road	0	No Observations	-	N/A
2008.10.20	A418 Road	0	No Observations	-	N/A
2008.10.20	Mid Road	0	No Observations	-	N/A
2008.10.20	North Road	0	No Observations	-	N/A
2008.10.20	South Road	0	No Observations	-	N/A
2008.10.23	A418 Road	0	No Observations	-	N/A
2008.10.23	Mid Road	0	No Observations	-	N/A
2008.10.23	North Road	0	No Observations	-	N/A
2008.10.23	South Road	0	No Observations	-	N/A
2008.10.27	A418 Road	0	No Observations	-	N/A
2008.10.27	Mid Road	0	No Observations	-	N/A
2008.10.27	North Road	0	No Observations	-	N/A
2008.10.27	South Road	0	No Observations	-	N/A

Caribou PKC/Rock Pile Observations - 2008

DATE	LOCATION	NUMBER	COMPOSITION	COMMENT/ BEHAVIOUR	DESCRIPTION OF INTERACTION
2008.05.05	Country Rock	0	No Observation	-	N/A
2008.05.05	PKC	0	No Observation	-	N/A
2008.05.08	Country Rock	0	No Observation	-	N/A
2008.05.08	PKC	0	No Observation	-	N/A
2008.05.12	Country Rock	0	No Observation	Fog, reduced visibility	N/A
2008.05.12	PKC	0	No Observation	-	N/A
2008.05.15	Country Rock	0	No Observation	-	N/A
2008.05.15	PKC	0	No Observation	-	N/A
2008.05.19	Country Rock	0	No Observation	-	N/A
2008.05.19	PKC	0	No Observation	-	N/A
2008.05.22	Country Rock	0	No Observation	-	N/A
2008.05.22	PKC	0	No Observation	-	N/A
2008.05.26	Country Rock	0	No Observation	-	N/A
2008.05.26	PKC	0	No Observation	-	N/A
2008.05.29	Country Rock	0	No Observation	-	N/A
2008.05.29	PKC	0	No Observation	-	N/A
2008.06.02	Country Rock	0	No Observation	-	N/A
2008.06.02	Country Rock	0	No Observation	-	N/A
2008.06.05	Country Rock	0	No Observation	-	N/A
2008.06.05	PKC	0	No Observation	-	N/A
2008.06.09	Country Rock	0	No Observation	-	N/A
2008.06.09	PKC	0	No Observation	-	N/A
2008.06.12	Country Rock	0	No Observation	-	N/A
2008.06.12	PKC	0	No Observation	-	N/A
2008.06.26	Country Rock	0	No Observation	-	N/A
2008.06.26	PKC	0	No Observation	-	N/A
2008.06.30	Country Rock	0	No Observation	-	N/A
2008.06.30	PKC	0	No Observation	-	N/A
2008.07.03	Country Rock	0	No Observation	-	N/A
2008.07.03	PKC	0	No Observation	-	N/A
2008.07.07	Country Rock	0	No Observation	-	N/A
2008.07.07	PKC	0	No Observation	-	N/A
2008.07.10	Country Rock	0	No Observation	-	N/A
2008.07.10	PKC	0	No Observation	-	N/A
2008.07.14	Country Rock	0	No Observation	-	N/A
2008.07.14	PKC	0	No Observation	-	N/A
2008.07.17	Country Rock	0	No Observation	-	N/A
2008.07.17	PKC	0	No Observation	-	N/A
2008.07.21	Country Rock	0	No Observation	-	N/A
2008.07.21	PKC	0	No Observation	-	N/A
2008.07.24	Country Rock	0	No Observation	-	N/A
2008.07.24	PKC	0	No Observation	-	N/A
2008.07.28	Country Rock	0	No Observation	-	N/A
2008.07.28	PKC	0	No Observation	-	N/A
2008.07.31	Country Rock	0	No Observation	-	N/A
2008.07.31	PKC	0	No Observation	-	N/A
2008.08.04	Country Rock	0	No Observation	-	N/A
2008.08.04	PKC	0	No Observation	-	N/A
2008.08.07	Country Rock	0	No Observation	-	N/A
2008.08.07	PKC	0	No Observation	-	N/A
2008.08.11	Country Rock	0	No Observation	-	N/A

DATE	LOCATION	NUMBER	COMPOSITION	COMMENT/ BEHAVIOUR	DESCRIPTION OF INTERACTION
2008.08.11	PKC	0	No Observation	-	N/A
2008.08.14	Country Rock	0	No Observation	-	N/A
2008.08.14	PKC	0	No Observation	-	N/A
2008.08.18	Country Rock	0	No Observation	-	N/A
2008.08.18	PKC	0	No Observation	-	N/A
2008.08.21	Country Rock	0	No Observation	-	N/A
2008.08.21	PKC	0	No Observation	-	N/A
2008.08.25	Country Rock	0	No Observation	-	N/A
2008.08.25	PKC	0	No Observation	-	N/A
2008.08.28	Country Rock	0	No Observation	-	N/A
2008.08.28	PKC	0	No Observation	Road was closed	N/A
2008.09.02	Country Rock	0	No Observation	-	N/A
2008.09.02	PKC	0	No Observation	-	N/A
2008.09.04	Country Rock	0	No Observation	-	N/A
2008.09.04	PKC	0	No Observation	-	N/A
2008.09.08	Country Rock	0	No Observation	-	N/A
2008.09.08	PKC	0	No Observation	-	N/A
2008.09.11	Country Rock	0	No Observation	-	N/A
2008.09.11	PKC	0	No Observation	-	N/A
2008.09.15	Country Rock	0	No Observation	-	N/A
2008.09.15	PKC	0	No Observation	-	N/A
2008.09.18	Country Rock	0	No Observation	-	N/A
2008.09.18	PKC	0	No Observation	-	N/A
2008.09.22	Country Rock	0	No Observation	-	N/A
2008.09.22	PKC	0	No Observation	-	N/A
2008.09.25	Country Rock	0	No Observation	-	N/A
2008.09.25	PKC	0	No Observation	-	N/A
2008.09.29	Country Rock	0	No Observation	-	N/A
2008.09.29	PKC	0	No Observation	-	N/A
2008.10.09	Country Rock	0	No Observation	-	N/A
2008.10.09	PKC	0	No Observation	-	N/A
2008.10.13	Country Rock	0	No Observation	-	N/A
2008.10.13	PKC	0	No Observation	-	N/A
2008.10.16	Country Rock	0	No Observation	-	N/A
2008.10.16	PKC	0	No Observation	-	N/A
2008.10.20	Country Rock	0	No Observation	-	N/A
2008.10.20	PKC	0	No Observation	-	N/A
2008.10.23	Country Rock	0	No Observation	-	N/A
2008.10.23	PKC	0	No Observation	-	N/A
2008.10.27	Country Rock	0	No Observation	-	N/A
2008.10.27	PKC	0	No Observation	-	N/A

Appendix IV

Grizzly Bear Incidental Observations

Incidental Grizzly Bear Observations, 2008

Date	Number of Animals	Color, Size, Markings of Animal	Location	Advisory Issued	Attractant Present	Corrective Measures Taken	Action Taken (Deterrents Used)	Comments
08/05/08	1	Blond with brown rump	On-ice drill rig - 20 km SE of site	None	None	N/A	Helicopter to deter	Persistent bear approaching drill within 300m
09/06/08	3	Sow & 2 yearlings - blonde	North Inlet	Bear Alert	None	N/A	Vehicle, Bear bangers	Moved off toward West Island
18/06/2008	3	Sow & 2 cubs	Airstrip - West approach lights	Bear Alert	None	N/A	No Deterrent Action	Moved off toward West Island
30/08/2008	3	Sow & 2 cubs	Airstrip	Bear Alert	None	N/A	No Deterrent Action	Moved off without deterrents
15/09/2008	3	Sow & 2 cubs - brown	Underground Laydown near Pond 2	Bear Alert	None	N/A	Vehicle, Helicopter	Helicopter in area with sample crew used briefly to re-direct bears to west for shortest water crossing

