

2017 Mary River Project Terrestrial Environment Annual Monitoring Report



Prepared For

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SUMMARY

The Mary River Project (the Project) is an iron ore mine located in the Qikiqtaaluk Region on North Baffin Island, Nunavut. The Project involves the construction, operation, closure, and reclamation of a 22.2 million tonne per annum (mtpa) open pit mine that will operate for 21 years. The high-grade iron ore is suitable for international shipment after crushing and screening with no chemical processing facilities. Construction on the project and associated facilities started in 2013, and mining began in September 2014. Currently, up to 4.2 mtpa of the crushed and screened iron ore is trucked to Milne Inlet year-round, stockpiled, and shipped during the open water season. Also approved is a railway system that will transport 18 mtpa of the ore from the mine area to a proposed all season deep water port at Steensby Inlet where the ore will be loaded into ore carriers for overseas shipment through Foxe Basin. The Project was issued Amendment # 1 to Project Certificate No. 005 by the Nunavut Impact Review Board (NIRB) on May 28, 2014. At this time the Project only trucks iron ore to Milne Port for open water shipping.

As a condition of Project approval, the Nunavut Impact Review Board (NIRB) Project Certificate #005 includes numerous conditions that require Baffinland to conduct effects monitoring for the terrestrial environment. Work conducted for the terrestrial environmental monitoring program is guided by Inuit Qaujimajatuqangit and by the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; (Baffinland Iron Mines Corporation 2017) and is overseen by the Terrestrial Environment Working Group (TEWG) which includes members from Baffinland, the Qikiqtani Inuit Association (QIA), the Government of Nunavut (GN), and Environment Canada and Climate Change (ECCC) and the Mittimatalik Hunters and Trappers Organization (MHTO). The terrestrial environment monitoring program began in 2012 and has continued through 2017 with adaptations to the programs over the years.

Baffinland anticipates that programs will continue in the future. However, all carnivore monitoring programs completed in the past were put on hold in 2015 as the Terrestrial Environment Working Group (TEWG) consider these surveys to no longer be required due to low abundance. These studies will be initiated in the future should changes occur in carnivore abundance and after further discussion with the GN and the TEWG.

This report summarizes the data collection and monitoring activities conducted in 2017 for the Project, including the following survey programs (summaries provided in Table 1):

- Dust fall monitoring program;
- Vegetation abundance monitoring;
- Vegetation and soil base metals monitoring;
- Rare plant observations (incidental findings);
- Helicopter flight height analysis;
- Snow track surveys;
- Snow bank height monitoring;



- Height of land caribou surveys;
- Pre-clearing nest surveys; and
- Cliff nesting raptor occupancy and productivity surveys.

Results of 2017 monitoring programs are as follows:

Climate, Dust and Traffic:

- Climate conditions were similar with regard to air temperature, but considerably drier in 2017 when compared to baseline data.
- The average number of vehicle passes on the Tote Road in all months regularly exceeded the projected maximum traffic volume; this vehicle activity is a contributor to dust fall as measured at both the south and north Tote Road crossing sample locations.
- Dust fall at the Mine Site was within predicted levels and 2017 annual dust was generally less than was observed in 2016, but some crusher activities in late November/early December 2017 resulted in higher than anticipated dust fall in those months compared to previous years.
- Dust fall at Milne Port exceeded predictions. The highest dust fall was noted near the ore stock piles and near the camp where dust is generated by both traffic and the nearby ore piles.
- Dust fall associated with the Tote Road at both the north and south crossing indicated a similar trend: Within 30 m and one kilometre on either side of the road, dust fall showed an increase over predictions. However, outside the one kilometre range the dust fall deposition rates decreased to just at or below laboratory detection limits, which is within predicted levels.
- At most year-round sampling locations throughout the Project area, dust fall in 2017 was less than in 2016. This overall decrease may be due to increased effectiveness of dust suppression activities, particularly along the Tote Road.

