D9   SPECIES AT RISK SUPPORTING INFORMATION

D9.1 WOODLAND CARIBOU HABITAT MODEL
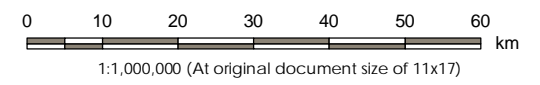
GENERATIONPGM

This woodland caribou disturbance model is based on methods and data sets described in MNRF's (2014b) *Integrated Assessment Protocol for Woodland Caribou Ranges in Ontario*, which was modified from Environment Canada's (2011) disturbance model to better reflect availability of Ontario data sets. Data sets used for this updated analysis differed slightly from those used in MNR (2014b) due to changes in data structure and availability from Land Information Ontario (https://geohub.lio.gov.on.ca/).

Lake Nipigon

Pagwachuan Range

N

Stantec

NORTHERN BIOSCIENCE

Legend

Caribou Winter Habitat
- Preferred
- Used

2020 Site Study Area (SSA)
2020 Caribou Local Study Area (LSA)
2020 Caribou Regional Study Area (RSA)
Lake Superior Coastal Range Boundary
Pukaskwa National Park
Waterbody (LIO 1:2M)
International Boundary

Discontinuous Range
(Lake Superior Uplands Linkage)

Schreiber
Terrace Bay
Marathon
Pic I.
Slate Is.

0 10 20 30 40 50 60 km
1:1,000,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
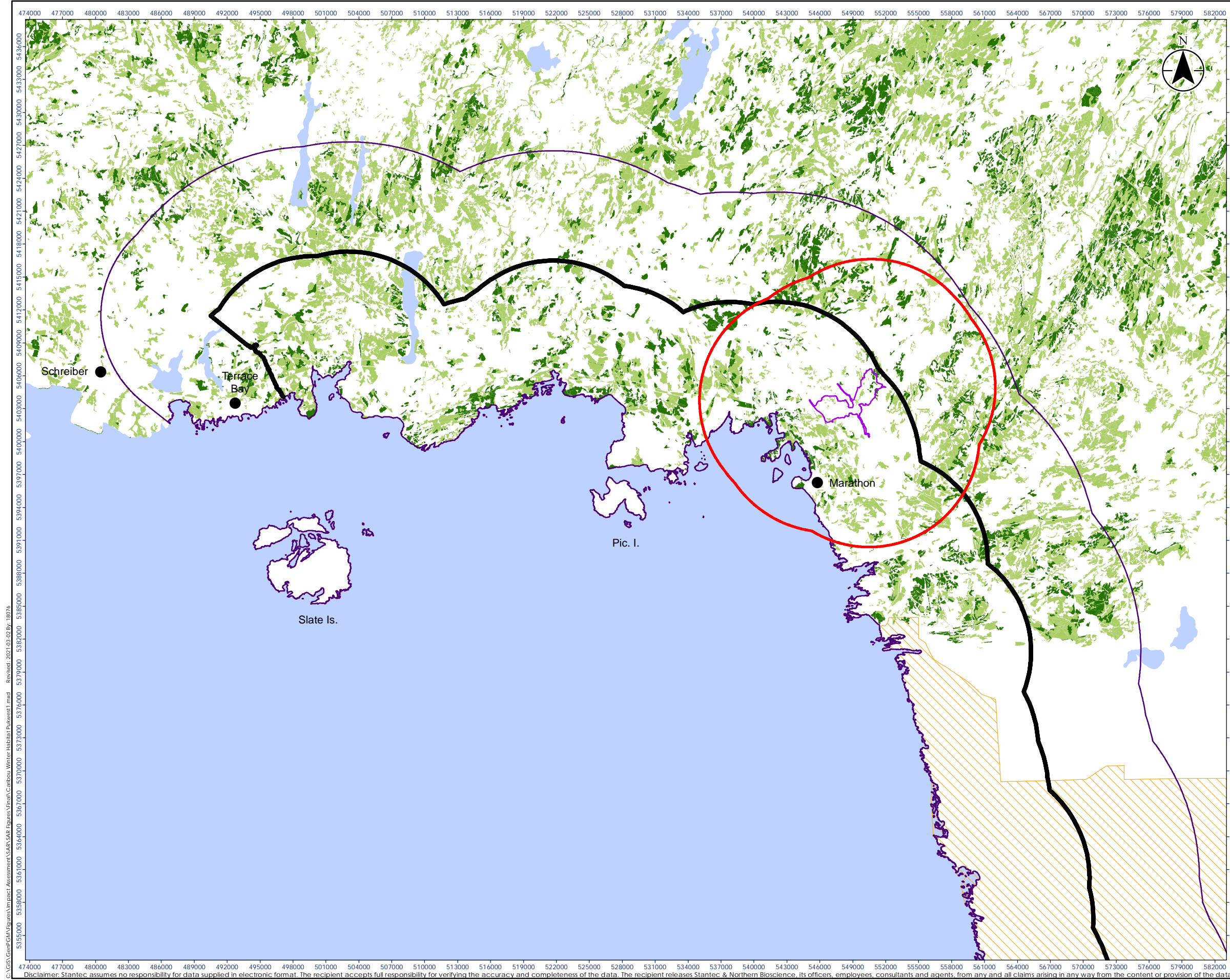
Lake Superior Coastal Range

Canada
United States

Lake Superior

Project Location

Ontario

Minnesota
Wisconsin
Michigan
Lake Superior
Lake Michigan
Lake Huron
Georgian Bay

Project Location
Marathon

Prepared by R. Foster on 2021-03-02

Client/Project
GENERATION MINING LTD.
MARATHON PALLADIUM PROJECT

Figure No.
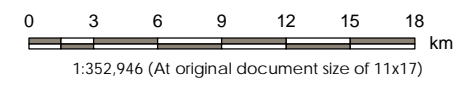Appendix D9.1-1

Title
Caribou Winter Habitat - RSA

Wa...

Caribou Winter Habitat - LSA and adjacent RSA

Caribou Winter Habitat - LSA Detail

Legend

Caribou Winter Habitat

- Preferred
- Used
- 2020 Site Study Area (SSA)
- 2020 Caribou Local Study Area (LSA)
- 2020 Caribou Regional Study Area (RSA)
- Lake Superior Coastal Range Boundary
- Waterbody (LIO 1:2M)
- International Boundary
- Towns

1:114,431 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.

Marathon

D9.2   MNR 2013 WOODLAND CARIBOU HABITAT CATEGORIZATION

Application of General Habitat Protection (Categorization) for Woodland Caribou for the Marathon Platinum Group Metals and Copper Mine Project

Ministry of Natural Resources

November 13, 2013

1.0 Introduction:

The Environmental Assessment process for the Marathon Platinum Group Metals and Copper Mine Project (Marathon Stillwater) has been ongoing since early 2010, and the Environmental Impact Study (EIS) included requirements to assess for impacts on woodland caribou. During this process, the potential impacts of the mine proposal on woodland caribou habitat and functions at various scales, from the site scale through to coastal continuous and inland discontinuous distribution scales, have been investigated. Specifics on caribou habitat composition, structure, function, and caribou occurrence data have already been well documented in reports and correspondence (MNR 2011, Northern Bioscience 2012, Northern Bioscience 2013), and through information request correspondence from the Ministry of Natural Resources (MNR) addressing various documents, as posted on the Canadian Environmental Assessment Registry website http://www.ceaa.gc.ca/050/documents-eng.cfm?evaluation=54755

In the fall of 2009, the government of Ontario issued the Caribou Conservation Plan (CCP) (MNR 2009), which is the government's policy response statement to the scientific advice provided in the recovery strategy. The CCP summarizes the government's goal for the recovery of caribou and summarizes the prioritized actions the government intends to take or support in response to the associated recovery strategy. The CCP contains policy direction for the Lake Superior Coast Range (LSCR) (continuous distribution) and the inland discontinuous distribution which links the LSCR with the more northern caribou ranges (continuous distribution). Based on the assessment work done in the EIS, it was determined that the mine proposal would cause a cumulative negative impact at various scales which would be contrary to the CCP. Details are contained in the documents cited above. Should the EA determine that the mine may proceed, then a mitigation package for caribou habitat must be developed and implemented, in order to offset the negative impacts and align with the CCP. The objectives and guiding principles for mitigation have been described in MNR's letter and attachment of April 22, 2013 (MNR 2013a). Work is ongoing on this mitigation package.

1.1 Endangered Species Act Requirements:

As of June 30, 2013, caribou are afforded general habitat protection under the Endangered Species Act, 2007 (ESA). A general habitat description for caribou has been developed, which supports interpretation/application of general habitat protection under the ESA - "General Habitat Description for the Forest-dwelling Woodland Caribou (Rangifer tarandus caribou)" (MNR 2013b). Proponents planning to undertake activities in caribou range (continuous and discontinuous) must consider the potential effects of their activities on caribou habitat, through application of the general habitat description (habitat categorization) and the Categorizing and

MARATHON PALLADIUM PROJECT ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

Protecting Habitat under the ESA policy (MNR 2012) to determine whether the activity is likely to have an adverse effect on caribou habitat. In addition to habitat categorization of sub-range features, the risk to caribou and current range condition must be considered in evaluating effects to caribou habitat. Should an adverse effect be identified and cannot be avoided, authorization under the ESA should be sought.

Based on the detailed assessments referenced above, and application of general habitat protection for caribou (categorization) it has been determined that the activities associated with the proposed mine development will result in a contravention under subsection 10 (1) of the ESA. However, knowing that caribou would receive habitat protection in June 2013, the offsite mitigation approach associated with the EA is being designed to meet the requirements of the ESA in anticipation that authorization would be required.