Appendix V

Wolverine Incidental Observations

Wolverine Incidental Observations - 2008

Date	Number Of Animals	Location	Attractant Present	Deterrent Action Taken	Comments
3-Jan-08	1	Near south camp	Yes - scent	None	
4-Jan-08	1	Near camps	Yes - scent	None	Reported following day
4-Jan-08	1	Crusher lab	No	None	
4-Jan-08	1	Waste Transfer Area	Yes - scent	Yes	Vehicle used to coax out of area
6-Jan-08	1	South camp kitchen	Yes - scent	None	
7-Jan-08	1	South tank farm	No	None	
9-Jan-08	1	Waste Transfer Area	Yes - scent	None	Reported at end of shift
9-Jan-08	1	PKC area	No	None	
16-Jan-08	1	South camp kitchen	Yes - scent/shelter	None	Ran under camp
16-Jan-08	1	South camp kitchen	Yes - scent/shelter	None	Ran under camp
18-Jan-08	1	New power house yard	No	None	
19-Jan-08	1	A418 pit	No	None	
19-Jan-08	1	Main camp cafeteria	Yes - scent	None	
22-Jan-08	1	South camp	Yes - scent/shelter	None	Leaving camp & headed to lake
23-Jan-08	1	South camp	Yes - scent/shelter	Yes	Smoke alarm due to damaged heat trace in south camp crawl space. ENR notified.
24-Jan-08	1	South camp	Yes - scent/shelter	Yes	All access points closed off
25-Jan-08	1	South camp	Yes - scent/shelter	Yes	Snowmachine & vehicle used to move wolverine off site. More access areas closed off.
26-Jan-08	1	South camp	Yes - scent/shelter	Yes	Additional skirting re-inforcements installed.
28-Jan-08	2	Waste Transfer Area	Yes - scent	None	Animals gone when Environment staff arrived.
29-Jan-08	1	South camp	Yes - scent/shelter	None	Environment staff in field all day
30-Jan-08	1	Waste Transfer Area	Yes - scent	Yes	Rubber bullets used to deter animal from area
31-Jan-08	1	South camp	Yes - scent/shelter	None	
1-Feb-08	1	Waste Transfer Area	Yes - scent	Yes	Vehicle used to coax out of area. One-way trap installed at south camp with permission from ENR.
2-Feb-08	1	Waste Transfer Area	Yes - scent	Yes	Bear bangers used to deter animal from the area.
3-Feb-08	2	Waste Transfer Area	Yes - scent	Yes	Bear bangers & vehicle used to move wolverine out of area.
4-Feb-08	1	Waste Transfer Area	Yes - scent	Yes	Deterred outside of gate.
8-Feb-08	1	PKC west dam	No	Yes	Deterred with vehicle west of emulsion plant.
9-Feb-08	1	Waste Transfer Area	Yes - heat	Yes	Rubber bullet & vehicle used to deter animal from area.
11-Feb-08	1	Waste Transfer Area	Yes - heat	Yes	Deterred with vehicle to west.
13-Feb-08	1	South tank farm	No	None	Received permission from ENR to destroy wolverine.
14-Feb-08	1	South camp	Yes - scent/shelter	None	
15-Feb-08	1	South camp	Yes - scent/shelter	None	Wolverine moved off from under south camp and was not destroyed.
26-Mar-08	1	Emulsion plant	No	None	
24-Apr-08	1	On-ice drill site	No	Yes	Used snow machine to deter animal from area.
7-May-08	1	Winter road approach	No	None	Moved off to lake
2-Nov-08	1	Process plant	No	None	
15-Nov-08	1	Water treatment plant	No	None	
16-Nov-08	1	South camp area	Yes - scent/shelter	Yes	Summer improvement project to skirting had been completed
17-Nov-08	1	South camp area	Yes - scent/shelter	None	
18-Nov-08	1	On lake ice	No	None	Headed east
19-Nov-08	1	Warehouse sprung	No	None	Heading onto lake
21-Nov-08	1	South camp kitchen	Yes - scent/shelter	Yes	Contacted ENR to assist in relocating or destroying animal. ENR direction to destroy animal & assisted with this on 26 November.
22-Nov-08	1	Emulsion plant	No	None	
20-Dec-08	1	Underground surface areas	No	None	Passing through
25-Dec-08	1	Airstrip	No	None	Moving east
25-Dec-08	1	Waste Transfer Area	Yes - scent	None	Left area prior to gaining entry

Appendix VI

Waste Management Plan

Rio Tinto

Diavik Diamond Mine

Health, Safety and Environment Department

Waste Management Plan

Operational Phase, Version 12

31 March 2009

REVISION HISTORY

REVISION VERSION	AUTHOR	MANAGERIAL APPROVAL	DATE: (MM/DD/YY)	Reason for Change
A	BJK		9/2/98	Initial issue
1	EM		8/15/99	Regulatory Application
2	BJK		8/30/00	Water License Submission
3	EM		1/31/01	Construction Phase Submission
4	CW		03/31/02	Construction Phase Submission
5	EM/DH		10/01/02	Operational Phase
6	EM/DH		03/31/03	Update Operational Phase
7	CE/SM		03/31/04	Annual Update
8	CE		03/31/05	Annual Update
9	CE		03/31/06	Annual Update
10	SM		03/31/07	Annual Update
11	SM/CE		03/31/08	Annual Update
12	CE		03/31/09	Annual Update

DISTRIBUTION LIST

COPY #	AFFILIATION	POSITION	FORMAT
1	DDMI	Health, Safety and Environmental Manager	Electronic*
2	DDMI	VP Operations	Electronic*
3	DDMI	Manager, Fixed Plants and Surface Operations	Electronic*
4	WLWB	Chairperson	Electronic

***** *On DDMI Intranet under Reference/Environment/Environmental Management Plans*

Contents page

Introduction

Diavik Diamond Mines Inc. (DDMI) is committed to taking all necessary steps to ensure that collection, storage, transportation and disposal of all wastes generated by the project are conducted in a safe, efficient and environmentally compliant manner. The fundamental basis of the plan is the practical and positive management of wastes, incorporating the implementation of a sound waste minimization program.

The main objectives of the plan are to:

- create a system for proper disposal of waste
- minimize potentially adverse impacts on the physical and biological environment
- comply with Federal and Northwest Territories (NWT) legislation

Along with the ideals of the four R's embodied in the Waste Management Plan - namely reduction, recovery, reuse and recycling of waste - appropriate mitigation measures are identified to counteract adverse environmental effects.

This plan will be reviewed annually and revised as required. The Waste Management Plan is an integral part of Diavik Diamond Mines' Environmental Management System (EMS).

Objectives and General Strategies

The Waste Management Plan focuses on minimizing generation of wastes, optimizing usage of materials before disposal and facilitating the collection and processing of wastes with the least adverse effects on the physical and biological conditions at site. The minimum standards of acceptability of the plan are to:

Establish compliance with Federal and Government of the Northwest Territories (GNWT) environmental legislation via:

- GNWT Public Health Act
- GNWT Environmental Protection Act (EPA)
- Canadian Environmental Protection Act (CEPA)
- Transportation of Dangerous Goods Act and Regulations (TDGA & TDGR)
- Workplace Hazardous Materials Information System (WHMIS) Safety Act
- Northwest Territories Waters Act
- Territorial Lands Act
- GNWT Pesticide Act

Establish compliance with the American Petroleum Institute (API) and Canadian Standards of Practice via:

- Design, Construction, Operations, Maintenance, and Inspection of Terminal & Tank Facilities, API-2610.
- Standard for Aboveground Steel Tanks for Fuel Oil and Lubrication Oil, CAN/ULC-S602M.
- Lining of Aboveground Petroleum Storage Tank Bottoms, ANSI/API 652.
- Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products, National Task Force on Storage Tanks for Canadian Council of Ministers of the Environment (CCME).

Other objectives of the Waste Management Plan are as follows:

- Prevent and reduce adverse impacts on the environment, including wildlife and wildlife habitat
- Protect the environmental integrity of soil, surface water and groundwater in the immediate area of the plant site
- Reduce site waste disposal costs
- Ensure due diligence

Objectives of the plan are achieved by using proven strategies and applying modern technological developments to ensure that materials are used efficiently when brought to the site and then disposed of in an environmentally compatible manner. General strategies chosen to achieve the objectives are:

Proactive Procurement Policy: Any tender documents notify prospective bidders of the environmental sensitivity of the site and solicit the use of the most environmentally suitable materials, equipment and products.

Pollution prevention: Pollution prevention methods to eliminate the generation of wastes continue to be evaluated and, where feasible, methods are being implemented. This is achieved by adopting reduction, substitution, segregation, reuse, recycle and recovery methodology discussed below.

Strategic material substitution: At the purchasing stage, the possibility of material substitution with less pollutant varieties is examined for materials that are hazardous to handle, generate hazardous wastes or create environmental problems.

Strategic chemical substitution: A policy of using cost effective chemicals that accomplish the same result as an originally desired chemical, while resulting in less or no hazardous waste generation.

Waste segregation: Categorical segregation of all waste streams to avoid undesirable synergistic effects and promote reuse, recycling, recovery and disposal of various wastes. All waste categories are analyzed and the principals of the following four R's applied:

> ***Reduction initiatives***: Reducing raw material consumption is the first step to reducing waste generation. To practice this principle, processes and material used will be evaluated on the basis of possibly reducing raw material usage.
>
> ***Reusing initiatives****:* Reuse of the material in other applications and/or by other parties is examined using waste material exchange.
>
> ***Recycling initiatives***: Recycling involves processing used materials for use in creating new products and is considered, where feasible, for successful management of waste streams.
>
> ***Recovery initiatives***: Recovery of usable material or energy as a by-product is a part of the four R's of the waste minimization process. For example, redistributing waste heat from generators to heat other buildings is a process for recovering energy that would otherwise be wasted.

Disposal: Disposal becomes the final option when the four R's are no longer applicable or practical. However, hazardous wastes are only stored temporarily on site and are ultimately transported to a licensed hazardous waste handling facility for possible recovery, treatment and/or disposal.

The following sections of the waste management plan provide specific information on waste sources and how various wastes generated are handled. This information is reviewed when significant changes are made to the waste streams, and at minimum on an annual basis.

Definition of Waste

A material is considered waste when it can no longer be used for its original intended purpose. This Waste Management Plan addresses solid and liquid wastes expected to be generated on site.

The types of solid wastes considered at right include inert wastes of various kinds such as: cans, filters, belts, scrap metals, non-hazardous wastes such as sewage sludge, domestic garbage, etc. Or hazardous wastes like: used oils, solvents, paints, used/unused chemicals, old batteries and chemical based sludge from wastewater treatment plants. Waste classifications are shown in Figures 1 and 2 (Appendix A).

Liquid wastes such as waste chemicals and waste petroleum products are considered as hazardous wastes within this plan.

The GNWT Department of Environment and Natural Resources (ENR, formerly RWED) "Guideline for General Management of Hazardous Waste" (February 1998) and "Guideline for Industrial Waste Discharges" (April 2004) defines hazardous wastes and non-hazardous wastes as follows:

The definition of 'solid waste' includes:

- ✓ any garbage, refuse, sludge from a waste or water treatment plant
- ✓ discarded material including solid, liquid, semi-solid or contained gaseous materials resulting from industrial, commercial, mining, and from domestic activities, but does not include solid or dissolved materials in irrigation, return flows or industrial liquid effluent discharges.

Hazardous Waste*: A contaminant which is a dangerous good that is no longer used for its original purpose and is intended for recycling, treatment, disposal or storage. A hazardous waste does not include a contaminant that is:*

- Household in origin
- Included in class 1 Explosives, or class 7 Radioactive materials, of Transportation of Dangerous Goods Regulations (TDGR)
- An empty container
- Exempted as a small quantity
- Intended for disposal in a sewage system or landfill that meet the applicable standards set out in schedules I, III or IV of the "Guideline for Industrial Waste Discharges in the NWT."

The considerations for small quantity hazardous wastes that can be classified under non-hazardous wastes are as follows:

Small Quantity*:* Hazardous waste that is generated in an amount less than 5 kilograms per month of a solid, or 5 litres per month of a liquid; and where the total quantity accumulated at any one time does not exceed 5 kilograms or 5 litres. This does not apply to mercury or in classes 2.3, 5.1 or 6.1 of TDGR. These wastes must be generated in an amount less than 1 kilogram per month of a solid or 1 liter per month of a liquid; and where the total quantity accumulated at any one time does not exceed 1 kilogram or 1 litre.

