Rio Tinto

# Wildlife Monitoring Program Report - 2011

March 2012

## Diavik Diamond Mine

Health, Safety, Environment and Training Department

# 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 allows 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 2011 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. Wherever possible, comparisons to the information gathered during the previous monitoring years (2000 to 2010) and the pre-construction baseline (June 1995 to August 1997) have been included.**

**General observations in each program are as follows:**

### Vegetation/Habitat Loss

- Total habitat loss to date from mining activities is 9.71 $km^2$ and is below that predicted during the Environmental Assessment (EA).
- At the end of 2011, actual habitat loss for Riparian Shrub (0.03 $km^2$), Esker Complex (0.17 $km^2$) and disturbed ground (0.06 $km^2$) were equal to that predicted during the EA.

### Barren-ground Caribou

- There was increase in mine footprint in 2011; therefore, the total number of habitat units (HU's) lost has increased to 2.47 HU's, which is less than what was predicted during the Environment Assessment.
- One natural caribou mortality occurred at East Island in 2011. On 18 October, a deceased caribou was found by Site Services personnel while completing their daily checks on the run way at the airport.
- During 2011, the caribou traffic advisory remained at "No Concern" for 344 days, as caribou numbers on the island did not exceed 100 at any given time. On, 7 October 2011, the traffic advisory sign was changed to 'Caribou Advisory' in response to approximately 200 caribou present by the Emulsion Plant and AN building. The caribou advisory was in effect for the duration that the caribou were at site; on the 27 October 2011 the caribou advisory was lifted as the caribou had travelled south off East Island.

- There were three occasions during 2011 that actions were taken by Environment personnel to herd caribou away from hazardous locations.
- DDMI suspended aerial surveys for 2011.
- Results from past surveys appear to support recent zone of influence (ZOI) estimates of 14-40 km, which is above the 3 to 7 km ZOI originally predicted during the Environmental Assessment, but influence of the lake on the ZOI is currently unclear.
- A total of 104 ground-based caribou behavioural observations occurred in 2011. EKATI did not complete any behaviour scans in 2011; therefore, wasn't able to pool data. Distances of observations ranged from less than 2 km to greater than 30 km from mine infrastructure.
- Caribou collar data from the GNWT showed that caribou moved west of Diavik during the northern migration and travelled South East of East Island for the southern migration.
- Caribou road surveys and PKC and rock pile monitoring were conducted on 59 occasions between 3 May and 30 November 2011. No caribou were observed during the PKC and rock pile surveys. Nine caribou observations along roads were made on five different days during 2011. Of these observations, two were <50 m from the road, six were between 50 and 200 m and the remaining one was on the road (South Road).

### Grizzly Bear

- There was an increase to mine footprint for 2011. To date, the total direct grizzly bear habitat loss is 7.16 $km^2$, which is below the amount predicted during the Environmental Assessment.
- Grizzly bears are still present in the Diavik wildlife study area, and were observed on the mine site from 10 May to 24 October 2011.
- A total of 56 incidental sightings were recorded at the mine site during 2011.
- No mining-related bear mortalities, injuries or relocations occurred during 2011.
- DDMI suspended hair snagging methodology to monitor grizzly bear presence within the Diavik wildlife study area for 2011 in order to investigate a methodology procedure for implementation in 2012.

### Wolverine

- Wolverines were present on East Island in 2011.
- No wolverine mortalities or relocations occurred during 2011.
- DDMI fulfilled its participation commitment to the DNA research program in 2011 and plans to conduct the program again in 2015.
- The snow track survey was conducted in 2011 and one community assistants participated in the monitoring program.

## Waste Management

- Regular inspections were conducted at the Waste Transfer Area (WTA) and Inert Landfill in 2011.
- At the WTA, food and food packaging were found during 4% and 7% of all inspections, respectively; similar compared to 2010 results.
- At the Inert Landfill, food was found during 4% of all inspections and food packaging was found during 27% of all inspections; similar compared to 2010 results.

## Falcons

- Pit wall-mine infrastructure inspections were conducted in 2011 in order to survey for active nest sites and falcon presence in and around mine site. There were no falcon nests confirmed during the conducted surveys.
- No falcon mortalities occurred on East Island in 2011.

## Waterfowl

- There was no direct habitat loss in 2011 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 limit 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 program has evolved over the years, with 2010 being the eleventh year of 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 so that there is similarity with 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 limit project-related effects on wildlife and whether or not these practices and policies require modification; and
- determine if new effects are found that were not predicted in the Environmental Assessment.

The wildlife study area (Figure 1-1) encompasses approximately 1,200 square kilometers ($km^2$). Its boundaries are roughly: west to the southwest arm of Lac de Gras, east to Thonokeid Lake, north to the BHP Billliton wildlife survey area and south to 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 $km^2$ 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**

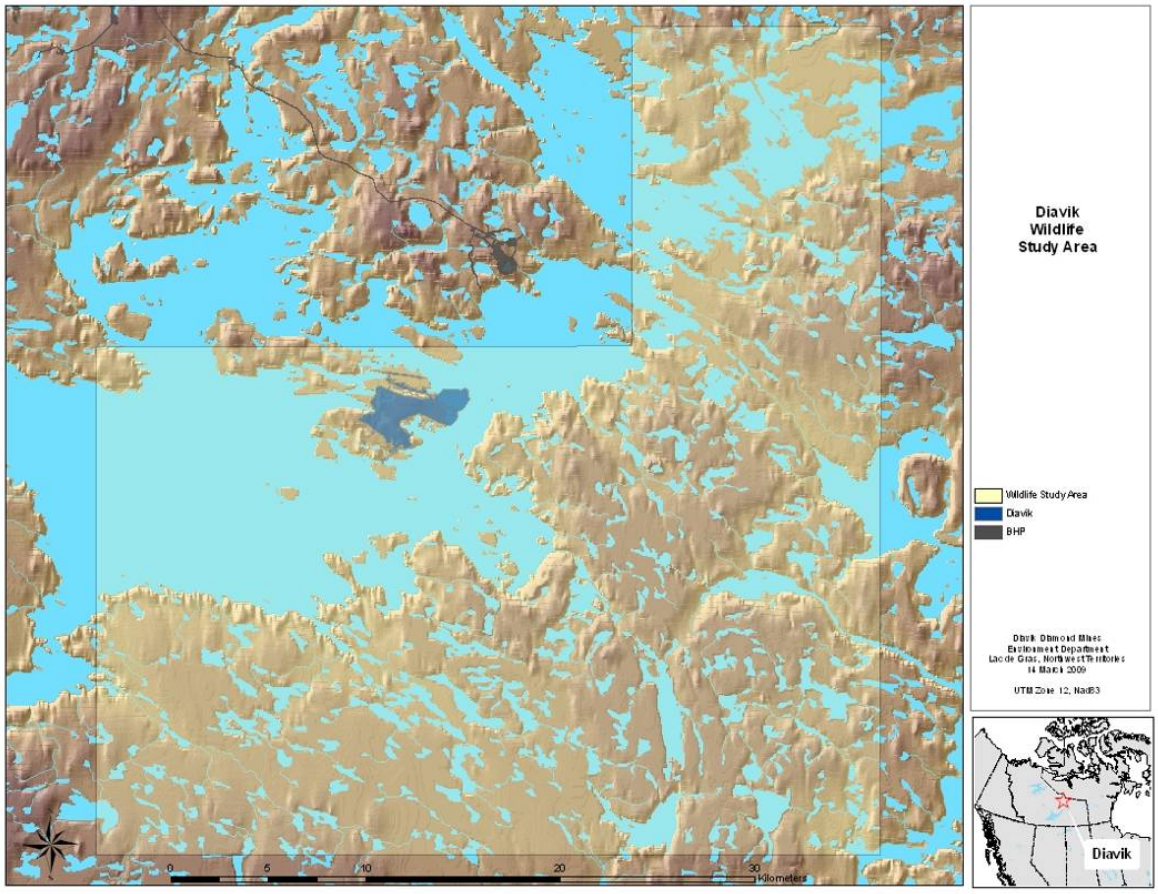


**Figure 1-2 Satellite Image of East Island – 2011**

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 2011, minimal surface construction was undertaken the main focus for increasing mine footprint in 2011 was development for wind farm roads east of AN building. All haul roads required for mining activities to date are complete. Development of the underground mine at the A154/418 decline continued during 2011, with 236,902 tonnes of waste and 425,067 tonnes of ore completed by year end. Infrastructure development included sumps, pump stations, the raise bore and electrical (MCC) rooms.

The number of people present on East Island increased from 2010, equalling an annual average of 630 people. The average population of the main camp accommodation was 335 people while the average for south camp accommodation was 295 people. During the month of April, East Island reached a peak population of 676 people.

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 are 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 2011 program), key recommendations are described in this report and will be incorporated into the WMP for subsequent years. The DDMI WMP is an evolving program that will reflect recommendations during previous years, as well as advances in project development. Changes such as these will be captured in annual revisions of the Wildlife Monitoring and Management Plan for the Diavik Diamond Mine. Community visits for Diavik are scheduled annually in order to present proposed changes and obtain feedback from the communities. During 2011, the majority of community visits relating to the wildlife monitoring program were conducted in the fall and winter.

# 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$^2$.***

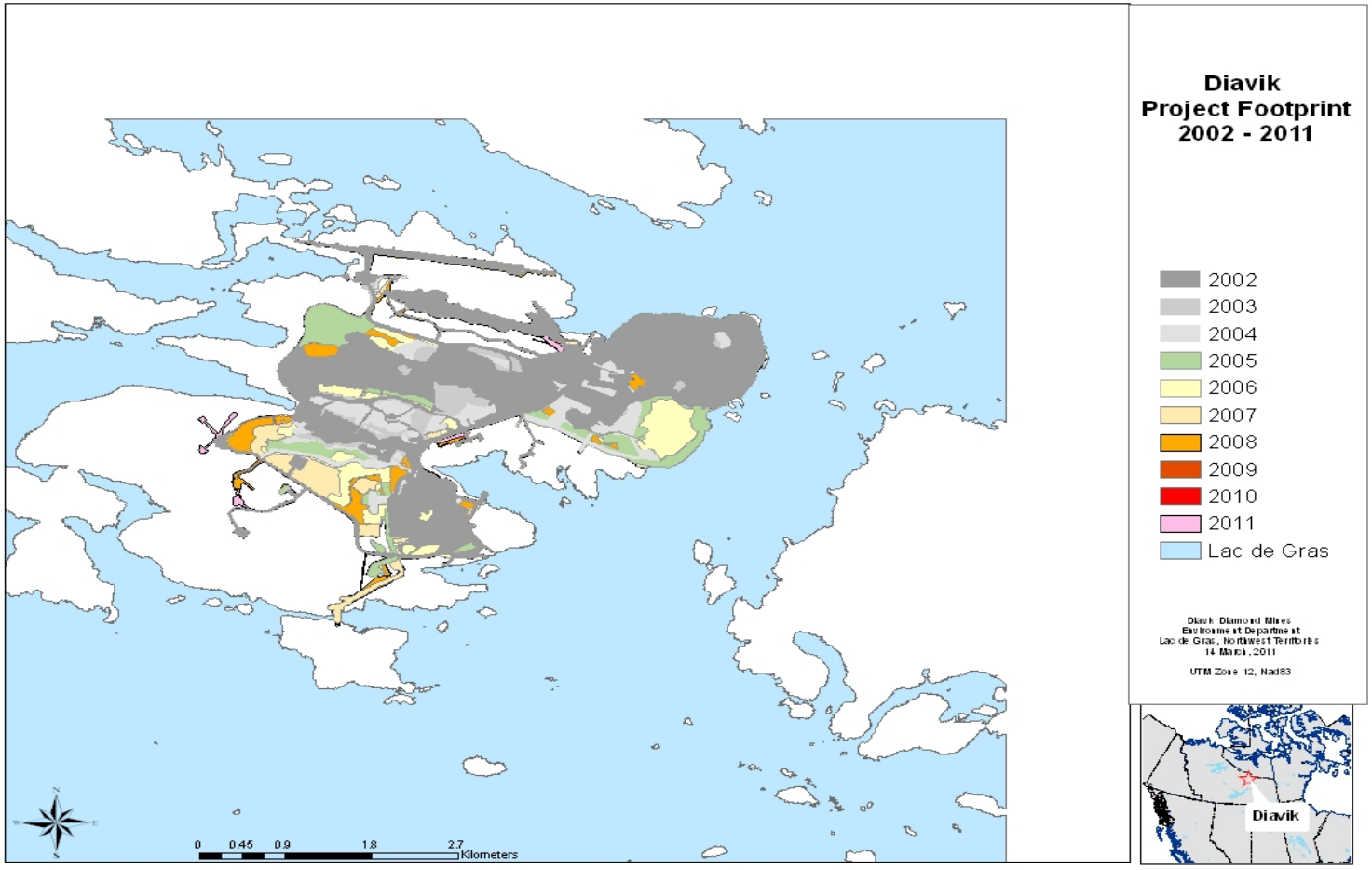
### Methods

A satellite image of the mine site area was obtained and used to update the area of the current mine footprint. 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 were made to determine how many square kilometers (km$^2$) of each habitat type has been replaced by the mine footprint (Figure 2-1).

### Results

As of December 2011, a total of 9.71 km$^2$ of habitat has been altered due to mine footprint expansion, with construction beginning in 2000. This represents a total loss of 76.6% of the predicted mine disturbance (Figure 2-1).

**Figure 2-1 Habitat Loss by Year, 2002-2011**



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.

**Table 2-1 Predicted Mine Disturbance versus Cumulative Actual Mine Disturbance for All Years (2000-2011)**

| | Total Area (km²) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Habitat Classification** | **up to 2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **Predicted** |
| Heath Tundra | 1.45 | 1.89 | 2.02 | 2.38 | 2.62 | 2.76 | 2.93 | 2.97 | 3.03 | 3.00 | 3.01 | **3.68** |
| Heath Bedrock (30-68%) | 0.08 | 0.34 | 0.36 | 0.4 | 0.45 | 0.49 | 0.53 | 0.58 | 0.59 | 0.58 | 0.59 | **0.78** |
| Health Boulder (30-68%) | 0.26 | 0.64 | 0.73 | 0.96 | 1.07 | 1.24 | 1.43 | 1.49 | 1.52 | 1.50 | 1.53 | **1.89** |
| Tussock/Hummock | 0.45 | 0.63 | 0.79 | 1.01 | 1.19 | 1.27 | 1.35 | 1.42 | 1.44 | 1.43 | 1.44 | **1.64** |
| Sedge Wetland | 0.02 | 0.03 | 0.04 | 0.09 | 0.16 | 0.16 | 0.17 | 0.21 | 0.21 | 0.21 | 0.21 | **0.26** |
| Riparian Shrub | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | **0.03** |
| Birch Seep & Shrub | 0.03 | 0.05 | 0.06 | 0.08 | 0.08 | 0.09 | 0.09 | 0.09 | 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 | 0.04 | 0.04 | 0.04 | **0.05** |
| Bedrock Complex | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | **0.07** |
| Shallow Water | 0.11 | 0.23 | 0.23 | 0.26 | 0.29 | 0.34 | 0.35 | 0.35 | 0.35 | 0.34 | 0.34 | **0.48** |
| Deep Water | 0.15 | 1.8 | 1.81 | 1.82 | 1.93 | 2.17 | 2.19 | 2.19 | 2.19 | 2.12 | 2.12 | **3.46** |
| Disturbed | 0 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | **0.06** |
| Esker | 0.13 | 0.14 | 0.14 | 0.15 | 0.16 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | **0.16** |
| **Total** | **3.12** | **5.88** | **6.32** | **7.3** | **8.15** | **8.86** | **9.4** | **9.66** | **9.78** | **9.65** | **9.71** | **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 2011, very few construction projects occurred outside the existing mine footprint, the main focus for development was construction of the wind farm roads located east of the AN building. Heath Tundra habitat has experienced the greatest loss to date (3.01 $km^2$). A progression of habitat loss from the mine footprint can be seen in Figure 2-1.

In 2010, total cumulative disturbance was calculated to be 9.78 $km^{2.}$ In reviewing the mine footprint for this year; the total disturbance value is 9.65 $km^{2.}$ This was an internal error with miss calculating the habitat classification areas to make up the mine footprint for that given year. The total vegetation loss has been updated with the (9.65 $km^{2.)}$ value in order to calculate the vegetation loss for 2011. For accuracy purposes, we have compared the recalculated value for

2010 and the vegetation loss for 2011 with the DDMI surveyors to ensure area has been calculated accordingly.

Values provided for habitat loss are estimates based on the predicted mine footprint, satellite imagery and the ecological classification map. DDMI will continue to monitor habitat loss as the mine expands and will identify any exceedences that may occur during this time.

# Caribou

**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).**

**NWT's barren-ground caribou herd declines are consistent with worldwide caribou trends. Between 2006 and 2010, a number of management and monitoring actions were implemented throughout the NWT to promote recovery of declining herds (ENR 2010, website). With management actions enforced and improved calf recruitment, results from the GNWT 2010 survey suggest the Bathurst herd is stabilizing. However, other herds in the NWT continue to decline, this includes the Ahiak herd (ENR 2010, website). Management actions for the herd are currently being considered by the Government of the Northwest Territories (GNWT) and the Wek'èezhìi Renewable Resources Board (WRRB).**

**The Ahiak herd was confirmed as distinct from the Bathurst herd based on movements and range use by satellite-collared caribou (ENR 2010, website). The Ahiak calving grounds are near the Queen Maud Gulf, Nunavut but can range as far south as the Thelon Game Sanctuary, and animals 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 in 1996 (ENR 2010, website).**

**The barren-ground caribou has been ranked as a 'Sensitive' species by the General Status Ranks of Wild Species in the Northwest Territories (GNWT, 2010). These 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

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). 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 habitat suitability 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 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 value (Table 3-1; DDMI, 1998b) to determine habitat units lost (HUs).

### Results

Direct summer habitat loss to date from the mine totalled 2.47 habitat units (Table 3-1). Heath tundra, which has the highest habitat suitability rating, represents 3.01 $km^2$ of lost vegetation since construction began (Table 2-1). Caribou summer habitat loss was greatest in 2001, when the majority of haul roads and laydown areas for mine infrastructure were constructed. Overall, total direct losses for all summer habitat suitability classes for caribou are currently below that predicted in the Environmental Assessment.