Climate, Dust and Traffic Monitoring will continue in 2018.

Vegetation:

- The vegetation monitoring program design was finalized in 2016 and provided a statistically robust program that will be able to detect Project-related changes in abundance and metals uptake should that effect occur.
- All vegetation abundance plots have been measured consistently for two years, and some for three years.
- To date, while annual changes in vegetation abundance in the Project area have been observed, there is no suggestion of changes in vegetation abundance as a result of a Project-related effect.
- Metal concentrations across all 2012 to 2016 vegetation and soil base metals monitoring sites are below Project thresholds. There is no suggestion of any Project-related effect of metals uptake in plants.
- Some previously reported rare plants have been found in the study area, and it is likely that more will be found as vegetation surveys continue in the Project area. Known populations will



continue to be monitored in the Project area and newly discovered populations will be documented as they are found on an opportunistic basis. There is no evidence to suggest that the Mary River Project is affecting the occurrence of rare plants.

Vegetation monitoring will continue, but the frequency of the detailed studies (e.g., abundance and metals sampling) is still being considered by the TEWG and Baffinland.

Mammals:

- Ground-based surveys continue to be used to monitor potential wildlife interactions with the Project. These include Height of Land surveys, Snow Track surveys, and incidental sighting reports from on-site personnel.
- In June 2013, a group of five caribou were observed in the PDA during Height of Land (HOL) surveys; however, caribou have not been observed during surveys conducted between 2014 and 2017. Lack of caribou observations on site follow the trends of low numbers recorded in regional observations and have been confirmed through collaboration with the GN who conducts caribou aerial surveys and through Inuit Qaujimagatuqangit received at workshops held in November 2015 and April 2016. Spring and fall caribou surveys were conducted in the North Baffin Region by the GN in 2017.
- Low numbers of incidental observations of caribou between the mine site and Milne Inlet between 2013 and 2017 also coincide with the lack of caribou observations during the HOL surveys.
- No caribou, wolf or other large mammal tracks were observed during snow tracking surveys conducted between 2014 and 2017; however, similar numbers of Arctic fox and Arctic hare tracks were observed throughout all survey years.
- The majority of snow bank height measurements were in compliance between 2014 and 2017. The number of snow bank height exceedances were similar from 2014–2016, with between 13–18 exceedances observed during these years. However, in 2017, 31 exceedances were recorded during the survey.

Height of Land, Snow Track, Snow bank height, and incidental observations will continue in 2018.

Birds:

- Active migratory bird nest searches (AMBNS) have been conducted since 2013 prior to any proposed land disturbance and/or clearing during the breeding bird window (May 31 – August 31), and raptor surveys (baseline and monitoring) have been conducted annually since 2011.
- In 2014 three nests were found during AMBNS surveys, one at the Mine Site and two at Milne Port; in each of these locations, construction activities were delayed until post fledging. No nests were located during any other year, so no buffers were required.



- In 2017, site occupancy, brood size, and nest success were monitored for all known nest sites located within 10 km of the PDA (the Raptor Monitoring Area). Areas with high nest-site suitability for cliff-nesting raptors located between known nest sites were also surveyed.
- A total of 166 unique nesting sites have been detected in the RMA, five of which were detected in 2017. Of these, 63 sites were occupied by raptors in 2017; 50 by peregrine falcon, five by rough-legged hawk, two by gyrfalcon, and four by common raven.
- Although annual variation in productivity for peregrine falcons and rough-legged hawks is apparent, it is most likely representative of natural variability associated with variation in prey availability and weather rather than due to any influence of disturbance.
- For rough-legged hawks, occupancy appears to be cyclical (approximately four-year oscillation), and strongly suggests that occupancy is associated with the natural lemming cycle, which is also known to cycle approximately every four years.
- Occupancy of potential nesting sites by gyrfalcon in the RMA have been too low to monitor annual trends.
- It appears that factors such as distance to disturbance and distance to nearest neighbour (individually and as an interaction) have no negative effect on occupancy or reproductive success for both peregrine falcon and rough-legged hawk.