Waste Sources

The sources and types of wastes generated at the mine site are presented in the following table:

Sources of Waste Generation

Source of Waste	*Type of Waste*
Chemical Handling and Storage Operations	Waste petroleum products, used chemicals
Sewage Treatment Plant	Biological sludge and grey water
Equipment Maintenance	Used batteries, engine oil, oil & air filters, tires, scrap metal, glass, hydraulic hoses, aerosol cans, etc.
Building Maintenance	Used transformers, fluorescent lighting ballasts, glycol, material scraps (partitions, carpets, plumbing, electrical, glass, insulation, etc.)
Laboratory	Chemical lab wastes, toxic substances, crucibles
Domestic waste from: accommodation building administration offices kitchens	Biological sludge, domestic garbage, oil & food wastes, paper, cardboard, aerosol cans, used alkaline batteries
Operational area	Inert waste: cement, sand, used materials (i.e. metals, pipes, glass, styrofoam, insulation, etc.)
First Aid Facility	Sharps (needles, syringes, scalpel blades), biological wastes (blood, human tissue, gauze pads)

Identification, Description, Classification and Disposal Plan

Waste containers are labeled at each facility, and hazardous waste signs are displayed in the applicable storage/transfer/disposal facilities. All wastes are to be segregated at point source. The Table below shows general treatment and disposal plans for wastes generated at the site.

The Waste Transfer Area (WTA) was relocated in 2008 and is now adjacent to the perimeter road to the explosives storage area on the south part of the island (Figure 4). The purpose of this facility is to store and dispose of site wastes in a practical, safe manner that reduces potential attractants for wildlife. Further information can be found in the WTA Operating Plan (Appendix B).

Treatment and Disposal Plan

WASTE TYPE	TREATMENT STRATEGY	HANDLING AND DISPOSAL METHOD
Petroleum Based:		
Used Oil	Reuse/ Recycle	Collect in trays, drums or pumped via pipeline. Transfer to large 467 000 liter storage tank at lube storage building, adjacent to the maintenance shop. Ship off-site for reuse/recycle. 20 L plastic pails or larger that contained oil are collected and sent to the WTA. The Site Services representative will inspect the container and, if drained, will dispose plastic container within the inert landfill. Containers that cannot be drained will be stored in a sea can at the WTA and shipped off site for cleaning and disposal.
Used Hydraulic Fluid	Reuse/ Recycle	Collect in trays, drums or pumped via pipeline. Transfer to 467 000 liter storage tanks adjacent to lube storage building or in drums to the waste transfer area. Ship off-site for recycling. Used hydraulic hoses will be disposed of in the landfill.
Used Grease	Reuse/Dispose off- site	Scrubber grease from the Process Plant and used cardboard grease tubes are collected in drums, stored at the WTA and shipped off-site for disposal.
Contaminated or Expired Fluids	Reuse/Recycle	Transfer to storage tanks and reuse where possible. Also used for Mine Rescue Team spill scenarios. If reuse not possible, ship off-site for recycling.
Oil Filters	Recycle/ Recovery	Oil filter canisters will be drained and crushed and placed in labeled drums. Drums will be taken to the waste transfer area and shipped off-site.
Contaminated Soil & Rock	Bioremediation	Spread in lined landfarm within the Waste Transfer Area (crush), or in the Type III rock pile (large rocks).

WASTE TYPE	TREATMENT STRATEGY	HANDLING AND DISPOSAL METHOD
Contaminated Water	Recovery/Reuse	Absorbent pads are used to collect any free product on top of the water. Remaining water is collected with a vacuum truck and taken to the PKC for disposal.
Contaminated Snow	Recover/Reuse	Snow is collected and deposited in the contaminated soils area. During thaw, absorbent pads are used to collect any free product on top of the water and the remaining water is collected with a vacuum truck and taken to the PKC for disposal.
Oily Rags	Reduce/ Incinerate	Collected in drums, store at the Waste Transfer Area and incinerate on site.
Used Absorbent Pads	Reduce/ Incinerate	Collected in drums, store at the Waste Transfer Area and incinerate on site.
Used Absorb-all	Reduce/ Incinerate	Collected in drums, store at the Waste Transfer Area and incinerate on site.
Chemicals:		
Used Glycol	Recycle	Collect in trays, drums or pumped via pipeline. Transfer to drums or 50 000 L storage tank located adjacent to lube storage building or power plant. Ship off-site for recycle or disposal.
Acids	Dispose off-site	Store in enviro-packs at the Waste Transfer Area and shipped to off-site disposal facility.
Solvents/EnSolv	Reduce/Dispose off-site	Use non-toxic solvents when feasible. Store in drums in Waste Transfer Area. Ship to disposal facility off-site.
Flocculant	Reduce/Dispose off-site	Collected in drums, stored at the WTA and shipped off-site for disposal.
Freon	Recycle/Dispose off-site	Collected in drums, stored at the WTA and shipped off-site for recycling/disposal.
Laboratory Products	Dispose off-site	Store at WTA. Dispose off-site.
Waste Batteries	Recycle	Label and store in Waste Transfer Area. Crate appropriately and ship off site for recycle/disposal.
Toxic Chemicals	Reduce/Dispose off site	Plastic containers that formerly held toxic chemicals in < 20 L containers will be collected in drums, stored in the WTA and shipped off-site for disposal. Any containers of this size that held benign products will be disposed of in the landfill.
Aerosol Cans	Recycle	Store in drums or crates in Waste Transfer Area. Ship off site for recycle or disposal.
Fluorescent Light Bulbs	Dispose off-site	Collected in trays, crates or boxes, stored at the WTA and shipped off-site for disposal.
Paint	Dispose off-site	Collected in a sea can or crate and allowed to dry. Cans incinerated (latex) and disposed of in landfill or shipped off-site for disposal (oil-based).

WASTE TYPE	TREATMENT STRATEGY	HANDLING AND DISPOSAL METHOD
Domestic Wastes:		
Food	Incinerate	Collect in plastic bags, store inside in designated containers. Incinerate immediately.
Paper and Cardboard	Recycle/ Incinerate	Burn dry, unstained materials in designated burn pit. Incinerate any paper or cardboard that has been in contact with food.
Cooking grease	Dispose off-site	Collected in plastic drums in the camp, packaged and transferred to the warehouse for immediate shipment for off-site disposal.
Inert Bulk Wastes:		
Conveyor Belts and Tires	Reuse	Re-use tires where feasible on site. Dispose in landfill.
Vehicles	Recycle	Store in laydown area parking lot. Drive or haul off-site.
Buildings and Bulk Debris	Reuse on/off-site	Relocate to other areas of site or dismantle and haul off-site.
Incinerator Ash	Burn Pit/Landfill	Store in bins in Waste Transfer Area. Use in burn pit then transfer to landfill.
Scrap Metal	Landfill	Store in non-burnable bins and transfer to inert landfill.
Scrap Copper	Recycle	Collecting in a sea can for off-site recycling opportunity.
Wood, Paper & Cardboard	Burn Pit/Incinerator	Clean cardboard, paper and wood products are taken to the WTA and are burned in the burn pit for disposal. Any of these products that are contaminated with food are incinerated.
Plastics	Burn Pit/Incinerator/ Landfill	Plastic containers that held non-hazardous materials are disposed of in the landfill. Those containing hazardous products are collected in drums, taken to the WTA and shipped off site for disposal. Those that contained food are incinerated.
Air Filters	Burn Pit/Landfill	Collected in bins, burned at the waste transfer area and disposed of in the landfill.
Sandblasting residues	Landfill	For small jobs, collect at source and store in drums at Waste Transfer Area. For large sandblasting jobs, contain residues in a designated area, transfer to truck and dispose in approved inert landfill.
Organic Waste:		
Sewage Sludge and grey water	Sludge Containment Area & PKC	Sewage sludge is collect from screens at the Sewage Treatment Plant (STP) & disposed of at approved sludge disposal area in WTA (solids). Grey water and treated sludge from the STP is disposed of in the PKC pond.

WASTE TYPE	TREATMENT STRATEGY	HANDLING AND DISPOSAL METHOD
Biological Wastes	Incinerate	Store in special waste receptacles in first aid centre. Trained medical technicians ensure proper handling. Needles, scalpels, syringes, gauze pads and blood are incinerated.

Hazardous Recyclable and Non-Recyclable Wastes

Hazardous wastes generated at Diavik are classified in the Hazardous Materials Management Plan. This plan outlines the methodology for identification, classification and storage of such materials. The plan also defines the safety protocols to be followed and records to be maintained by personnel handling such wastes, including final disposal practices. This Waste Management Plan discusses the generation of solid wastes, which also includes hazardous wastes, and their storage and final disposal methodologies.

Petroleum Waste Stream

The petroleum wastes generated at site consist of used oil, diesel fuel, lubricants and solvents. These wastes are segregated in order to make the individual waste streams easier to reuse or recycle, or to permit recovery of any by-products. Special precautions are exercised when handling these materials since their improper release or disposal could adversely affect the environment. Personnel working with these products receive specific safety training for their handling.

Used Oil

The used oil generated from servicing vehicles, equipment, and generators is stored in marked, aboveground tanks adjacent to the lube storage building beside the maintenance shop (467 000L) and the power plant (96 000L). Any smaller amounts collected in drums are stored at the Waste Transfer Area. All connecting pipes are aboveground, making it easy to inspect for leaks. The Diavik Surface Operations department undertakes regular monitoring.

Transfer of used petroleum products is performed in the lined area of the storage facility. Used petroleum products not suitable for reuse are ultimately back-hauled to an off-site licensed facility for recycling.

Used oil pails that are 20 L or larger are collected separately and will be inspected by Site Services to determine requirements for draining and disposal. Plastic containers that are drained will be placed within the inert landfill, while others that cannot be cleaned will be stored in a sea can(s) at the Waste Transfer Area and shipped off site for disposal.