**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 2011 | 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 | 2009 | 2010 | 2011 | |
| Heath Tundra | 0.37 | 0.01 | | | | | | | | | | | | | | | |
| Heath Boulder | 0.4 | 0.03 | | | | | | | | | | | | | | | |
| Riparian Shrub | 0.46 | 0.00 | High | **2.13** | 0.3 | 0.42 | 0.19 | 0.09 | 0.23 | 0.14 | 0.12 | 0.14 | 0.09 | 0.03 | 0.00 | 0.02 | **1.77** |
| Bedrock Complex | 0.27 | 0.00 | | | | | | | | | | | | | | | |
| Tussock/Hummock | 0.3 | 0.01 | | | | | | | | | | | | | | | |
| Sedge Wetland | 0.28 | 0.00 | | | | | | | | | | | | | | | |
| Esker | 0.3 | 0.00 | Moderate | **0.63** | 0.07 | 0.12 | 0.07 | 0.05 | 0.08 | 0.08 | 0.02 | 0.03 | 0.03 | 0.01 | 0.00 | 0.00 | **0.55** |
| Birch Seep & Shrub | 0.11 | 0.00 | | | | | | | | | | | | | | | |
| Boulder Complex | 0.21 | 0.00 | | | | | | | | | | | | | | | |
| Heath Bedrock | 0.23 | 0.01 | Low | **0.2** | 0.02 | 0.05 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0 | 0.00 | 0.00 | **0.15** |

*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 estimated at 3 to 7 km during Diavik's Wildlife Environmental Effects Report (EER) so that a conservative approach was used in the assessment of the possible impacts from human activity on caribou. The ZOI were estimated 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. 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 current 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 revised impact predictions determined in Handley (2010) are:

***To determine whether the zone of influence changes in relation to mine activity***

***To determine if caribou behavior changes with distance from the mines***

### Methods

#### Behavioural Observations

In an attempt to obtain more localized effects data on caribou behaviour, ground-based behavioural observations, or scan sampling, is conducted. These types of observations can provide useful data on potential changes in caribou behaviour as they move closer to or further from the mine. For the 2010 sampling season, EKATI and Diavik continued to pool data from behavioural observations between both mines. The EKATI mine regularly has caribou close to mine infrastructure, while the location of the Diavik mine on East Island is better suited to collecting observations further from the mines.

Individual caribou activities were 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).

The GPS location was recorded, and observations were conducted during the spring, summer, and autumn; the bulk of observations were conducted in the fall when more caribou were passing through the area. Group composition was classified, and the number of animals in the group was 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 were performed within one habitat type (tundra with < 30% bedrock or boulders) and the level of insect harassment was recorded.

The group was 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 was recorded. For all caribou groups, instantaneous observations were used to assess the response of caribou to different potential stressors as a function of distance. In the event that a stressor was introduced during scan sampling, the observers noted the time and recorded the response of caribou to stressors as “no reaction” or “exhibiting a reaction”. The reaction of the majority of the group was used in selecting the category. Estimated distance (m) from the stressor was also recorded. Stressors included type of wildlife, type of aircraft, type of vehicle, and blasts from pits.

The observers then waited until the animals resumed their previous behaviour (usually 1-2 minutes), and would begin scanning observations again. For the scan observations, weather conditions such as wind speed and direction, temperature, and type of precipitation were documented.

## Results

### Aerial Surveys

Aerial surveys were suspended in 2010 and 2011. This decision was based on recommendations from the Advisory Boards for each of the mines, as well as feedback from communities relating to concerns over aircraft disturbance as a potential stressor for the caribou. During the time when surveys were suspended, additional analysis was undertaken and alternative methods for conducting aerial surveys were considered and discussed among stakeholders.

A ZOI is apparent for all caribou groups in the area of the mine, with the threshold distance varying from year to year. For example, a ZOI near 40 km was noted for three monitoring years (2001, 2005 and 2009) and a ZOI of 15 km was noted in 2006. However, large lakes such as Lac de Gras appear to have a stronger influence on the distribution of caribou when compared to the level of activity at the mine, in some years (e.g. 2005 and 2009). The calculated zones of influence varied from year to year, but not in a progressively increasing manner. There was no relationship between the extent of the ZOI and the level of activity at the Diavik mine site. Analysis of collar data (both satellite and GPS collars) also indicated that the percentage of collared animals within the study area has not declined from 1996 to 2011, which provides further

evidence that changes in mining activity over time have not caused caribou to exclude the Lac de Gras region from their post-calving range.

**Behavioural Scans**

A total of 104 behavioural observations of caribou were obtained during 2011 (Appendix IV). The number of observations can be categorized into the following distance categories listed in Table 3-2. The sample size for analysis (n = 104); Ekati did not complete any behavioural scans in 2011.

**Table 3-2 Caribou behavioural observations as a function of distance from mine infrastructure, 2011**

| Total Number of Scans Conducted (Diavik & EKATI) | Distance from Mine Infrastructure | Number of Scans Conducted by Diavik Personnel |
|---|---|---|
| 43 | ≤ 2 km | 43 |
| 0 | 2-8 km | 0 |
| 4 | 8 – 15 km | 4 |
| 8 | 15 – 20 km | 8 |
| 41 | 20 – 30 km | 41 |
| 8 | > 30 km | 8 |

A statistical analysis (2010) was conducted to assist in interpreting behavioural response mechanisms within the ZOI. Behavioural responses of caribou groups without calves largely appeared to be related to environmental considerations such as weather and insect activity. However, in groups with calves, the amount of time spent feeding or resting increased with distance from the mine. Groups with calves that were within 5 km of the mines spent 10% less time feeding or resting and 7% more time alert or moving than groups further than 5 km from the mine. Additionally, caribou groups without calves were found to spend approximately 5% less time feeding when they were within 7 km of the mine. Overall, the results of the analysis indicate that caribou behaviour changes with distance from the mine footprints in the region.

## 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, 1998b) 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

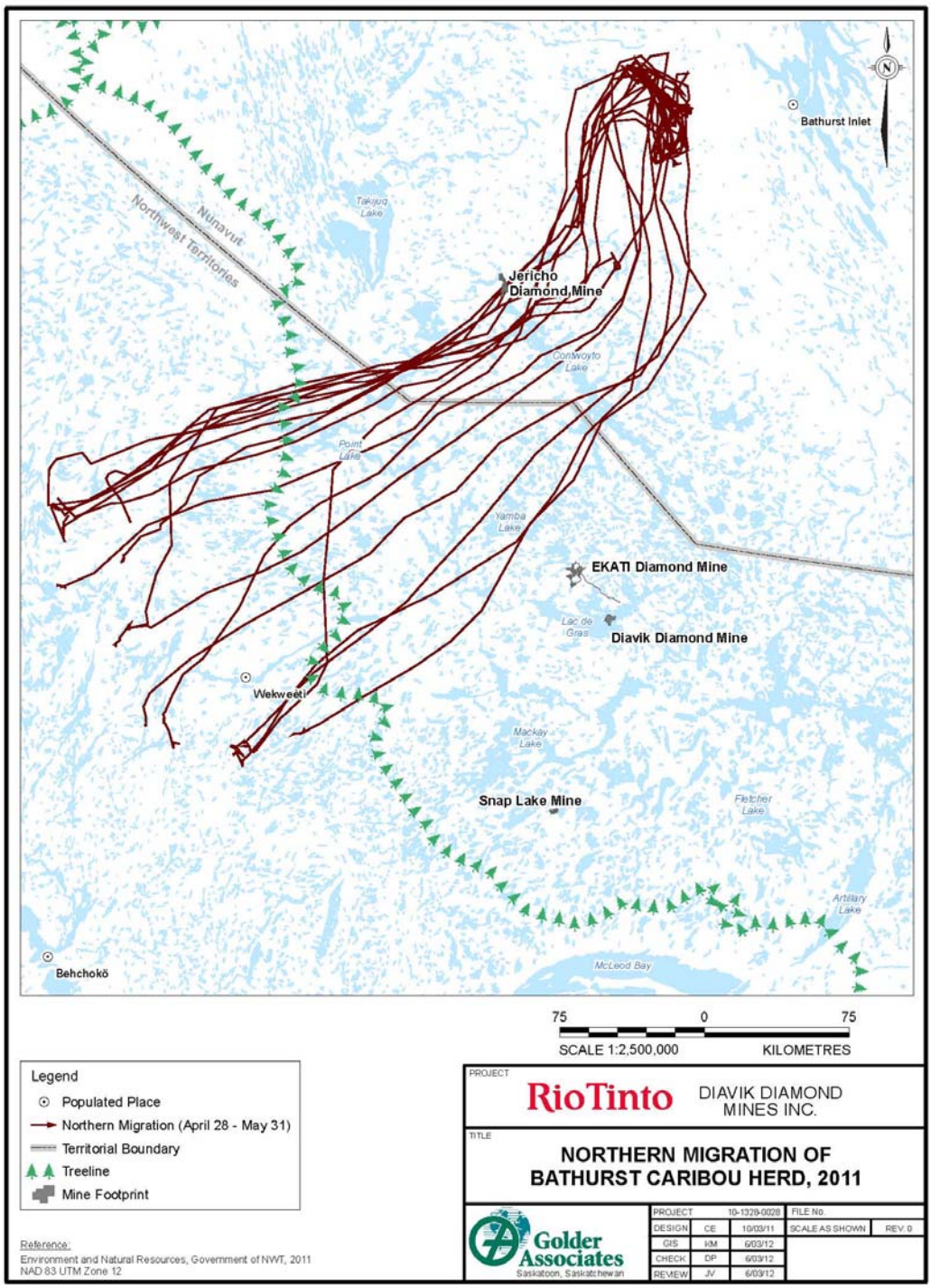
ENR provided weekly data on the geographic location of collared cows and this information was used to show general locations of the Bathurst caribou herd during migration periods (Gunn *et al.*, 2002). Movements of collared Bathurst caribou during the 2011 northern and southern migrations are included in this report. Historical data for 2002 to 2011 caribou collar locations can be found in Golder (2005, 2008, 2011).

### Results

#### Northern Migration

Data from satellite-collared caribou suggested that the majority of females in the Bathurst herd travelled west of the mine during the 2011 northern migration (Figure 3-2). This result appears to be in alignment with the impact prediction. Data from satellite-collared caribou provide a reliable estimate of the movement of animals within the Lac de Gras region. While aerial surveys were not conducted during the northern migration in 2011, past aerial survey data has shown support of the data provided by collars (Appendix I).

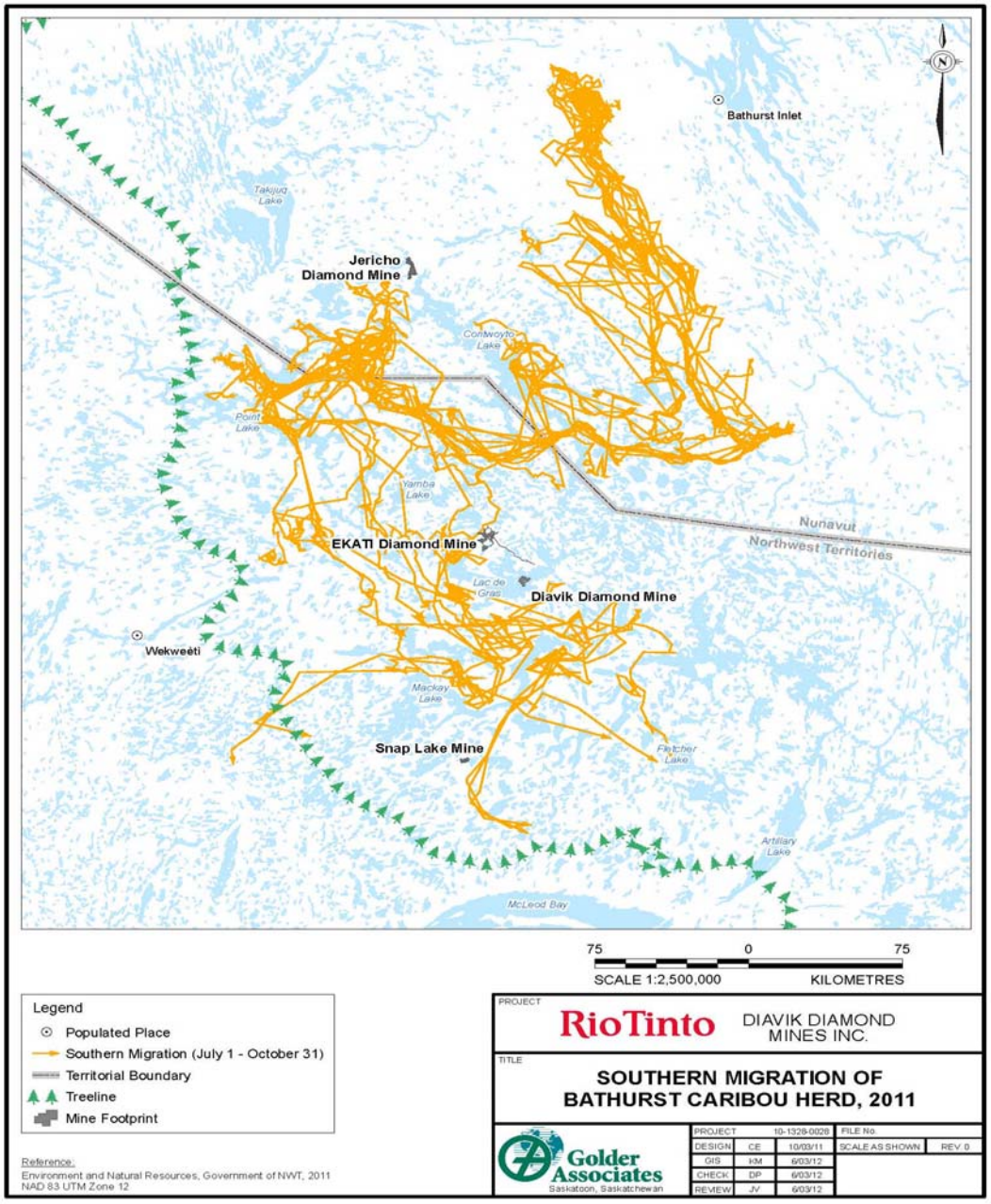
**Figure 3-2 Northern Migration of Bathurst Caribou Heard 2011**



**Southern Migration**

Maps are generated using fixed dates to define the migration period, with the fall migration ending 31 October of any given year. For 2011, collared data illustrated more movement to the south of Diavik (Figure 3-3) when compared to 2010 data. The comprehensive analysis shows that from 2002 to 2010, the majority of collared caribou traveled adjacent to or through the southeast corner of the study area. Overall, data collected in 2011 for the southern migration appears to agree with the impact prediction found in the EER (DDMI, 1998b), stating that caribou would travel east of the mine site during the southern migration.

**Figure 3-3 Southern Migration of Bathurst Caribou 2011**



## 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 an 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.

### Results

No project-related caribou mortalities or injuries occurred on East Island in 2011. A summary of natural and mine-related caribou mortalities from baseline through 2011 is provided in Table 3-3.

**Table 3-3 Caribou mortalities on East Island**

| | Baseline* | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Caribou Mortalities on East Island | 8 | 7 | 1 | 1 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Project-related Mortalities | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*Includes data from 1995-1997

One natural caribou mortality; occurred at East Island in 2011. On 18 October, a deceased caribou was found by Site Services personnel while completing their daily checks on the run way. The caribou carcass was approximately 30 meters south of the run way at the airport. ENR was notified of the event and Environment staff followed up with incident. The caribou carcass was not disposed of as there were reports of wolves and bears in the area.

In addition to the natural mine site mortality, there were two other events noted during 2011, where caribou carcasses were found on the ice off of mine site infrastructure. On 7 June, a caribou carcass was spotted approximately 200 m off of the A154 dike on the ice. Due to unsafe ice conditions, Environment personnel were not able to respond to location. Lastly, on 5 November, a caribou carcass was found approximately 400 m off of the A21 causeway by Environment while under going compliance inspections. In both events cause of death is unknown.

## Recommendations

Conduct caribou aerial surveys at a frequency cycle of 3 years on/2 years off in an effort to capture changes to the zone of influence as mine activity levels decrease over time. Caribou aerial will commence in 2012 with collaborative effort with BHP- Billiton.

Continue to conduct future surveys in cooperation with BHP-Billiton over a combined study 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 so that 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 2011, the caribou traffic advisory remained at “No Concern” for 344 days, as caribou numbers on the island did not exceed 100 at any given time. On, 7 October 2011, the traffic advisory sign was changed to ‘Caribou Advisory’ in response to approximately 200 caribou present by the Emulsion Plant and AN building. The caribou advisory was in effect for the duration that the caribou were at site; on the 27 October 2011 the caribou advisory was lifted as the caribou had travelled south off East Island.

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. All incidental observations of caribou are reported in Appendix V.

## 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 and if there is preferential use of areas impacted by dust (DDMI, 2002).**

## Caribou Herding

While on the island, caribou movements were monitored so that mine site 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 are 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.

### Methods

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

### Results

There were three occasions during 2011 that actions were taken by Environment personnel to herd caribou away from hazardous locations.

On 17 October, a heard of approximately a100 plus caribou were moved off of the airstrip in order for a plane to safely land. The caribou were deterred off of the airstrip using a Light vehicle and were moved south off of airstrip to a safe location within the North Inlet area.

Secondly, on 23 October, twelve caribou were moved from the intersection of ROM road and South Haul road. Action taken was to move the animals south past Waste Transfer Area.

Lastly, on 24 October, three caribou were spotted in PKC area; at the north dam road and were moved using Light vehicle south heading towards AN building.

## 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 2011 Annual Report (DDMI, 2011).

## Methods

Road observations were conducted twice a week from the beginning of May to the end of November 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 the 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 V). East Island was divided up into four haul road sections (Figure 5-1) for a total of 9.8 kilometres 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 59 occasions between 3 May and 30 November 2011. Results are attached to this report as Appendix II. No caribou were observed during the PKC and rock pile surveys. However, on 24 October 2011 three caribou were observed on the north dam of the PKC road; this observation did not occur during a PKC survey, Environment personnel herded the animals south away from the PKC area. Nine caribou observations along roads were made on five different days during 2011. Of these observations, two were <50 m from the road, six were between 50 and 200 m and the remaining one was on the road (South Road).