AMBNS surveys will continue in future years prior to any proposed land disturbance and/or clearing during the breeding bird window, and raptor monitoring will continue to focus on multiple nesting territory visits in 2018.

Helicopter Flight Height:

- Helicopter flight heights continue to be used to monitor potential disturbance to birds and other wildlife inside and outside the snow goose area.
- Helicopter flight height compliance inside the goose area during moulting period was considerably higher in 2017 (95%) than in 2015 (55%) and 2016 (10%). This increase was largely due to an additional analysis performed in 2017, which considered justifications provided by pilots for many of the transits flown below the elevation requirements. For analytical purposes, non-compliant data points were converted to represent compliance with Project Conditions in cases where reasonable rationale were provided on daily timesheets. If a data point was originally non-compliant and no explanation was given, then the point remained non-compliant.
- Helicopter flight height compliance within and outside the goose area in all months was higher in 2017 (76%) than in 2015 (40%) and 2016 (33%), which was also largely due to the additional analysis performed in 2017, as stated above.

Helicopter flight height analysis including rationale from pilot timesheets will continue in 2018.

**Table 1** Terrestrial baseline, monitoring and research activities conducted in 2017 for the Mary River Project.

Survey	Reason for survey ¹	Work completed, effects observed, required mitigation and recommendations for future work
Dust fall monitoring program	Addresses Project Conditions 36, 50, 54d, 58c, and Project Commitment 60	<p>33 dust fall collectors are distributed around the Project area, some of which are further away from the Potential Development Area (PDA) and are controls. More than three years of monitoring from August 2013 to December 2016 are now complete.</p> <p>Future monitoring will continue to investigate dust fall at the 33 sites through the summer season and a subset of 16 year-round sites.</p> <p>Improvements were made to the traffic logs to better quantify road traffic.</p>
Vegetation abundance monitoring	Addresses Project Conditions 36 & 50, and Project Commitment 67	<p>A trends analysis was conducted to assess potential changes in percent plant cover and plant group composition with the relationship of distance to Project infrastructure and treatment effect between open and closed plots. Inter-annual differences in total percent ground cover, total percent canopy cover, and plant group composition were small in magnitude and consistent across all distance classes and treatments; therefore, differences are attributed to natural variation among years rather than a Project related effect in the first three years of monitoring.</p>
Vegetation and soil base metals monitoring	Addresses Project Conditions 34, 36 & Project Commitment 50	<p>All soil and lichen samples from 2016 were below thresholds with the exception of two sites which were suspected sampling errors. These sites, L-71 and L-91, were resampled in 2017.</p> <p>The results of the vegetation and soil base metals monitoring analysis determined that metal concentrations in soil and lichen samples at sites L-71 and L-91 were below CCME and relevant thresholds provided in the literature.</p> <p>2017 sampling confirms that baseline metal concentrations in soil and lichen are below Project thresholds for all vegetation and soil base metals monitoring sites.</p> <p>Future monitoring will consider changes in metal concentrations for soil and vegetation (i.e., lichen) and compare these concentrations to Project specific thresholds.</p>
Helicopter flight height analysis	Addresses Project Conditions 59, 71 and 72	<p>Prior to flying for Baffinland, all personnel are made aware of flight height requirements to reduce stress to the wildlife of Baffin Island, particularly during sensitive times (e.g. staging, calving etc.).</p> <p>Ensuring that aircraft maintain, whenever possible (except for specified operational purposes such as drill moves, take offs and landings), and subject to pilot discretion regarding aircraft and human safety, a cruising altitude of at least 650 metres during point to point travel when in areas likely to have migratory birds, and 1,100 metres vertical and 1,500 metres horizontal distance from observed concentrations of migratory birds. Flight corridors are also used to avoid areas of significant wildlife importance.</p> <p>In 2017, compliance within the snow goose area during the moulting season was 95%, and compliance within and outside the snow goose area in all months was 76%. 2017 was the first year that flight height data were cross-referenced with pilot logs from daily timesheets to help justify non-compliant transits. For analytical purposes, non-compliant flight height data were converted to represent compliance with Project Conditions in cases where reasonable explanations were provided by pilots. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years. Examples given to explain low-level flights included: weather, slinging, staking, surveys, drop off/pick up, demobilization and evacuations.</p>

¹ Project Conditions and Project Commitments as per: Project Certificate No. 005.

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Snow track surveys	Addresses Project Condition 54dii, 58f Addresses QIA concerns about snow bank heights and the effects on wildlife crossings	Snow track surveys were completed along the Tote Road to investigate the movement of caribou in April – Arctic fox and Arctic hare were the only species detected; no evidence of caribou was observed during the survey. As part of the survey, at all locations where tracks crossed the Tote Road, snow bank depths were recorded, and tracks were followed to see if the individual was deterred by road crossing conditions. Future monitoring will continue to look for caribou and other wildlife tracks and indications of their interaction with the Tote Road.
Snow bank height monitoring	Addresses Project Conditions 53ai and 53c Addresses QIA concerns about snow bank heights and the effects on wildlife	Snow bank height monitoring was conducted in April to ensure compliance with recommended snow bank heights no greater than 1 m. The management of snow bank height allows for wildlife, specifically caribou, to cross the transportation corridor without being blocked by steep snow banks, as well as allowing drivers greater visibility to help reduce wildlife–vehicle collisions. In 2017, snow bank heights were found to exceed the maximum snow depth of 100 centimetres at 31 sites, with a maximum recorded depth twice the suggested maximum height. In some areas where snow bank heights exceeded the guideline, the snow was being piled according to landscape limitations. The survey crew observed a dozer on multiple days pushing back off the snow banks in various locations.
Height-of-land caribou surveys	Addresses Project Condition 53a, 53b, 54b, 58b	All 24 HOL stations were visited at least once in 2017. Just over 19.5 hours of surveys were conducted at these stations in April (late winter), and early June (caribou calving) with an EDI biologist and a Mittimatalik Hunter and Trappers Organization representative. No caribou were observed during any of these surveys. In 2016, viewshed mapping was completed to demonstrate the extent of area surveyors could observe while conducting HOL surveys. Monitoring is expected to be conducted annually. The 2017 observations will add to a larger database as monitoring efforts continue through the life of the Project.
Pre-clearing nest surveys	Addresses Project Conditions 66, 70	In 2017 approximately 162,915 m ² of land was disturbed for Project infrastructure. Of the approximate areas cleared, 36% of the work was done outside the breeding bird window. During the breeding bird window, approximately 103,473 m ² of land was cleared. Thirteen pre-clearing surveys were conducted, a total of 8.71 person hours and 141,917 m ² (14.1 ha) of area were searched for active nests in the Mine Site, Tote Road and Milne Port development areas. No nests were detected and therefore no buffers were required. Surveys will continue to be required whenever clearing vegetation within the migratory bird nesting season.
Cliff-nesting raptor occupancy and productivity surveys	Addresses Project Conditions 50, 73, 74, and Project Commitment 75	This program is a continuation of baseline and effects monitoring work conducted since 2011. Approximately 37% of the 166 known nesting sites within the raptor monitoring area surveyed in 2017 were occupied by cliff-nesting raptors. Of these, 50 were occupied by peregrine falcons, five by rough-legged hawks, two by gyrfalcons, and four by common raven. Productivity for peregrine falcons and rough-legged hawks was 1.2±0.2 and 1.5±0.5 nestlings, respectively. 2017 surveys focused on confirming raptor occupancy and productivity of known nesting sites.