Hydraulic Fluid

Hydraulic fluid that is not reused is disposed of along with waste petroleum products to an off-site registered facility. Used hydraulic fluid is placed in labeled drums and stored in the waste transfer area or the bulk lube storage area and back hauled to an off-site facility for reuse or recycling.

Used hydraulic lines are disposed of in the landfill.

Oil Filters
Filters are required to be drained for 48 hours. A designated location has been made in the maintenance shop for the draining of oil filters. Once drained, they are crushed and stored in labeled drums. Full drums are then picked up by the Site Services department, transported to the waste transfer area and inventoried. The crushed filters are then shipped off-site to a licensed disposal facility for recycling.

Contaminated or Out-of-Date Fuels
For safety, some fuels such as Jet B aviation fuel may be condemned because of contamination, or an expired shelf life. These drums are labelled in this manner and may be reused within other fuel burning devices at site that do not have the same specifications as aviation. If fuel cannot be reused on site, it is shipped off-site and recycled as low-grade fuels at appropriate facilities.

Soil & Rock Contaminated with Petroleum Product
This plan emphasizes and facilitates the reduction of soil contamination through the lining of storage facilities, inspection and maintenance of equipment, use of trays for draining, lining of loading and unloading zones, and using secondary containment such as a berm around the tank farm areas. In spite of these measures, spills, leaks or pipe/hose ruptures can occur, resulting in hydrocarbon contamination of the soil.

The waste transfer area has a large lined area to deal with contaminated soils, referred to as a landfarm. Contaminated soil is spread in the designated area to facilitate sub-aerial bioremediation that could occur during the summer months.

Large rocks that become contaminated with petroleum products are disposed of in the Type III rock pile. Due to the size of the rocks, a puncture to the lining in the landfarm could occur and landfarming is less effective as there is little or none of the organics necessary for bioremediation. Surrounding rock piles and collection ditches prevent leachate from the Type III pile from entering the environment.

Snow Contaminated with Petroleum Product
Snow that is contaminated with petroleum products is collected in drums and taken to the Waste Transfer Area. Here it is added to the contaminated soils area. During spring thaw, water is contained within the lined, bermed area. Absorbent pads are placed on top of the water and a primitive oil water separator is used to collect any free product. The remaining water is collected with a vacuum truck and taken to the PKC pond for disposal.

Water Contaminated with Petroleum Product
Water may become contaminated with petroleum products in the event of a spill or leak. Free petroleum products tend to float on top of water, facilitating collection using absorbent materials such as berms and pads. These pads are then collected and disposed of as outlined below. Because the Diavik water treatment plant does not treat for hydrocarbons, any of the remaining water that may have come into contact with the product is collected using a vacuum truck and disposed of within the lined and contained PKC pond.

Oily Rags and Used Absorbent Materials
All materials used to clean up petroleum products are collected in drums around site, transported to the waste transfer area and stored for on site incineration.

Grease

Scrubber grease is used as part of the recovery process for diamonds and is mixed with a granular material. Once it is no longer possible to reuse the scrubber grease, it is collected in drums, transported to the waste transfer area and stored for off-site disposal.

Cardboard grease tubes are collected in drums from various areas around site and are taken to the WTA for storage until being shipped off site for disposal.

Chemicals

The site does not generate large amounts of chemical wastes. However, processing of anticipated chemical waste products is described below.

Glycol

Ethylene glycol is used for heating, vehicles, equipment, and at the airstrip as antifreeze. If spilled, the sweet smell of the material could attract and affect wildlife, and have a negative impact on the environment. The glycol waste stream is segregated from other wastes and is stored in marked, aboveground tanks to the lube storage building beside the maintenance shop (50 000L) and the power plant (28 000L). Any smaller amounts collected in drums are stored at the Waste Transfer Area. All connecting pipes are aboveground, making it easy to inspect for leaks. The Diavik Surface Operations department undertakes regular monitoring.

Transfer of glycol is performed at the lube storage building. Product not suitable for reuse is ultimately back-hauled to an approved off-site facility for recycling.

Waste Batteries

The types of batteries used include lead acid, potassium hydroxide (alkaline) and nickel-cadmium. Use of rechargeable batteries is promoted wherever possible, and provides an example for minimizing wastes. Rechargeable batteries are regularly maintained while in service, and tested prior to disposal to confirm that it is spent. Spent batteries are labelled and stored in a designated location in the Waste Transfer Area until being crated or drummed and shipped off site for recycling (where possible) or disposal. The Site Services department is responsible to deliver the spent batteries to the waste transfer area and inventory them regularly.

Acids

Used acids are stored in lined drums that are contained within enviro-packs at the Waste Transfer Area. They are then shipped off-site to an approved facility for disposal or recycling, if feasible.

Solvents

Most solvents around site have been replaced with non-toxic, citrus-based detergents and are primarily used as degreasing agents in the maintenance shops and other service buildings. An example is the use of EnSolv which is an environmentally-friendly, non-hazardous solvent specifically used within the Recovery plant. These wastes, along with any small amounts of specialty degreasing solvents which are usually toxic petroleum based chemicals, are collected and stored on site for disposal. Residual or used solvents are stored in labeled leak-proof containers or drums and/or are transferred to larger storage containers in the waste transfer area. The drums/containers are shipped off-site to a licensed disposal facility.

Flocculant
Minimal amounts of flocculants are used in the process, sewage and water treatment plants as a thickener for tailings or sludge. Any flocculants that may be spilled is collected in drums, stored at the Waste Transfer Area and shipped off site for disposal.

Freon
Freon is commonly used in refrigeration and tends to be re-circulated within equipment. However, should a leak or spill of this product occur during operations or servicing, it is collected in drums and stored at the Waste Transfer Area until it can be shipped off site for disposal.

Fluorescent Light Bulbs
Fluorescent light bulbs contain trace amounts of mercury. For this reason, they are collected in trays or boxes around site, stored at the Waste Transfer Area and shipped off site for disposal.

Aerosol Cans
The use of aerosol cans on site is discouraged because of the potential damage they represent to the ozone layer. Aerosol cans are difficult to handle as a waste because they cannot be incinerated directly. The cans are collected separately in marked containers, stored in the Waste Transfer Area and shipped off site to a licensed disposal facility. Camp occupants are advised about this procedure and cleaning staff alerted to separate them from the general waste stream. To comply with the waste minimization policy, aerosol cans are substituted wherever possible with refillable pump/spray bottles. DDMI is investigating the possibility of using an aerosol crusher to reduce bulk aerosol disposal requirements.

Paint
Used paint cans are collected and allowed to dry in a sea can within the Waste Transfer Area. Cans containing latex paints are incinerated and taken to the landfill for disposal. Containers that held oil-based paints are properly stored within the sea can and back-hauled in a crate to an approved off-site recycle/disposal facility.

Laboratory Chemical Wastes
Any chemical wastes which cannot be safely incinerated or landfilled at site are stored in appropriate containers at the waste transfer area and back-hauled to an approved treatment/disposal facility off site.

Biological Waste
Small amounts of hazardous biological wastes and other medical materials, such as needles, syringes, scalpels and blood and tissue contaminated items, are generated in the first aid areas. These wastes are properly contained, labeled and stored in a secure area marked “Biohazard” in the first aid centre until they are removed and incinerated. Since the contracted medical staff is most aware of the potential risks involved, these wastes are to be left under their supervision until they can be incinerated or transported off-site.

Inert Solid Waste
Throughout operations, inert wastes will be generated on site. The bulk of these wastes can be disposed of on site, but some do require shipment off site for reuse or disposal. This

category includes items such as vehicles, buildings, plastics, clean paper and wood products, and air filters.

Conveyor Belts and Tires
Re-use of tires is encouraged; some alternate uses for tires are to store materials in the parts lay-down area and to protect roads in turning areas. Research is being done to try and find alternative uses or recycling options for conveyor belts and tires. Used conveyor belts and tires are disposed of in the landfill and eventually covered with large quantities of waste rock or coarse processed kimberlite.

Vehicles
Vehicles and equipment will be driven or back-hauled for reuse/recycle when they are no longer useable for the project. While awaiting backhaul, salvageable vehicles will be stored in a laydown area.

Plastics
Plastic wastes generated are mainly from food packaging, cleaning products and lubricants. Plastic containers that originally contained toxic or hazardous materials are fully drained before being stored in the WTA for off site disposal. Plastic containers that contained non-toxic, non-hazardous materials will be disposed of in the inert landfill. Plastic waste from food containers is incinerated to prevent animal attraction.

In accordance with the waste minimization policy, use of disposable dishes is discouraged in an effort to reduce waste generation.

Corrugated Cardboard
Clean, corrugated cardboard waste is generated mainly from packaging. Cardboard is burned in the designated burn pit within the waste transfer area.

Paper
Paper waste generated consists of office paper, newsprint, and packaging. Shredders shred confidential paper, which may then be re-used as packaging material. Paper reduction is achieved by using e-mail, voice message devices, telephone or verbal communications rather than written whenever possible, and using both sides of the paper when photocopying or printing. Intermediate collection points for recyclable paper are established in office areas. Paper materials are incinerated or burned in the burn pit.

Scrap Metal
This waste stream consists of ferrous and nonferrous scrap metals of various types, which have low recycling price and are hard to recycle. Metal scraps are generated from siding, piping, and other similar items. Scrap metal is disposed of in the landfill.

Waste Lumber
Waste lumber is burned in the designated burn pit in the waste transfer area. Larger pieces are salvaged and temporarily stored in laydown areas until condemned by site staff. Once condemned, they are also burned within the burn pit. DDMI will be considering stockpiling used lumber materials and will evaluate the use of backhauls to communities for use as building materials.

Air Filters

Air filters are collected in burnable garbage collection bins around site. These filters are taken to the burn pit at the Waste Transfer Area and are burned to reduce their volume prior to being disposed of at the landfill.

Buildings & Bulk Debris

Old buildings no longer required, or any other large sized debris, will be relocated for reuse to other areas on site, where possible.

