GIS # BR_FEIS_NA_tab_WinterIceRoadCorridor_v1b

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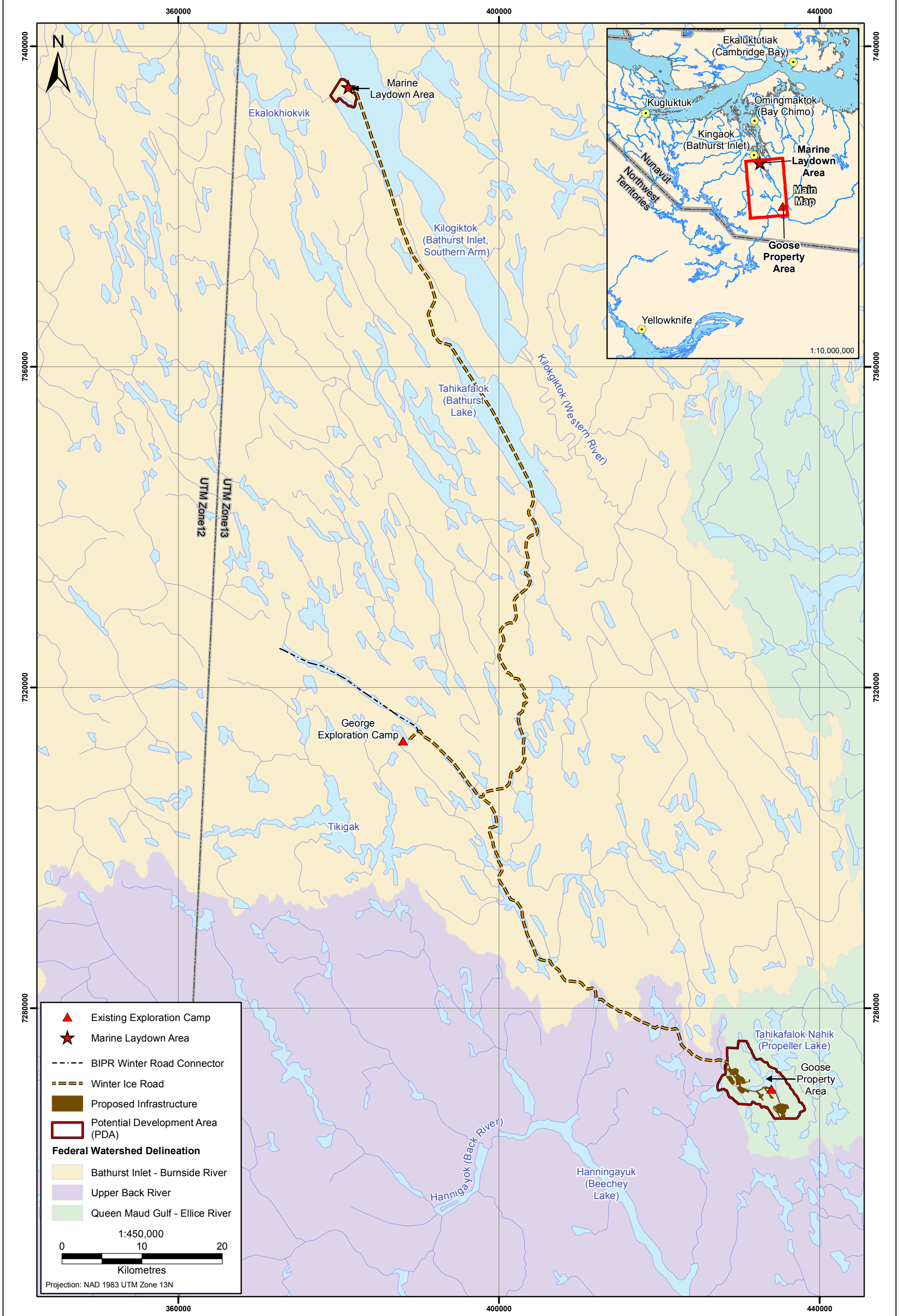

Figure 3

Sabina
GOLD & SILVER CORP.