## Recommendations

DDMI to look at revamping Caribou Mine site Surveys (i.e-Caribou road, rock, PKC surveys). Formalize survey method to ensure accuracy in data collection, review current survey technique and explore other survey options for collecting data that enables the surveyor to visually observe area with no obstructions. Further investigate a more effective method; is driving a specific set of roads the most effective methodology for collecting data of caribou presence at mine site and determine adequate survey frequency for monitoring caribou at DDMI mine site.

# Grizzly Bear

**The barren-ground grizzly bear ranges throughout most of the Northwest Territories. It is considered a 'Species of Special Concern', as assessed by the Committee on the Status of Endangered Species (COSEWIC, 2002) and as 'Sensitive' by the General Status Ranks of Wild Species in the Northwest Territories (GNWT, 2010).**

**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).**

**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 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 7.16 km$^2$ (Table 6-1). This loss represents a value up to December 2011 and includes losses prior to 2000. The wildlife study area is approximately 1,200 km$^2$ (including shallow and deep water) and a loss of 7.16 km$^2$ represents a 0.60% of habitat available in the wildlife study area.

**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 | Area Lost ($km^2$) 2009 | Area Lost ($km^2$) 2010 | Area Lost ($km^2$) 2011 | Total Area Lost ($km^2$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Heath Tundra | **3.68** | 0.65 | 0.8 | 0.41 | 0.14 | 0.37 | 0.24 | 0.14 | 0.2 | 0.04 | 0.06 | 0 | 0.01 | **3.05** |
| Heath Boulder | **1.89** | 0.15 | 0.3 | 0.19 | 0.08 | 0.23 | 0.11 | 0.17 | 0.2 | 0.06 | 0.03 | 0 | 0.03 | **1.52** |
| Riparian Shrub | **0.03** | 0.01 | 0 | 0.01 | 0 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | **0.03** |
| Bedrock Complex | **0.07** | 0.02 | 0.03 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0.06** |
| Tussock/Hummock | **1.64** | 0.19 | 0.26 | 0.19 | 0.15 | 0.22 | 0.18 | 0.08 | 0.1 | 0.07 | 0.02 | 0 | 0.01 | **1.46** |
| Sedge Wetland | **0.26** | 0.02 | 0 | 0.02 | 0.01 | 0.04 | 0.07 | 0 | 0 | 0.04 | 0 | 0 | 0 | **0.2** |
| Esker | **0.16** | 0.13 | 0 | 0 | 0 | 0 | 0.03 | 0 | 0 | 0 | 0 | 0 | 0 | **0.16** |
| Birch Seep & Shrub | **0.11** | 0.01 | 0.02 | 0.02 | 0.01 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0.08** |
| Boulder Complex | **0.05** | 0.01 | 0.01 | 0.01 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0.04** |
| Heath Bedrock | **0.78** | 0.06 | 0.2 | 0.08 | 0.03 | 0.04 | 0.05 | 0.04 | 0 | 0.05 | 0.01 | 0 | 0.01 | **0.56** |
| **Total** | **8.67** | **1.25** | **1.62** | **0.94** | **0.42** | **0.93** | **0** | **0.43** | **0.5** | **0.26** | **0.12** | **0.0** | **0.06** | **7.16** |

*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). The revised impact prediction determined in Handley (2010) is:

***To determine if mine related activities influence the relative abundance and distribution of grizzly bears in the study area over time.***

### Methods

Grizzly bear habitat surveys were previously used to monitor the presence of grizzly bears; however, this methodology was discontinued in 2009 due to safety concerns associated with the field work component of the program. In 2010, a pilot study using hair snagging technique was conducted to assess its effectiveness in determining grizzly bear presence in the Diavik wildlife study area.

The grizzly bear hair snagging program used the existing plots from the former grizzly bear habitat survey (36 plots) that were located in preferred habitats for bear foraging activity (Figure 6-2) (Gau et. al, 2002). However, two locations (GRSW05 and GRSW06) were not included in the 2011 program due to field personnel working in close proximity of the plots. Wooden tripods wrapped with barbed wire were placed within each plot and a commercially prepared lure was mounted in the centre of each tripod (Figure 6-1). Throughout the monitoring season (June to August), each tripod was checked three times at 14 day intervals; if hair was observed, a sample was collected and considered as confirmation of bear presence within that plot. All hair samples collected were archived.

Incidental observations of grizzly bears on East Island and within the DDMI wildlife study area were also recorded and used as a measure of grizzly bear presence.

**Figure 6-1 Grizzly Hair Snag Structure**

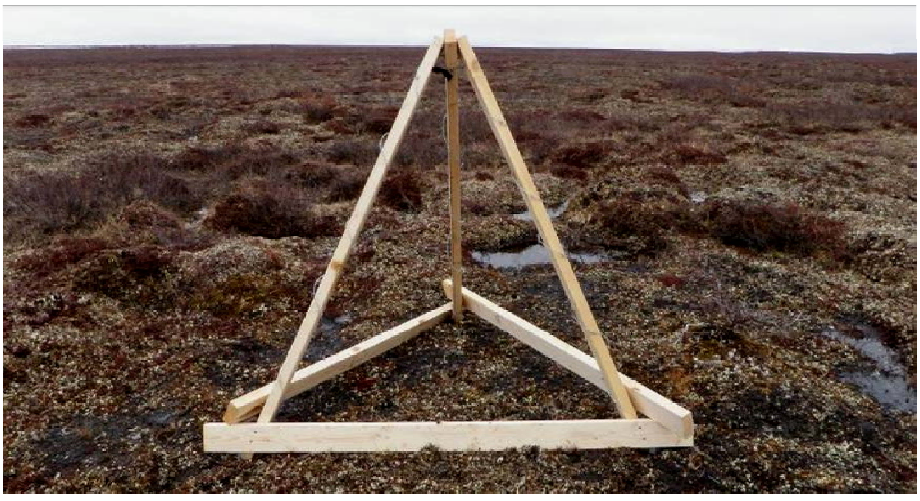
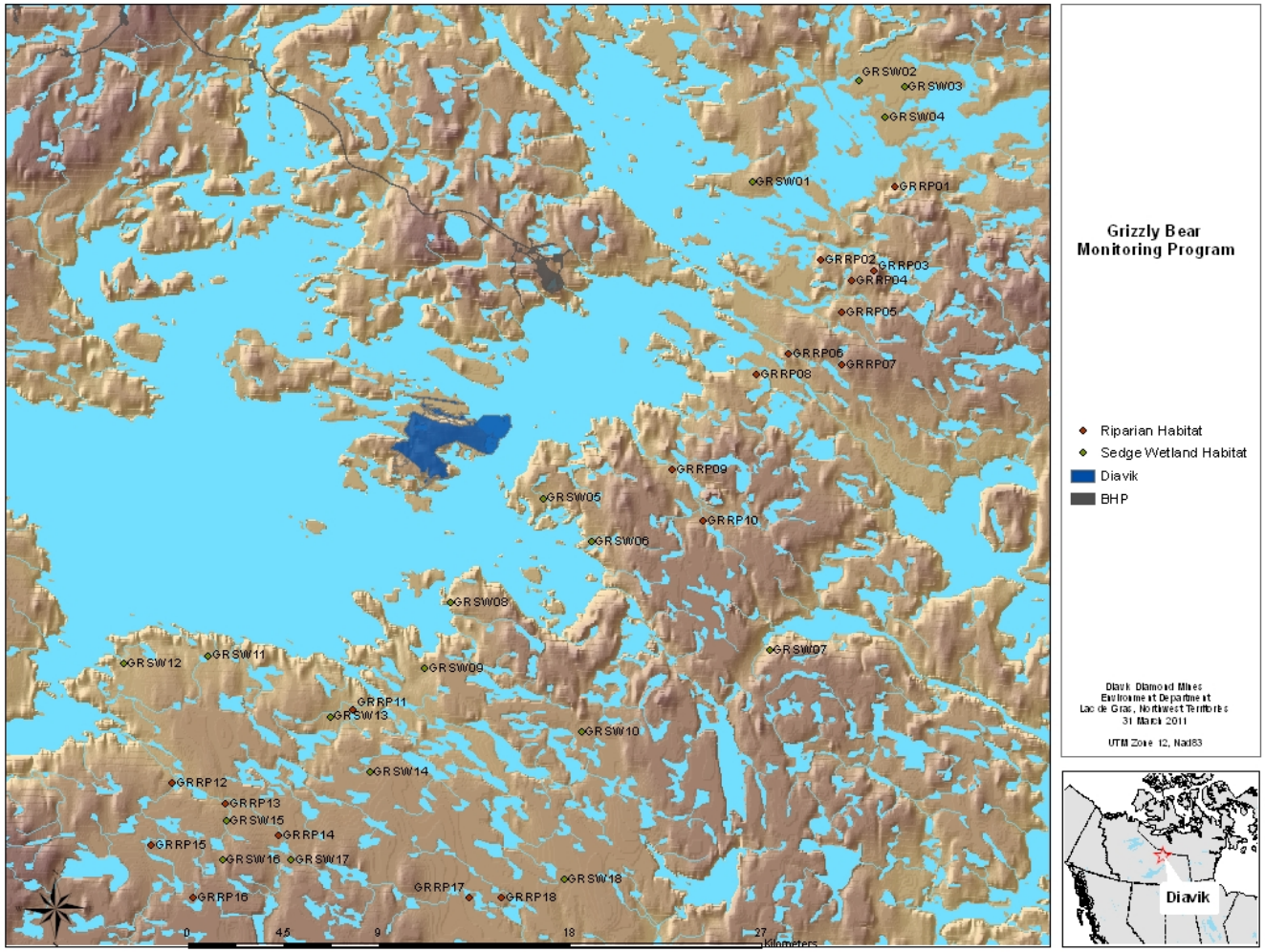


**Figure 6-2 Grizzly Bear Hair Snag Locations (former Habitat Plot Locations)**



## Results

### Grizzly Bear Hair Snag Program – Pilot Study

The pilot study was suspended for 2011 and will be implemented in 2012 with a clear methodology for all stakeholders.

### Incidental Observations

Grizzly bear incidental observations on East Island in 2011 totalled 56 sightings over 41 days (Table 6-4). 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 (Appendix V).

**Table 6-4 Average Camp Population and Number of Incidental Grizzly Bear Observations by Year, 2002-2011**

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| Average Camp Population | 1100 | 470 | 397 | 646 | 716 | 747 | 979 | 562 | 579 | 630 |
| # Grizzly Bear Observations on East Island | 5 | 19 | 24 | 43 | 21 | 41 | 5 | 22 | 44 | 56 |

2 Blonde bears frequented East Island for much of the summer, from approximately 18 June to 06 October 2011. These bears have visited DDMI in previous years with the sow. In 2011, the sow was no longer present with the cubs for any bear sightings at DDMI site.

The first sighting on East Island occurred on 10 May 2011 of a single bear; the observation was at the test piles next to WTA. The last recorded observation was a sow and two cubs observed in front of Main accommodations on 24 October 2011.

### Summary

In 2011, DDMI suspended pilot study to assess the effectiveness of using a grizzly bear hair snagging technique.

Incidental observations of grizzly bears in 2011 were similar to numbers recordings in 2010. Year to date, 2011 currently has the highest number of bear observations on East Island.

## 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 2011 (Table 6-5), despite the high volume of bear observations on East Island for 2011.

**Table 6-5 Grizzly Bear Statistics for All Monitoring Years**

**Grizzly Bear Statistics for All Monitoring Years**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Days with Bear Visitations on East Island | 15 | 14 | 5 | 15 | 24 | 34 | 20 | 34 | 5 | 22 | 44 | 56 |
| Days deterrent Actions were Utilized | 10 | 8 | 2 | 6 | 20 | 23 | 8 | 20 | 3 | 18 | 40 | 31 |
| Relocations | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mortalities | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

In 2011, a total of 56 observations occurred on East Island and an additional sighting was noted off the Island approximately 14 miles to East of Diavik of a sow and two cubs. These observations occurred over 41 days between 10 May and 24 October 2011. Deterrent actions, primarily consisting of pen launched bear bangers and vehicles to protect people and property by moving the bears off to a safe distance (Appendix VI). During nine 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 any animals that come into contact with the mine site. Bear awareness sessions continue to help raise employee awareness and response, and contributed to the timely reporting of bears approaching site. This, in turn, limits unwanted interactions.

Construction began at the Diavik Diamond Mine site in the year 2000. The calculated mine mortality rate over the past ten years is 0.10, which falls below the range predicted during the environmental assessment.

# Recommendations

A restructured hair snagging grizzly program will be introduced in 2012 with collaborated effort from GNWT and BHP Billiton.

# 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' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2003) and as a 'Sensitive' by the General Status Ranks of Wild Species in the Northwest Territories (GNWT, 2010).**

**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, construction, and operations in the Lac de Gras 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 revised impact prediction determined in Handley (2010) is:

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

### Methods

Wolverine presence around the Diavik Diamond Mine was monitored in three ways: snow track surveys, DNA research and incidental observations at site. Representatives of DDMI record all incidental sightings of wolverines on East Island.

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. Each route is driven once by snowmobile in March or April 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 a community member, when available.

### Results

The spring wolverine snow track survey was conducted from 30 March to 3 April 2011. A total of 27 wolverine tracks were encountered on the 40 transects Surveyed (Figure 7-1). This resulted in a track index of 0.17 wolverine tracks per kilometre (reference table).

**Table 7-1 Wolverine Track Index and Mean days Since Snow Fall, 2003-2011**

| | Spring 2003 | Spring 2004 | Winter 2004 | Spring 2005 | Winter 2005 | Spring 2006 | Spring 2008 | Spring 2009 | Spring 2010 | Spring 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| Tracks Encountered | 13 | 16 | 12 | 7 | 16 | 5 | 15 | 12 | N/A *** | 27 |
| Track Index (Tracks/km) | 0.09 | 0.11 | 0.08 | 0.05 | 0.11 | 0.03 | 0.09* | 0.08** | N/A *** | 0.17 |
| Mean Days Since Snow | 2 | 4 | 4 | 7.5 | 2 | 1 | 2 | 1 | N/A *** | 1 |

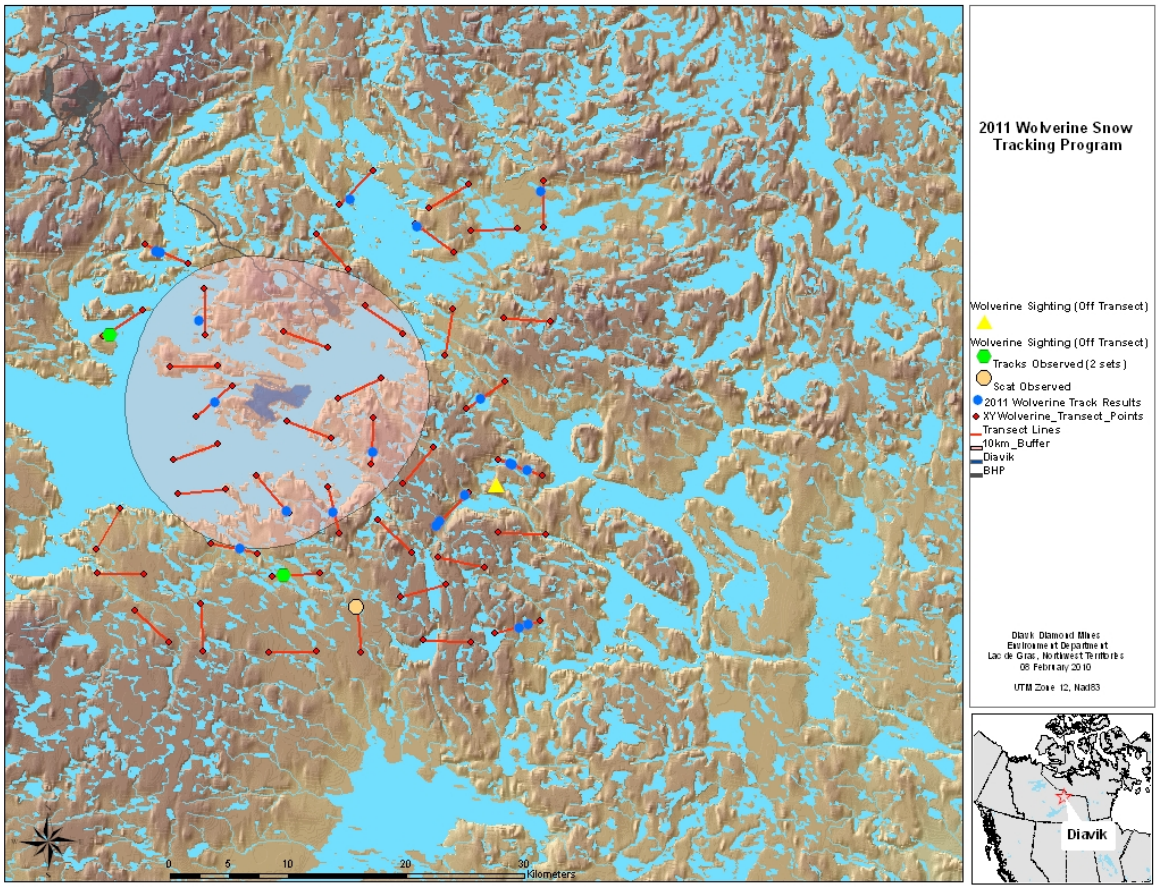
**New survey design resulting in greater distance travelled (160 km vs 148 km)*

***Distance surveyed was 152 km, due to 2 missed transects*

*** Survey was not completed in 2010 due to community assistant not being available to participate in survey.

One community assistant, Fred Eyakfwo, participated in the Wolverine Track survey in 2011. DDMI staff and Fred noted a very active area, with several wolverine tracks spotted roughly 28 KM south of Diavik Diamond Mine. The predominant sign identified during the 2011 survey was wolverine tracks, with having one event of scat observed as a wolverine sign. There were two occasions during the course of the program where two sets of tracks were identified at one given location, suspected to be a male and female. Through out the Wolverine Track survey there was one confirmed sighting of a wolverine observed off of the surveyed transects, 19.08 KM SE of DDMI. Caribou and wolf tracks were also noted on several occasions during the track survey. On 2011.03.30, Bear tracks were identified between line WT 35-2 and WT35-1 heading west. It was suspected to be Juvenile Female.

**Figure 7-1 Wolverine Snow Tracking Program 2011**




Using a 10 km zone around Diavik mine site, a proximity analysis of total wolverine track densities for 2011 show an index of 0.10 tracks per kilometre for all transects located within 10 km and an index of 0.15 tracks/km for those transects outside 10 km zone.

## Presence

The objective for this program is to determine if mining activities are influencing the presence of wolverines in the study area, and the revised impact prediction determined in Handley (2010) is:

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

### Methods

The wolverine DNA research program is a regional research program conducted in partnership with the GNWT-ENR and BHP Billiton. The survey is carried out during the month of April by snowmobile. A total of 134 posts (4"x 4" x 5' in length) are erected across the Diavik study area 3 kilometres apart from one another. Each post is spiral-wrapped in barbed wire, intended to snag

hair from the wolverines, and baited with a small portion of local meat and two types of commercially prepared lures. Hair samples are submitted to a genetics laboratory for DNA analysis. The DNA research program was conducted in 2005, 2006, 2010 and 2011. This program is also conducted with the assistance of community members.

### Results

The wolverine DNA sampling program was conducted from 3 April to 29 April 2011. A total of 168 samples were analyzed for individual identification. Of these samples, a total of 18 individuals (9 males and 9 females) were identified within the Diavik study area during the 2011 program. Of the 18 assigned individuals, 14 were previously detected in the Diavik Study. Impressively, 11 of 18 individuals detected in the Diavik study area this year were "captured" in both sessions. Over the course of 4 years of sampling (2005, 2006, 2010 and 2011), a total of 50 individuals (25 males and 25 females) have been identified within the Diavik study area.

The results from the data collected across the Slave Geologic Province for the DNA research program will be published in a separate document, planned for 2012. The report will incorporate wolverine genetics data from the two mining companies (Diavik and EKATI) and the Daring Lake Tundra Research Station (GNWT-ENR).

A total of 4 sightings occurred on East Island and an additional two observations were noted off East Island in 2011; no deterrent efforts were taken (Table 7-1). All incidental observations of wolverines on East Island during 2010 were recorded by Diavik staff (Appendix VI).

**Table 7-2 Wolverine Statistics for All Monitoring Years**

| | Baseline* | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Days with Wolverine Visitations on East Island | 27/year Total = 82 | 25 | 36 | 4 | 38 | 14 | 43 | 31 | 19 | 46 | 21 | 28 | 4 |
| Days deterrent Actions were Utilized | Unknown | 9 | 10 | 0 | 1 | 1 | 5 | 2 | 1 | 17 | 1 | 0 | 0 |
| Relocations | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mortalities | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

*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.

## 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 limiting 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

Since 2000, two wolverines have been relocated and two mortalities have occurred at the Diavik mine site. There were no mortalities during 2011.

## Recommendations

DDMI is planning in participating in another DNA research program with both Ekati and GNWT in 2015.

# Waste

**Diavik Diamond Mines Inc. is committed to taking all the necessary steps so 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 VII), 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 limit wildlife attraction.**

**Incineration, segregation and storage of waste takes place at the DDMI Waste Transfer Area (WTA), which was established to provide proper handling and storage of waste on site. The facility is located on the south side of East Island and is approximately 100 X 165 meters (m). The WTA is a lined facility surrounded by a gated, 3 meter high chain link fence erected to control wind transportation of any litter and prevent most 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.**

## Methods

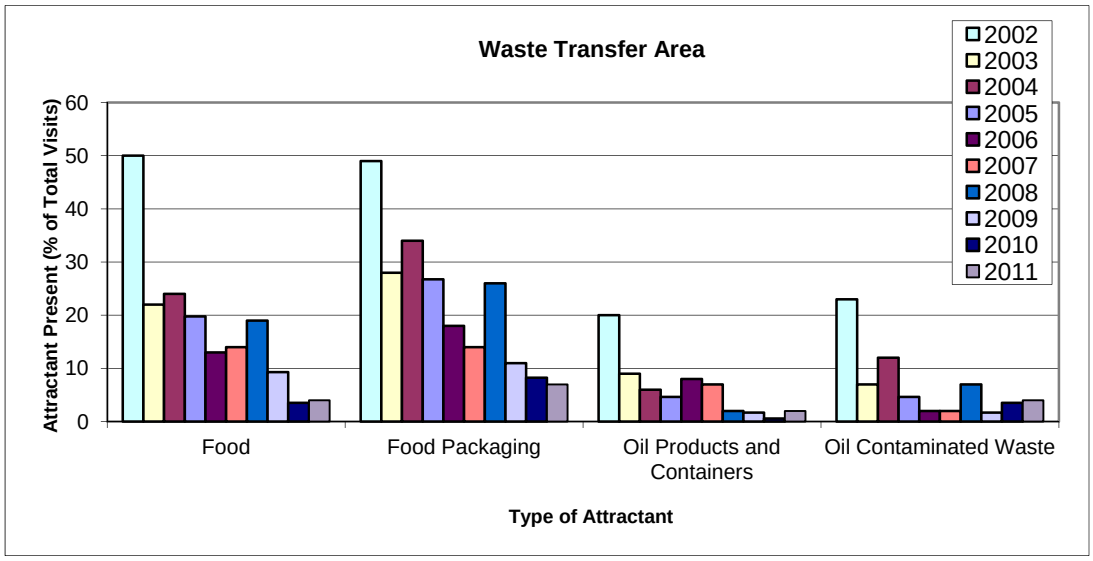
Waste inspections are conducted to check that all waste segregation, storage and disposal procedures set out in the DDMI Waste Management Plan are being followed, thereby preventing the attraction of wildlife and protecting environmental integrity. Environment personnel record all occurrences of improperly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

In 2011, inspections of the Waste Transfer Area (WTA) and Inert Landfill were conducted every two days beginning 1 January and ending 31 December. Inspections consisted of Environment personnel walking the area of the WTA 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

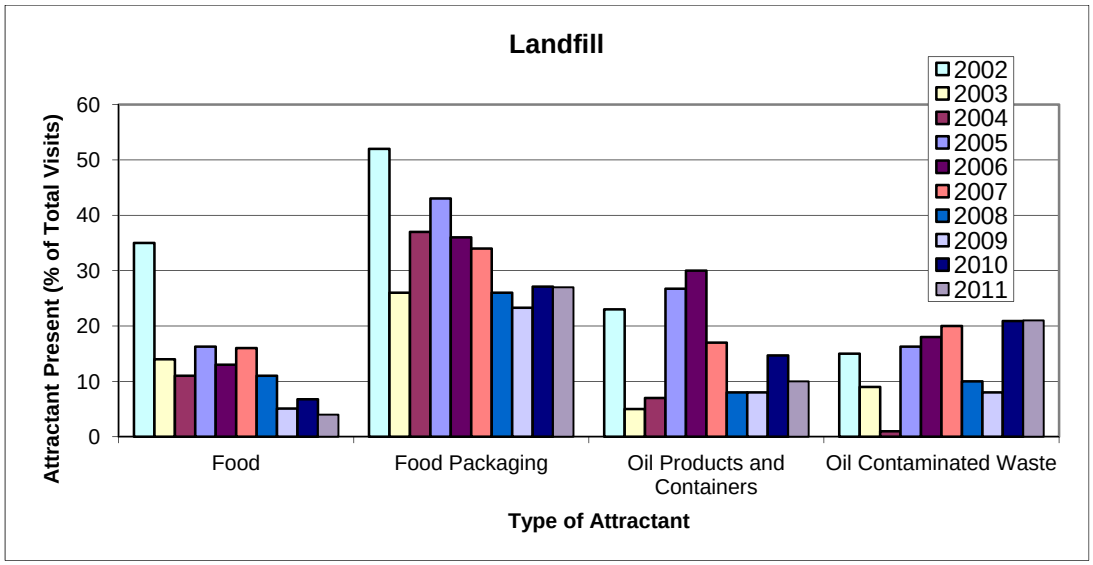
During 2011, potential wildlife attractants (i.e. oil contaminated waste and food) were found at the WTA on 18% of the 185 inspections. Food packaging was the most commonly observed attractant, found during 7% of all inspections (Figure 8-1).

**Figure 8-1 Percentage of Total Inspections Identifying Attractants at the Waste Transfer Area 2002-2011**




At the landfill, attractants were found on 53% of the 187 inspections, and the occurrence of each attractant was found to increase when compared to the previous year. Food packaging was the most commonly found attractant, having been observed during 27% of all inspections during 2011(Figure 8-2).

**Figure 8-2 Percentage of Total Inspections Identifying Attractants at the Inert Landfill 2002-2011**




Wildlife was observed on 49% of all inspections of the WTA, and on 9% of inspections at the landfill. Wildlife sightings remained the same compared to 2010 at the landfill; however, an increase of 6% was noted at the WTA when compared to 2010. Ravens were the most frequently observed wildlife at both areas, followed by foxes and then gulls (Table 8-1).

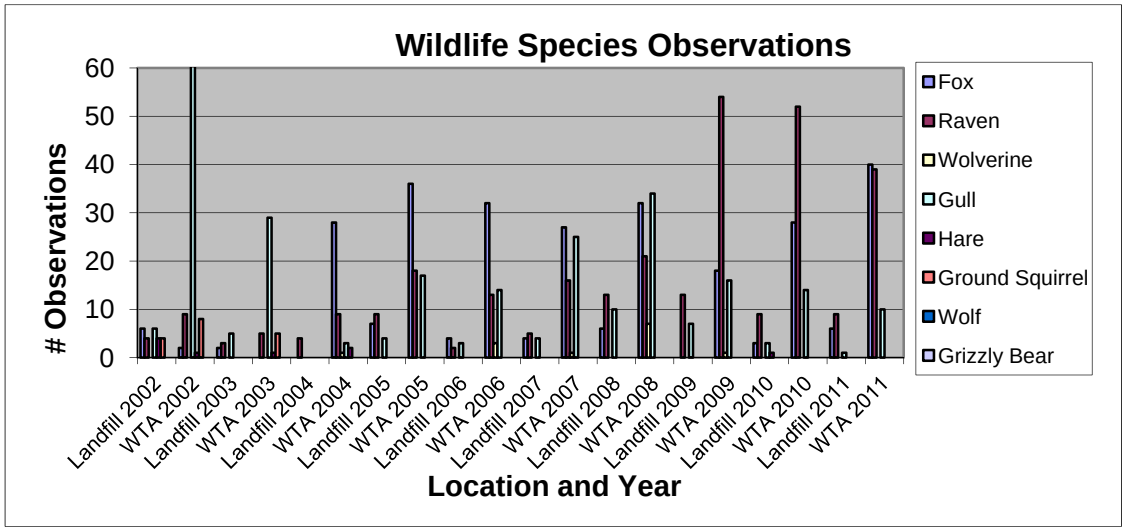
Wildlife sign was found on 41% of visits to the WTA and 15% of visits to the landfill. There was a 6% decrease in the amount of wildlife sign observed at the landfill compared to 2010 inspections, and wildlife signs at the WTA remained the same as 2010 at 41%. The most commonly observed sign, as with previous years, was associated with foxes (Table 8-1).

**Table 8-1 Occurrences of Wildlife or Wildlife Sign during Waste Inspections 2011**

| | WTA (185 visits) | | Landfill (187 visits) | |
|---|---|---|---|---|
| | **Wildlife** | **Wildlife Sign** | **Wildlife** | **Wildlife Sign** |
| Gull | 10 | 0 | 1 | 0 |
| Raven | 39 | 7 tracks | 9 | 3 tracks |
| Fox | 40 | 64 tracks, 1 scat,1 chew | 6 | 24 scat, 1 scat |
| Hare | 0 | 0 | 0 | 0 |
| Ground Squirrel | 0 | 0 | 0 | 0 |
| Wolverine | 0 | 0 | 0 | 0 |
| Wolf | 0 | 0 | 0 | 0 |
| Grizzly Bear | 0 | 0 | 0 | 0 |

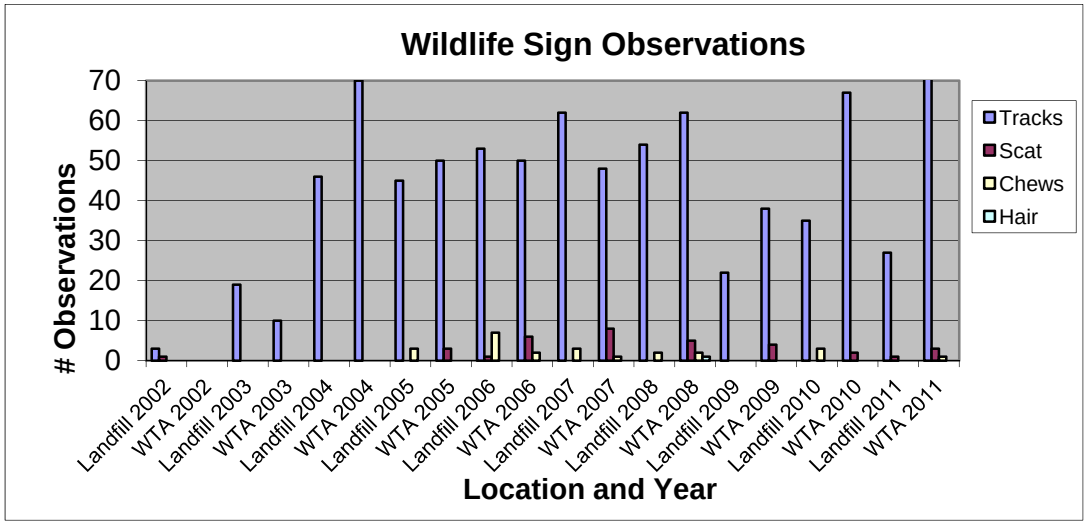
Presence of wildlife and wildlife sign at the WTA and landfill are summarized in Figures 8-3 and 8-4, respectively. Wildlife sightings within the landfill have remained similar across all years. Ground squirrel and hare sightings were more common during 2002, and likely decreased due to increased infrastructure (rock pile and crusher) in the area of the landfill. There was an overall increase in fox observations at both the Landfill and Waste Transfer Area in 2011 compared to 2010. In 2010 there were (3 sightings) of fox observation at the landfill and (6 sightings) of fox observations in 3011. For the WTA, there were 28 observations in 2010 and 40 observations for 2011.

**Figure 8-3 Presence of Wildlife (Sightings) at the Diavik Landfill and WTA 2002-2011**




Tracks are the predominant sign of wildlife in each of the waste disposal locations on site. From 2002 to 2004, an increase in the number of tracks was observed at both the landfill and at the WTA. Since 2004, the number of tracks has shown has shown minimal variation between the years; with the exception of 2009, which showed a decrease. The cause of the decrease during 2009 is likely related to the 6 week summer shut down that occurred; hence a reduction in personnel on site. To date, the highest number of wildlife sign at the landfill occurred in 2007 with a total of 62 observations. Within the WTA, observations of wildlife sign peaked during 2004 with 70 observations and then again during 2011 with 71 observations.

**Figure 8-4 Presence of Wildlife Sign at the Diavik Landfill and WTA, 2002-2011**



## Recycling Initiatives

During 2008, Diavik implemented an employee-driven recycling program for plastic bottles and aluminium cans generated on site. Proceeds from this program are donated to the Stanton Territorial Breast Cancer Foundation and benefits people from all communities. Throughout 2011, 9,505 aluminium cans and 27,028 plastic bottles were recycled. This resulted in a total donation of $3,653.30.

In addition to these smaller-scale programs, a number of waste materials generated on site are also shipped to Alberta using winter road backhauls each year. Diavik is committed to maximizing recycling opportunities for wastes generated from mine operations that cannot be disposed of on site. Items shipped for recycling include:

- used oil, oil filters and grease;
- used glycol;
- aerosol cans;
- batteries (lead-acid and dry cell);
- expired/waste fuel (e.g. Jet B);
- oil-based paint; and,
- fluorescent tubes.

During 2011, Diavik is looking to continue to increase recycling opportunities within the business, with a particular focus on the waste streams generated at the mine site.

## Summary

The DDMI Waste Management Plan outlines the practices in place so that materials which may act as wildlife attractants are routed toward the Waste Transfer Area (WTA) 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 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, and this trend continued during 2011 with the exception on Oil Products and Containers, which showed a 1% increase from 2010.

The landfill established in 2008 is located within the rock pile and a gate was installed in an effort to limit uncontrolled dumping in this area. While a nominal increase in food and food packaging was observed in 2011, overall all attractant observations have decreased in 2011 from 2010.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. Diavik remains committed to carrying out employee education programs related to waste handling.

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

## Recommendations

There are no new recommendations for this program.

# Falcons

**The peregrine falcon was selected as a 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. The General Status Ranks of Wild Species in the Northwest Territories ranks the peregrine falcon as 'Sensitive' (GNWT, 2010).**

## Presence and Distribution

Habitat loss, sensory disturbance, and impacts to prey populations may influence raptors nesting in the Lac de Gras area. The revised impact predictions determined in Handley (2010) are:

***To determine nest site occupancy and productivity of historic peregrine falcon nest sites in the study area to contribute to the Canadian Peregrine Falcon Survey (CPFS) which monitors recovery of species and long term population trends.***

***To determine if pit walls or other infrastructure are utilized as nesting sites for raptors. Determine nest success in areas of development and document effectiveness of deterrent efforts that may be employed for nest relocations.***

Other raptors present in the study area include gyrfalcons, rough-legged hawks, snowy owls, and short-eared owls. However, these species are not common, and their presence from year to year is unpredictable. Peregrine falcons are thereby used to monitor impacts to raptors specifically for DDMI's Wildlife Monitoring Program.

### Methods

## Mortality

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. 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 determined in Handley (2010) is:

***Document and determine the cause of direct mine-related mortalities of raptors***

## Pit Wall/Mine Infrastructure Inspections

Pit Wall/ Mine Infrastructure inspections at DDMI were conducted bi-weekly from mid May until October. The purpose of the inspections was to determine whether or not bird nests are present in pit walls or mine infrastructure, identify the species of birds within the pit walls and around mine site, determine the location of nesting activity, identify egg and chick bearing nests and lastly determine based on location of the nest, if deterrent actions are necessary. The Pit Wall/ Mine Infrastructure inspections were divided up into six locations of the mine site: A154 Pit area, A418 Pit area, Mine South, Mine Central and Mine North, and Other. The survey was conducted by driving through area and stopping at a clear vantage point in order to thoroughly scan the area for any potential nesting locations. If any nesting activity was present or any birds of prey sighted, GPS coordinate of location are documented and notes are collected on sighting.

### Results

There were no falcon injuries or mortalities at the Diavik site during 2011.

Pit Wall Surveys conducted in 2011. One active raven's nest was confirmed by Environment. It was located In the Mine North area behind the site Services truck line up. Two ravens were mainly present during surveys conducted.

For the A154 and A418 area no confirmed nest locations were observed for 2011. There were observations of Gryfalcon, rough legged hawk, Peregrine falcon and Merlin sighted in these locations during the month of May; no confirmed nesting activities had been identified( results have been attached to Appendix IV.

## Recommendations

No recommendations to this program.

# Waterfowl

**The Diavik site lies along the western arctic feeding ground for migratory birds known as the central flyway. 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 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. 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. The amount of shallow and deep water disturbed has remained the same since 2008. 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 2.56 $km^2$ 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 2011**

| | | Actual Area Lost ($km^2$) | | | | | | | | | | | Total Area Lost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species** | **Baseline (1995-1997)** | **Up to 2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **( $km^2$)** |
| Shallow Water, <2M | 0.48 | 0.11 | 0.12 | 0.01 | 0.03 | 0.03 | 0.04 | 0.01 | 0 | 0 | 0 | 0 | **0.83** |
| Deep Water, >2M | 3.46 | 0.15 | 1.66 | 0.01 | 0.01 | 0.12 | 0.24 | 0.02 | 0 | 0 | 0 | 0 | **2.21** |
| **Total Area** | **3.94** | **0.26** | **1.78** | **0.02** | **0.04** | **0.15** | **0.28** | **0.03** | **0** | **0** | **0** | **0** | **2.56** |

*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 is used to 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 for 5 weeks during peak migration, 23 May to 29 June 2011. 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 have been identified or monitored since initiation of this monitoring program.

**Figure 10-1 East Island Shallow Bay Monitoring Locations 2011**

**Figure 10-2 Mine Altered Waters on East Island 2011**

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 Species observations, from both the shallow bays and mine-altered water bodies, were categorized into groups based upon easily identifiable characteristics and similarities (i.e. shorebird, geese, dabbling duck and diving duck). Birds that were unidentifiable during surveys were categorized as unknown species within each group. 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.

## Results

### Shorebirds

In 2011, 8 species of shorebird were recorded during waterfowl monitoring surveys (Table 10-2). Six species observed during baseline surveys identified were also identified in 2011, these species were the Semipalmated Plover, Semipalmated Sandpiper, Least Sandpiper, Bairds Sanpiper, Dulin and the Red-necked Phalarope. Five species were observed during baseline but were not identified in 2011; these species were the America Golden Plover, White Rumped Sandpiper, Pectoral Sandpiper, Stilted Sandpiper and the Sanderling. The Semipalmated Plover, Semipalmated Sandpiper and the Least Sandpiper were observed for all monitored seasons from baseline till 2011.

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

| Species | Baseline (1995-1997) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Semipalmated Plover | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Black-bellied Plover | × | × | × | × | × | ✓ | ✓ | × | × | × | × | ✓ | × |
| American 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 | × | × | × | × | × | × | × | × | × | ✓ | × | ✓ | × |

A total of 132 shorebird observations were made in 2011, 8 of which were recorded as unidentified shorebird species. The Semipalmated Plover was the most common species of shorebird observed in 2011 comprising 33% of total shorebird observations. The Dulin and Ruddy Turnstone species were the least commonly observed shorebird, with only one observation made for each species (Table 10-3).

**Table 10-3 Waterfowl Survey Shorebird Observations 2011**

| Species | Observations |
|---|---|
| Baird's Sandpiper | 3 |
| Dulin | 1 |
| Least Sandpiper | 19 |
| Ruddy Turnstone | 1 |
| Red Necked Phalarope | 14 |
| Semipalmated Plover | 43 |
| Semipalmated Sandpiper | 41 |
| Spotted Sandpiper | 2 |
| Shorebird species | 8 |
| **Total** | 132 |

## Geese

The Canada Goose, Greater White-fronted Goose, Snow Goose and Tundra Swan were all identified and confirmed present on site for the 2011 monitoring season (Table 10-4).

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

| Species | Baseline (1995-1997) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Canada Goose | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | × | ✓ | ✓ | ✓ | ✓ |
| Greater White-fronted Goose | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Snow goose | ✓ | × | ✓ | ✓ | × | ✓ | ✓ | × | × | × | ✓ | ✓ | ✓ |
| Tundra Swan | ✓ | ✓ | × | × | × | × | ✓ | × | × | ✓ | × | ✓ | ✓ |

The total number of geese observations made during 2011 was 76, 3 of which were recorded as unidentified goose species (Table 10-5).

The Greater White-fronted Goose comprised 83% of observations made of goose species. The Canada Goose compromised of 9% of goose species observations for 2011. The Snow goose and Tundra Swan had similar observations during 2011 which consisted of 1 and 2 observations (Table 10-5).

**Table 10-5: Waterfowl Survey Goose Observations 2011**

| Species | Observations |
|---|---|
| Canada Goose | 7 |
| Greater White-fronted Goose | 63 |
| Snow Goose | 2 |
| Tundra Swan | 1 |
| Goose species | 3 |
| **Total** | **76** |

### Dabbling Ducks

Three species of dabbling ducks were confirmed present during the 2011 waterfowl monitoring surveys. 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 seventh straight year (Table 10-6).

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

| Species | Baseline (1995-1997) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Pintail | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mallard | ✓ | × | × | ✓ | × | × | × | × | ✓ | ✓ | ✓ | × | × |
| American Wigeon | ✓ | × | ✓ | × | × | × | × | ✓ | × | ✓ | ✓ | × | ✓ |
| American Green-winged Teal | ✓ | ✓ | ✓ | × | × | × | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

During the 2011 monitoring period a total of 112 dabbling duck observations were recorded, 19 of which were categorized as unknown duck species. The Northern Pintail continues to be the most abundant dabbling duck observed accounting for 74% of all observations. The American Wigeon was the least common dabbling duck identified with only one observation during 201l, this species has been observed during 6 monitoring seasons from baseline(10-7).

**Table 10-7 Waterfowl Survey Dabbling Duck Observations 2011**

| Species | Observations |
|---|---|
| Northern Pintail | 83 |
| American Wigeon | 1 |
| American Green-winged Teal | 9 |
| Duck species | 19 |
| **Total** | **112** |

## Diving Ducks

Ten bird species categorized as diving ducks were observed during the 2010 shallow bay and mine-altered water body monitoring programs. To date, the Long Tailed Duck is the only species to be observed during baseline and all subsequent monitoring years (Table 10-8).

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

| Species | Baseline (1995-1997) | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Long Tailed Duck | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 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, 90 observations were made from the diving duck category in 2011 (Table 10-9). The Long Tailed Duck was the most common diving duck observed for 2011, with 68%.

**Table 10-9 Waterfowl Survey Diving Duck Observations 2011**

| Species | Observations |
|---|---|
| Common Loon | 2 |
| Common Merganser | 1 |
| Greater Scaup | 6 |
| Lesser Scaup | 12 |
| Long Tailed Duck | 61 |
| Red Throated Loon | 6 |
| Loon spp. | 2 |
| **Total** | **90** |

## Habitat Utilization

The water management system for the Diavik mine includes several engineered lined ponds to collect site run off water. There are 12 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, 7, 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, which resulted in exposed “new” shoreline habitat that may potentially be used by waterfowl and shorebirds. The 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. These 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.***

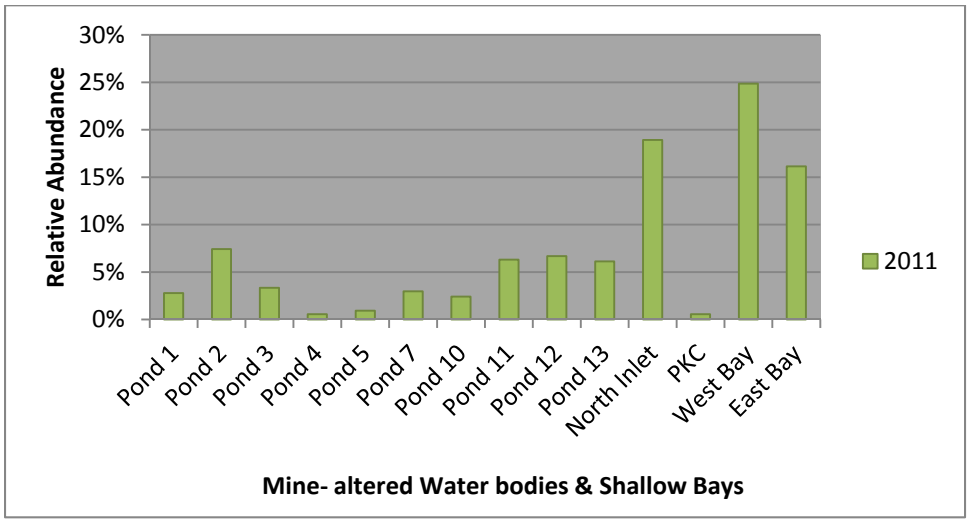
## Methods

Mine-altered water bodies and East Island shallow bays were surveyed daily from 23 May to 29 June 2011. In accordance with the 2011 DDMI waterfowl survey methods, 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 539 bird observations. The West and East shallow bays each accounted for 16% (87) and 25% (134) of all observations, respectively. Mine-altered water bodies combined accounted for the remaining 59% (318) of observations (Figure 10-3).

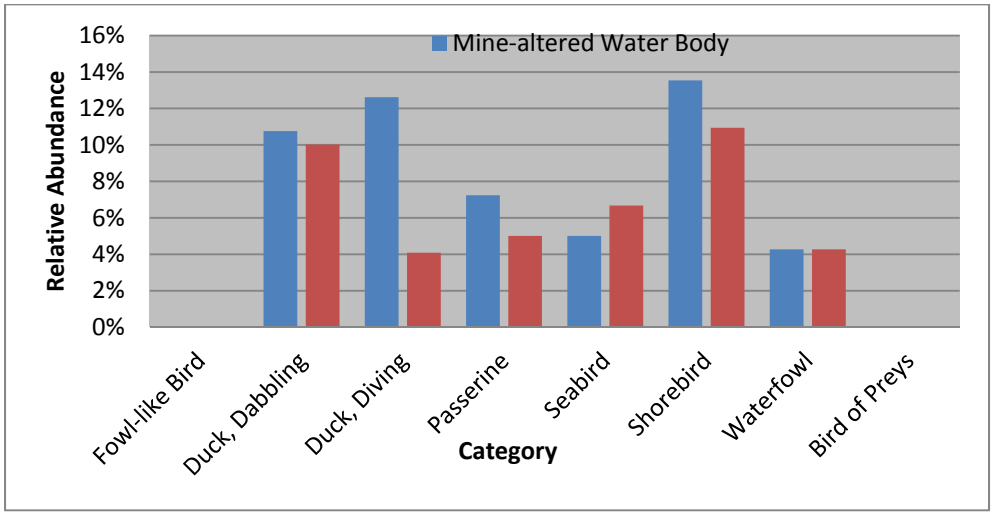
**Figure 10-3 Relative abundance of observations by habitat area**




In 2011, 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 did take place during the summer of 2011 in the PKC area.

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). 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 2011 also show an affinity for seabirds to mine-altered ponds and waterfowl to the shallow bays. Overall, 2011 bird observation is significantly lower when compared to 2009 and 2010 data. Bird Observation has decreased by 40% when compared to 2010. The low number of bird observation in 2011 could be attributed to seasonal variability or the migration started before monitoring commenced on 23 May 2011.

**Figure 10-4 Relative abundance of Waterfowl – Shallow Bays vs. Mine-altered water bodies 2011**




## Recommendations

For DDMI to complete spot checks around site early in May; if there are high volumes of bird observation; ensure monitoring is conducted on earlier date and don't rely specifically on fixed dates from previous years as seasonal variability takes effect.

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# Appendix I

## Caribou Behavioural Observations

## Caribou Behavioural Observations Summary - 2011

| Date | Distance from Mine Infrastructure | Observation Time | Easting | Northing | Herd Size | Herd Composition | Comments |
|---|---|---|---|---|---|---|---|
| 2011.05.17 | ≤ 2 KM | 11:35 | 533267 | 7150569 | 3 | M/F | |
| 2011.05.19 | ≤2 KM | 17:20 | 533284 | 7150537 | 3 | M/F | |
| 2011.09.10 | 8-15 KM | 9:35 | 535203 | 7170779 | 10 | M/F | |
| 2011.09.10 | 8-15 KM | 10:02 | 534556 | 7170363 | 8 | M/F | |
| 2011.09.10 | 8-15 KM | 10:04 | 534556 | 7170363 | 11 | M/F | |
| 2011.09.10 | 20-30 KM | 11:18 | 533972 | 7176459 | 12 | M/F | |
| 2011.09.10 | 20-30 KM | 11:22 | 533972 | 7176459 | 8 | M/F | |
| 2011.09.10 | 20-30 KM | 11:25 | 533972 | 7176459 | 5 | M/F | |
| 2011.09.10 | 20-30 KM | 11:27 | 533972 | 7176459 | 4 | F/M/C | |
| 2011.09.10 | 20-30 KM | 12:54 | 516936 | 7165933 | 5 | M/F | |
| 2011.09.10 | 20-30 KM | 13:43 | 516936 | 7165904 | 5 | M | |
| 2011.09.10 | 20-30 KM | 13:45 | 516936 | 7165905 | 6 | M/F | |
| 2011.09.12 | 20-30 KM | 10:58 | 550594 | 7167176 | 6 | F/M/C | One calf |
| 2011.09.12 | 20-30 KM | 11:00 | 550594 | 7167176 | 5 | M/F | |
| 2011.09.12 | 20-30 KM | 11:38 | 550509 | 7166961 | 5 | M/F | |
| 2011.09.12 | 20-30 KM | 11:40 | 550509 | 7166961 | 7 | M/F | |
| 2011.09.12 | 20-30 KM | 12:38 | 551295 | 7172922 | 4 | M/F | |
| 2011.09.12 | 20-30 KM | 12:40 | 551295 | 7172922 | 6 | F/M/C | One calf |
| 2011.09.12 | 20-30 KM | 12:42 | 551295 | 7172922 | 8 | M/F | |
| 2011.09.12 | 20-30 KM | 12:44 | 551295 | 7172922 | 9 | F/M/C | |
| 2011.09.12 | 20-30 KM | 11:52 | 550509 | 7166961 | 9 | F/M/C | |
| 2011.09.12 | 20-30 KM | 13:51 | 562922 | 7180800 | 9 | F/C | |
| 2011.09.12 | >30 KM | 13:53 | 562922 | 7180800 | 8 | M/F | |
| 2011.09.12 | >30 KM | 14:13 | 562922 | 7180800 | 8 | M/F | |
| 2011.09.21 | 20-30 KM | 11:30 | 550055 | 7128974 | 34 | F/M/C | |
| 2011.09.21 | 20-30 KM | 9:54 | 532550 | 7128808 | 11 | F/M/C | |
| 2011.09.21 | 20-30 KM | 14:50 | 551883 | 7129204 | 19 | F/M/C | |
| 2011.09.21 | 20-30 KM | 16:40 | 523591 | 7135824 | 3 | M | |
| 2011.09.21 | 20-30 KM | 16:40 | 523591 | 7135824 | 8 | M/F | |
| 2011.09.21 | 20-30 KM | 15:24 | 553450 | 7129642 | 28 | F/M/C | |
| 2011.09.21 | 20-30 KM | 9:50 | 532550 | 7128809 | 30 | F/M/C | |
| 2011.09.21 | 20-30 KM | 11:30 | 550058 | 7128975 | 28 | F/M/C | |
| 2011.09.21 | 20-30 KM | 14:45 | 551883 | 7129204 | 7 | M/F | |
| 2011.09.21 | 20-30 KM | 15:22 | 553450 | 7129642 | 13 | F/C | |
| 2011.09.21 | 20-30 KM | 16:30 | 530681 | 713061 | 8 | M/F | |
| 2011.09.22 | 20-30 KM | 12:31 | 520813 | 7129369 | 5 | F/M/C | |
| 2011.09.22 | 20-30 KM | 13:20 | 519250 | 7130735 | 20 | F/M/C | |
| 2011.09.22 | 15-20 KM | 15:21 | 528395 | 7136621 | 26 | F/M/C | |
| 2011.09.22 | 15-20 KM | 15:57 | 528139 | 7135220 | 4 | F/M/C | |
| 2011.09.22 | 20-30 KM | 13:08 | 519248 | 7130735 | 13 | F/M/C | |
| 2011.09.22 | >30 KM | 14:19 | 516541 | 7128526 | 87 | F/M/C | |
| 2011.09.22 | 15-20 KM | 15:58 | 528139 | 7135220 | 3 | F/M/C | |
| 2011.09.28 | 20-30 KM | 14:21 | 519483 | 7129786 | 9 | M/F | |
| 2011.09.28 | 20-30 KM | 15:15 | 519384 | 7130641 | 22 | M/F | |
| 2011.09.28 | 20-30 KM | 15:18 | 519384 | 7130641 | 14 | M/F | |
| 2011.09.28 | 20-30 KM | 15:50 | 518380 | 7132474 | 31 | F/M/C | |
| 2011.09.28 | 20-30 KM | 15:52 | 518380 | 7132474 | 8 | F/M/C | |
| 2011.09.28 | 20-30 KM | 14:19 | 519483 | 7129786 | 18 | F/M/C | |
| 2011.09.28 | 20-30 KM | 15:53 | 518380 | 7132474 | 7 | F/M/C | |
| 2011.09.28 | 20-30 KM | 16:42 | 524968 | 7130435 | 32 | F/M/C | |
| 2011.09.28 | 20-30 KM | 16:44 | 524968 | 7130435 | 7 | M/F | |
| 2011.09.30 | 8-15 KM | 10:30 | 543328 | 7140108 | 13 | F/M/C | |
| 2011.09.30 | 20-30 KM | 11:22 | 544080 | 7132208 | 9 | M/F | |
| 2011.10.07 | >30 KM | 16:08 | 515988 | 7127294 | 5 | M | |
| 2011.10.07 | >30 KM | 16:11 | 515988 | 7127294 | 10 | F/M/C | |
| 2011.10.07 | >30 KM | 16:13 | 515988 | 7127294 | 10 | M/F | |

| Date | Distance from Mine Infrastructure | Observation Time | Easting | Northing | Herd Size | Herd Composition | Comments |
|---|---|---|---|---|---|---|---|
| 2011.10.07 | >30 KM | 16:15 | 515988 | 7127294 | 10 | M/F | |
| 2011.10.07 | >30 KM | 16:17 | 515988 | 7127294 | 10 | M | |
| 2011.10.08 | ≤2 KM | 9:58 | 531913 | 7150963 | 12 | F/M/C | |
| 2011.10.08 | ≤2 KM | 10:00 | 531913 | 7150963 | 10 | M/F | |
| 2011.10.08 | ≤2 KM | 10:02 | 531913 | 7150963 | 8 | M/F | |
| 2011.10.08 | ≤2 KM | 10:04 | 531913 | 7150963 | 5 | M | |
| 2011.10.08 | ≤2 KM | 10:06 | 531913 | 7150963 | 14 | M/F | |
| 2011.10.08 | ≤2 KM | 10:13 | 531913 | 7150963 | 16 | F/M/C | |
| 2011.10.08 | 15-20 KM | 16:29 | 528384 | 7132286 | 9 | M/F | |
| 2011.10.08 | 15-20 KM | 16:36 | 528384 | 7132286 | 40 | M/F | |
| 2011.10.08 | 15-20 KM | 16:38 | 528384 | 7132286 | 20 | M/F | |
| 2011.10.08 | 15-20 KM | 16:40 | 528384 | 7132286 | 40 | F/M/C | |
| 2011.10.08 | 15-20 KM | 16:42 | 528384 | 7132286 | 11 | M/F | |
| 2011.10.09 | ≤2 KM | 9:57 | 532065 | 7150711 | 25 | M/F | |
| 2011.10.09 | ≤2 KM | 12:02 | 533358 | 7150052 | 9 | F/M/C | |
| 2011.10.09 | ≤2 KM | 9:55 | 532065 | 7150711 | 4 | M/F | |
| 2011.10.09 | ≤2 KM | 12:04 | 533358 | 7150052 | 15 | M/F | |
| 2011.10.09 | ≤2 KM | 12:06 | 533358 | 7150052 | 11 | M | |
| 2011.10.09 | ≤2 KM | 12:00 | 533358 | 7150052 | 4 | M | |
| 2011.10.09 | ≤2 KM | 12:09 | 533358 | 7150052 | 19 | F/M/C | |
| 2011.10.10 | ≤2 KM | 12:02 | 531983 | 7150806 | 10 | M/F | |
| 2011.10.10 | ≤2 KM | 12:00 | 531983 | 7150806 | 7 | M/F | |
| 2011.10.10 | ≤2 KM | 12:06 | 531983 | 7150806 | 18 | M/F | |
| 2011.10.10 | ≤2 KM | 12:04 | 531983 | 7150806 | 37 | F/M/C | |
| 2011.10.11 | ≤2 KM | 17:38 | 532579 | 7151337 | 5 | M/F | |
| 2011.10.11 | ≤2 KM | 17:45 | 532579 | 7151337 | 5 | M/F | |
| 2011.10.11 | ≤2 KM | 17:40 | 532579 | 7151337 | 9 | M/F | |
| 2011.10.11 | ≤2 KM | 17:42 | 532579 | 7151337 | 31 | M/F | |
| 2011.10.12 | ≤2 KM | 16:20 | 510492 | 7121279 | 19 | F/M/C | |
| 2011.10.12 | ≤2 KM | 16:22 | 510492 | 7121279 | 22 | M/F | |
| 2011.10.12 | ≤2 KM | 16:24 | 510492 | 7121279 | 45 | F/M/C | |
| 2011.10.13 | ≤2 KM | 16:55 | N/A | N/A | 5 | M/F | |
| 2011.10.13 | ≤2 KM | 16:57 | N/A | N/A | 8 | M/F | |
| 2011.10.13 | ≤2 KM | 17:24 | N/A | N/A | 48 | F/M/C | |
| 2011.10.15 | ≤2 KM | 10:29 | 532406 | 7152230 | 24 | F/M/C | |
| 2011.10.16 | ≤2 KM | 15:50 | 534931 | 7154003 | 132 | F/M/C | |
| 2011.10.19 | ≤2 KM | 11:02 | 535604 | 7152947 | 10 | F/M/C | |
| 2011.10.19 | ≤2 KM | 16:45 | 535693 | 7152969 | 10 | F/M/C | |
| 2011.10.20 | ≤2 KM | 16:28 | 535008 | 7152137 | 15 | F/M/C | |
| 2011.10.21 | ≤2 KM | 17:31 | 534998 | 7152192 | 22 | F/M/C | |
| 2011.10.22 | ≤2 KM | 10:04 | 533734 | 7153971 | 11 | F/M/C | |
| 2011.10.22 | ≤2 KM | 16:00 | 533952 | 7154232 | 27 | F/M/C | |
| 2011.10.29 | ≤2 KM | 11:36 | 534529 | 7151144 | 11 | F/M/C | |
| 2011.10.30 | ≤2 KM | 10:36 | 534772 | 7150836 | 11 | F/M/C | |
| 2011.11.01 | ≤2 KM | 16:03 | 534129 | 7151227 | 10 | M/F | |
| 2011.11.02 | ≤2 KM | 10:20 | 533626 | 7150480 | 15 | F/M/C | |
| 2011.11.03 | ≤2 KM | 11:20 | 532598 | 7151166 | 15 | F/M/C | |
| 2011.11.04 | ≤2 KM | 15:37 | 534136 | 7151210 | 15 | F/M/C | |

**Notes:**

F = Females

C = Calves

M = Males

N/A = coordinates not collected

All coordinates recorded using NAD 83 datum

# Appendix II

## Caribou Road, Rock Pile, PKC Observations

**Caribou Road Observations - 2011**

| Date | Location | Number of Animals | Composition | Behaviour | Distance from Road | Comments |
|---|---|---|---|---|---|---|
| 2011.05.03 | All Roads | | | | | No Observations |
| 2011.05.07 | All Roads | | | | | No Observations |
| 2011.05.10 | All Roads | | | | | No Observations |
| 2011.05.14 | All Roads | | | | | No Observations |
| 2011.05.17 | South Haul Road | 3 | M/F | B | 50-200 m from road | Activity Budget completed |
| 2011.05.21 | South Haul Road | 3 | M/F | F* | 50-200 m from road | |
| 2011.05.24 | All Roads | | | | | No Observations |
| 2011.05.28 | All Roads | | | | | No Observations |
| 2011.05.31 | All Roads | | | | | No Observations |
| 2011.06.04 | All Roads | | | | | No Observations |
| 2011.06.07 | All Roads | | | | | No Observations |
| 2011.06.11 | All Roads | | | | | No Observations |
| 2011.06.14 | All Roads | | | | | No Observations |
| 2011.06.18 | All Roads | | | | | No Observations |
| 2011.06.21 | All Roads | | | | | No Observations |
| 2011.06.25 | All Roads | | | | | No Observations |
| 2011.07.05 | All Roads | | | | | No Observations |
| 2011.07.09 | All Roads | | | | | No Observations |
| 2011.07.12 | All Roads | | | | | No Observations |
| 2011.07.16 | All Roads | | | | | No Observations |
| 2011.07.19 | All Roads | | | | | No Observations |
| 2011.07.23 | All Roads | | | | | No Observations |
| 2011.07.26 | All Roads | | | | | No Observations |
| 2011.07.31 | All Roads | | | | | No Observations |
| 2011.08.02 | All Roads | | | | | No Observations |
| 2011.08.06 | All Roads | | | | | No Observations |
| 2011.08.09 | All Roads | | | | | No Observations |
| 2011.08.13 | All Roads | | | | | No Observations |
| 2011.08.16 | All Roads | | | | | No Observations |
| 2011.08.20 | All Roads | | | | | No Observations |
| 2011.08.23 | All Roads | | | | | No Observations |
| 2011.08.28 | All Roads | | | | | No Observations |
| 2011.08.30 | All Roads | | | | | No Observations |
| 2011.09.03 | All Roads | | | | | No Observations |
| 2011.09.06 | All Roads | | | | | No Observations |
| 2011.09.10 | All Roads | | | | | No Observations |
| 2011.09.13 | All Roads | | | | | No Observations |
| 2011.09.18 | All Roads | | | | | No Observations |
| 2011.09.20 | All Roads | | | | | No Observations |
| 2011.09.24 | All Roads | | | | | No Observations |
| 2011.09.27 | All Roads | | | | | No Observations |
| 2011.10.01 | All Roads | | | | | No Observations |
| 2011.10.04 | All Roads | | | | | No Observations |
| 2011.10.08 | South Haul Road | 50 | M/F | F* | 50-200 m from road | |
| 2011.10.11 | South Haul Road | 5 | M/F | F* | 50-200 m from road | |
| 2011.10.11 | South Haul Road | 22 | M/F | W | 50-200 m from road | |
| 2011.10.11 | South Haul Road | 4 | F | W | On the road | |
| 2011.10.11 | South Haul Road | 9 | M/F | W | < 50 m from the road | |
| 2011.10.15 | All Roads | | | | | No Observations |
| 2011.10.18 | All Roads | | | | | No Observations |
| 2011.10.22 | Mid Road | 22 | F/M/C | F* | < 50 m from the road | Grazing on veg plot by south haul road |
| 2011.10.22 | North Road | 11 | F/M/C | F* | 50-200 m from road | Caribou located on south side of runway. |
| 2011.10.25 | All Roads | | | | | No Observations |
| 2011.10.29 | All Roads | | | | | No Observations |
| 2011.11.01 | All Roads | | | | | No Observations |
| 2011.11.05 | All Roads | | | | | No Observations |
| 2011.11.08 | All Roads | | | | | No Observations |
| 2011.11.12 | All Roads | | | | | No Observations |
| 2011.11.15 | All Roads | | | | | No Observations |
| 2011.11.19 | All Roads | | | | | No Observations |
| 2011.11.22 | All Roads | | | | | No Observations |
| 2011.11.26 | All Roads | | | | | No Observations |
| 2011.11.29 | All Roads | | | | | No Observations |
| 2011.11.30 | All Roads | | | | | No Observations |

**Notes:**

M - Male
F - Female
C - Calves
B - Bedding
F* - Feeding
W - Walking

**Caribou PKC and Rock Pile Observations - 2011**

| Date | Location | Number | Composition | Behaviour | Comments |
|---|---|---|---|---|---|
| 2011.05.03 | Rock Pile & PKC | | | | No Observation |
| 2011.05.07 | Rock Pile & PKC | | | | No Observation |
| 2011.05.10 | Rock Pile & PKC | | | | No Observation |
| 2011.05.14 | Rock Pile & PKC | | | | No Observation |
| 2011.05.17 | Rock Pile & PKC | | | | No Observation |
| 2011.05.21 | Rock Pile & PKC | | | | No Observation |
| 2011.05.24 | Rock Pile & PKC | | | | No Observation |
| 2011.05.28 | Rock Pile & PKC | | | | No Observation |
| 2011.05.31 | Rock Pile & PKC | | | | No Observation |
| 2011.06.04 | Rock Pile & PKC | | | | No Observation |
| 2011.06.07 | Rock Pile & PKC | | | | No Observation |
| 2011.06.11 | Rock Pile & PKC | | | | No Observation |
| 2011.06.14 | Rock Pile & PKC | | | | No Observation |
| 2011.06.18 | Rock Pile & PKC | | | | No Observation |
| 2011.06.21 | Rock Pile & PKC | | | | No Observation |
| 2011.06.25 | Rock Pile & PKC | | | | No Observation |
| 2011.07.05 | Rock Pile & PKC | | | | No Observation |
| 2011.07.09 | Rock Pile & PKC | | | | No Observation |
| 2011.07.12 | Rock Pile & PKC | | | | No Observation |
| 2011.07.16 | Rock Pile & PKC | | | | No Observation |
| 2011.07.19 | Rock Pile & PKC | | | | No Observation |
| 2011.07.23 | Rock Pile & PKC | | | | No Observation |
| 2011.07.26 | Rock Pile & PKC | | | | No Observation |
| 2011.07.31 | Rock Pile & PKC | | | | No Observation |
| 2011.08.02 | Rock Pile & PKC | | | | No Observation |
| 2011.08.06 | Rock Pile & PKC | | | | No Observation |
| 2011.08.09 | Rock Pile & PKC | | | | No Observation |
| 2011.08.13 | Rock Pile & PKC | | | | No Observation |
| 2011.08.16 | Rock Pile & PKC | | | | No Observation |
| 2011.08.20 | Rock Pile & PKC | | | | No Observation |
| 2011.08.23 | Rock Pile & PKC | | | | No Observation |
| 2011.08.28 | Rock Pile & PKC | | | | No Observation |
| 2011.08.30 | Rock Pile & PKC | | | | No Observation |
| 2011.09.03 | Rock Pile & PKC | | | | No Observation |
| 2011.09.06 | Rock Pile & PKC | | | | No Observation |
| 2011.09.10 | Rock Pile & PKC | | | | No Observation |
| 2011.09.13 | Rock Pile & PKC | | | | No Observation |
| 2011.09.18 | Rock Pile & PKC | | | | No Observation |
| 2011.09.20 | Rock Pile & PKC | | | | No Observation |
| 2011.09.24 | Rock Pile & PKC | | | | No Observation |
| 2011.09.27 | Rock Pile & PKC | | | | No Observation |
| 2011.10.01 | Rock Pile & PKC | | | | No Observation |
| 2011.10.04 | Rock Pile & PKC | | | | No Observation |
| 2011.10.08 | Rock Pile & PKC | | | | No Observation |
| 2011.10.11 | Rock Pile & PKC | | | | No Observation |
| 2011.10.15 | Rock Pile & PKC | | | | No Observation |
| 2011.10.18 | Rock Pile & PKC | | | | No Observation |
| 2011.10.22 | Rock Pile & PKC | | | | No Observation |
| 2011.10.25 | Rock Pile & PKC | | | | No Observation |
| 2011.10.29 | Rock Pile & PKC | | | | No Observation |
| 2011.11.01 | Rock Pile & PKC | | | | No Observation |
| 2011.11.05 | Rock Pile & PKC | | | | No Observation |
| 2011.11.08 | Rock Pile & PKC | | | | No Observation |
| 2011.11.12 | Rock Pile & PKC | | | | No Observation |
| 2011.11.15 | Rock Pile & PKC | | | | No Observation |
| 2011.11.19 | Rock Pile & PKC | | | | No Observation |
| 2011.11.22 | Rock Pile & PKC | | | | No Observation |
| 2011.11.26 | Rock Pile & PKC | | | | No Observation |
| 2011.11.29 | Rock Pile & PKC | | | | No Observation |
| 2011.11.30 | Rock Pile & PKC | | | | No Observation |

# Appendix III

## 2011 Wolverine Track Survey Results

**Wolverine Track Survey-2011**

| Day | Days Since Snow | Snow Condition | Greater or Less than 10 KM | Observation Type | Number | Age of Sign | Comments |
|---|---|---|---|---|---|---|---|
| 2011.03.30 | 1 | Poor | < 10 KM ( 10.79 KM) | Tracks | 1 | Days | Single track/ Saw fox and hare tracks as well. |
| 2011.03.30 | 1 | Poor | < 10 KM ( 28.40 KM) | Tracks | 1 | Days | 2-3 day old tracks. |
| 2011.03.30 | 1 | Poor | < 10 KM ( 15. 21KM) | Tracks | 2 | Days | 2 sets of tracks travelling on lake, 4-5 days old. Wolf tracks noted as well. |
| 2011.03.30 | 1 | Poor | < 10 KM ( 18.87 KM) | Scat | 1 | Days | 1 day old scat observed, WOLF TRACKS noted. |
| 2011.03.30 | 1 | Excellent | < 10 KM ( 29. 46 KM) | Tracks | 1 | Days | |
| 2011.03.31 | 1 | Excellent | < 10 Km (18.06 KM) | Tracks | 1 | Weeks | 1 week old tracks |
| 2011.03.31 | 1 | Good | >10 KM ( 5.91 KM) | Tracks | 1 | Days | 5 day old tracks |
| 2011.03.31 | 1 | Excellent | > 10 KM ( 9.12 KM) | Tracks | 1 | Weeks | Adult |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 15. 97 KM) | Tracks | 1 | Days | ADULT |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 15.65 KM) | Tracks | 1 | Days | ADULT |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 15. 39 KM) | Tracks | 1 | Days | ADULT |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 14.99 KM) | Tracks | 2 | Days | Two sets of tracks together( possibly female/ male) |
| 2011.03.31 | 1 | Excellent | >10 KM ( 9. 28KM) | Tracks | 1 | Days | 1 day old tracks. |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 17.24 KM) | Tracks | 1 | Days | Fresh tracks |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 20.01 KM) | Tracks | 1 | Days | 4-5 days old tracks |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 20.86 KM) | Tracks | 1 | Days | 1 day old tracks |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 22.28KM) | Tracks | 1 | Days | 4 day old tracks Photos on drive |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 17.85 KM) | Tracks | 1 | Hours | Wolverine observed @ WPT# 0553312 7145012. |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 17.16 KM) | Tracks | 1 | Days | |
| 2011.03.31 | 1 | Excellent | < 10 KM ( 17.00 KM) | Tracks | 1 | Hours | Photos on drive of tracks |

| Day | Days Since Snow | Snow Condition | Greater or Less than 10 KM | Observation Type | Number | Age of Sign | Comments |
|---|---|---|---|---|---|---|---|
| 2011.04.01 | 0 | Poor | > 10 KM ( 4.77 KM) | Tracks | 1 | Days | Single Adult , 2 days old. |
| 2011.04.01 | 0 | Fair | < 10 KM ( 12.79 KM) | Tracks | 1 | Hours | Single Adult |
| 2011.04.01 | 0 | Good | > 10 KM ( 9.50 KM) | Tracks | 1 | Hours | Single Adult |
| 2011.04.03 | 1 | Good | < 10 KM ( 28.68 KM) | Tracks | 1 | Days | |
| 2011.04.03 | 1 | Good | < 10 KM ( 28.81 KM) | Tracks | 1 | Days | Active area |

# Appendix IV

## Pit Wall/Mine Infrastructure Summary

**Pit Wall/Mine Infrastructure Inspections- 2011**

| Date | Area | Method Used | Bird Species | Number of Observed | Confirm Active Nest (Y/N) | Potential Nesting (Y/N) | Young/ Fledgings ( Y/N) | Distance (m) Direction | UTM-E | UTM-N | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011.05.17 | A154 | D | CORA | 1 | N | N | N | | | | Flying |
| 2011.05.17 | A154 | D | Unknown | 1 | N | N | N | | | | Flying |
| 2011.05.17 | A418 | L | | | N | N | N | | | | No obs |
| 2011.05.17 | Mine South | D | | | N | N | N | | | | No obs |
| 2011.05.17 | Mine central | D | | | N | N | N | | | | No obs |
| 2011.05.17 | Mine North | D | CORA | 3 | Y | N | Y | | | | |
| 2011.05.21 | A154 | D | MERL | 2 | N | N | N | | | | |
| 2011.05.21 | A418 | D | PEFA | 2 | N | Y | N | | 536088 | 7151955 | Could hear chirping |
| 2011.05.21 | Mine South | D | | | N | N | N | | | | No obs |
| 2011.05.21 | Mine central | D | | | N | N | N | | | | No obs |
| 2011.05.21 | Mine North | D | CORA | 2 | Y | Y | N | 50m West | 534170 | 7151365 | Site service area |
| 2011.05.25 | A154 | L | RLHA | 1 | N | Y | N | 500m East | 536927 | 7153297 | Coordinates taken from obs opoint |
| 2011.05.25 | A418 | L | | N | N | N | N | | | | |
| 2011.05.25 | Mine South | D | | N | N | N | N | | | | |
| 2011.05.25 | Mine Central | D | | N | N | N | N | | | | |
| 2011.05.25 | Mine North | D | CORA | 2 | Y | N | Y | 20 | | | On rock face behind site service equip lineup |
| 2011.05.25 | A154 | L | CORA | 1 | N | N | N | 500m South | 536927 | 7153297 | Cordinates taken from observation point |
| 2011.05.28 | A154 | L | | N | N | N | N | | | | |
| 2011.05.28 | A418 | L | | N | N | N | N | | | | To musch dust for a good visual |
| 2011.05.28 | Mine South | D | | N | N | N | N | | | | |
| 2011.05.28 | Mine Central | D | | N | N | N | N | | | | |
| 2011.05.28 | Mine North | L | CORA | 1 | Y | N | Y | 10m from line up | | | Behind site services line up, on rock face |
| 2011.05.31 | A154 | L | | | N | N | N | | | | No obs |
| 2011.05.31 | A418 | L | | | N | N | N | | | | No obs |
| 2011.05.31 | Mine South | D | | | N | N | N | | | | No obs |
| 2011.05.31 | Mine Central | D | | | N | N | N | | | | No obs |
| 2011.05.31 | Mine North | D | CORA | 2 | Y | N | Y | | | | No changes |
| 2011.06.04 | A154 | L | | | N | N | N | | | | |
| 2011.06.04 | A418 | L | | | N | N | N | | | | |
| 2011.06.04 | Mine South | D | | | N | N | N | | | | |
| 2011.06.04 | Mine Central | D | | | N | N | N | | | | Pera. Fal. behind S. Services |
| 2011.06.04 | Mine North | D | | | N | N | N | | | | CORA nest behind SS Truck line up |
| 2011.06.08 | A154 | L/D | CORA | 1 | N | N | N | | | | |
| 2011.06.08 | A418 | L/D | | | N | N | N | | | | |
| 2011.06.08 | Mine South | D | | | N | N | N | | | | |
| 2011.06.08 | Mine Central | D | | | N | N | N | | | | |
| 2011.06.08 | Mine North | D | CORA | 1 | N | N | N | 30m West | 534170 | 7151365 | Located behind Site Services Building |
| 2011.06.11 | A154 | L/D | | | N | N | N | | | | |
| 2011.06.11 | A418 | L/D | | | N | N | N | | | | |
| 2011.06.11 | Mine South | D | | | N | N | N | | | | |
| 2011.06.11 | Mine Central | D | | | N | N | N | | | | |
| 2011.06.11 | Mine North | D | CORA | 2 | Y | Y | Y | 50m West | 534170 | 7151365 | Observed fledging in nest with adult |
| 2011.06.18 | A154 | D | | | N | N | N | | | | |
| 2011.06.18 | A418 | D | | | N | N | N | | | | |
| 2011.06.18 | Mine South | D | | | N | N | N | | | | |

| Date | Area | Method Used | Bird Species | Number of Observed | Confirm Active Nest (Y/N) | Potential Nesting (Y/N) | Young/ Fledgings ( Y/N) | Distance (m) Direction | UTM-E | UTM-N | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011.06.18 | Mine Central | D | | | N | N | N | | | | |
| 2011.06.18 | Mine North | D | CORA | 1 | Y | Y | Y | 50m West | 534170 | 7151365 | |
| 2011.06.21 | A154 | D | | | N | | N | | | | |
| 2011.06.21 | A418 | L | | | N | | N | | | | |
| 2011.06.21 | Mine South | D | | | N | | N | | | | |
| 2011.06.21 | Mine Central | D | | | N | | N | | | | |
| 2011.06.21 | Mine North | D | CORA | 1 | Y | Y | Y | 50m West | 534170 | 7151365 | |
| 2011.06.25 | A154 | L | | | N | | N | | | | |
| 2011.06.25 | A418 | L | | | N | | N | | | | |
| 2011.06.25 | Mine South | D | | | N | | N | | | | |
| 2011.06.25 | Mine Central | D | | | N | | N | | | | |
| 2011.06.25 | Mine North | D | CORA | 1 | Y | N | Y | | | | Nest on rock face behind site service shop |
| 2011.06.28 | A154 | D | RLHA | 1 | N | Y | N | | 537086 | 715028 | Soaring and perching on first two ledges, no sign of nest, but was acting defensive of area - swooping and diving |
| 2011.06.28 | A418 | L | | | N | | N | | | | |
| 2011.06.28 | Mine South | D | | | N | | N | | | | |
| 2011.06.28 | Mine Central | D | | | N | | N | | | | |
| 2011.06.28 | Mine North | D | CORA | 1 | Y | Y | Y | 50m West | 534170 | 7151365 | Located behind Site Services Building |
| 2011.07.10 | A154 | L/D | RLHA | 2 | N | Y | Y | | 536553 | 7152597 | Soaring then moved to 536901 - 7153123 |
| 2011.07.10 | A418 | D | | | N | N | N | | | | |
| 2011.07.10 | Mine South | D | | | N | N | N | | | | |
| 2011.07.10 | Mine Central | D | | | N | N | N | | | | |
| 2011.07.10 | Mine North | D | | | N | N | N | | | | |
| 2011.09.10 | Mine North | L | PEFA | 2 | Y | Y | Y | | 533947 | 7151301 | Two PEFA perched @ nest - mating male/female |
| 2011.09.17 | Mine North | L | PEFA | 1 | Y | N | N | | | | Single Peregrine, appears to be adult, |
| 2011.09.24 | Mine North | D | | | N | N | N | | | | No obs |
| 2011.10.02 | Mine North | L | | | N | N | N | | | | No obs |
| 2011.10.09 | Mine North | L/D | | | N | N | N | | 534170 | 7151365 | No activity in nest |
| 2011.10.16 | Mine North | D | | | N | N | N | | | | No obs |
| 2011.10.23 | Mine North | D | | | N | N | N | | | | No obs |

**Notes:** L = Lookout
D=Driving

Y= Yes, Present
N= No; Absent

# Appendix V

## Incidental Observations-Caribou, Wolverine and Grizzly Bear

## Caribou Incidental Observations - 2011

| Date | Number of Animals | Location | Comments |
|---|---|---|---|
| 2011.05.16 | ~100 | Exploration Camp, 4.5 KM North of DDMI * | Sightings did not occur on East Island |
| 2011.05.17 | 3 | AN Road | Animals bedded |
| 2011.05.19 | 3 | AN Road | Animals bedded |
| 2011.05.21 | 3 | AN Road Area | 1 Animal bedded, 2 walking SE |
| 2011.06.07 | 1 | 200 m off A154 dike | Caribou deceased |
| 2011.10.07 | 7 | On Tundra beside Emulsion Plant | Animals feeding |
| 2011.10.07 | 50 | On Tundra beside Emulsion Plant | Animals feeding |
| 2011.10.07 | 100 + | Emplulsion Plant Area | Animals walking south on tundra |
| 2011.10.08 | 200 + | AN Area | Animals both bedded down and feeding |
| 2011.10.09 | 250 + | AN Area | Animals both bedded down and feeding |
| 2011.10.16 | 1 | Approx. 20 m off of Runway at Airport | Deceased Caribou |
| 2011.10.29 | 11 | Inbetween raw water intake and snow Gauge | Animals feeings and bedded down |
| 2011.10.29 | 2 | On tundra by North Inlet water treatment Plant | Feeding |
| 2011.10.30 | 12 | Behind south camp | Animals travelling towards Lac de Gras |
| 2011.10.30 | 15 | Inbetween Main Camp and South Camp | Animals grazing |
| 2011.11.05 | 1 | Approx. 400 m off of A21 Causeway | Animal deceased |

**Note:** * Observation not on East Island

## Wolverine Incidental Observations - 2011

| Date | Number of Animals | Location | Attractants Present | Action Taken Deterrent | Comments |
|---|---|---|---|---|---|
| 2011.02.07 | 1 | PKC North Dam | No | None | Animal travelling west on road |
| 2011.03.31 | 1 | Off site * | No | None | Sighting during Snow tracking Survey |
| 2011.08.05 | 1 | By Cloud Berry Island | No | None | Wolverine spotted swimming in water |
| 2011.11.27 | 1 | Upper Type III Dump | No | None | |
| 2011.11.27 | 1 | South Tank Farm | No | None | Animal travelling SW toward South tankfarm |
| 2011.11.28 | 1 | Inbetween Main Camp and DOC | No | None | |

**Note:** * Not on East Island

**Grizzly Bear Incidental Observations - 2011**

| Date | Number of Animals | Characteristics of Animals | Location | Advisory Issued | Atrractant Present | Action Taken (Deterrents Used) | Comments |
|---|---|---|---|---|---|---|---|
| 2011.05.10 | 1 | reddish brown colour | Test Piles area next to WTA | Yes | No | 2 horn blasts and truck | Moved bear west towards AN road |
| 2011.05.10 | 1 | reddish brown colour | A21 Causeway | No | No | None | Bear moving in SE off island |
| 2011.05.18 | 4 | Sow & cubs too far away, single Large Male - reddish brown with dark legs | Approach 28 | Yes | No | Truck & 1 bear Banger - Large Male | Sow and 2 cubs one siting and 1 large male sited shortly afterwards |
| 2011.05.30 | 1 | Unknown | By A418 dike | No | No | None | bear heading East towards Mainland |
| 2011.05.30 | 1 | Unknown | By A154 pit | No | No | None | bear on route to Mainland |
| 2011.05.31 | 1 | Dark brown, medium size | 1000 M Nw from Emulsion Plant | No | No | None | |
| 2011.06.04 | 1 | Light Blonde, dark brown legs | Near Pond 3 | No | No | truck | West Island |
| 2011.06.05 | 1 | Blonde, Large Male | Between North Inlet and Runway | No | No | helicopter | Bear last seen on Mainland |
| 2011.06.17 | 2 | Juvenile, Both Blonde | Bear at Airport parking lot | Yes | No | 4 bear bangers,1 air horn, truck | Bear settled into North Inlet Area |
| 2011.06.18 | 2 | Juvenile, Both Blonde | North Inlet south side of spigot | Yes | No | 2 air horns, 2 bear bangers | |
| 2011.06.18 | 2 | Juvenile, Both Blonde | NIWTP | Yes | No | 1 air horn, 11 bear bangers, 2 screamers, 3 rubber bullets, 3 explosive | Bears settled into A154 fish habitat area |
| 2011.06.19 | 2 | Juvenile, Both Blonde | Inside of A154 Dike Area | Yes | No | 5 bear bangers, 2 air horns, truck, 1 screamer | 1 bear sleeping, the other feeding in fish habitat area |
| 2011.06.20 | 2 | Juvenile, Both Blonde | ERT Training Ground | Yes | No | Truck | area |
| 2011.06.21 | 2 | Juvenile, Both Blonde | Airport on Tundra | No | No | None | |
| 2011.06.22 | 2 | Juvenile, Both Blonde | A154 Dike Area | No | No | 2 bangers, 1 screamer | |
| 2011.06.24 | 2 | Juvenile, Both Blonde | D1 Lay Down Area | No | No | truck, Horn blast, 4 bear bangers | Bear last seen east of airport runway |
| 2011.06.25 | 3 | Sow, 2 cubs | Between runway and North Inlet | No | No | None | |
| 2011.06.26 | 1 | Juvenile, Blonde | Between A418/A154 | No | No | Truck | |
| 2011.06.27 | 1 | Juvenile, Blonde | nbetween North Inlet and Airport Roa | Yes | No | 1 bear banger, truck, helicopter | |
| 2011.06.28 | 1 | Mostly Brown | A154 Dike Area | No | No | truck, Horn blast | BHP |
| 2011.07.01 | 1 | Large - cinnomon colored | | No | No | None | Believe this bear is the same (dark / cinnamon colored) one mentioned in the |
| 2011.07.06 | 1 | Dark brown | Airport by North Inlet | No | No | None | area |
| 2011.07.06 | 1 | Large Brown Bear | 1/2 way between Airport & North Inlet Water Treatment Plannt | No | No | None | Berlieve it is the same bear as earilier |
| 2011.07.07 | 2 | (Bear 1) 1 Large Brown (Bear 2) 1 Light brown bear | (Bear 1)1/2 way between Airport & North Inlet Water Treatment Plannt (Bear 2) North Inlet by 200 marker on runway | Yes | No | None | Visuals lost on both bears, Alert updated |
| 2011.07.07 | 2 | (Bear 1)Large Cinnamon Colored (missisng part of right ear) (Bear2) Light colored, juvenile dark legs & rings around eyes | (bear 1) On South side of North Inlet. (Bear 2)Airport 2500 marker on north side of runway | Yes | No | Used the helicopter twice on light colored bear, Used Helicopter 1 on large bear. Used the truck once on each bear. | Moved Bear 2 off the Islant to the west, Bear 1 remains on Island to the north of the airport |
| 2011.07.07 | 1 | Large Dark Brown | Airport - 100 marker | No | No | Use Air horn, 2 bear bangers and truck | Bedded down at end of runway |
| 2011.07.08 | 1 | Cinnamon Colored | Airport at approch 10 wind sock | No | No | 2 bear bangers, truck | Bear last seen On West Island |
| 2011.07.09 | 2 | Juvenile Blonde | North Inlet between pipe and water | No | No | Truck, 3 rubber bullets, 1 explosive shell | Both bears bedded down in the North Inlet |

| Date | Number of Animals | Characteristics of Animals | Location | Advisory Issued | Atrractant Present | Action Taken (Deterrents Used) | Comments |
|---|---|---|---|---|---|---|---|
| 2011.07.10 | 1 | Juvenile Blonde | Pond at the SE quadrant of the North Inlet | No | No | None | Verified by Environment |
| 2011.07.10 | 1 | Juvenile Blonde | At the North Inlet by the pipes | No | No | None | Bear was feeding |
| 2011.07.10 | 2 | Juvenile Blonde | Hanging Tree area | Yes | No | truck | Bedded down in North Inlet |
| 2011.07.10 | 1 | Juvenile Blonde | Paste Plant, by black pipe. | Yes | No | 2 Bear bangers, truck, 1 explosive shell air horn | Ended up in Emulsion Plant area |
| 2011.07.11 | 1 | Juvenile Blonde | Dump 12 by the A418 dyke | Yes | No | 2 Bear bangers, 1 explosive shell, truck, air horn | Bedded down near A21 Cause way |
| 2011.07.11 | 1 | Juvenile Blonde black patch on shoulder | Between An and Emulsion plant by Pond 7 | No | No | None | Lost visual |
| 2011.07.11 | 1 | Unknown | Pond 4 | No | No | None | obtained |
| 2011.07.11 | 1 | Juvenile Blonde | Pond 2 | No | No | Truck | Bear walking toward the AN building @ 22:55 leave area |
| 2011.07.12 | 1 | Juvenile Blonde | Pit area-Pond10-Dump 7 | No | No | 1 bear banger, truck | Bear bedded down below dump 7 |
| 2011.07.25 | 1 | blonde with dark brown face legs & under belly | North Inlet | Yes | No | Truck horn x 2 | Lost visual in North Inlet |
| 2011.07.26 | 1 | Unknown | North Inlet | No | No | None | obtained |
| 2011.07.29 | 2 | 1 - blonde with dark brown face legs & under belly 1- Not as much dark color on the face, blonde | South of 154 Portal in the shallow Bay | Yes | No | 2 rubber bullets, 1 screamer, 3 bear bangers, truck x2 | Left bears in A21 area, they were bedded down. |
| 2011.07.29 | 2 | 1 - blonde with dark brown face legs & under belly 1- Not as much dark color on the face, blonde | Met Con Area | No | No | 4 bear bangers, truck x 2, helicopter x1 | On Island north of the Airstrip |
| 2011.07.30 | 1 | Adult female, dark brown face, legs, rump, & underbelly - lighter hair on back | Intersection of dykes | No | No | 7 bear bangers, 1 rubber bullet, truck x3 (horn & back up alarm), Helicopter | Tag in the bears left ear. |
| 2011.08.01 | 1 | Smaller, Darker one of the blonde cubs | North Inlet on the pipes | No | No | Helicopter | Bear on Island north of Airport |
| 2011.08.02 | 1 | Larger, lighter one of the blonde cubs | 154 dyke in fish habitat | No | No | Helicopter | Bear on Island north of Airport |
| 2011.08.03 | 1 | Unknown | North Inlet Water Treatment Plant | No | No | None | Bear sleeping in Fish Habitat Area |
| 2011.08.04 | 1 | Blonde cub with darkpatch on front left leg | West Shallow bay | Yes | No | 4 Bear bangers, helicopter | Bear swimming towards island SEof the A 418 dyke |
| 2011.08.05 | 1 | Unknown | A418 Team Drilling lay down area | Yes | No | None | Bear laying down |
| 2011.08.06 | 1 | Larger, lighter one of the blonde cubs | Shallow Bay area | Yes | No | 2 bear bangers, Helicopter | Bear last seen heading NE on Mainland |
| 2011.08.06 * | 3 | Sow and 2 cubs | 14 miles East of Diavik on tundra 0552000-714600 | No | No | None | Report by Exploration |
| 2011.08.06 | 1 | Unknown | On apron at airport | No | No | None | logged in incidental sightings only |
| 2011.10.06 | 1 | Blonde with dark patch on hump | NW corner of Airport | No | No | None | Visual lost on bear last seen moving NW |
| 2011.10.12 | 1 | Large dark brown | On Tundra 0535657-7152783 | No | No | None | kill site |
| 2011.10.18 | 3 | Sow and 2 cubs | Emulsion Plant | Yes | No | None | obtained |
| 2011.10.18 | 2 | Sow and 1 cub | Airport | No | Yes - Caribou Kill | None | Bears last spotted on the north side of the runway heading west. Caribou Advisory |

| Date | Number of Animals | Characteristics of Animals | Location | Advisory Issued | Atrractant Present | Action Taken (Deterrents Used) | Comments |
|---|---|---|---|---|---|---|---|
| 2011.10.19 | 1 | Dark Brown in color (Probably sow from yesterday) | Airport | No | Caribou Kill (between marker 3000/4000 on airstrip) | None | Bear last seen On West Island |
| 2011.10.23 | 2 | 1 Large sow and 1 cubs all dark brown | Airport | No | Yes Caribou Kill (between marker | None | Only logged in incidentals - photos on drive |
| 2011.10.24 | 3 | 2 Large sow and 2 cubs all dark brown | In front of Main Accomadation | Yes | No | None | Monitored bears, 1 cub broke away from sow eventually lost visual on all 3 |

**Note:** * Observation occurred off of East Island

# Appendix VI

## Waste Management Plan

Rio Tinto

# Waste Management Plan

## Operational Phase, Version 14.1

28 March 2011

Diavik Diamond Mine

Health, Safety and Environment Department

HSEQ Element 10, RT Standard E7
OPCO-025-0410 R14

# 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 |
| 13 | JP | | 01/04/10 | Annual Update |
| 14 | JO | | 03/28/11 | Annual Update |
| 14.1 | JH | | 08/31/11 | Corrected Issue Date |

## 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 | ENR | Director, Wildlife | 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 litre 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:<br>accommodation building<br>administration offices<br>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 labelled 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 3). The purpose of this facility is to store and dispose of site wastes in a practical, safe manner that reduces potential attractants for wildlife.

**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 litre 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 litre 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 labelled 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). |
| Contaminated | Recovery/Reuse | Absorbent pads are used to collect any free product on |

| | | |
|---|---|---|
| Water | | 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 Tipper bins, stored at the Waste Transfer Area and incinerated on site. |
| Used Absorbent Pads | Reduce/ Incinerate | Collected in Tipper bins, stored at the Waste Transfer Area and incinerated on site. |
| Used Absorb-all | Reduce/ Incinerate | Collected in Tipper bins, stored at the Waste Transfer Area and incinerated on site. |
| ***Chemicals:*** | | |
| Used Glycol | Recycle | Collect in trays, drums or pumped via pipeline. Transfer to drums, 50 000 L storage tank located adjacent to lube storage building, 28 000L tank at power plant 1 or 30 000L tank at power plant 2. Ship off-site for recycle or disposal. |
| Acids | Dispose off-site | Stored in approved plastic containers or enviro-packs at the Waste Transfer Area within the chemical shipping cotnainer 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). |
| ***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. |
| 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), power plant 1 (96 000L) and power house 2 (72 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 labelled 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 labelled 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 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 tipper bins 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 de-icing fluid. 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), power plant 1 (28 000L) and power plant 2 (30 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 wet-filled, 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. Containers used for storage are plastic lined. The Surface Operations department is responsible to deliver the spent batteries to the waste transfer area and inventory them regularly.

### Acids

Used acids are stored in approved plastic containers that are contained within enviro-packs at the Waste Transfer Area and stored within the chemical shipping container. 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 labelled 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 plastic lined 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.

**Waste Paint Material**
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, labelled 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 Surface Operations 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;
- Chemical storage shipping container;
- 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 3.

## 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 3). 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 land farm is also located within the facility for deposition and remediation of petroleum contaminated soils. A new incinerator building has been constructed with two incinerators inside this building. This new incinerator is being commissioned in April of 2012. This new incinerator will handle all of the sites burnable waste products. Once this new Incinerator facility is in full operation the other two incinerators will be decommissioned.

## Land Farming

Hydrocarbon contaminated soils from spills or other releases are land-treated in a designated area within the Waste Transfer Area. The WTA cell is designed and constructed with a berm, arctic geomembrane liner and sump system. 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 labelled, 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 litre aboveground used oil tank is located in this area as well as a 50,000 litre waste coolant tank. Adjacent to power plant 1, inside a concrete bermed area is a 28 000 litre used glycol tank and a 96 000 litre used oil tank. Adjacent to power plant 2, inside a concrete bermed area is a 30 000 litre used glycol tank and a 72 000 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, labelled 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. The onsite Emergency Response Team (ERT) is 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

There is a new Incinerator Building that has been constructed. This building holds two new water scrubbed incinerators. The two old incinerators that have been used over the past years will be decommissioned once the new Incinerator is into full operation. The new incinerator is located at the waste transfer area and is built to incinerate burnable materials, including food wastes, as required. The incinerated ash is stored inside a bin. Ash is then disposed of in the burn pit and finally disposed of in the landfill area.

# Appendix A

## Figures

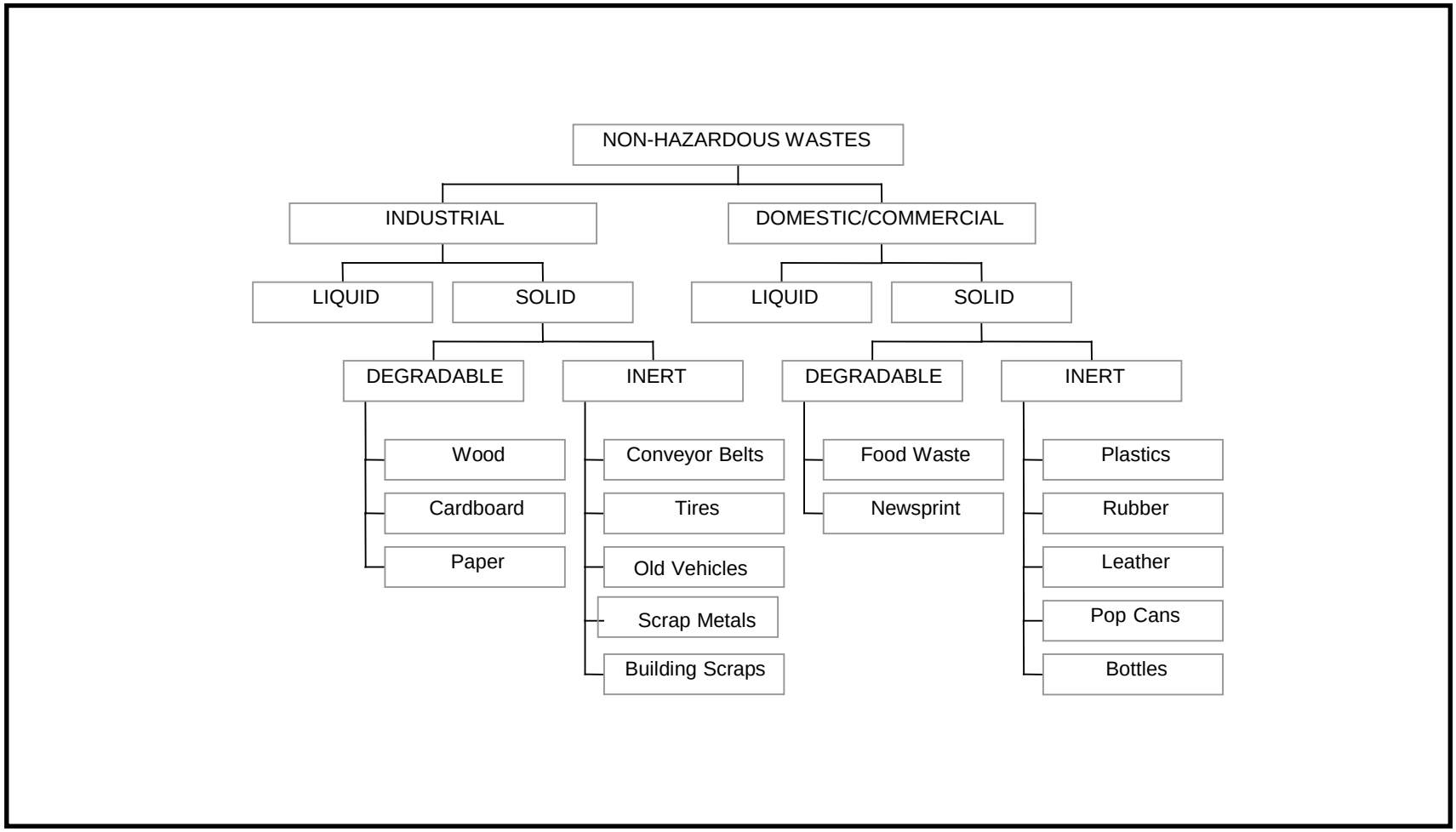


*Figure 1: Classification of Non-hazardous Waste Generated at Diavik Mine Site*

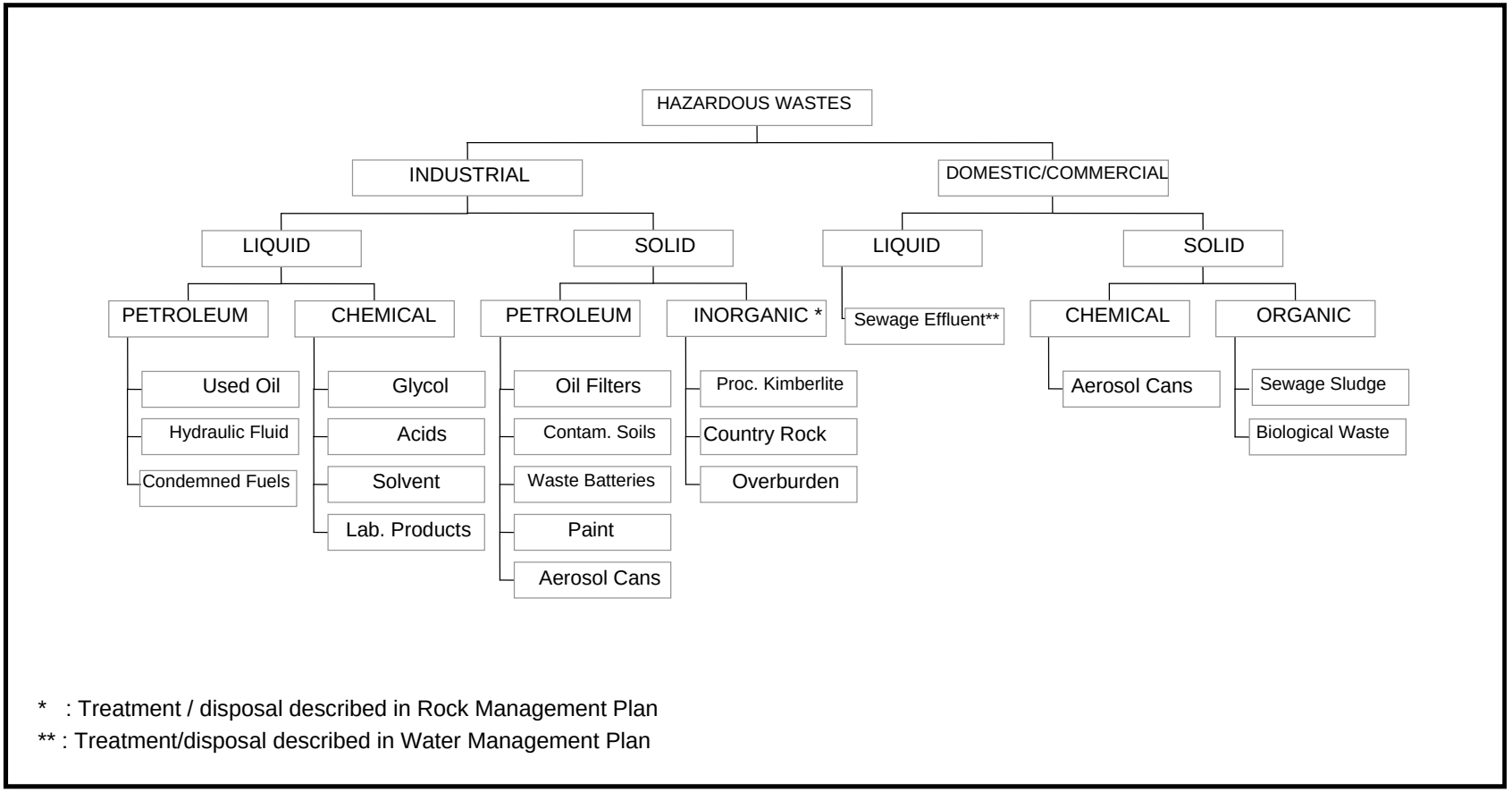


*Figure 2: Classification of Hazardous Waste Generated at Diavik Mine Site*

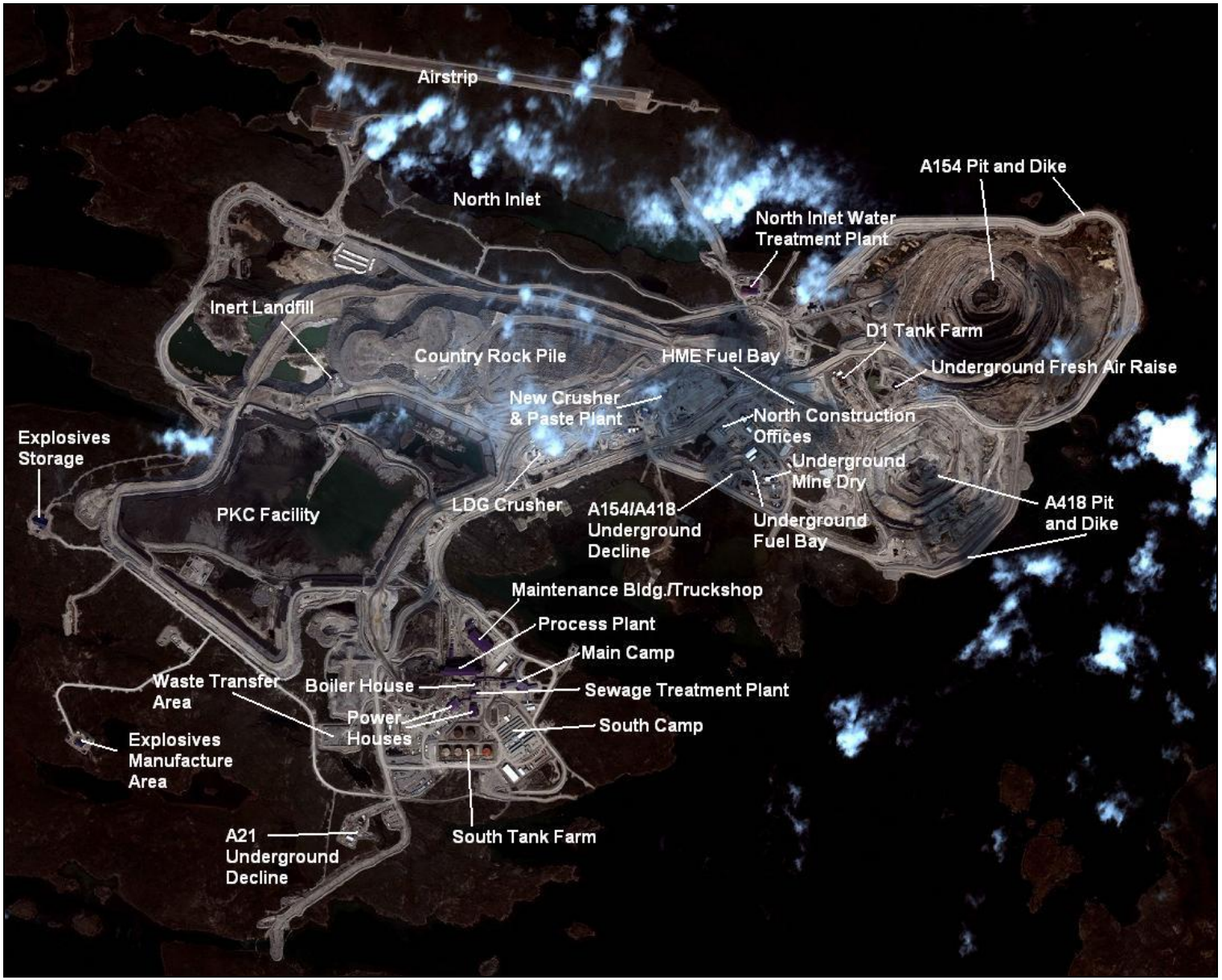


*Figure 3: Diavik Mine Site Layout*