Sandblasting Residue

Sandblasting operations are carried out to prepare some metal surfaces for coatings. During sandblasting activities, the surrounding areas are shrouded for dust control and all residual materials resulting from the sandblasting are collected and stored in drums in the waste transfer area. For large sandblasting activities, the sandblast residue is stockpiled in a designated area, transferred to a truck and disposed of in the inert landfill. Any stored material is placed in the approved landfill or is shipped off-site for disposal.

Incinerator Ash

Ash from the incinerators is collected in bins adjacent to the incinerators themselves. This ash is then transferred to the burn pit to assist in burning operations. When the burn pit is cleaned out, contents are placed in the landfill.

Solid Domestic Waste

The solid domestic waste stream consists of food waste, recyclable containers (cans, bottles), inert non-combustible domestic waste, packaging, corrugated cardboard, paper, and paper products. These materials are incinerated daily to prevent the attraction of wildlife. All non-recyclable solid wastes, which cannot be incinerated, will be transported to the landfill and buried there.

Food Waste

Kitchen staff collects all food waste indoors. Waste transfer staff collects this waste and incinerates it as soon as possible. This is done throughout each day in order to minimize potential attraction of and its negative impacts on wildlife in the area. Bag lunches are collected daily from remote offices and trailers for incineration. An employee-driven recycling program for pop cans and bottles was initiated in 2007, and proceeds from this program are donated to charity.

Paper and Cardboard

Any paper or cardboard products that may have come into contact with food, or was used as food packaging, is disposed of in the incinerators.

Cooking Grease

Oil and grease from the kitchen is collected in plastic drums and packaged indoors. Once the drums are full, they are transferred to the warehouse for immediate shipment off site to Yellowknife for disposal.

Sewage Sludge

The biodegradable organic components removed by screening in the sewage treatment plant are dewatered and stored in the designated sludge storage area within the waste transfer

area. Grey water and non-biodegradable sludge, such as chemically precipitated sludge or sludge settled from the wastewater treatment plants with the aid of flocculants or coagulants, is pumped into the Processed Kimberlite Containment (PKC) area.

Miscellaneous Waste

Various kinds of waste other than those mentioned above are collected and sorted in the waste transfer area. These other wastes are then either stored in designated locations for back hauling, burnt in the incinerators or burn pit, or disposed of in the landfill. All the wastes will be handled and transported by trained personnel employed by the Site Services department.

Site Facilities

The waste transfer area (WTA) has been established to ensure the proper handling of wastes on site. Contained within this area are the following facilities:

- Contaminated soil containment area;
- Incinerators;
- Burn pit;
- Sewage sludge containment area;
- Storage areas and sheds for drums, crates, bins, totes, etc.; and,
- Office, lunchroom & washroom facilities.

An approved landfill is also used for the disposal of clean, inert waste. Location of the facility is shown in Appendix A, Figure 4.

Waste Transfer Area

The facility was relocated in 2008 and is now adjacent to the perimeter road to the explosives storage area on the south part of the island (Figure 4). The whole area is lined with HDPE material and is surrounded by a gated, chain link and barbed-wire fence erected to control wind transportation of any litter and wildlife intrusion. The majority of wastes are stored and inventoried here while awaiting backhaul. Sea cans and sheds are used for storage of labelled items that will be back hauled to recycling or disposal facilities. This helps to prevent items being buried by drifting snow, and ensures year-round accessibility. Drums are labelled appropriately, inventoried, manifested and eventually transported off site. The burn pit is operated here, as are the incinerators for food waste. Sewage sludge is collected in an approved area within this facility for future use in reclamation. An approved landfarm is also located within the facility for deposition and remediation of petroleum contaminated soils. The possibility of a new incinerator building is being considered to assist in segregating, storing, and taking inventory of waste in the future.

Land Farming

Hydrocarbon contaminated soils from spills or other releases are land-treated in two designated areas on site: one within the Waste Transfer Area and one atop the Type III rock pile. The WTA cell is designed and constructed with a berm and arctic geomembrane liner. The geomembrane was placed on a sand cushion and covered with two layers of select material.

Hydrocarbon-contaminated soil is placed in rows or piles during summer months to allow for remediation to acceptable levels by using natural microbiological processes (bioremediation). Depending on the concentration of contaminant, additional soil may be added. To enhance the turn around time, fertilizers such as ammonium nitrate or sewage sludge could be applied to aid the bioremediation process and improve the efficiency of the landfarm. Once hydrocarbons have degraded to the CCME Industrial level for coarse-grained surface soils,

the soil will be transferred to the landfill where it will be encapsulated within the rock pile or PKC area.

Petroleum Waste Storage Facilities

Design and Location

Individual departments are responsible for collecting all petroleum-based waste in leak proof containers within their workshops or laydown areas. The Surface Operations department periodically collects and transports these waste products, stores them in properly labeled, lined and sealable containers in the Waste Transfer Area or transfers them to aboveground bulk storage tanks on site.

A lined, bermed bulk storage area is located beside the lube storage building adjacent to the maintenance complex. A 467 000 liter aboveground used oil tank is located in this area as well as a 50,000 litre waste coolant tank. Adjacent to the power plant, inside a concrete bermed area is a 28 000 litre used glycol tank and a 96 000 litre used oil tank. Also in this area is a day tank for diesel fuel.

Manifest Requirements

Manifests are compiled to accompany hazardous recyclables or wastes when they are transported to approved facilities. Information on the manifest includes type of waste, amount shipped, how the material is contained and facility to which it is being transferred. The Surface Operations department is responsible for preparation and tracking of these manifests, as well as arranging methods of transportation of the materials to the off-site licensed facility.

Incompatible Wastes and Container Requirements

The risk of mixing various wastes that could react to produce heat, gas, fire, explosion, corrosive or toxic substances is reduced by segregating all chemical waste according to their hazard classification, and leaving outdated chemicals in their original, labeled containers. Chemicals requiring special containers remain in the containers in which they were purchased (e.g. acids) with additional appropriate empty containers available for emergency purposes.

Training

There are designated operators for handling hazardous material/waste. All operation personnel involved in the handling of hazardous waste are fully trained for personal safety and protection. They are also trained in spill response. Responsibility for waste management is assigned to the Surface Operations department. In addition, all personnel entering the camp are given basic instructions for complying with the waste management system during site orientation and environmental awareness training sessions.

Surveillance and Monitoring

Personnel using the vehicles, machinery and equipment for the various facilities on site identify any requirements for maintenance work and report the need for repairs. Routine scheduled inspections are performed to minimize the potential for leaks or atmospheric pollution and a record is kept of maintenance needs and servicing performed. The Site Services department maintains the various waste collection transfer and disposal points, inventories of bulk wastes, waste management datasheets, and status of protective

equipment and spill kits. This assists in evaluating the capacity of waste management facilities, planning for logistics associated with back hauling and requirements for any modifications to the system. In addition to this, the Environment department conducts waste inspections at the waste transfer area and landfill every other day, as well as a site-wide compliance inspection on a weekly basis.

Landfill

Site Selection and Design

The approved inert landfill at the former quarry was closed in January 2008. The new inert landfill location was approved by the INAC Inspector and is located within the country rock pile. Any future requirements for additional landfill sites would be selected in consultation with the INAC Inspector and given full consideration of environmental criterion required for site selection.

The landfill site is to be used to dispose of inert solid waste as well as ash from the incinerator. The landfill will be regularly covered with either course kimberlite material or Type I (clean) rock. A two to three meter layer of till and waste rock will be applied as a cap before abandoning the landfill, ensuring that the contents of the landfill will remain permanently frozen. This will restrict the production and movement of leachate. The fill for the cover will be obtained from the till stockpile in the northeast sector of the north country rock pile. The cover will be applied as the landfill progresses, with most of the capping done during the summer so that at closure only a small area would require capping. During the winter months only a thin cover will be applied. The layer will be re-compacted during the spring and built up during summer.

Signs will be posted to identify the disposal area. The landfill will be operated by trained personnel from the Surface Operations department, with inspection and monitoring being performed regularly. Records will be kept regarding findings and recommendations will be evaluated and executed.

Contingency Planning

Improper Disposal

Any improperly disposed material identified by waste management crews are removed and transferred for proper disposal. For example, non-burnable material will be removed from the incinerator waste stream and transferred to the designated area in the landfill. Hazardous wastes are stored in the waste transfer area until they can be shipped to licensed facilities off-site.

Fire

In case of an accidental disposal of oxidizing, reactive or flammable material, members of the Emergency Response Team (ERT) are notified immediately and the emergency response unit is dispatched in accordance with the procedures outlined in the Contingency Plan.

Extreme Weather Conditions

During extreme winds and blizzards, the disposal of ash will be curtailed. Mitigative procedures such as cover and containment work in the landfill are initiated to shield materials from winds or disposal is curtailed until weather conditions improve.

Incinerators

Two incinerators are located at the waste transfer area to incinerate burnable materials, including food wastes, as required. The incinerated ash is stored inside a bin capable of holding 1.2 cubic meters. Ash is then used in the burn pit and finally disposed of in the landfill area.