2.0 Habitat Categorization:

Habitat categorization provides a framework for identifying which areas of habitat a species may be able to tolerate more or less changes. Where an activity is determined to have the potential to damage and destroy habitat, the habitat categorizations will help to inform the conditions that may be required for an authorization (MNR 2012).

The General Habitat Description (GHD) document for woodland caribou (MNR 2013b), applies to all forest-dwelling woodland caribou habitat in the province. Caribou habitat and the ecological drivers of habitat function are diverse across Ontario. Applying the GHD to the unique habitat and range condition of the LSCR and adjacent discontinuous distribution, proved to be challenging. The policy is new, and this is the first application of a habitat categorization on the Lake Superior coast. In addition, this is the first application of the GHD in the discontinuous distribution zone.

In order to focus the categorization at a reasonable scale for viewing convenience, a 25 km radius extent on the mine property was chosen. (see sec. 2.3 for details).

2.1 Caribou Habitat Categorization summaries:

Category 1 are high use areas. These are sub-range habitat features that currently exhibit repeated, intensive use by individuals or multiple caribou, and include nursery areas, winter use areas and travel corridors. Category 1 (red) identifies habitat features or areas anticipated to have the lowest tolerance to alteration before their function, or usefulness, in supporting caribou is compromised. In this broad study area, data for mapping is either not available, and where it exists it is very sparse, there are few animals, and they are living at extremely low densities. Pic Island is the one area within the 25 km viewing extent where high use data exists, demonstrating continued use most winters, and therefore it was considered as Category 1. At further distances in the study area, the Slate Islands, Michipicoten Island, and Otter Island in Pukaskwa have current high use data, and are Category 1 areas by definition.

Category 2 are seasonal ranges. These are large sub-range habitat features that encompass the majority of current caribou distribution during all seasons within the range. Caribou are generally not distributed evenly within seasonal ranges in any given year. Individual animals

GENERATIONPGM

utilize the extent of these large features over multiple years to effectively space themselves out from threats that may change annually (e.g. anthropogenic disturbance, predators) and carry out all their life processes. Consequently, these features tend to be much larger than the current, known annual home ranges of individual caribou currently occupying the range at any one point in time. Category 2 (orange) identifies habitat features or areas anticipated to have a moderate tolerance to alteration before their function is compromised.

Category 3 are the remaining areas within the range that support caribou indirectly by maintaining the overall refuge function within the range. Category 3 areas generally have the biophysical features and forest composition consistent with seasonal ranges, yet are currently young or disturbed (< 40 years old). Category 3 (yellow) identifies habitat features or areas anticipated to have the highest tolerance to alteration before their function is compromised.

The GHD document also emphasizes that tolerance to alteration is relative to the risk to caribou and range condition. For example, the potential future function of a large tract of a recently burned or disturbed (<40 years old) area (Category 3), may be critically important to the future refuge function of the range and just as significant as protecting other, currently occupied features (Categories 1 and 2). As such, there may be less flexibility for development activities to occur in these ranges overall (MNR 2013b).

Currently most of the discontinuous distribution does not directly support a group of animals using the concept of "seasonal range" and therefore will be non-categorized at this time. However there is relatively recent use data recorded in discontinuous distribution within the Neys-Coldwell-Kilalla (NCK) linkage area, and connectivity management and recovery actions have been implemented here in forest management plans. This linkage feature is considered at this time to be directly or indirectly supporting existing groups of animals, and therefore will be categorized using the concept of seasonal range.

2.2 Interpretation of Caribou Habitat Categorization for the Stillwater Project:

An integrated range assessment for the LSCR has not been completed. However the existing documentation submitted in the EA provides a general interpretation of the overall state of the range. The landscape is fragmented with various types of disturbances (anthropogenic and natural). The terrain is very rugged, and the habitat currently exists in a finer and sparser pattern, with no large uniform patches of habitat typical of patterns that support caribou in northern continuous distribution. The trend in the LSCR has been one of chronic range recession, and decline of population sizes, to the point where persistence is uncertain, i.e. coastal extinction is a possibility. In general, the state of the population in the LSCR is precarious, and the immigration functions provided by the discontinuous distribution are also impaired.

Generally, the entire mainland LSCR is considered to have a low tolerance to alteration because of the current state of the population. Action 4.1.4 outlined in the CCP states the government's intentions for this area, 'The Lake Superior coastal population will be managed for population security and persistence. The focus will be to protect and manage habitat and encourage connectivity to caribou populations to the north''.

GENERATIONPGM

MARATHON PALLADIUM PROJECT ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

In applying the GHD, to the chosen viewing extent (SSA + 25km) Pic Island was the only Category 1 habitat (high use areas) identified. However, this is a reflection of the paucity of data. High use areas beyond the map extent include the Slate Islands and Michipicoten Island, and Otter Island in Pukaskwa, where high use data exists.

Based on historic data we know that the LSCR was occupied through space and time. Based on typical home range size (i.e., >100 km2 per animal, and animals living as individuals during the spring and summer months, spacing themselves apart from other animals), the entire coast can still be considered occupied, or potentially occupied, albeit at extremely low densities, with gaps and many years between observed occurrences at smaller scales. MNR has cautioned however that on most of the mainland LSCR, search effort has been low, and tracking collar studies have been few, i.e., low search effort. As such, the area in and around the mine proposal lends itself to a Category 2 habitat (seasonal range), including the NCK linkage in the discontinuous distribution.

Caribou habitat is dynamic (subject to natural disturbance), and currently disturbed areas may develop into future suitable habitat and provide important refuge function, and perhaps develop into future high use areas. In consideration of the CCP which emphasizes the need to protect and manage habitat in the LSCR, the remaining areas within the viewing extent in the LSCR and NCK linkage area in the discontinuous distribution that are disturbed are considered Category 3 habitat (remaining areas within the range). Actions to improve forest condition and recover habitat for caribou being undertaken in approved forest management plans in close proximity to the proposed project also support this categorization.

Based on all these considerations, it was deemed appropriate to use a simple, generalized, and objective methodology for habitat categorization at a coarse scale. The analysis of specific habitat attributes to develop offsets for cumulative negative impacts and achieve overall benefit will be accomplished at more detailed technical levels, using various data layers including soils, vegetation, surficial geology, and opportunities for silvicultural habitat actions.

2.3 Categorization Map Specifications:

Extent of view: A 25 km extent, drawn from the edge of the mine property, was chosen for viewing convenience (figure 1). The background research documents on file have already established general life history of caribou where movements of individual animals and concepts of habitat occupancy and connectivity extend well beyond this extent, in both continuous and discontinuous ranges. Therefore the actual area for mitigation and overall benefit is not constrained by this viewing extent. Details on eligible locations for mitigation and overall benefit are described in MNR's guiding principles and objectives document (MNR 2013a).

Category 1 (red): Pic Island is the only category 1 area in the view extent. Category 1 does exist beyond the extent.

Category 2 (orange): All the landscape that is not "disturbed" in the LSCR and NCK linkage area of the discontinuous distribution (see category 3 for disturbance definition). This is shown in two shades of orange for convenience, delineating the continuous distribution - LSCR, and the NCK discontinuous distribution in the extent.

GENERATIONPGM

MARATHON PALLADIUM PROJECT ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

Appendix D9.2 MNR 2013 Woodland Caribou Habitat Categorization

Category 3 (yellow): All the landscape that is "disturbed". Disturbance is defined as: (a) all forest <40 years old; and (b) all anthropogenic features, (e.g. roads, transmission corridors, urban areas, aggregate pits, etc). All available disturbance layers were used.

Mine property: This polygon was toned with a yellow overlay. The base layers include category 2 and 3.

The remaining area of the discontinuous distribution is coloured gray to indicate that it is covered by policy, but at this time is non-categorized.

Details on the data layers used for habitat categorization are included in the metadata accompanying the electronic data product.

Map Note 1:

There is much more disturbance than is illustrated on this map from activity on active mining claims, some forestry road segments, and private land. Unfortunately, data layers do not exist for what forest is actually disturbed and what is not for these active claims, additional forestry road segments not updated in digital inventories, or private lands. For example, the mine property itself does not have a disturbance layer for existing roads and exploration trails. The analysis team considered using all the active mining claim outlines, and delineating them as entirely disturbed (Category 3, yellow). Using this mapping construct would produce very large swaths of continuous yellow on this map and over-estimate actual physical disturbance at finer scales. This over-estimate is done at large range scale for integrated range assessment in the north because "active" by definition means some degree of disturbance. Range scale assessments in the northern ranges also enlarge disturbance shapes through buffering of anthropogenic disturbances, but all this spatial buffering is done for statistical prediction of caribou recruitment probabilities, and population health.

The purpose of this project is to produce a simple categorization map, not a population health predictive analysis. The analysis team concluded that for this map, the existing disturbance data as-is would be used, without buffering or active mining claims. Therefore, the actual disturbance is under-estimated. The mine property itself is a mixture of categories 2 and 3.

Other visual products showing recent disturbance can be used to assist in mitigation and overall benefit site selection, such as the enhanced forest resource inventory, the active mining claims, supplementary aerial photography, and mining company data. For the purposes of the EA and ESA authorization on this file, category 2 or 3 categorization differentiation does not affect off-site selection criteria for mitigation or overall benefit actions.

Map Note 2:

This categorization map is reflection of available data layers interpreted into habitat categories as described in the GHD. This product is solely applicable to the proposed Stillwater mine project.