Winter Ice Road Corridor Overview

2. Incorporation of Inuit Qaujimajatuqangit Principles

Sabina acknowledges the following Inuit Qaujimajatuqangit (IQ) principles, as described by the Government of Nunavut:

1. Inuuqatigiitsiarniq - Respecting others, relationships, and caring for people.
2. Tunnganarniq - Fostering good spirit by being open, welcoming, and inclusive.
3. Pijitsirniq - Serving and providing for family and/or community.
4. Aajiiqatigiinniq - Decision making through discussion and consensus.
5. Pilimmaksarniq/Pijariuqsarniq - Development of skills through practice, effort, and action.
6. Piliriqatigiinniq/Ikajuqtigiinniq - Working together for a common cause.
7. Qanuqtuurniq - Being innovative and resourceful.
8. Avatittinnik Kamatsiarniq - Respect and care for the land, animals, and the environment.

IQ values have helped guide Sabina's decision making for the Project and have been incorporated into the design of the Company's overall Project management approach. Table 3.1-2 in FEIS Volume 3, Chapter 3 outlines the ways in which IQ values have been incorporated into the Project. Furthermore, Sabina actively worked to collect and incorporate regional and Project-specific TK in addition to scientific knowledge throughout the FEIS. This information has also been used to inform Sabina's approach to the terrestrial environment section of the FEIS.

3. Community Engagement and Traditional Knowledge

Sabina initiated a comprehensive community engagement program in the Kitikmeot Region to ensure all regional residents were provided with opportunities to learn about the Project and provide feedback. Likewise, a considerable amount of TK was collected by Sabina and integrated into the FEIS submission. The following reports were prepared by Sabina and later reviewed for TK specific information related to Valued Ecosystem Component (VEC) features:

- *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project; Naonaiyaotit Traditional Knowledge Project (NTKP)* (KIA 2012) (FEIS Appendix V3-3A);
- *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (June 2014)* (KIA 2014) (FEIS Appendix V3-3B);
- *Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories (FEIS Appendix V3-3C); and*
- *Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut (FEIS Appendix V3-3D).*

Example, in response to TK and a request by the KIA, the WIR north of Tahikafflok Lake (Bathurst Lake) was realigned to address potential impacts to riparian zones identified during two local focus group workshops (Cambridge Bay Hunter Focus Group 2012; Kugluktuk Hunter Focus Group 2012). This request was made during review of the DEIS and was captured, and honoured, in commitment (KIA-5 from PHC Report).

Sabina is committed to considering and incorporating TK into the Plan. The incorporation of TK will occur throughout all stages of the Plan, including identification of mitigation measures, monitoring study design, data collection, and follow-up programs to obtain feedback.

4. Existing Environment and Baseline Information

Vegetation was considered a VEC in the FEIS (Volume 5, Chapter 4). Baseline studies to characterize the baseline vegetation present within the regional and local area of the Project were carried out in 2012. The focus of these studies was on ecosystems, habitat, and vegetation identified by Inuit, scientists, regulators, or the public as ecologically, socially or culturally important. Vegetation information (e.g., rare plant species/communities) was used to inform the operations footprint with the objective to avoid sensitive species-rich plant communities, and areas with high rare plant potential, where possible. For example, as previously mentioned, the WIR north of Tahikafflok Lake (Bathurst Lake) was realigned to address potential impacts to riparian zones in response to TK and a request by the KIA.

The vegetation Local Study Area (LSA) that was established for the baseline study compromises a total of 134,370 ha. The LSA was divided into the following three sub-areas:

- Goose Property Sub-area (32% of LSA);
- Winter Road Sub-area (62% of LSA);
- Marine Laydown Sub-area (6% of LSA);

This information is provided in the 2012 Ecosystems and Vegetation Baseline report (Rescan 2013a, FEIS Appendix V5-4a) and forms the basis for evaluating potential effects of the Project on ecosystems, vegetation, and special landscape features. As outlined in the 2012 Ecosystems and Vegetation Baseline Report (FEIS Appendix V5-4A), extensive baseline studies were conducted; some highlights include:

- Conducting soils and vegetation mapping of a very large local study area of 134,370 ha defined by the local the watersheds;
- Developed an ecological classification system for the area that links soil types with vegetation communities;
- Classified terrain, soils and ecological communities for the entire LSA;
- Conducted 817 field plots to ground truth the mapping, including the project development area, marine laydown area, winter road and control sites; and
- Conducted rare and invasive plant surveys using a qualified botanist.

Table 4-1 provides a summary of ecosystems mapped within the LSA. Table 4-2 provides a list of terrestrial vegetation identified through TK.

Table 4-1. Ecosystem Classes in the Local Study Area

Ecosystem Class	Area (ha)	% of Total LSA
Bedrock	10253	7.6
Disturbed/Barren	190.7	0.1
Esker	1337.1	1.0
Freshwater	24425.1	18.2
Marine	539.9	0.4
Riparian	1445.4	1.1
Riparian (marine)	439.6	0.3
Tundra	74393.6	55.4
Tundra (marine)	7278.4	5.4
Wetland	12760.7	9.5
Wetland (marine)	1305.6	1.0
TOTAL	**134369.1**	**100**

Table 4-2. Ecosystem Classes in the Local Study Area

Inuinnaktun Name(s)	English Name	Latin Name(s)	Specific Use/Part of Plant
Kublak[2]	Bear Berry	*Arctous rubra, A. alpina*	Fruit
Kabluk	Bear Berry	*Arctous rubra, A. alpina*	Fruit
Kublakot	Bear Berry	*Arctous rubra, A. alpina*	Leaves
Akpik; Aaukpik[1]	Cloudberry	*Rubus chamaemorous*	Fruit
Paungak; Paungan[1]; Paurnngait[2]	Crowberry; Blackberries	*Empetrum nigrum*	Fruit
Mahok	Liquorice root	*Hedysarum alpinum*	Root
Qunguliit[2]	Mountain Sorrel	*Oxyria digyna*	Leaves
Kimminait[2]	Bog cranberry	*Vaccinium vitis-idaea*	Fruit
Kigutangirnait[2]	Blueberries	*Vaccinium uliginosum*	Fruit
	Willow	*Salix* spp.	Bark
Qijuktaaqpait[2] (Baffin)	Northern Labrador tea	*Ledum palustre* subsp. *Decumbens*	
Kangayot[1]	Cottongrass	*Eriophorum* spp.	Seed heads
Kablakot[1]	Unknown; plant used for tea	Unknown	
Avalakiak[1]	Unknown; low-growing plant for starting fires	Unknown	
Eehoktin[1]	Unknown; small plant for starting fires	Unknown	
Aatogoayak[1]; igloohoutinnik[1]	Unknown; mushrooms eaten by caribou	Unknown	

[1] From the vocabulary in Section 11 of the NTKP report (KIA 2012). Where only the Inuinnaqtun names are provided, it is difficult to correlate them with corresponding English or Latin names; [2] Inuktitut names from Mallory and Aiken (2004)

5. Objectives

The main objectives of the Vegetation Monitoring Plan are:

- To measure plant species abundance and diversity at vegetation plots along the WIR, MLA, and Goose site;
- Measure direct loss of plant communities as result of the construction and operations of Project infrastructure at Goose Property, the MLA, and WIR;
- Measure plant health (vigour) as part of the vegetation monitoring program;
- Measure distribution and abundance of non-native invasive plant species;
- Monitor and evaluate the effectiveness of mitigation measures;
- Identify unanticipated effects; and
- Provide an early warning of undesirable change in the environment and to inform adaptive management measures.

6. Monitoring Approach

6.1 VEGETATION MONITORING

Vegetation monitoring will occur during Construction, Operations, and Closure of the Project. It will be performed every three years during the flowering period (i.e., July–August) for identification purposes, and for contaminant analysis (presence of berries). The program will focus on objectives noted in Section 5, with heavy focus on vegetation health and invasive plant species. Fugitive dustfall will be documented as part of the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) and its relevance considered in the Vegetation Monitoring Plan.

6.1.1 Vegetation Health

Vegetation health monitoring will include two components:

1. Vegetation abundance, richness (diversity), vigour (health); and
2. Contaminant (metal) levels in vegetation.

The first will be conducted through permanent monitoring plots in a variety of habitat types (minimum two plots per habitat type) within the Project area and in control areas within the Regional Study Area. Within each of the plots species richness (diversity), and abundance (percent cover), and vigour of each species (in each strata) will be estimated, in addition to the documentation of any rare plants (if present). The second part of vegetation health monitoring will involve the collection of vegetation samples (lichen and berry-producing plants) which will be sent to accredited laboratories for chemical analysis (Table 6-1).

Table 6-1. Vegetation Monitoring: Vegetation Health

Indicator	Vegetation Health
Measurable Parameter	1) Vegetation diversity (richness), and abundance, and 2) Contaminant (metal) levels in lichen and berry-producing plants.
Key Project Interaction	Effluent, dust and emissions released into the environment have the potential to impact vegetative health. Dust affects the survival of certain plant species (leading to changes in species diversity and abundance). The deposition of contaminants (metals) in the dust, which are absorbed by plants, can enter the food chain via ingestion by animals and humans, and may have an effect on health.
Goal	The project will not result in a significant increase in contaminant uptake in vegetation.
Objective	To quantify through continued monitoring throughout the duration of the Project: 1) vegetation abundance (percent cover), diversity (richness) and vigour (vegetation health), and 2) Contaminant (metal) levels in lichen (caribou forage) and berry-producing plants (traditional use); through continued monitoring throughout duration of the Project.
Threshold	Thresholds for vegetation diversity and abundance to be determined.
Scope of Monitoring Work	Regional Monitoring: Assess baseline vegetation composition/species richness, abundance, and vigour, and contaminant (metal) levels in lichen and berry-producing plants

6.1.2 Invasive Plants

Invasive plant species monitoring will occur during Construction and Operations of the Project. Monitoring will be completed within the Goose Property, MLA and WIR footprint and adjacent habitats to ensure that no invasive plant species are introduced to the Arctic environment. Invasive plant observations will be conducted every three years in conjunction with the vegetation monitoring, and informal observational surveys will occur on an ongoing basis and additional surveys may be triggered by

observations of invasive species (Table 6-2). Prior to Project initiation, staff will be trained on invasive plant establishment pathways, species identification (e.g., photos of common invasive plants in Nunavut) and mitigation measures (see Section 8). Should invasive plant species be found, these will be immediately reported to environment department and be destroyed and, if the pathway of entry can be determined, changes will be made to reduce/eliminate the possibility of further introductions.

Table 6-2. Vegetation Monitoring: Invasive Plant Species

Indicator	Invasive Plant Species
Measurable Parameter	Occurrence of invasive plant species
Key Project Interaction	Introduction of invasive plant species
Goal	The Project will not introduce invasive plant species to the RSA
Objective	To prevent the occurrence/establishment of invasive plant species
Threshold	No introduction of invasive plant species as a result of Project activities
Scope of Monitoring Work	Local monitoring: Surveillance of Project footprint and adjacent habitat, surveys to be conducted every 3 years in conjunction with vegetation monitoring or triggered by observations invasive plants

6.1.3 Dust Monitoring

The Mine is expected to create fugitive dust through various sources, primarily by blasting and crushing rock, and road construction and traffic. As part of the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) dustfall monitoring will be conducted via sampling between June and September for a number of experimental and control areas within the LSA to determine the level of dust deposition associated with the mine site and WIR (Table 6-3).

Dust monitoring will be carried out during the Construction and Operation phases of the Project. Sampling locations will be situated at varying distances from the Project site to determine spatial extent of dust fall. Additional details can be found within the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17).

Table 6-3. Vegetation Monitoring: Dust Fall

Indicator	Dust fall
Measurable Parameter	Surveillance and monitoring
Key Project Interaction	Dust fall has potential to affect vegetation health, as well as forage palatability for caribou
Goal	The Project will not have a significant effect on palatability of vegetation for caribou
Objective	Quantify: The magnitude of dust fall on vegetation surrounding mine infrastructure and WIR; distance from point sources and roadway at which dustfall is measured; and seasonal variation in dust fall through continued monitoring of Project.
Threshold	Refer to Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17)
Scope of Monitoring Work	Refer to Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17)

7. Roles and Responsibilities

Sabina's Environmental Department is responsible for monitoring compliance with applicable regulations and permit requirements. The responsibility of implementation of mitigation measures rests with the VP Operation.

Compliance is achieved through ongoing monitoring, and development and implementation of operational standards, procedures, and employee training.

8. Mitigation and Adaptive Management

The following mitigation measures and best management practices will reduce the potential for loss of vegetation:

- The Project has been designed to employ winter road-only access corridors that travel primarily over lakes and rivers, thereby minimizing potential negative effects on terrestrial vegetation and limiting dust emissions.
- Minimize the Project footprint, thus minimizing the disturbance to the terrestrial environment.
- The clearing of vegetation and removal of soil from unique landscape features will be minimized, including eskers, wetlands, exposed bedrock, cliffs, etc., which often provide high value habitat to wildlife and may support sensitive vegetation communities and growth forms. Exceptions to this management will only be considered after assessing and weighing all implications.

The following mitigation measures and best management practices will reduce the potential for degradation of vegetation:

- The design of the WIR has been optimized to minimize the distance travelled which will minimize emissions.
- All vehicles and machinery will restrict travel to designated road surfaces; thus avoiding creation of ruts in vegetated ecosystems.
- Loads carried by vehicles will be enclosed or covered when possible.
- Regular wheel-cleaning will be undertaken of vehicles travelling around and leaving the site.
- Equipment being brought to site will be inspected for any invasive plant species and be cleaned before being brought on to site.
- Vehicles will be driven at designated speeds on the WIR.

The following mitigation measures will be implemented to prevent the establishment of invasive species:

- Staff education on how invasive plant species can be introduced into an area.
- Staff education on how to identify common invasive plant species.
- Staff education on their individual roles in preventing invasive plant establishment.
- Ensuring vehicles and machinery are clean prior to entry on-site.
- Minimizing ground disturbance, where possible.
- Maintaining a healthy vegetation cover to prevent unwanted vegetation establishment.
- Immediate reporting of any invasive plant sightings to the environmental department.

The need for any corrective actions to on-site management or installation of additional control measures will be determined on a case-by-case basis. Indications of the need for corrective actions and additional control measures may include:

- If vegetation monitoring threshold limits are reached;

- If results from the Site Water Monitoring and Management Plan show non-compliance related to tundra discharges; or
- If results from the Wildlife Mitigation and Monitoring Program Plan, which will monitor select wildlife species and habitat around the mine infrastructure and activities show adverse effects to wildlife or wildlife habitat.

9. Quality Assurance and Quality Control

Quality assurance and quality control will include the following:

- field plant ecologists will be familiar with identification of subarctic plants and plant sampling techniques. Examples of estimating plant cover will be reviewed and rules applied consistently;
- data are to be downloaded from the field immediately upon returning to camp and manually checked by qualified personnel; and
- data will be downloaded consistent with detailed written operating instruction from qualified.

Data analysis will focus on evaluating trends and determining if there are statistical differences in plant species composition and abundance as a function of distance from the Mine and from construction through closure. The variables measured will include the following:

- plant species composition, as defined by plant species richness; and
- plant species abundance, as defined by mean percent species cover.

10. Reporting

An annual Vegetation Monitoring Summary Report for the Project will be completed for the mine, WIR, and associated infrastructure. The purpose of this report is to summarize the annual data collected from the Plan, and to identify and communicate natural variation and potential mine-related changes in vegetation populations and health.

The annual report will provide the objectives, methodology, historical and current year results, as well as a comparison to impact predictions, mitigation and management recommendations of each monitoring program. As the accumulation of data increases, trends will also be reported. The report will be submitted to the KIA, GN, and the NIRB.

11. References

Cambridge Bay Hunter Focus Group. 2012.

Kugluktuk Hunter Focus Group. 2012.

Mallory, C. and S. Aiken. 2004. *Common plants of Nunavut.* Nunavut Department of Education.