Appendix A

Figures

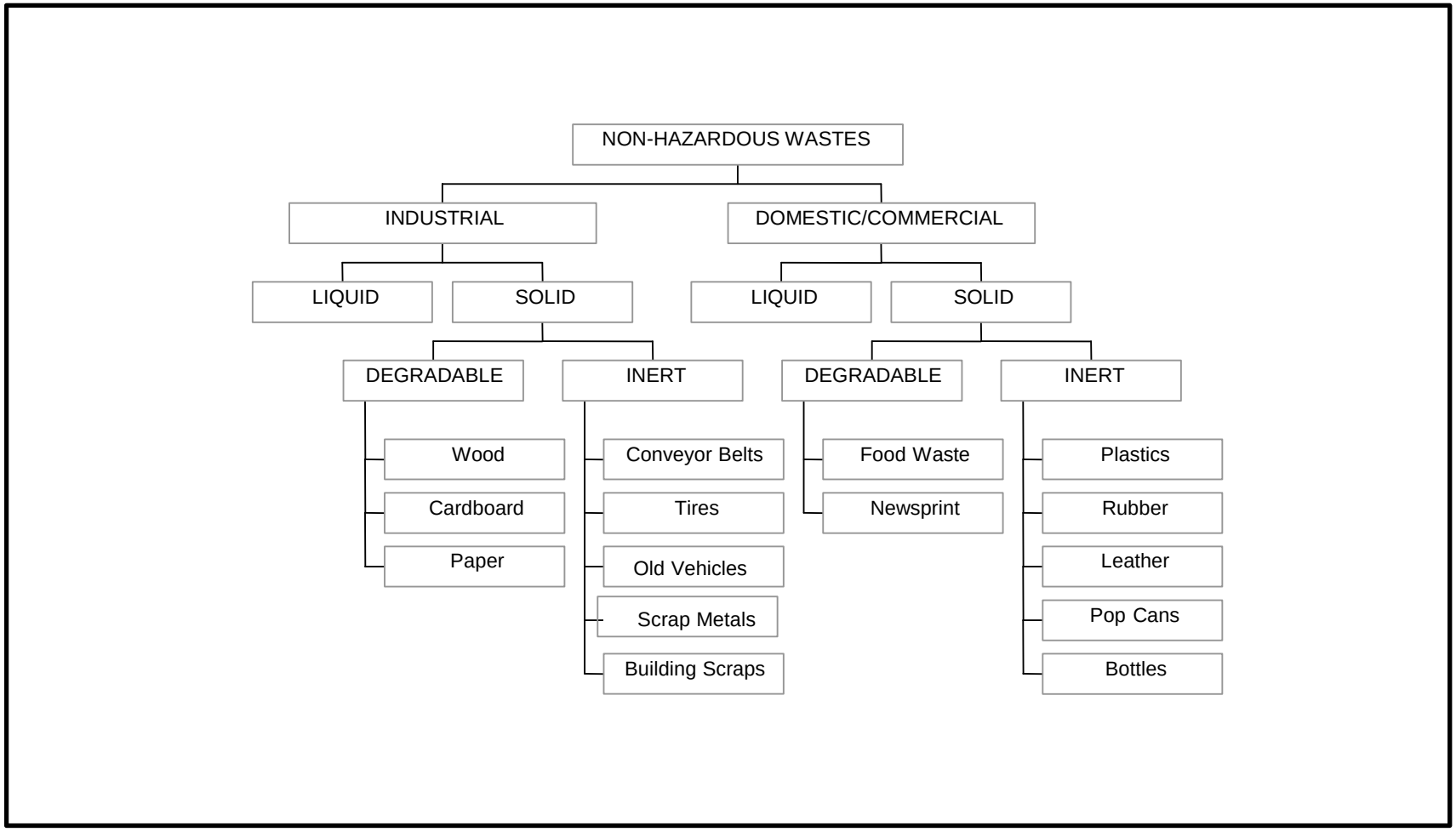


Figure 1: Classification of Non-hazardous Waste Generated at Diavik Mine Site

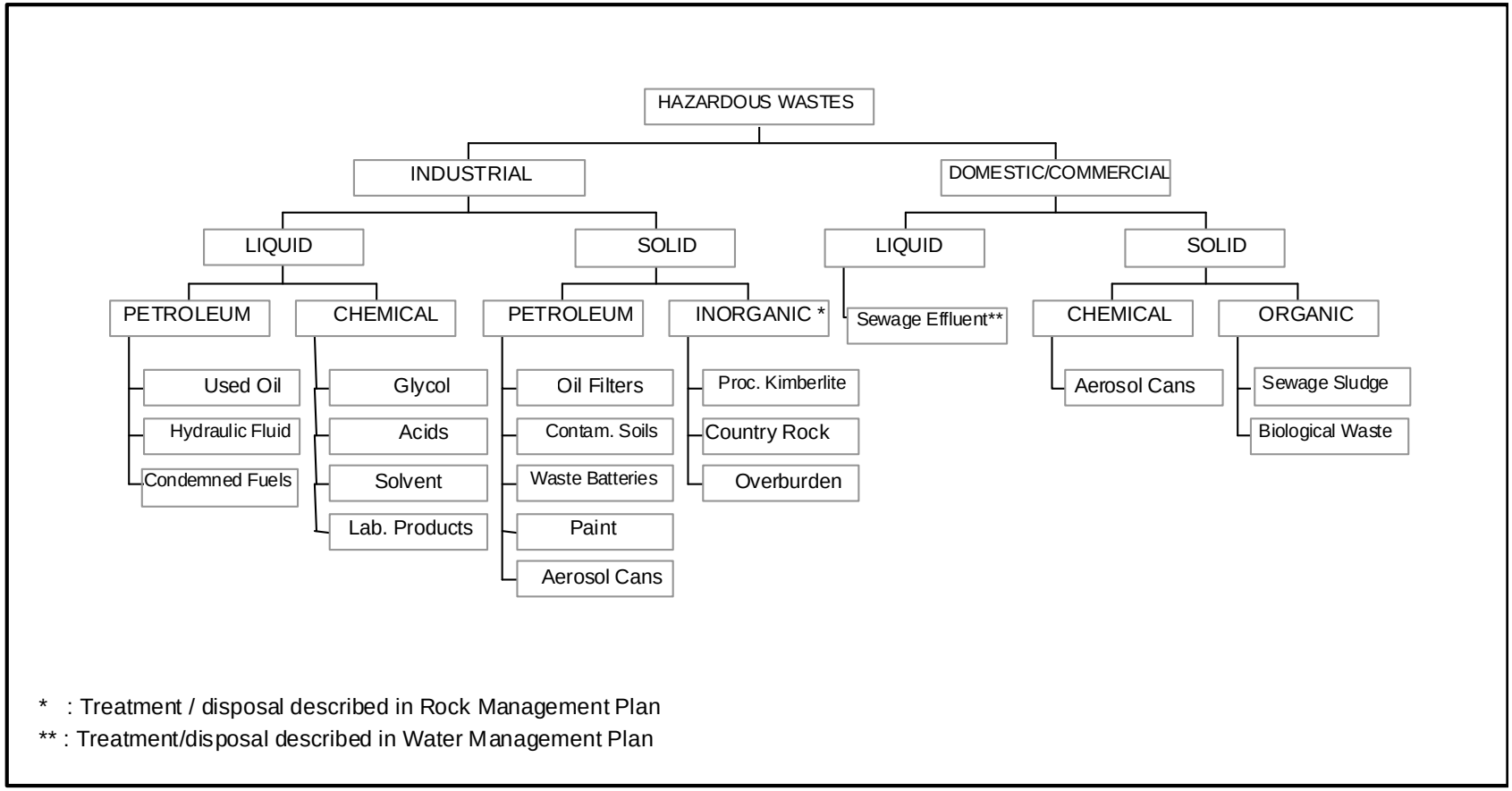


Figure 2: Classification of Hazardous Waste Generated at Diavik Mine Site

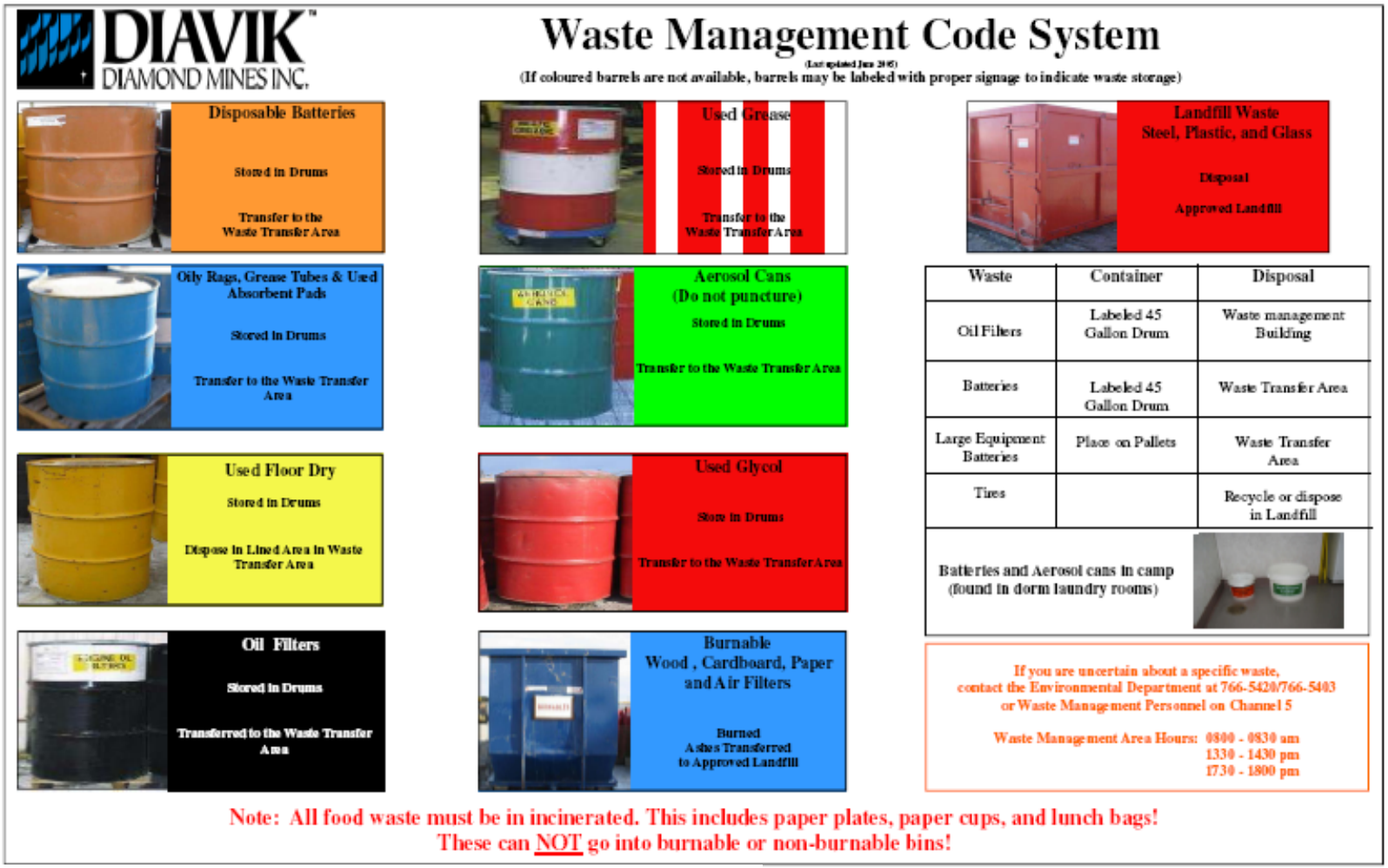


Figure 3: Waste Management Code System

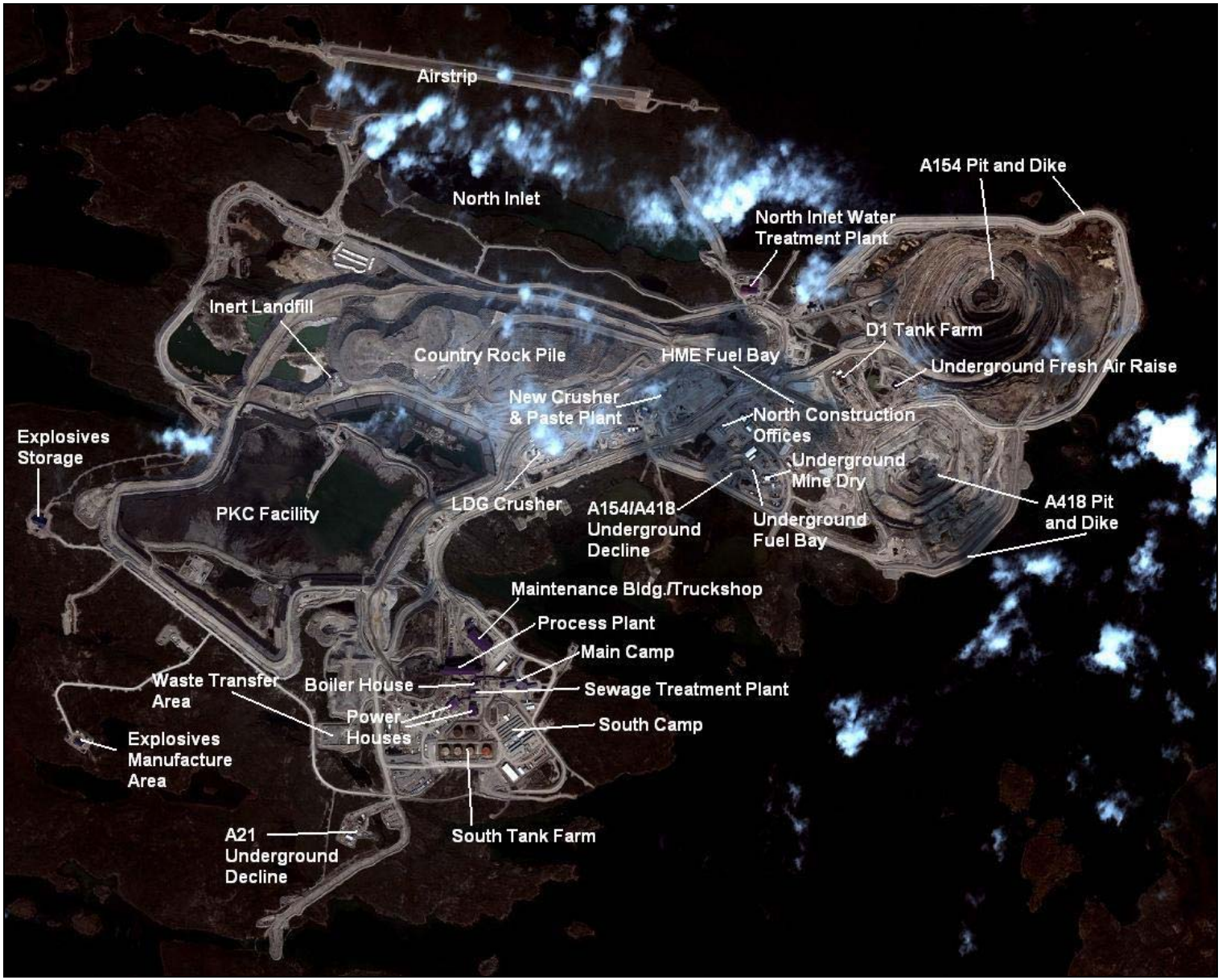


Figure 4: Diavik Mine Site Layout

Appendix B

Waste Transfer Area Operating Plan

DIAVIK DIAMOND MINES INC.

WASTE TRANSFER AREA OPERATING PLAN

VERSION 6

March 2009

Table of Contents

1. INTRODUCTION

Diavik Diamond Mines Inc. (DDMI) has developed a plan to manage the Waste Transfer Area (WTA) at the Lac de Gras site. DDMI is committed to ensuring every necessary step is in place to collect, transport, store and dispose of all wastes generated on site.

The fundamental basis of the WTA is to promote a positive and practical waste management system that minimizes effects on the environment.

The objective of the WTA is to ensure proper waste handling and management procedures are followed. These procedures provide important guidelines that support our commitment to efficiency while maintaining environmental integrity and controlling costs.

This document is included as an Appendix to the Waste Management Plan, and both documents are updated annually or as required.

2. BACKGROUND

During construction of the Diavik mine in 2002, a waste transfer facility was assembled on the south perimeter road. This facility officially began operations on 15 July 2003.

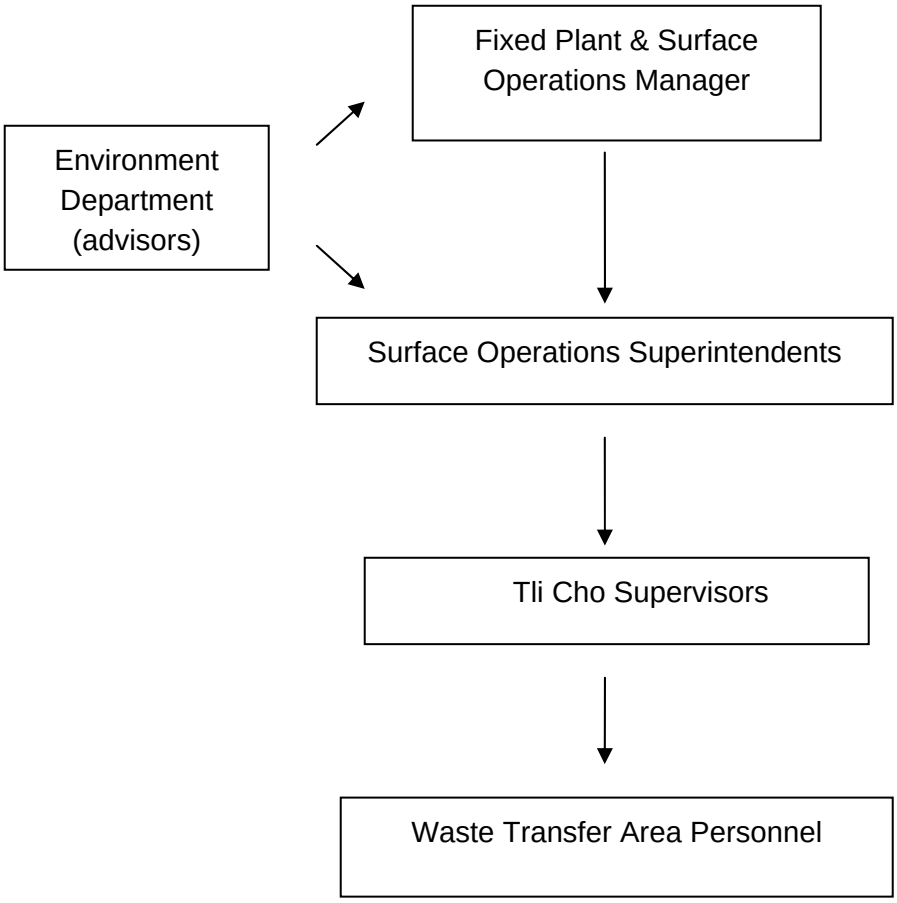
The general function of the WTA is to facilitate collection, sorting, packaging, storage and disposal of all site wastes. All wastes generated on site are managed through the WTA where garbage and food waste is burned/incinerated, contaminated soils and sludge materials are stored and hazardous materials are collected, sorted and stored for shipment to an approved facility via the winter ice road.

The layout of the facility permits proper segregation of waste material as well as short-term storage of hazardous materials and wastes (Figure 1). Storage areas for waste material are adequate for yearly accumulations of segregated waste and, as material is packaged for shipping, it can be moved to a designated area for transport. Ideally there are no plans for long-term storage of waste material as the objective of the WTA is waste management, rather than waste storage.