GENERATIONPGM

Appendix D9.2 MNR 2013 Woodland Caribou Habitat Categorization
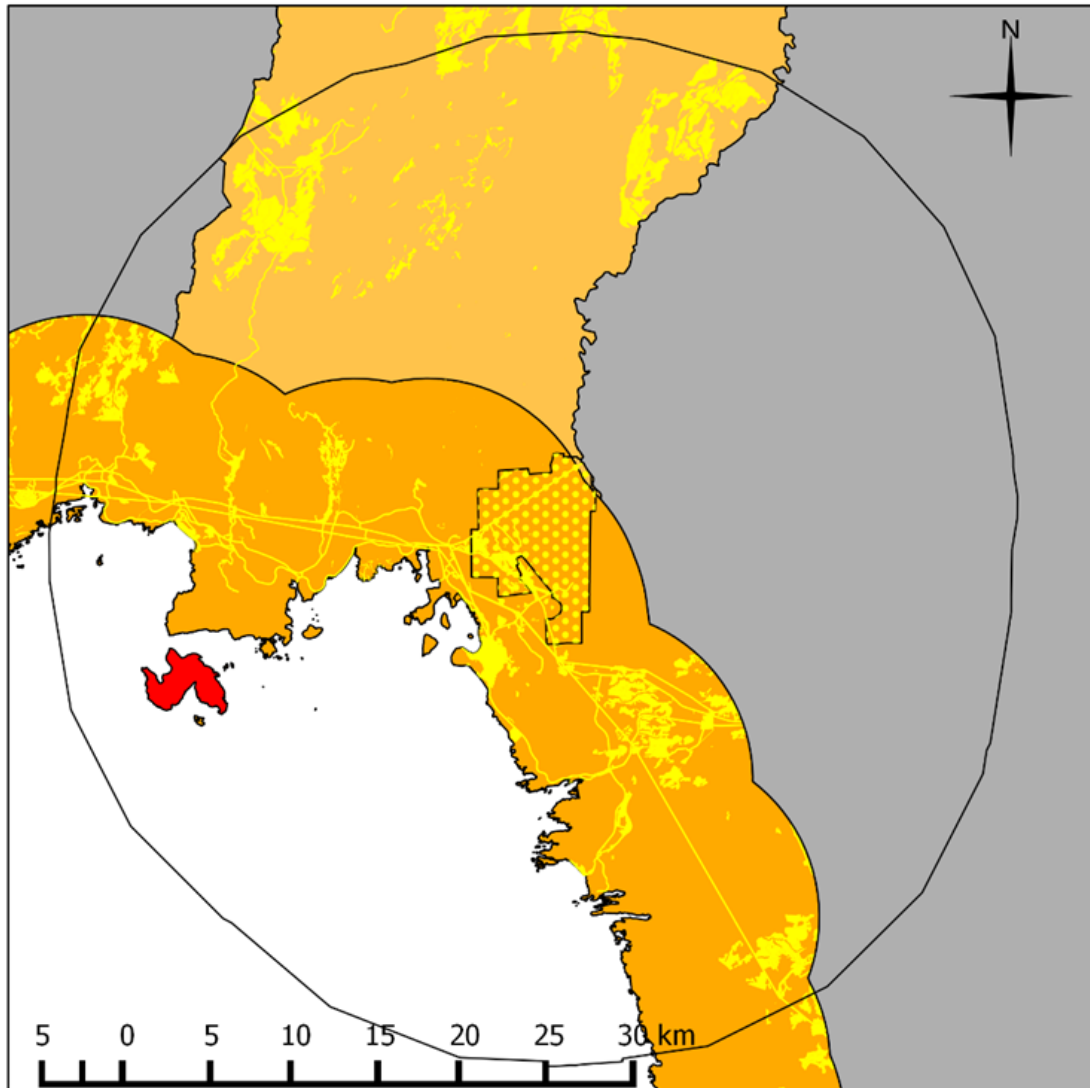
Legend

Range Boundaries

- Category 1, Pic Island, Lake Superior Coastal Range (Continuous Distribution)
- Category 2, Lake Superior Coastal Range (Continuous Distribution)
- Category 2, Neys-Coldwell-Kilalla linkage (Discontinuous Distribution)
- Category 3
- Currently non-categorized (Discontinuous Distribution)
- Marathon Stillwater property boundary
- 25km Categorization View Area

GENERATIONPGM

3.0 References cited:

Northern Bioscience 2012. Supporting Information Document No. 26 – Marathon PGM-Cu Project: Assessment of Impacts on Woodland Caribou. 103p.

Northern Bioscience 2013. Environmental Assessment Information Request Response 23.1: Fragmentation and Woodland Caribou. 24p.

MNR 2009. Caribou Conservation Plan. Queen's Printer for Ontario. 28p.

MNR 2011. Letter "and attachment, Oct 14, 2011: "Appendix 1: Assessing the Effects of the Proposed Marathon Platinum Group Metals and Copper Mine Project on Woodland Caribou". 11p.

MNR 2012. Categorizing and Protecting Habitat under the Endangered Species Act. February 2012. Queen's Printer for Ontario. 10p.

MNR 2013a. Letter: "Opportunities for Mitigating Impacts to Woodland Caribou"; and attachment: "Guiding Principles and Objectives for Offsetting Impacts to Woodland Caribou Marathon Platinum Group Metals and Copper Mine Project", April 22, 2013. 6p.

MNR 2013b. "General Habitat Description for the Forest-dwelling Woodland Caribou (Rangifer tarandus caribou)". June 30, 2013. Queen's Printer for Ontario. 15p.

D9.3 MECP 2020 WOODLAND CARIBOU HABITAT CATEGORIZATION

GENERATIONPGM

MARATHON PALLADIUM PROJECT ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

Appendix D9.3 MECP 2020 Woodland Caribou Habitat Categorization

Category 1 habitat in the Lake Superior Coastal Range (LSCR) by MECP.

Category 1: Nursery Areas (NAs) and Winter Use Areas (WUAs) on the mainland of the LSCR were delineated in a manner consistent with those in the northern Ranges:

- Identified using all available direct and indirect observations (e.g., sightings, tracks, pellets, cratering, etc.). It should be noted that, unlike the northern ranges, NAs and WUAs in the LSCR were not informed by collaring data because there is none available for the mainland.
- Very few spatial algorithms/automated processes are used for Cat 1 areas in general (even in the northern ranges)
    - Instead, Cat 1 areas are generally delineated by snapping to biophysical features (e.g., linear features, shorelines, forest stands, etc.) and relying on professional judgement calls to identify specific boundaries.
    - Nursery Areas criteria and spatial data sets:
        - One or more documented observations demonstrating evidence of use (e.g., cow and/or calf sighting, calf pellets, calf tracks, large and small beds, etc.) in the same local area over a single or repeated years between May 1st and September 15th within the last 20 years*
    - Winter Use Areas criteria and spatial data sets:
        - Numerous documented observations (e.g., 10-20) demonstrating evidence of high use (e.g., heavy tracking, slushing, cratering, etc.) in the same local area throughout the winter timeframe over repeated years between December 1st and March 31st within the last 20 years*
- *in NAs and WUAs where the last known observations are 20 years or older, surveys over multiple years would need to occur within these Areas to evaluate whether they Areas are/are not still used by caribou – they are not simply removed from the GHD (or downgraded) because the data supporting their delineation is older than 20 years.
- Delineate using biophysical features surrounding the above observations
    - Remotely Sensed Imagery (e.g., eFRI, SPOT, Landsat, Google Earth, etc.)
    - Potential barriers to movement (e.g., anthropogenic disturbance)
    - See tables below for more detailed delineation criteria and data sets used for NAs and WUAs
- Avoidance of predation risk is the apparent primary habitat selection criteria employed by the LSCR population

The following tables outline what data and criteria are used to delineate NAs and WUAs in all of Ontario's caribou ranges. Some of the criteria are more applicable in the LSRC than others.

Nursery Area: Spatial data sets and criteria used to map NAs		
Data Sets	- Waterbodies - Watercourses - Wetlands - Forest Resource Inventory, where available - Provincial Landcover 2000 (if FRI not available) - Topography - Disturbance (e.g., anthropogenic, natural) - Other detailed biophysical feature data	
Mapping Considerations	**Lakes – where applicable**	
	Small Lakes (<100 ha) with or without islands	Identify the entire lake as a Nursery Area delineated (i.e., buffered) 200 m inland from the shoreline. Islands within that area are all considered part of the Nursery Area
	Large lakes with observed caribou use dispersed across all or a large portion of the lake or its shoreline	Identify the entire lake as a Nursery Area delineated (i.e., buffered) 200 m inland from the shoreline. Islands within that area are all considered part of the Nursery Area
	Large lakes with documented search effort at likely locations across the entire lake but with observations of caribou only in a localized area with unique biophysical features (i.e. bay, one end of lake, or group of islands)	Identify all the portions of the lake and lakeshore demonstrating similar biophysical features to those of demonstrated use and delineate (i.e., buffered) 200 m inland from the shoreline. Islands within that area are all considered part of the Nursery Area
	Large lakes with documented search effort only in the areas with the documented observations	Identify all the contiguous portions of the lake sharing the attributes of the portion of the lake with observed caribou activity as the Nursery Area delineated (i.e., buffered) 200 m inland from the shoreline. Islands within that area are all considered part of the Nursery Area
	Additional Considerations: *Factors to consider in the mapping of portions of the lake as having attributes that function as Nursery Areas include number and size of islands, physical attributes of the shoreline, and the state of the forest cover and wildlife populations in the vicinity of the lake.* *Factors to consider in the inclusion of small lakes and/or wetlands adjacent to the main feature being mapped where observed caribou use extends beyond 200 m from the shoreline and there is clear intent to use the small lakes and/or wetlands, those lakes and/or wetlands that are adjacent to the lake being mapped should be amalgamated into the Nursery Area.*	

GENERATIONPGM

Nursery Area: Spatial data sets and criteria used to map NAs	
	Factors to consider in the inclusion of additional areas adjacent to the main feature being mapped where there is demonstrated evidence-of-use of additional mainland area (i.e., beyond 200 m), that area should be amalgamated into the Nursery Area by extending the buffer to 500 m.
Peatlands – where applicable	
Small peatlands (< 1,000 ha) with or without islands	Identify the entire peatland as a Nursery Area
Large peatland complexes with observed caribou use dispersed across all or a large portion of the peatland complex	Identify the entire peatland complex inclusive of islands and peninsulas of upland into the peatlands, as a Nursery Area
Large peatland complexes with observations of caribou only in one portion of the peatland complex or only on unique biophysical features within the peatland complex	Identify all the portions of the peatland complex demonstrating those unique biophysical features as the Nursery Area up to a maximum of 10,000 ha
Additional Considerations: *Factors to consider in the mapped of peatland Nursery Areas must include hydrological features governing the occurrence of hydric substrates, inclusions of upland islands and peninsulas, and consideration and inclusion of adjacent upland areas that directly contribute to the hydrological function of the peatland complex.*	
Other Landforms – frequently used for LSRC	
Landforms other than water bodies or peatlands that have documented use by cows with calves identified during the nursery period may be identified as Nursery Areas (e.g., upland linkage areas between lakes or peatlands)	

GENERATIONPGM

Winter Use Areas: Spatial data sets and criteria used to map WUAs	
Data Sets	- Waterbodies - Watercourses - Wetlands - Forest Resources Inventory (FRI), where available: 　▪ classified as winter preferred or winter used habitat by the ecosite definitions in the *Forest Management Guidelines for the Conservation of Woodland Caribou: A Landscape Approach,* 　▪ classified as winter and/or suitable habitat as defined in the Forest Management Guide for Boreal Landscapes (MNRF 2014a), or 　▪ other - Provincial Landcover 2000 (if FRI not available) - Quaternary Geology of Ontario Seamless Coverage (e.g., Surficial Geology) (OGS 1997) - Northern Ontario Engineering Geology Terrain Study 1 (NOEGTS) (Gartner *et al*, 1981), where available (e.g., Glaciofluvial, Eolian (sand dune), or Bedrock) with a low local relief, and/or variety demonstrating plain, ridged, or sloping - GapTool Landscape Vegetation Analysis (Davis 2006) (e.g., LVFRI, LVFN, LV2000, etc.) - Disturbance (e.g., anthropogenic, natural) - Other detailed biophysical feature data

Mapping Considerations	**Landform Features**	
	Discrete clusters of suitable vegetation (e.g., preferred and used ecosites, treed fen/bog, etc.) on an appropriate landform (e.g., bedrock, moraine, organic, etc.) demonstrating high use over repeated years from more than one animal (as identified in section 2.2)	Identify the entire area as a Winter Use Area delineated by the stand and/or geological boundaries using other distinct edges (e.g., lakes, rivers, etc.) to reasonably delineate an inferred extent. Small, isolated areas of unsuitable landform and/or vegetative cover within the delineated bounds are all considered part of the Winter Use Area.
	Large landform features dominated by a continuous cover of coniferous/sparse forest greater than 40 years that have caribou use (as identified in section 2.2) dispersed across all or a large portion of the area over repeated years	Identify the entire area as a Winter Use Area delineated by the stand and/or geological boundaries using other distinct edges (e.g., lakes, rivers, etc.) to reasonably delineate an inferred extent. Small, isolated areas of unsuitable landform and/or vegetative cover within the delineated bounds are all considered part of the Winter Use Area.

Winter Use Areas: Spatial data sets and criteria used to map WUAs	
Large landform features with documented search effort only in the areas with the documented observations	Identify the contiguous portions of the feature sharing the attributes of the portion of that feature with observed caribou activity as the Winter Use Area delineated by the stand and/or geological boundaries using other distinct edges (e.g., lakes, rivers, etc.) to reasonably delineate an inferred extent. Small, isolated areas of unsuitable landform and/or vegetative cover within the delineated bounds are all considered part of the Winter Use Area.
Large landform features with documented search effort across the entire feature over two or more years, but with observations of caribou only in a localized area	Identify the portions of the feature demonstrating similar biophysical attributes with observed caribou activity as the Winter Use Area delineated by the stand and/or geological boundaries using other distinct edges (e.g., lakes, rivers, etc.) to reasonably delineate an inferred extent. Small, isolated areas of unsuitable landform and/or vegetative cover within the delineated bounds are all considered part of the Winter Use Area.
Additional Considerations: *Factors to consider in the mapping of the biophysical feature as having attributes that function as Winter Use Areas include physical attributes of the landform and/or forested stands (e.g., age class, stand composition, etc.), the state of the forest cover (e.g., young forest and permanent disturbance) and other wildlife populations in the vicinity of the feature.*	

GENERATIONPGM

Stantec | NORTHERN BIOSCIENCE
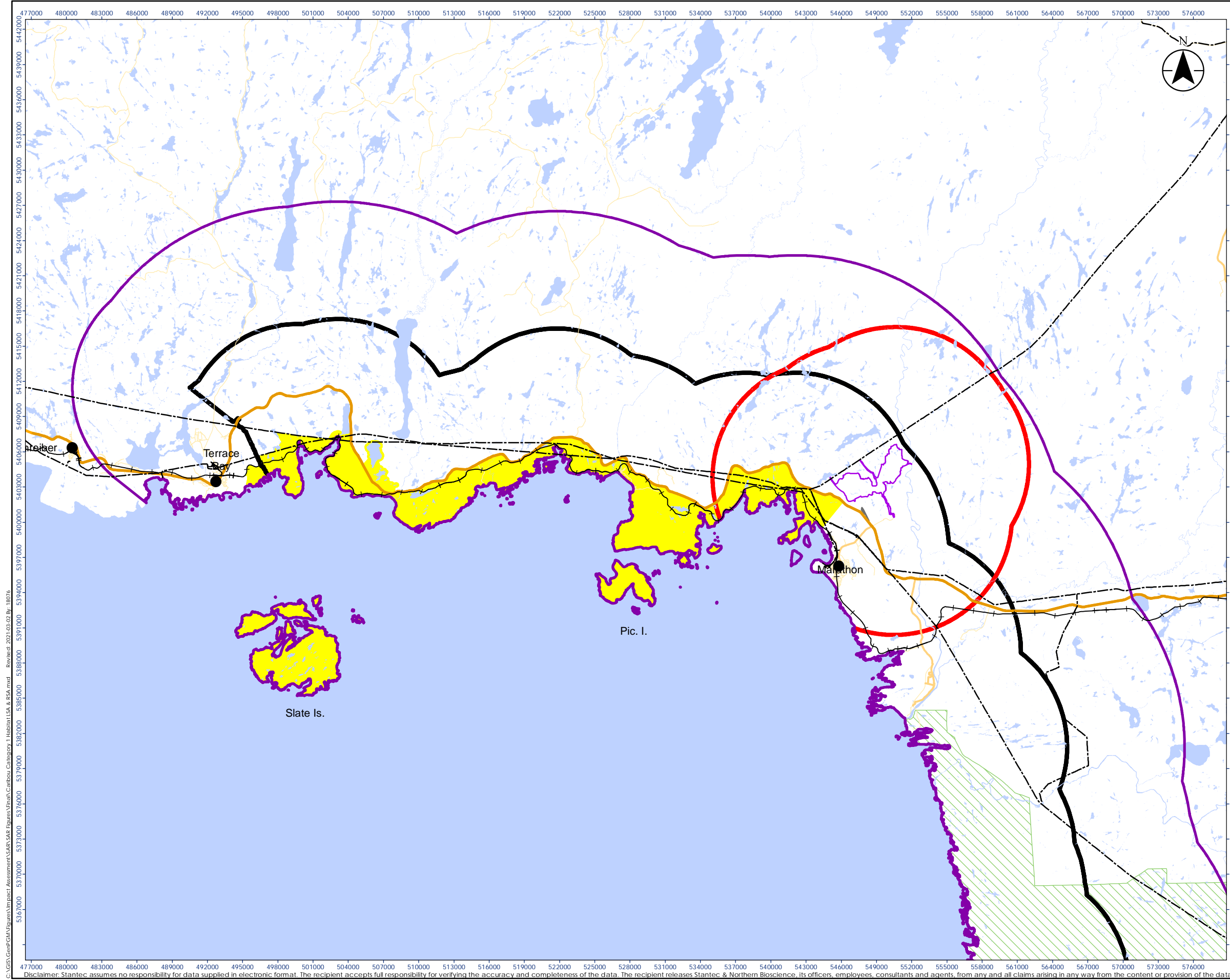
Legend

- ▨ Category 1 Caribou Habitat (OMNRF)
- ▭ 2020 Site Study Area (SSA)
- ▭ 2020 Caribou Local Study Area (LSA)
- ▭ 2020 Caribou Regional Study Area (RSA)
- ▬ Lake Superior Coastal Range Boundary
- ▬ Expressway / Highway
- ▨ Pukaskwa National Park
- ▨ Waterbody (LIO 1:2M)
- ┉ International Boundary
- ● Towns

Utility Line

- ─·─·─ Utility Line
- ─┼─ Railway
- ▬ Highway
- ▬ Major Road
- ▬ Minor Road
- ▨ Waterbody (LIO)
- ▨ Airport Infrastructure
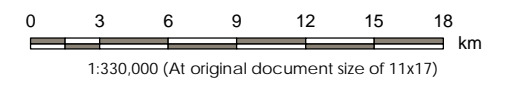
0 3 6 9 12 15 18 km

1:330,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.

Project Location
Marathon

Prepared by R. Foster on 2021-03-02

Client/Project
GENERATION MINING LTD.
MARATHON PALLADIUM PROJECT

Figure No.
1

Title
Caribou Category 1 Habitat in LSA and Adjacent RSA

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec & Northern Bioscience, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.
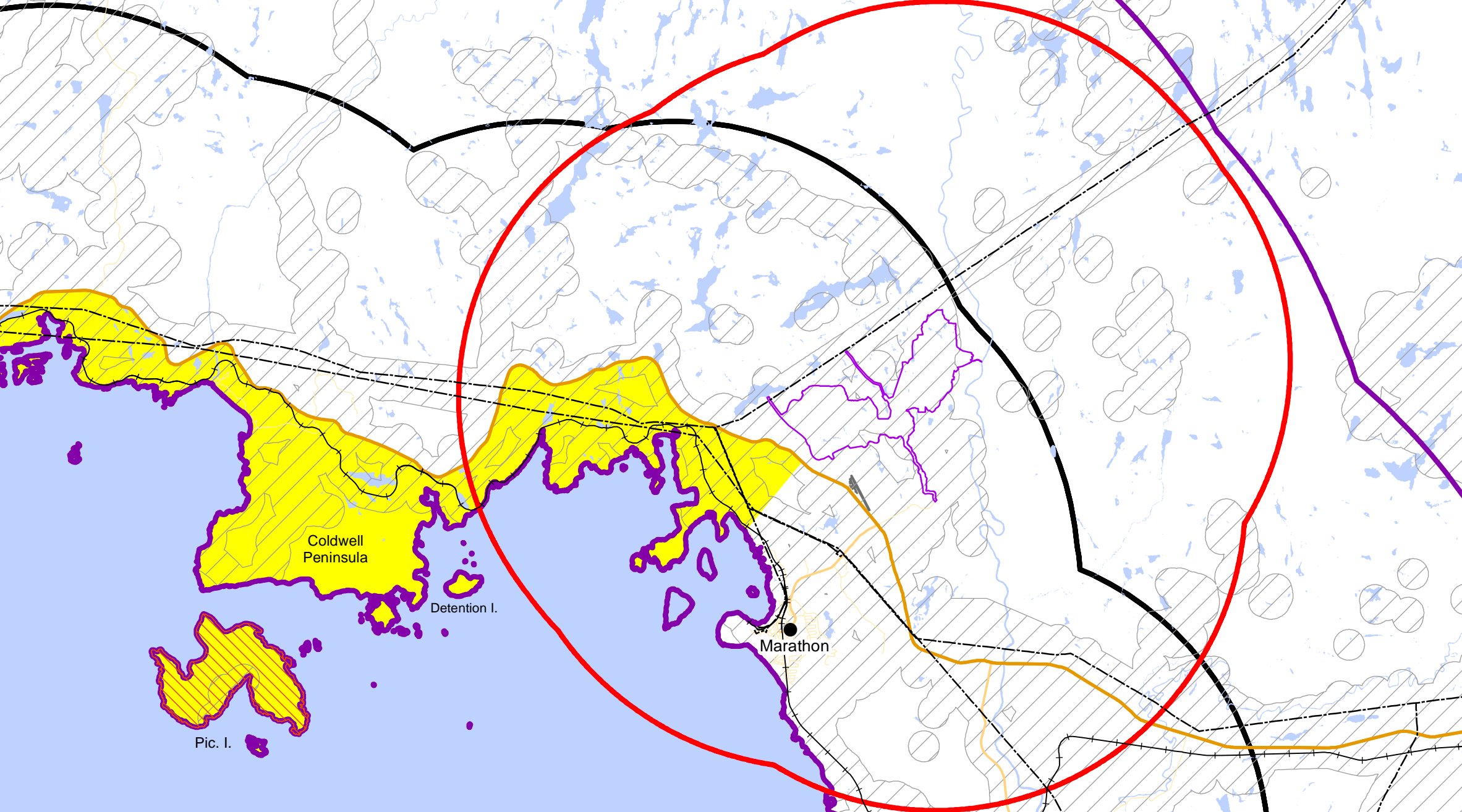
Coldwell
Peninsula

Detention I.

Pic. I.

Marathon

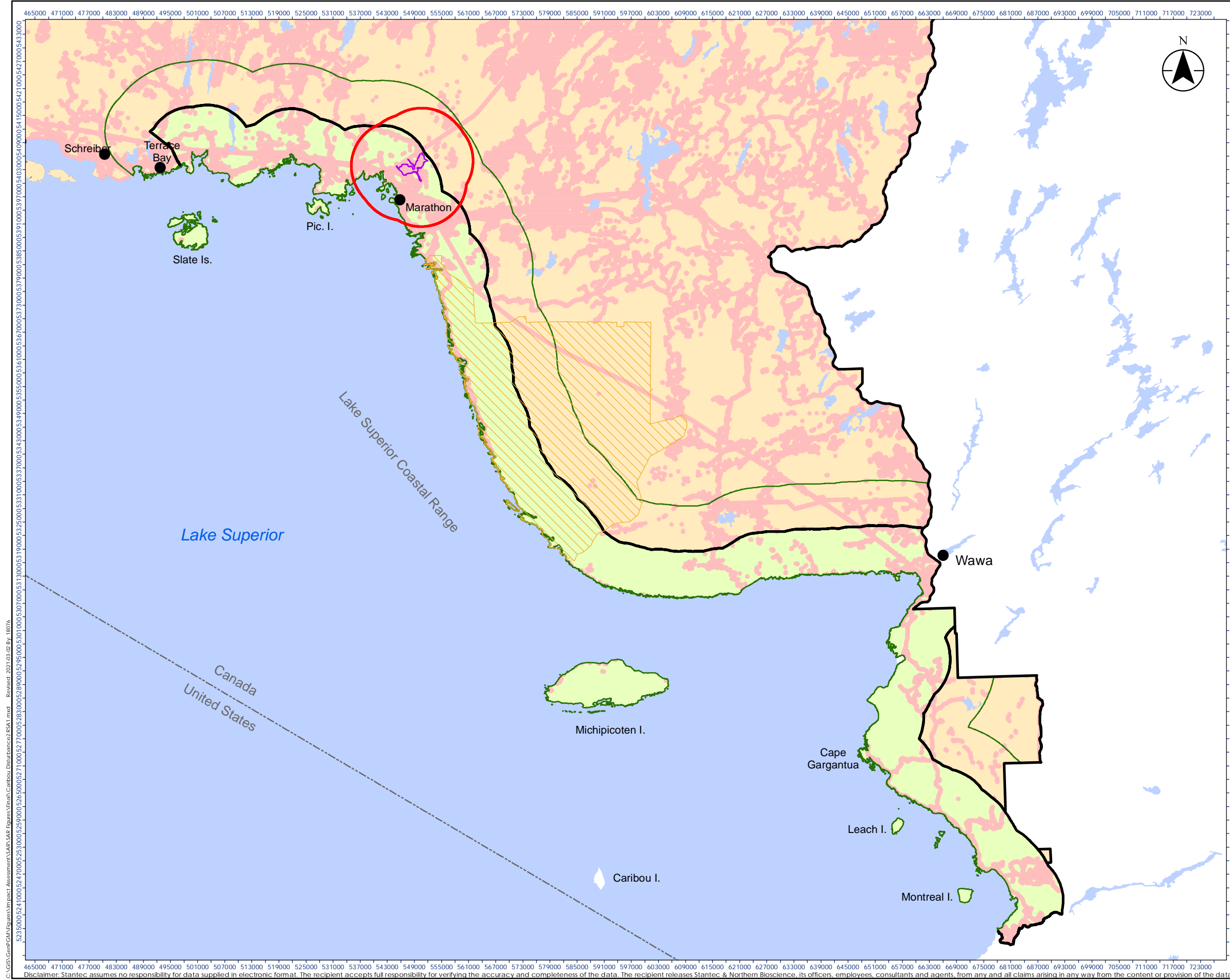# _D9.4   WOODLAND CARIBOU HABITAT DISTURBANCE MODEL_

This woodland caribou disturbance model is based on methods and data sets described in MNRF's (2014b) *Integrated Assessment Protocol for Woodland Caribou Ranges in Ontario*, which was modified from Environment Canada's (2011) disturbance model to better reflect availability of Ontario data sets. Data sets used for this updated analysis differed slightly from those used in MNR (2014b) due to changes in data structure and availability from Land Information Ontario (https://geohub.lio.gov.on.ca/).

Stantec

NORTHERN BIOSCIENCE
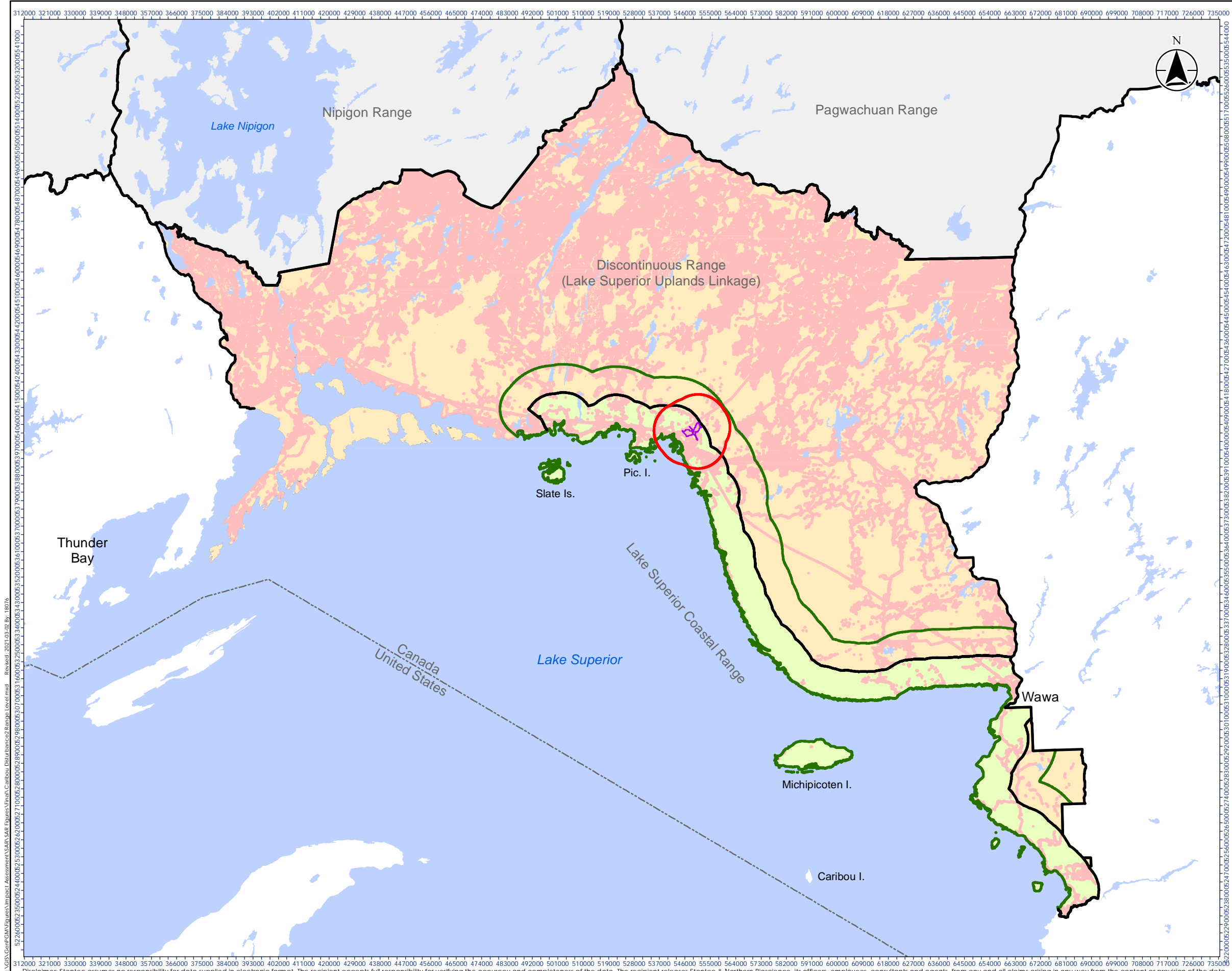
Legend

- ▨ Disturbed Habitat (2020)
- ▭ 2020 Site Study Area (SSA)
- ▭ 2020 Caribou Local Study Area (LSA)
- ▭ 2020 Caribou Regional Study Area (RSA)

2013 Caribou RSA
- ▨ Lake Superior Coastal Range (LSCR)
- ▨ Discontinuous Range (LSUL)
- ▨ Other Caribou Ranges (Continuous Distribution)
- ▨ Waterbody (LIO 1:2M)
- ▭ International Boundary
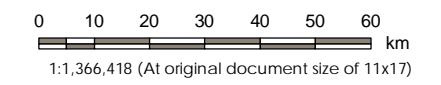
0 10 20 30 40 50 60 km

1:1,366,418 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.

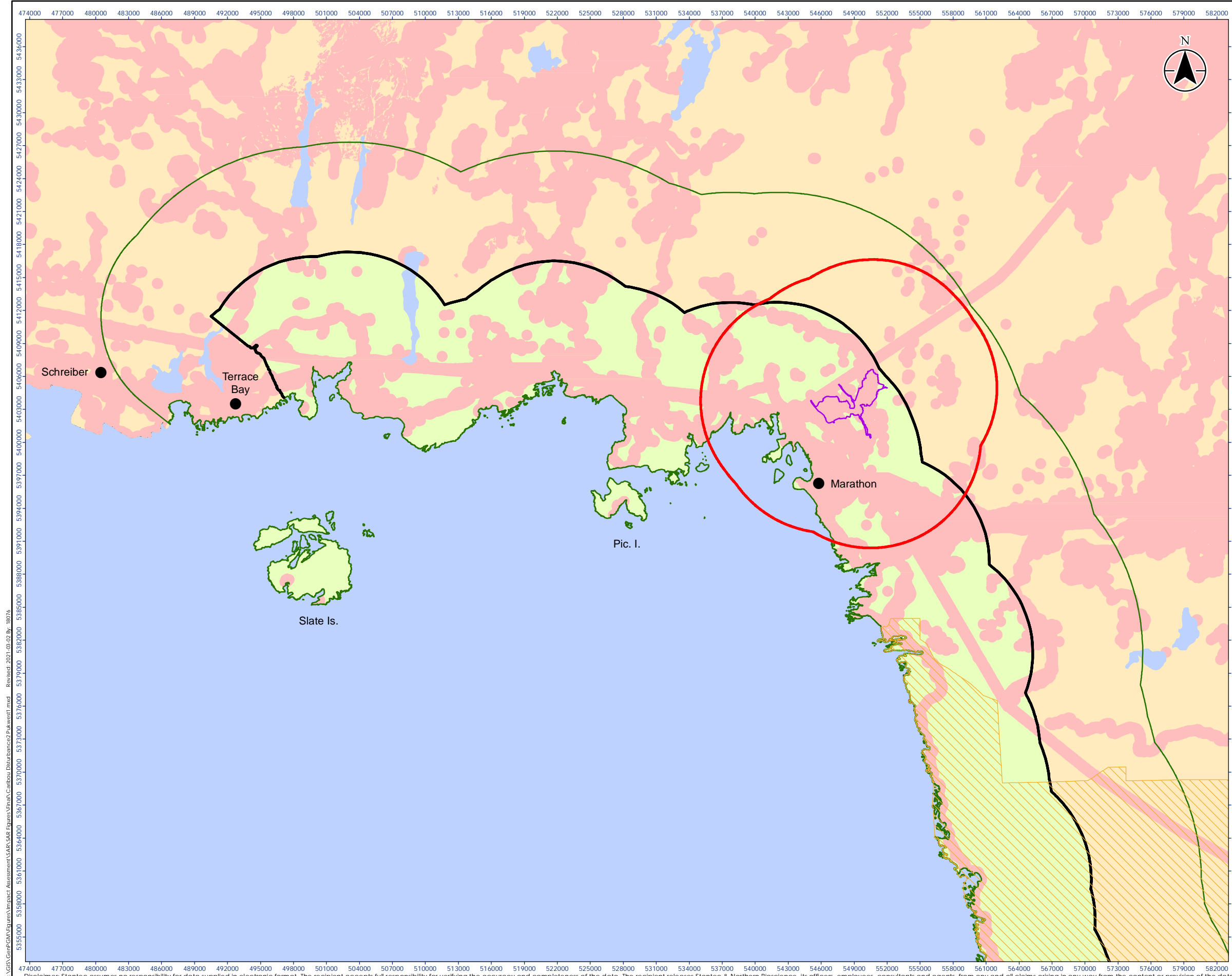Project Location
Marathon

Prepared by R. Foster on 2021-03-02

Client/Project
GENERATION MINING LTD.
MARATHON PALLADIUM PROJECT

Figure No.
Appendix D9.4-1

Title
Disturbance in the Coastal Rnage and Discontinous Distribution
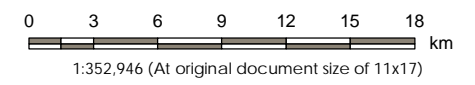

Nipigon Range

Lake Nipigon

Pagwachuan Range

Discontinuous Range
(Lake Superior Uplands Linkage)

Slate Is.

Pic. I.

Thunder Bay

Lake Superior Coastal Range

Lake Superior

Canada
United States

Wawa

Michipicoten I.

Caribou I.

Project Location

Ontario

Minnesota

Wisconsin

Michigan

Lake Superior

Lake Michigan

Lake Huron

Georgian Bay

0 8 16 24 32 40 48
km

1:850,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.

Project Location
Marathon
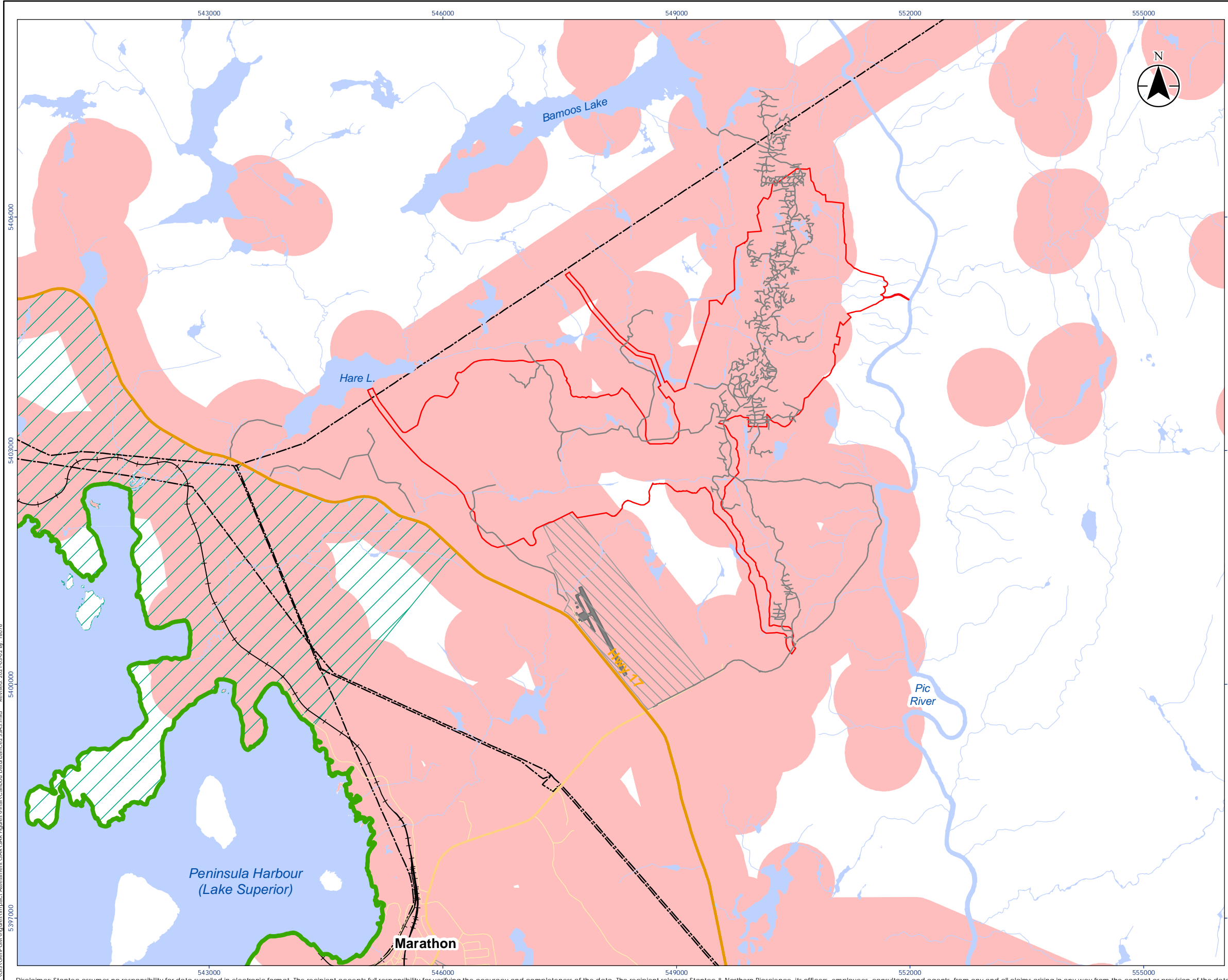
Prepared by R. Foster on 2021-03-02

Client/Project
GENERATION MINING LTD.
MARATHON PALLADIUM PROJECT

Figure No.
Appendix D9.4-2

Title
Disturbance in the Caribou Regional Study Area

Lake Superior

Lake Superior Coastal Range

Schreiber

Terrace Bay

Pic. I.

Slate Is.

Marathon

Wawa

Michipicoten I.

Cape Gargantua

Leach I.

Caribou I.

Montreal I.

Canada
United States

Schreiber

Terrace Bay

Marathon

Pic. I.

Slate Is.

Disturbance in the SSA and adjacenct Caribou LSA

Legend

- Disturbed Habitat (2020)
- Site Study
- Regional Study
- Category 1 Caribou Habitat (MECP 2020)
- Waterbody (LIO)
- Highway
- Major Road
- Minor Road
- Watercourse
- Trails and Stripping
- Utility Line
- Railway
- Highway
- Major Road
- Minor Road
- Airport
- Airport Infrastructure

0 1 2 3 km

1:50,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.

Project Location
Marathon

Prepared by R. Foster on 2021-03-02

Client/Project
GENERATION MINING LTD.
MARATHON PALLADIUM PROJECT

Figure No.
Appendix D9.4-4

Title
Disturbance in the SSA and adjacenct Caribou LSA

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec & Northern Bioscience, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

D9.5   CANADA WARBLER HABITAT MODEL

Habitat associations for Canada warbler vary across its broad Canadian range (COSEWIC 2008; ECCC 2016c; Foster et al. 2017). For example, in Alberta, Canada warblers are commonly associated with older deciduous forest at the local scale, particularly near small, incised streams, and greater amounts of deciduous forest at the stand scale (Ball et al. 2016). In the Maritimes (BCR 14) however, Canada warbler typically breeds in wet deciduous and mixedwood forests, as well as moist seeps between areas of upland forest (Westwood et al. 2017).

Boreal Avian Modelling Project

Based on extensive modelling using data from 1000s of point counts, the Boreal Avian Modelling Project (BAMP 2021) derived the following habitat association (Figure 2) for Canada warbler breeding habitat in Bird Conservation Region 8 (BCR 8): Boreal Softwood Shield, which broadly overlaps the Marathon Palladium Project.
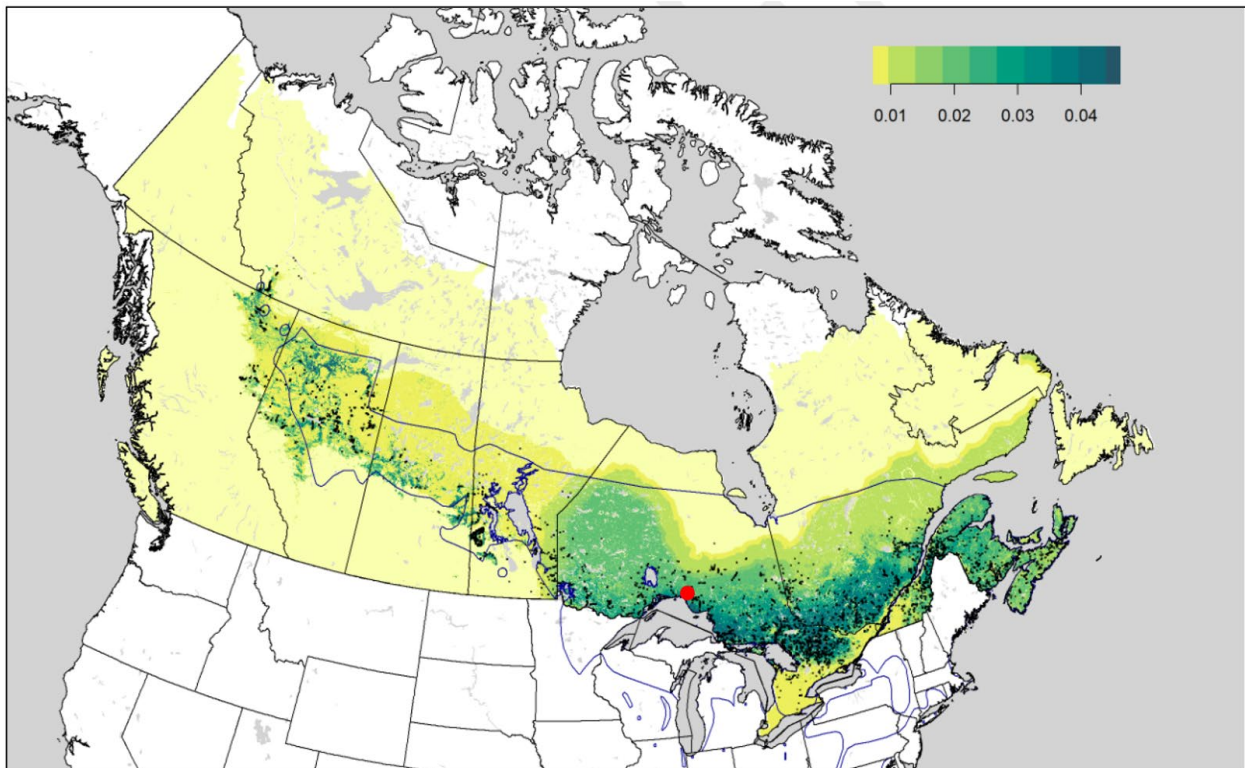
Figure 1. Density map of Canada warbler breeding density (average density, males/ha) with point counts (black dots) where Canada Warbler were detected. Boreal Conservation Region (BCR) 8 in grey outline Source: https://borealbirds.github.io/species/CAWA. Marathon Palladium Project denoted by red dot.

GENERATIONPGM

Appendix D9.5 Canada Warbler Habitat Model

8 Boreal Softwood Shield
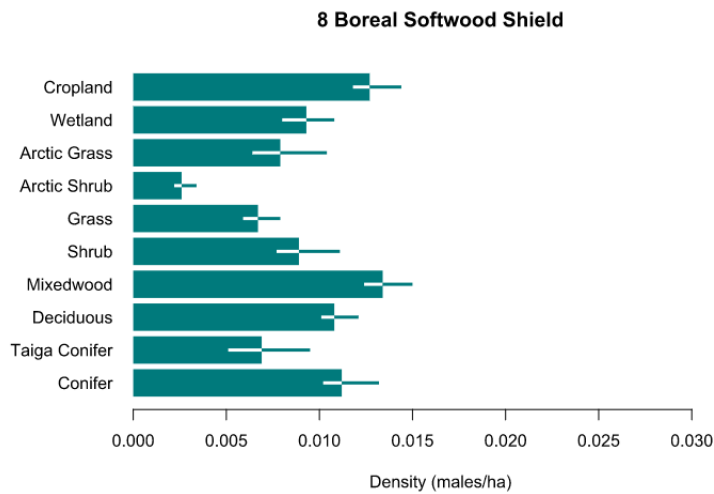
Figure 2. Estimated Canada warbler breeding density for different land cover classes in Boreal Softwood Shield (BCR 8) (Source: https://borealbirds.github.io/species/CAWA).

BCR 8 extents from northeastern Alberta through to Newfoundland, and Canada warblers are expected to be as abundant in cropland as mixedwood forest based on the modelling for the BCR. Given that, it appears the BAMP habitat association is of limited value in predicting Canada warbler density at the Project site.

East-West Tie Transmission Project

Habitat modelling for Canada warbler was presented in the recently approved environmental assessment for the East-West Tie (EWT) Transmission Project (Nextbridge 2018). The EWT passes less than 3 km south of the SSA and its Canada warbler habitat modelling section is reproduced below.

GENERATIONPGM

1.7   Canada Warbler

Throughout their range, Canada warblers (*Cardellina canadensis*) nest in a range of usually wet, forest types, with a well-developed, dense shrub layer (COSEWIC 2008; Environment Canada 2015b). This species is commonly found in shrub marshes, red maple (*Acer rubrum*) stands, cedar (*Thuja* spp.) stands, swamps dominated by black spruce (*Picea mariana*) and tamarack (*Larix laricina*), and riparian woodlands (COSEWIC 2008). In the eastern portion of their range, which includes the warbler RSA, Canada warblers are associated with wet mixedwood forests and early successional forests (6 to 30 years) created by forest harvesting or natural disturbance (Ball and Bayne 2014; Environment Canada 2015b).

The FRI data were used to determine suitable Canada warbler habitat in the wildlife and wildlife habitat LSA and the warbler RSA. The following habitats were determined to be suitable for Canada warbler:

■   forest stands 6 to 30 years of age (all ecosites);

■   riparian areas (all ecosites); and

■   forest stands greater than 30 years of age in the ecosites presented in Table 14-III-8.

Table 14-III-8:   Land Cover Types Identified as Suitable Breeding Habitat for Canada Warbler in the Wildlife and Wildlife Habitat Regional Study Area

Code[a]	Description
C18	Poplar - White Birch - White Spruce - Balsam Fir
C19	Poplar - Jack Pine - White Spruce - Black Spruce
C21	White Cedar - White Pine - White Birch - White Spruce
C22	White Cedar - Other Conifer
C31	Black Spruce - Tamarack: very moist mineral and wet organic soils
C32	White Cedar - Black Spruce - Tamarack: very moist mineral and wet organic soils
C33	White Cedar - Other Conifer: very moist to wet soils
C34	White Cedar - Lowland: very moist to wet soils
NE05	Black Spruce - Fine/Medium Soil
NE06	Black Spruce - Trembling Aspen/Trembling Aspen - Black Spruce - Jack Pine/Trembling Aspen - Black Spruce - Balsam Fir
NE08	Black Spruce - Feathermoss - Sphagnum - Moist Soil
NE09	Black Spruce - Larch/White Spruce - Balsam Fir - White Cedar
NE11	Black Spruce - Labrador Tea - Organic Soil
NE12	Black Spruce - Larch - Labrador Tea - Organic Soil

NEXTBRIDGE
INFRASTRUCTURE

APPENDIX 14-III
WILDLIFE HABITAT MODELS

Table 14-III-8:   Land Cover Types Identified as Suitable Breeding Habitat for Canada Warbler in the Wildlife and Wildlife Habitat Regional Study Area

Code[a]	Description
NE13	Black Spruce - Larch - Speckled Alder/White Cedar - Black Spruce
NE14	Black Spruce - Leatherleaf - Organic Soil
NE15	Red Maple
NW16	Hardwood - Fir - Spruce Mixedwood: Sandy Soil
NW17	White Cedar: Fresh - Moist, Coarse - Fine Loamy Soil
NW19	Hardwood - Fir - Spruce Mixedwood: Fresh, Sandy - Coarse Loamy Soil
NW23	Hardwood - Fir - Spruce - Mixedwood: Moist, Sandy - Coarse Loamy Soil
NW28	Hardwood - Fir - Spruce Mixedwood: Fresh, Silty Soil
NW29	Hardwood - Fir - Spruce Mixedwood: Fresh, Fine Loamy - Clayey Soil
NW30	Black Ash Hardwood: Fresh, Silty - Clayey Soil
NW33	Hardwood - Fir - Spruce Mixedwood: Moist, Silty - Clayey Soil
NW34	Treed Bog: Black Spruce / Sphagnum: Organic Soil
NW35	Poor Swamp: Black Spruce: Organic Soil
NW36	Intermediate Swamp: Black Spruce (Tamarack): Organic Soil
NW37	Rich Swamp: Cedar (Other Conifer): Organic Soil
NW40	Treed Fen: Tamarack - Black Spruce / Sphagnum: Organic Soil
NW44	Thicket Swamp: Organic - Mineral Soil

a) Ecosite (Racey et al. 1996).

GENERATIONPGM

MARATHON PALLADIUM PROJECT ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

Appendix D9.5 Canada Warbler Habitat Model

The "eastern portion" of Canada warbler range is not actually Ontario, but rather the Atlantic provinces (see Figure1 above). Canada warbler habitat associations in the Atlantic provinces are considerably different than in central Canada i.e., where the EWT and current Project are located. Although COSEWIC (2008) does state that Canada warbler habitat consists of "shrub marshes, red maple (*Acer rubrum* L.) stands, cedar stands, conifer swamps dominated by black spruce (*Picea mariana*) and larch and riparian woodlands", most of the references are from other jurisdictions or refer to their broad continental range. Red maple is lacking from the Project site, and both cedar and larch are uncommon. Furthermore, at least in Alberta, Canada warbler is negatively associated with the amount of black spruce at the landscape scale (Ball et al. 2013 *in* Ball and Bayne 2014; Norton et al. 2000). Unfortunately, 22 of the 31 landcover types used in the Nextbridge Canada warbler model are dominant species that are absent or rare in the SSA (i.e., black ash, cedar, red maple, larch), or may not be preferred by Canada warbler in Ontario (e.g., black spruce). COSEWIC (2008, citing Conway 1999) states that Canada warbler is most common in mixed deciduous-coniferous forest with a well-developed shrub layer; this generally appears to be true in Ontario (Foster et al. 2017) and at the Project site. Given these factors, use of the Nextbridge model was considered inappropriate for the Project site and a model specific to this location was developed.

Northern Bioscience

Data from a total of 374 Northern Bioscience point counts from along the north shore of Lake Superior were compiled from four areas within 100 km of the Project:

a) 150 point counts for this Project (2008-2010, 2020 combined),

b) 84 point counts north and west of this Project for Stillwater Canada Inc. mineral exploration (Foster 2019a),

c) 51 point counts near Pick Lake, 20 km northwest of Schreiber (Foster 2019b)

d) 89 points counts near Dayohessarah Lake, 20 km northeast of White River (Foster 2012, 2016, 2020).

Georeferenced incidental observations (n ≤10) of Canada warbler locations were also included in the model.

The location of Canada warblers observed during the above surveys were overlain with current Forest Resource Inventory (FRI) data available from MNRF in a GIS environment (ESRI ArcMap 10.3) to generate a frequency distribution of the provincial ecosites (Banton et al. 2009) used by Canada warbler in the RSA and broader landscape. Presence/absence (rather than # individuals) in an FRI stand was used since some point counts were single visit rather than repeat visit; this also allowed the use of incidental observations. Results of positive ecosite associations and overstory attributes summarized from FRI data are presented below in Table 1. Canada warblers were observed in 73 FRI stands during these surveys, of which most (77% of stands) were ecosites B055 Aspen-Birch Hardwood, B050 Pine-Black Spruce Conifer, and B052 Spruce-Fir Conifer. Ecosites B050 and B052 used by Canada warbler were conifer-dominated, but black spruce canopy cover in these stands was only 27% on average (range 0-60%), and hardwood (mainly white birch) had a mean canopy cover of 29% (range 20-50%). Other ecosites were used less frequently by Canada warbler, some of which (e.g., B134, B142) likely only

represented a portion of their used home range (i.e., calling male may have been heard from the adjacent forest by the observer standing in the open meadow marsh or thicket swamp). In general, used stands were mature to overmature (i.e., least 100 years of age) with a tall (>15m) overstory. The overstory canopy was typically fairly open, averaging only 50% cover, which often allowed a dense shrub understory (that Canada warbler prefer) to develop in the sunlit gaps.

Table. 1. Boreal ecosites and overstory metrics of Canada warbler observations from the north shore of Lake Superior (Northern Bioscience unpublished data).

Boreal Ecosite	# Obs.	Mean Height (m)	Age (years)			Mean Canopy Closure (%)
			Mean	Min.	Max	
B012 Very Shallow, Dry to Fresh: Pine - Black Spruce Conifer	2	13.5	143	140	145	33
B014 Very Shallow, Dry to Fresh: Conifer	1	12.0	66	66	66	30
B016 Very Shallow, Dry to Fresh: Aspen - Birch Hardwood	3	9.0	70	37	135	52
B040 Dry, Sandy: Aspen-Birch Hardwood	2	18.5	73	51	95	70
B047 Dry to Fresh, Coarse: Shrub	2					
B049 Dry to Fresh, Coarse: Jack Pine - Black Spruce Dom.	1	9.0	30	30	30	90
B050 Dry to Fresh, Coarse: Pine - Black Spruce Conifer	5	15.5	96	86	116	61
B052 Dry to Fresh, Coarse: Spruce - Fir Conifer	12	15.8	114	66	156	48
B055 Dry to Fresh, Coarse: Aspen - Birch Hardwood	39	16.5	116	26	156	52
B065 Moist, Coarse: Pine - Black Spruce Conifer	2	15.0	120	95	145	68
B067 Moist, Coarse: Spruce - Fir Conifer	1	12.0	86	86	86	50
B070 Moist, Coarse Aspen - Birch Hardwood	1	24.0	100	100	100	45
B134 Mineral Thicket Swamp	1					
B142 Mineral Meadow Marsh	1					
All Observations	**73**	**14.9**	**103**	**37**	**156**	**50**

GENERATIONPGM

MARATHON PALLADIUM PROJECT ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

Considering B050, B052, B055 as "preferred" Canada warbler habitat and the remaining ecosites with confirmed use as "used", the respective habitat availability in the Project study areas is presented in Table 2 below. There is approximate 771 ha of preferred habitat in the SSA, or about 0.17% of its availability in the RSA.

Table 2. Abundance of preferred and used Canada warbler breeding habitat in the Project study areas.

Canada Warbler Habitat	Total Area (ha)			SSA as % of LSA
	SSA	**LSA**	**RSA**	
Preferred	771	2701	443,184	0.17
Used	300	904	302,126	0.10
Total	1071	3605	745,310	0.14

GENERATIONPGM