The WTA is approximately 0.0195 km^2 and is surrounded by a chain link fence. If the personnel are not present, this facility is kept locked and entry is only permitted by authorized personnel. This helps to prevent improper storage of materials within the WTA. The facility contains a lined area for contaminated soils, a sludge disposal area, burn pit, incinerators, an office, shop, washrooms and sea-cans used for the storage of materials to be transferred to an approved facility via the winter ice-road. Some of the materials stored in the sea-cans include batteries, oil filters and paint cans.

3. OPERATING ORGANIZATION

Operating Organization Personnel:



4. PERFORMANCE REQUIREMENTS, MONITORING AND REPORTING

Daily activities at the waste transfer area include:

- Inspection of the site;
- Count of bags and weights for incineration; and,
- Updates to the site logbook.

All daily inspections are carried out by waste management personnel. A weekly inspection is also performed by WTA staff, which includes an assessment of all safety and environmental interests, as well as an inventory of all hazardous materials within the area. Inventory counts are conducted monthly.

The Environment department act as advisors to the Site Services department and conduct a weekly compliance inspection of the waste transfer area. Additionally, Environment conducts inspections focused on the incinerators and burn pit every second day. The purpose of this inspection is to ensure that wastes that could be potential attractants are recorded and disposed of properly. The Manager of Site Services is ultimately responsible for any change in procedure that would affect the performance of the WTA.

4.1 General

Daily general duties of waste transfer personnel are:

- Ensure that gates to the WTA are closed and locked at all times;
- Collect food wastes from around site and incinerate daily;
- Collect drums used for waste storage around site and move to designated areas;
- Control and sort incoming materials;
- Clean ash from incinerators; and,
- Ensure that housekeeping of the WTA is sustained.

Seasonally, waste management staff is tasked with preparing shipments of waste materials for back haul on the winter ice road to an approved disposal facility.

A Standard Operating Procedure (SOP) for the WTA is found in Appendix A, which describes more specific duties of the waste transfer area staff in relation to the various types of waste that are managed on site.

Records of inventory and inspections are filed within the office at the WTA.

4.2 Inspections

Daily routine inspections are conducted on:

- Camp kitchen food waste collection rooms;
- Incinerator area for general housekeeping;
- Burn pit operations and housekeeping; and,
- Cleanliness of lunchroom and washrooms;

Weekly routine inspections are conducted on:

- Drums and containers stored in the waste transfer area;
- Fence surrounding the WTA for damage and housekeeping; and,
- Contaminated soils area

4.3 Soil Remediation Area

The only materials permitted in the remediation area are crush and small amounts of snow contaminated with petroleum and glycol residue. Large boulders mixed in with the contaminated soils will be removed and transferred to the encapsulated Type III rock pile. This will allow even spreading of soils/snow at a minimum depth and maximum surface area. During spring thaw, water may accumulate within the soil containment area. A primitive oil water separator has been installed at one corner of the contaminated soils area. The intention of this sump is to collect any free product inside the berm and allow remaining water to flow through the berm via a pipe to a collection well outside the berm. Again, free product will be collected and disposed of accordingly and remaining water from the collection well will be transported to the PKC for disposal.

In summer months, as soon as the soil is workable, it is placed in piles or rows and toiled every 14 days, at a minimum, to allow contaminated material exposure to air and sunlight. This would equate to approximately six turning events during the summer season. A designated area near the southwest corner will be left available to add newly introduced contaminated soils. Composite samples from within the piles/rows will be obtained at the start, middle and end of the summer season to determine the amount of remediation that has occurred. Should a significant precipitation event occur, the sump would be inspected to determine if it is necessary to collect runoff water.

As stated in the Waste Management Plan, because the end use of this soil would be capping material within the landfill, soil will be remediated to CCME Industrial levels for coarse-grained surface soils, as it will be encapsulated within the rock pile or PKC area.

By the end of the summer of 2007, should contaminant levels not show a significant change, the possibility of encapsulating contaminated materials in a clear plastic tarp with regular additions of sewage sludge or ammonium nitrate will be investigated for the following year. Additionally, further research on treatment technologies will continue to be conducted to ensure this remediation area is managed efficiently to assist in further reclamation of the mine site.

For more information on the management of wastes within the WTA, please refer to the Waste Management Plan, Version 11, March 2008.

Figure 1: Waste Transfer Area Layout

Appendix A

Standard Operating Procedure

Task Description:	Waste Handling	**Task Number:**	SOP1120-003
		Revision:	03
Area:	1120 - Waste Transfer	**Date Created:**	September 04/2005
Created by:	Site Services	**No. of Pages:**	04

Objective:

The purpose of this procedure is to provide foremen and workers with a safe procedure for waste collection.

Responsibilities:

It is the Superintendents responsibility to ensure that the supervisors, tradesmen, operators and workers are trained and understand this procedure.

It is the supervisors, tradesmen, operators and workers responsibility to follow this procedure.

Procedure:

1. **WASTE OIL DRUMMED**
   - Place waste oil in drum with a non-removable lid, to maximum of 80% capacity
   - Once drum has been filled to 80% capacity, bungs must be installed and secure
   - Drum must be labeled as to the contents and date sealed
   - Only product which name appears on label is to be stored in that drum
   - Top and exterior of drum must be wiped down and the exterior must be free of any residue
   - Once waste oil is collected it is delivered to the lube building or the power house where it is pumped into a 467 000 or 96 000 liter (respectively) aboveground bulk storage tank until it can be shipped off site

2. **WASTE OIL BULK**
   - Place waste into lube cube to maximum of 80% capacity
   - Once lube cube has been filled to 80% capacity, hatches and valves must be secured
   - Lube cube must be labeled as to the contents and the date sealed
   - Only product which name appears on label is to be stored in that cube
   - Top and exterior of cube must be wiped down and the exterior must be free of any residue
   - Once waste oil is collected it is delivered to the lube building or power house where it is pumped into the 467 000 or 96 000 liter (respectively) waste oil bulk storage tanks for holding until it is shipped off site, or remain in the cube for shipment off site

3. **OIL FILTERS**
   - Must be drained into waste oil drum (as above)
   - Once drained the filters are to be crushed and then stored in leak proof drums provided for such storage
   - Drum must be labeled as to the contents
   - Only product which name appears on label is to be stored in that drum

Task Description:	Waste Handling	**Task Number:**	SOP1120-003
		Revision:	03
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- Exterior of drum must be wiped down and the exterior must be free on any residue
- Full drums will be collected from waste pickup points on a weekly or as required basis
- Once filters have been placed in covered drums, the drums will be picked up by the Site Services Department and stored in the appropriate waste transfer area until being shipped off site

4. AEROSOL CANS

- Must be empty
- Must be stored in leak proof container (drum) provided for such storage
- Drum must be labeled as to contents
- Only product which name appears on label is to be stored in that drum
- Full drums will be collected from waste pickup points

5. **GLYCOL/ANTIFREEZE**

- Pour waste into drum with a non-removable lid, to maximum of 80% capacity
- Once drum has been filled to 80% capacity bungs must be installed and secure
- Drum must be labeled as to the contents and the date sealed
- Only product which name appears on label is to be stored in that drum
- Top and exterior of drum must be wiped down and the exterior must be free on any residue
- Full drums will be collected from waste pickup points and delivered to the waste transfer area for storage until they are pumped into the 50 000 liter waste glycol tank at the lube building

6. **PAINT**

- Lids must be removed from waste paint cans
- Cans are to be in open air until waste paint is completely dry
- Once paint has dried cans and lids may be deposited at the waste pickup point where they will be collected and brought to the waste transfer area.
- Latex paint cans can be incinerated and then discarded as waste metal at the landfill
- Oil-based paint cans will be collected in sea can, then packaged in a lined, wooden crate with vermiculite for shipment off site

7. LEAD ACID BATTERIES

- Must be collected and delivered to the waste transfer area
- Batteries must be stored upright
- Must isolate from any metal contact
- Batteries will be stored in the waste transfer area where the will be placed in approved shipping crates for shipment off site

8. NICKEL CADMIUM/ALKALINE BATTERIES

- Must be deposited in labeled storage container identified for such storage and located at convenient locations around the main camp complex and shop areas
- Batteries will be stored in the waste transfer area where they will be placed in approved containers for shipment off site

Task Description:	Waste Handling	**Task Number:**	SOP1120-003
		Revision:	03
Area:	1120 - Waste Transfer	**Date Created:**	September 04/2005
Created by:	Site Services	**No. of Pages:**	04

9. SOLVENTS (VARSOL)

- Pour waste into drum with a non-removable lid, to maximum of 80% capacity
- Once drum has been filled to 80% capacity bungs must be installed and secure
- Drum must be labeled as to the contents and the date sealed
- Only product which name appears on label is to be stored in that drum
- Top and exterior of drum must be wiped down and the exterior must be free of any residue
- Full drums will be collected from waste pickup points and delivered to the waste transfer area for storage until they are shipped off site

10. WASTE PAPER & CARDBOARD

- Clean papers and cardboard are to be placed in burnable dumpsters provided on site.
- Once waste/paper & cardboard is collected it will be brought to the waste transfer area burn pit for disposal.

11. FOOD WASTE AND GENERAL CAMP WASTE

- All food waste must be deposited in clear plastic bags. These bags are placed in the kitchen waste storage room, or within the lunch rooms around site.
- Food waste receptacles will be collected on a regular basis. (Note: all food waste, lunch bags, cardboard and packaging, etc. must be stored in the above manner and delivered to the waste transfer area for incineration. This is an important issue, as food waste discarded in a haphazard manner will draw animals into camp)
- The Site Services department will collect all waste of this nature.
- This waste will be immediately incinerated.

12. SPILLED MATERIALS

- Spills of oil, fuel, glycol and acid will be cleaned up as follows:

NOTE: This information is in addition to that provided in other site documents, procedures and directives. These procedures are not meant to take the place of any other spill reporting, handling or clean up process. It is meant as a means of preparing contaminated soil for pickup and processing at the appropriate waste transfer area contaminated pit.

- Pour recovered waste liquid into a drum or suitable leak proof container, to maximum of 80% capacity and seal.
- Drum or container must be labeled as to the contents and the date filled
- Only product which name appears on label is to be stored in that drum or container
- Top and exterior of drum must be wiped down and the exterior must be free of any residue
- Drums of contaminated soil will be taken to the Waste Transfer Area for disposal
- Drums of recovered material will be disposed of according to the waste management procedures outlined for that specific material

Task Description:	Waste Handling	**Task Number:**	SOP1120-003
		Revision:	03
Area:	1120 - Waste Transfer	**Date Created:**	September 04/2005
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13. CONTAMINATED ABSORBENT PADS

- Pads that are saturated will be placed in drums.
- The drums may then be dropped off at one of the pickup points and from there they will be taken to the waste transfer area for disposal.

14. CONTAMINATED SOIL

- Contaminated soil must be collected and stored in containers applicable for the task
- These containers may then be dropped off at one of the pickup points and from there they will be taken to the waste transfer area.
- Petroleum-contaminated soils will be added to the contaminated soil containment area

15. SEWAGE SLUDGE

- Sludge is drawn from the Sewage Treatment Plant, with screened material delivered to a containment cell within the waste transfer area, while the liquid is deposited in the PKC.

16. SCRAP METAL

- Scrap metal is deposited in roll off boxes identified for such use
- Upon request full bins are taken to the landfill for disposal

17. KITCHEN GREASE

- Stored inside near the kitchen in 205 liter plastic drums
- Drums are collected by Site Services on an as required basis and delivered to the warehouse
- Drums are shipped off site on the next available aircraft.

18. WOOD

- Wood is burned in the burn pit.
- Ash will be landfilled in the designated landfill site

Area Supervisor:		Date:
Area Manager:		Date: