WILDLIFE CHARACTERIZATION AND EFFECTS ASSESSMENT OF THE PROPOSED ALL-SEASON ROAD PROJECT 6

FINAL REPORT

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Prepared for:

Manitoba
Infrastructure
Remote Road Operations

Prepared by:

Joro Consultants

EXECUTIVE SUMMARY

This report provides the results and analysis of wildlife studies and assessment of effects and potential mitigation measures for the proposed Project 6 (P6 or the Project) All-Season Road (ASR). P6 is a proposed ASR connecting Bunibonibee Cree Nation, Manto Sipi Cree Nation and God's Lake First Nation. P6 will also provide access to the Northern Affairs community of God's Lake Narrows that is connected to God's Lake First Nation via an existing all-season road. Included in this report is a description of baseline wildlife information, rationales for determination of the wildlife species to be considered as valued components (VC) and Species of Conservation Concern (SOCC) for use in the Environmental Impact Statement for Project 6. Reporting includes the evaluation of potential environmental effects, before and after mitigation, identification of feasible mitigation measures and the characterization of residual effects after mitigation.

The RAA is located within the Boreal Shield Ecozone, which is the largest ecozone in Canada. In Manitoba, it extends north from the southeast corner of the province, encompassing the area between Lake Winnipeg and the Ontario border, and proceeds across the northern extent of the Lake as a broad band from the Ontario to Saskatchewan borders (Smith *et al*., 1998). The ecozone is dominated by both lowlands and broadly rolling uplands. The surficial geology is composed of Precambrian granite bedrock outcrops, moraines, glaciofluvial, and colluvial deposits.

The entire RAA lies within the Hayes River Upland (89) Ecoregion, which extends from the Grass River Basin in east-central Manitoba to the Manitoba-Ontario border. The Hayes River that flows northeast and eventually drains into Hudson Bay is the major waterway in the region. Both Knee Lake and Oxford Lake are widened expanses of the Hayes River. The area is characterized by numerous small streams connecting a network of small lakes and wetlands between drumlinoid ridges, most of which haves exposed bedrock. The RAA is intersected by parts of three ecodistricts, Island Lake (364), God's Lake (365), and Knee Lake (360). The God's Lake Ecodistrict accounts for more than 85% of the total area within the RAA.

Baseline data included in this report are results of desktop literature reviews on wildlife and their habitats and specific studies conducted to document distribution and relative abundance of mammals, birds, and herptiles (i.e. reptiles and amphibians) and local and Aboriginal Traditional Knowledge (TK) in the Regional Assessment Area (RAA) related to wildlife. Baseline field data gathered on mammals has been acquired for P6 from a number of specific monitoring techniques and individual studies, including:

- Aerial multispecies winter track surveys, conducted in the winters of 2012 and 2016, aerial scouting flight in the winters of 2011 and 2014, and aerial group count in winter of 2012 to determine distribution of moose (*Alces alces*), caribou (*Rangifer tarandus caribou)*, and furbearers;
- Aerial winter minimum count moose surveys near the P6 alignment conducted in the winter of 2016 and 2017;

- GPS collar data from woodland caribou captured and collared between 2010 and 2016 occupying the Norway House Range (forest-dwelling ecotype), and the Pen Islands caribou (forest-tundra ecotype);
- GPS collar data for Pen Islands caribou (forest-tundra ecotype) from 2010 to 2016 that came near the P6 RAA shared by Manitoba Sustainable Development (MSD); and
- Trail camera studies beginning in 2016 to detect distribution of moose, caribou, predators, and furbearers.

In addition to these specific monitoring activities, a local trapper participation program was undertaken in the fall/winter of 2016/2017 to provide data on furbearer occurrence in the RAA through documentation of track observations and animals harvested on traplines.

Monitoring activities for birds and amphibians included the use of Autonomous Recording Units (ARUs) deployed during the 2016 breeding season to determine their occupancy and diversity. Data from surveys conducted by the Manitoba Breeding Bird Atlas also provided additional information on breeding bird diversity and occupancy within the RAA. Aerial surveys were conducted during the spring and fall of 2016 in proximity to waterbodies near the P6 alignment to detect potential seasonal staging areas for waterfowl. Raptor stick nests (mainly eagles) were documented during these surveys, as well as during other winter aerial surveys as “incidental wildlife observations”.

The wildlife monitoring program also included the documentation of local and traditional wildlife knowledge pertaining to mammals, birds, and herptiles learned through community wildlife workshops and interviews. The results of workshops and interviews conducted in 2015 and 2016 in the three First Nation communities (Bunibonibee Cree Nation, Manto Sipi Cree Nation, and God’s Lake First Nation) provided supplemental information verifying species presence and the identification of important habitats for caribou, moose, furbearers, birds, and amphibians. Local community members also participated in many of the wildlife surveys in addition to the trapper program.

Results of the bird monitoring studies revealed the diversity of bird species and their abundance within the RAA. Four bird species of conservation concern (SOCC)[1] were documented in the RAA using wildlife monitoring methods outlined above.

Results of winter aerial surveys illustrated consistency in moose observations between two separate surveys, thereby providing a precise baseline estimate with little associated uncertainty. The caribou telemetry data[2] demonstrated that seasonal occupation and migration of the Pen Islands caribou occurs through the RAA during winter. Local and traditional knowledge, trail camera observations, and GPS collar data verified that a few caribou established year-round residency within the RAA. The eastern extent of the range of the Norway House Boreal woodland caribou population intersects a very small portion of the western extreme of the RAA. Local and traditional knowledge also identified that some

[1] Species of conservation concern include those listed under Species at Risk Act (SARA), Manitoba Endangered Species and Ecosystems Act (MESEA), Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and as S1 (very rare) or S2 (rare) by Manitoba Conservation Data Center (MBCDC).

[2] Telemetry data and locational mapping for species of conservation concern and hunted species is considered sensitive and has been removed from this document, as disclosing the information may cause substantial harm to the species.

species such as raccoons (*Procyon lotor*) and polar bear (*Ursus maritimus*), which are outside of their normal range, occur occasionally in the RAA.

Wildlife valued component (VC) species for the study included wildlife species known or likely to occur in the RAA, which are measurable for project effects over the long term, and identified as important by First Nations, science and/or government regulators. The 14 species selected as wildlife VCs include: caribou (*Forest-tundra and Forest-dwelling)*, moose, beaver (*Castor canadensis*), marten (*Martes americana*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos)*, ring-necked ducks (*Aythya collaris*), bald eagle (Haliaeetus leucocephalus), ruffed grouse (*Bonasa umbellus*), magnolia warbler (*Setophaga magnolia)*, ovenbird (*Seiurus aurocapilla)*, yellow-bellied flycatcher (*Empidonax flaviventris)*, palm warbler (*Setophaga palmarum)*, and northern spring peeper (*Hyla crucifer crucifer)*.

A separate evaluation conducted for Species of Conservation Concern (SOCC), comparable to that of VCs, included a determination of potential effects, and appropriate mitigation if required. Fourteen SOCC may also occur within the RAA. These include 11 birds and 3 mammals (Appendices A-C). Further detail on conservation status listing for species within the RAA are provided in Section 4.3.4.

The potential effects to wildlife VCs and SOCC from construction and operation of Project 6, before and after mitigation, were identified by Joro Consultants Inc. and included:

Ungulates (VCs: caribou and moose):

- Habitat loss / alteration / fragmentation
- Sensory disturbance and displacement including calving areas
- Increased mortality due to vehicle collisions
- Increased mortality due to changes in hunting access
- Increased mortality due to changes in predation
- Introduction of disease from white-tailed deer (i.e., brainworm [*P. tenuis*])

Furbearers (VCs: beaver and marten):

- Habitat loss / alteration from changes in local drainage
- Sensory disturbance
- Increased mortality due to vehicle collision, winter water drainage, and problem wildlife removal

Birds (VCs: Canada goose, mallard**,** ring-necked duck, bald eagle, ruffed grouse, magnolia warbler, ovenbird, yellow-bellied flycatcher, palm warbler):

- Habitat loss / alteration/ fragmentation
- Loss of nests, mortality to young
- Sensory disturbance
- Increased mortality due to project infrastructure and vehicle collisions

Reptiles and Amphibians (northern spring peeper VC):

- Habitat loss/alteration/fragmentation
- Winter mortality from compaction

These effects were evaluated before and after mitigation using criteria (duration, magnitude, extent, frequency, reversibility and ecological and socio-economic context) identified by the Canadian Environmental Assessment Agency (the Agency) guidelines issued for Project 6 and the results of baseline studies, habitat modeling and pertinent literature. Key mitigation measures include the timing of clearing and construction to avoid key breeding and reproduction periods for VC species and the maintenance of vegetative buffers and water flow patterns. Potential residual effects to wildlife VC and SOCC that may remain after mitigation are also identified and include habitat loss.

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ACKNOWLEDGEMENTS

We would like to thank the First Nation communities of God's Lake, Bunibonibee and Manto Sipi for welcoming the Manitoba Infrastructure (MI) Wildlife Program Team into their communities and for participating in the Wildlife Workshops. We appreciated the opportunity to speak with a number of local resource users and the openness for which they shared their knowledge and understanding. In addition, we would like to thank local trapper participants who assisted with collecting baseline furbearer data. Select caribou data was shared by Indigenous and Northern Relations, Resource Management Boards which allowed for a more robust assessment. We are grateful for the Breeding Bird Atlas' participation in baseline data gathering in the Project 6 area. We would also like to acknowledge and appreciate the data contributions of the Boreal Avian Modelling (BAM) Project, its data partners, funding agencies (including Environment Canada and the U.S. Fish & Wildlife Service) and Technical Committee members, listed in full at www.borealbirds.ca/index.php/acknowledgements.

GLOSSARY OF TERMS

Brunisols - Soil formed under forest and is brown in color and may have either clay or aluminum and iron compounds, or both.

Colluvial* – A mass of sediments deposited by colluvial processes, most commonly loose rock debris.

Drumlinoid Ridges - A rock drumlin or drift deposit whose form approaches but does not fully attain that of a classic drumlin, even though it seemingly results from similar processes of moving ice.

Depressional – an area of low ground surrounded by higher ground in all directions, or a sinkhole; the depression may or may not be filled with water.

Ericaceous* – Plants in or related to the heather family (Ericaceae), typically found on acid soils.

Eutric Brunisols – Part of the Brunisolic soils, they lack a well-developed mineral-organic surface horizon and have a high pH.

Fibrisols - Organic soil contains mostly un-decomposed fibric organic material and occurs in peat deposits of Sphagnum mosses.

Glaciofluvial* – Pertaining to the channelized flow of glacier meltwater and deposits and landforms formed by meltwater streams.

Glaciolacustrine* – Pertaining to glacial lakes.

Gleysols – Soil developed under wet conditions and periods of reduction, which may have 40 cm of mixed peat or 60 cm of fibric moss peat on the surface and occurs under a range of climatic conditions.

Kettled fluvioglacial deposits* – Shallow, sediment-filled bodies of water formed by retreating glaciers.

Luvisol - Well to imperfectly drained soil in sandy to loamy sites with a layer of silicate clay and are the base saturated parent material under forest vegetation.

Mesisol – Organic soil found in peatlands at an intermediate stage of decomposition.

Moraines* – A landform that consists of un-stratified glacial drift that is usually till or, less commonly, of other drift.

Organic Cryosols – Developed primarily from organic material and are underlain by permafrost within 1 m of the surface.

Pathway of effect – mechanism through which an affect to Valued Component (change in evnironment) occurs as a result of a project activity**.**

Physiography* – Pertains to the factors that influence the development of landforms or a landscape, such as relief and topography, bedrock geology and structure, and geomorphological history.

Regosols – Weakly developed soils that lack recognizable primary horizons and commonly associated with unstable land surfaces.

Serotiny – An ecological adaptation exhibited by some seed plants, in which seed release occurs in response to an environmental trigger, rather than spontaneously at seed maturation. The most common and best studied trigger is fire.

Stochasticity – The quality defined by a process which is random, uncertain, or unpredictable; i.e involving a random variable.

Surficial geology* – The geology of surficial materials.

*All definitions have been described in Dunster and Dunster (1996), the remainder as described in Smith *et al. (*1998).

1.0 INTRODUCTION

Manitoba Infrastructure is developing an all-season road (ASR) network to the remote First Nation (FN) and Northern Affairs communities on the east side of Lake Winnipeg. ASR development is part of a Large Area Transportation Network (LATN; Map 1) that includes Manto Sipi Cree Nation, Bunibonibee Cree Nation, God's Lake FNcollectively known as Project 6 (P6 or the Project; Map 2). P6 will also provide access to the community of God's Lake Narrows via an existing all-season road connection from God's Lake First Nation. Project 6 is proposed to be a two-lane gravel road located on Provincial Crown Land, approximately 138 kilometres (km) long and has a 60 metre (m) wide right-of-way (ROW; Map 2). An Environment Act Licence (Class II) is required, and the P6 Project may require an Environmental Impact Assessment (EIA) is expected to undergo both provincial and federal review.

This report identifies and evaluates potential Project effects associated with wildlife in the RAA and mitigation. It includes a summary of the existing environment, criteria for the selection of Valued Wildlife Components (VC's) and rationale for the assessment of potential effects and mitigation related to construction and operation of the project. Additional detail on baseline data collected in the RAA and on data collection methods, on which the effects assessment is founded, is described in a separate report titled Project 6: Existing Environment Wildlife Report (Joro, 2017).

Baseline wildlife data collected over the last six years (2011 - 2017) were used to characterize the distribution and relative abundance of mammals, birds, and herptiles (i.e. reptiles and amphibians) in the P6 Regional Assessment Area (RAA; Map 2). The data collected supported the identification and evaluation of potential effects related to P6. Mammal studies to delinate ranges, habitat types and seasonal use, and abundance were conducted and included:

- GPS collar data from woodland caribou occupying the Norway House (forest-dwelling ecotype) and the Pen Islands (forest-tundra ecotype) populations,
- aerial multispecies winter track surveys, aerial winter minimum count moose surveys, and
- trail camera studies.

Bird and amphibian studies, to determine potential for SCC, occupancy and relative abundance of avifauna included data collected from Autonomous Recording Units (ARUs), Manitoba Breeding Bird Atlas (MBBA) point count surveys, and aerial spring and fall waterfowl surveys.

A local trapper participation program was also undertaken to acquire local knowledge on furbearer occurrence and relative abundance. Local and traditional wildlife knowledge gathered from community wildlife workshops held in the three FN communities (Manto Sipi, Bunibonibee, and God's Lake) provided valuable information from community members, including hunters and trappers, to supplement wildlife monitoring results. In addition, community members participated in many of the wildlife field surveys.

Results of data analyses on baseline wildlife data collected on mammals, birds, amphibians and herptiles, summarized in this report and detailed in a Project 6 Existing Environment Wildlife Report (Joro, 2017), were used to identify and assess potential project-related effects including: habitat loss, disturbance, mortality and invasive species. Specific criteria, identified by the Canadian Environmental Assessment Agency (CEAA) (including duration, magnitude, geographic extent frequency, reversibility and ecological and social context) were used to evaluate and rank the degree of potential project-related effects on wildlife. This report documents the additional information on data analysis, results and supporting documentation for the rankings that were derived.

2.0 STUDY AREA

The RAA, encompassing an area of 9,005 km^2 P6 RAA (Figure 1; Map 2). The boundaries of the RAA were determined by KGS and MI, with input from technical specialists including Joro, using a multi-disciplinary approach incorporating both biophysical and social factors resulting in the area extending approximately 20 km beyond the alignment. Species of importance to FNs were determined through workshops, open houses and community discussions and included (but not limited to), large mammals (moose and caribou), furbearers, and migratory waterfowl. The extent of the RAA boundary was selected with consideration of home ranges of large ranging species such as moose and areas of traditional use in proximity to P6. Administrative boundaries that best describe the RAA are the MSD, Wildlife and Fisheries Branch, Game Hunting Area (GHA) 3A (MSD, 2016a) or the MSD, Forestry Branch, Forest Management Unit (FMU) 76, 94, 95, 96, 97, 98, and 99 (MSD, 2013) (Map 3).

The RAA includes a small portion of the Pen Islands (Eastern Migratory) caribou range and the Norway House woodland caribou range. The Pen Islands migratory caribou population are known to have a very large range, extending to the Hudson Bay coast and north of the Nelson River. The Norway House woodland caribou population occurs north east of Lake Winnipeg, ranging from the northeastern coast of Lake Winnipeg north to Bunibonibee Cree Nation and east towards the Ontario border. Baseline data on caribou have been gathered across these ranges and are included in this report. The RAA also encompasses habitat for other species with smaller, multi-generational home ranges that are expected to exist throughout P6 (e.g., furbearers and small mammals), as well as areas important as breeding and/or staging habitat for waterfowl and other migratory birds, and areas of known or potential local resource and traditional use.

FN communities located within the RAA include Bunibonibee, Manto Sipi, and God’s Lake. God’s Lake Narrows Northern Affairs community is also located within the RAA. These communities utilize sections within the RAA as traditional hunting and trapping areas for wildlife species. In addition, winter roads, hydro transmission lines, recreational trails, quarries, and traplines occur throughout the RAA. There are also several lodges and outposts which provide various services focused mainly on angling and hunting.

The Local Assessment Area (LAA) for P6 is defined as a 5-km buffer on either side of the proposed P6 ASR route, encompassing an area of 1,327 km^2 (Figure 1; Map 2). For caribou and moose, the LAA is defined as a 10 km buffer extending from the Project footprint, an area of 2,503 km^2 while the 5 km buffer was maintained for all other wildlife VCs. This expanded 10 km buffer LAA is shown as the Ungulate LAA within subsequent figures in this report. The Project Footprint (PF) for P6 is defined as the 100 m ASR ROW, encompassing an area <14 km^2.

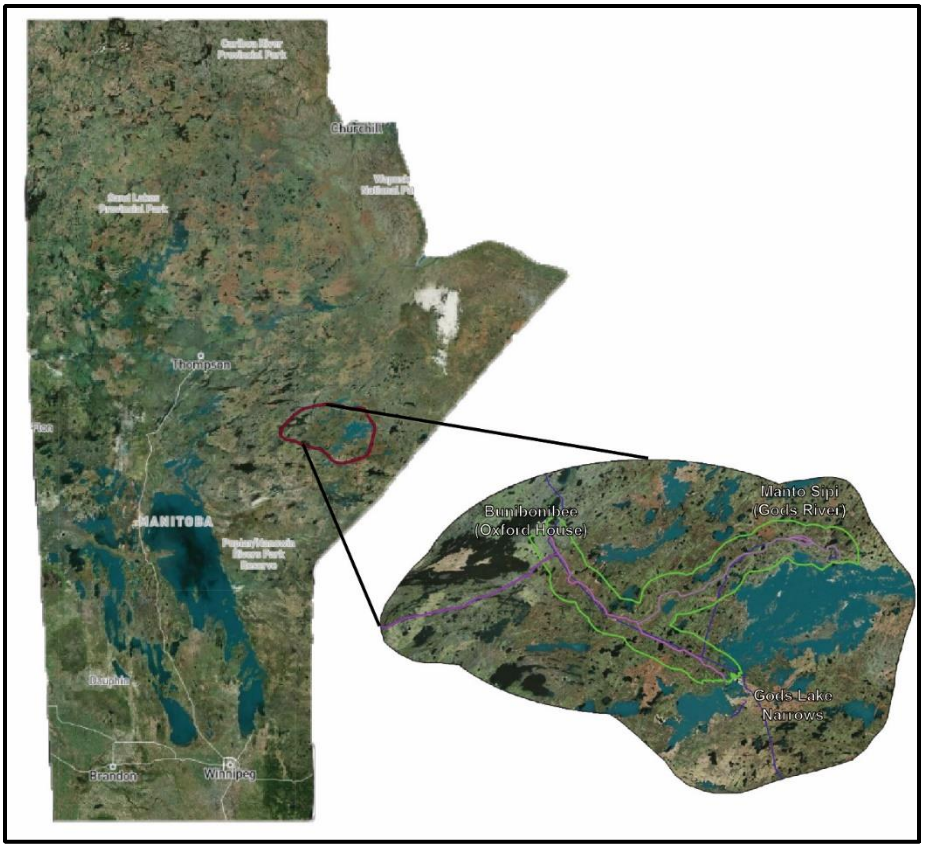

Figure 1: Location of the P6 RAA and the LAA within northeastern Manitoba

3.0 METHODS

3.1.1 **Desktop Methods**

Biophysical information for the P6 RAA including ecodistrict information, surficial geology, soil types, forest cover, and fire history was reviewed from various sources (Rowe, 1972; Zoladeski *et al.,* 1995; Smith *et al*., 1998; NRC, 2003; LGRFN and OMNR, 2011; Trommelen, 2012). See sections 4.1 and 4.2 for detailed biophysical information in the RAA.

Species' range maps and conservation status information was also utilized to determine listings of potential wildlife that may occur in the area (Caras, 1967; Banfield, 1974; Smithsonian (n.d.); Preston, 1982; Manitoba Avian Research Committee, 2003; MBBA, 2014a; Cornell Lab of Ornithology, 2015; Canadian Herpetological Society, 2016; Nature North, 2017), and their current conservation ranking (Committee on the Status of Endangered Wildlife in Canada or COSEWIC, 2017; Manitoba Conservation Data Centre or MBCDC, 2016a; Manitoba Endangered Species and Ecosystems Act or MESEA, 2017; Species at Risk Act or SARA, 2017). See Section 4.5 for a detailed overview of wildlife present in the RAA.

3.1.2 Wildlife Monitoring and Assessment Methods

As part of a suite of baseline monitoring methods to map wildlife distribution, characterize habitat use and movement patterns within the RAA, various methods were used to record species of ungulates, predators, furbearers, birds and herptiles, including:

- GPS collaring of woodland caribou to obtain detailed telemetry data to provide information on distribution and seasonal occupation (February 2010 - March 2017);
- Trail camera studies to detect ungulate, predator, and furbearer occupancy (2016);
- Aerial multispecies distribution surveys to record tracks and observations of ungulates, furbearers, and large stick nest surveys (winters of 2011, 2012, 2014, 2015 and 2016);
- Incidental wildlife observations recorded during all aerial and ground-based surveys and studies (2011 - 2017);
- Total minimum count aerial moose surveys to acquire baseline information on areas of high moose concentration and provide an estimate of moose densities and distribution within a baseline survey area associated with the preferred P6 alignment (winters of 2016 and 2017), ARUs deployed in selected habitat types to detect vocalizations from a variety of bird and amphibian species (spring 2016);
- Aerial waterfowl surveys to record waterfowl species presence during breeding and staging periods in spring and fall (2016);
- TK workshops and interviews with First Nation community members to gather information on wildlife movement and distribution, and identify species that are important to community members (2016); and
- The trapper program was conducted in 2016 - 2017 to initiate trapper involvement, acquire furbearer baseline data through local and regional distribution, and promote collaboration with the local trapping community (2016 - 2017).

Additional detail on field data methods utilized to collect data on individual species can be found in Sections 6.1 to 6.6 of this report, and further detail on general methods can be found in the Project 6 Existing Environment Wildlife Report (Joro, 2017). This report also provides methods and results of assessments on wildlife Valued Components (VCs) based on criteria for wildlife VC selection and assessment of project related effects before and after mitigation. Wildlife VC habitat modelling was also conducted to determine amount and location of high quality habitat within the RAA, LAA and project footprint areas (Section 6.0).

4.0 EXISTING ENVIRONMENT

4.1 Environmental Setting

This section provides a summary of the existing environment for the P6 RAA and describes the environmental setting and baseline data gathered on wildlife as it relates to P6 RAA (Figure 1; Map 2). Information on the environmental setting for the P6 RAA is also summarized in the Project 6 Existing Environment Wildlife Report (Joro, 2017).

The RAA is located within the Boreal Shield Ecozone, which is the largest ecozone in Canada. In Manitoba, it extends north from the southeast corner of the province, encompassing the area between Lake Winnipeg and the Ontario border, and proceeds across the northern extent of the Lake as a broad band from the Ontario to Saskatchewan borders (Smith *et al.,* 1998). The ecozone is dominated by both lowlands and broadly rolling uplands.

The **surficial geology**[3] is composed of Precambrian granite bedrock outcrops, **moraines**, **glaciofluvial**, and **colluvial** deposits. The continental climate is typically characterized by short warm summers and cold, snowy winters. Soils are dominated by **luvisols** in the south and **brunisols** in the north (Zoladeski *et al.*, 1995). Brunisolic soils comprise one of three forest soil orders and can be viewed as part of a prolonged evolutionary sequence that begins with an unweathered parent material (**Regosols**) and ends with development of a “mature” forested soil of the Podzolic or Luvisolic orders; the Brunisolic “stage” may last for several thousands of years.

The entire RAA falls within the Hayes River Upland (89) Ecoregion (Figure 2), which extends from the Grass River Basin in east-central Manitoba to the Manitoba-Ontario border. The Hayes River that flows northeast and eventually drains into Hudson Bay is the major drainage channel in the region; both Knee Lake and Oxford Lake are widened expanses of the Hayes River. The area is characterized by numerous small streams connecting a network of small lakes and wetlands between **drumlinoid ridges**, most of which have exposed bedrock. Most of the area is a mix of till blankets and till veneers over bedrock. Well to moderately-well drained till and glaciolacustrine parent materials are generally associated with eluviated eutric brunisol soils, while imperfect to poorly drained deposits are frequently overlain by regosolic gleysols and a mix of cryosols and mesisols (Trommelen, 2012).

[3] Words in bold are defined in the Glossary of Terms

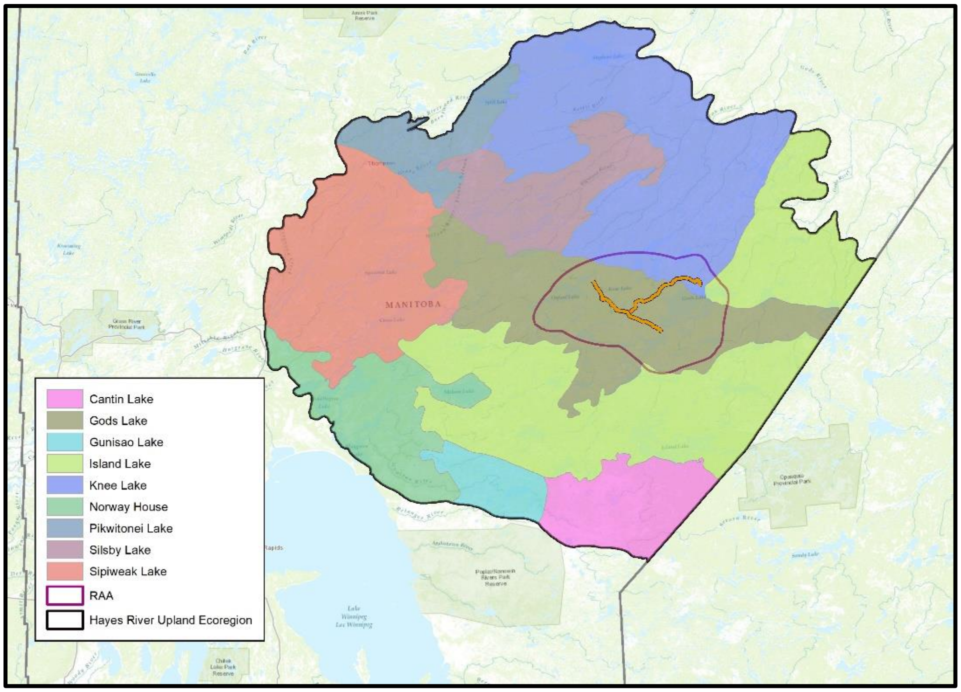

Figure 2: Location of the P6 RAA and ecodistricts within the Hayes River Upland in northeastern Manitoba

4.2 Ecodistricts

The RAA is intersected by parts of three ecodistricts, Island Lake (364), God's Lake (365), and Knee Lake (360) (Figure 3). The God's Lake Ecodistrict accounts for more than 85% of the total area within the RAA (Figure 3).

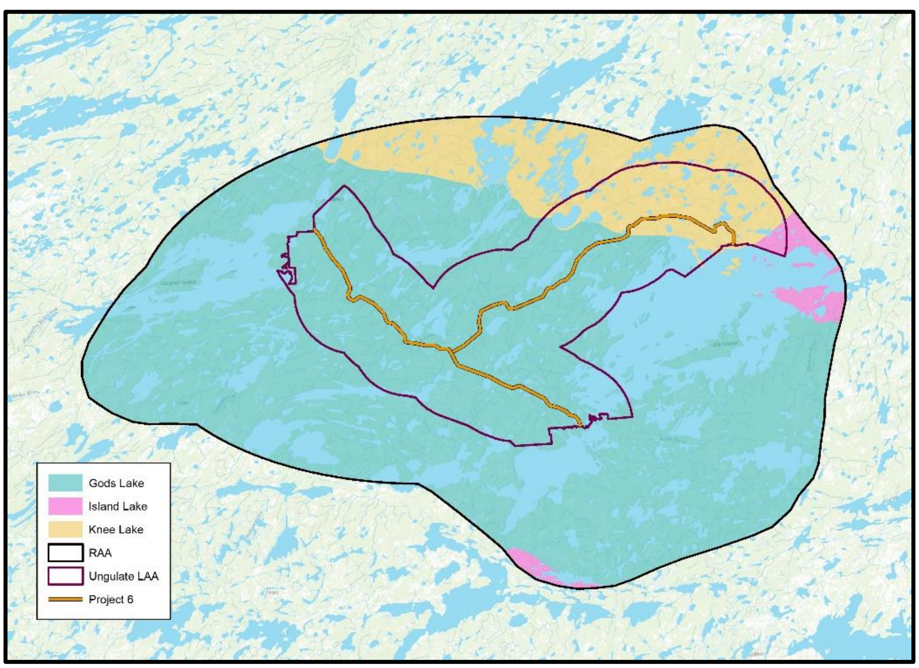

Figure 3: Location of ecodistricts that intersect the P6 RAA in northeastern Manitoba

The surficial geology and soil to a large extent determine the organic productivity of the landbase, including the vegetation communities and the wildlife it supports (Figure 4 and Figure 5). The glacial tills are a product of the scraping and plucking of bedrock by glacial ice resulting in variably sized rock fragments that were transported, crushed and mixed into a thin sediment layer. Till veneers and till blankets underlie most of the area accounting for almost 75% of the whole RAA area.

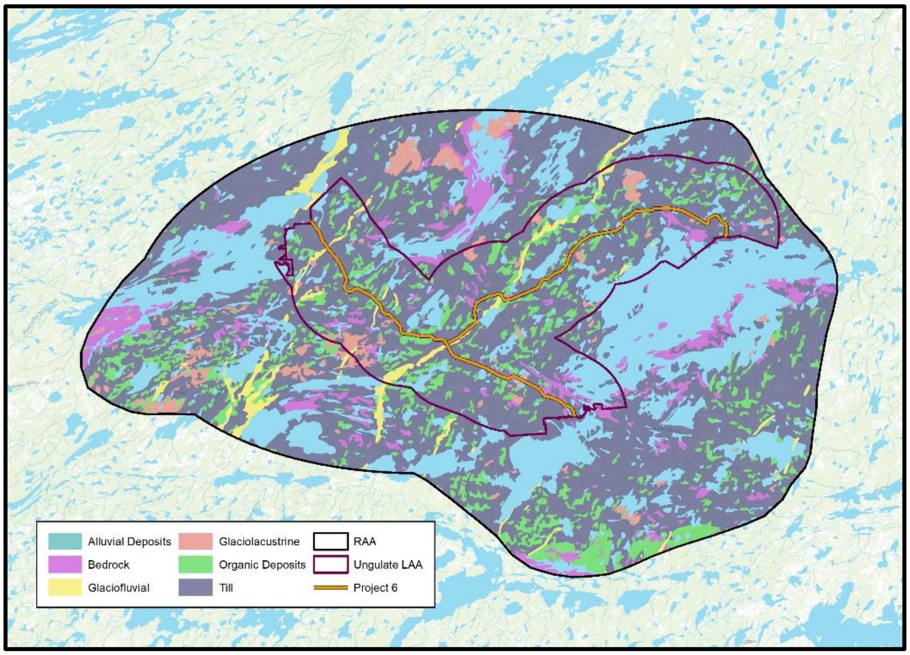

Figure 4: Surficial geology within the P6 Regional Assessment Area

Eutric brunisols (>71%) and cryosols (25%) dominate the soil profile within the RAA (Figure 5).

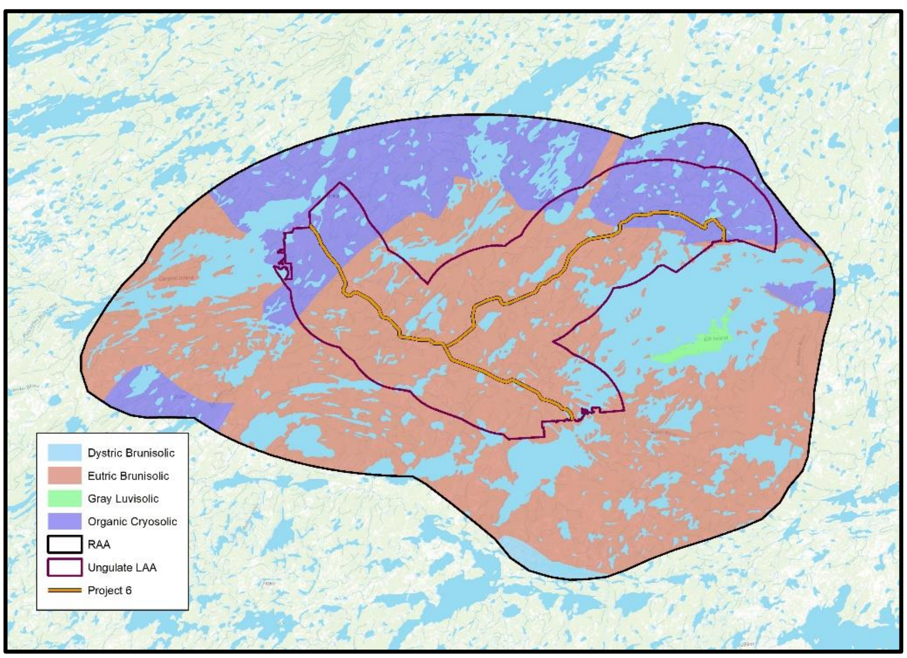

Figure 5: Distribution of major soil types within the P6 RAA

4.2.1 The God's Lake (365) Ecodistrict

This is the predominant ecodistrict in the RAA; it begins at Landing Lake and lies entirely within Manitoba except for its most eastern tip which falls in Ontario. This ecodistrict is located in the central part of the Hayes River Ecoregion and is bordered on both north and south by the Island Lake (364) Ecodistrict and also by the Knee Lake (360) Ecodistrict to the north (Figure 3) (Smith *et al.*, 1998). The mean annual temperature is -1.5°C with an average growing season of 155 days. The mean annual precipitation is approximately 560 mm, of which less than one-third falls as snow (Smith *et al.*, 1998).

The **physiography** of the region consists of undulating to hummocky morainal plain of calcareous, sandy to loamy till deposits with clayey **glaciolacustrine** veneers and blankets all over the region, especially on lower slopes and depressions. Northern plateau bog, peat plateau bog, flat bog, patterned and horizontal fens (deep peat deposits), and veneer bog (shallow peat materials) frequently cover the fine textured glaciolacustrine sediments. There are also areas where prominent **kettled fluvioglacial deposits** occur (Smith *et al.*, 1998). Oxford Lake and God's Lake are the largest of the wide range of lakes within the ecodistrict that contribute to the region's northward flowing water (Smith *et al.*, 1998).

The God's Lake Ecodistrict has well to imperfectly drained mineral soils comprised of eluviated **eutric brunisols** and **gray luvisols** which can be found on upland clayey glaciolacustrine deposits. Peat-filled areas cover a large area on this region and are comprised of poorly drained bogs and very poorly drained fens. The soil is composed of a range of peat types including **fibrisols** (slightly decomposed sphagnum and feather moss peat), **mesisols** (moderately decomposed moss and forest peat), and **organic cryosols** (areas with permafrost) (Smith *et al*., 1998). The deeper layers of peat are generally more decomposed than those close to the surface as is the case in peat fens. In areas with gentle slopes, shallow peat soils with slight to moderately decomposed sphagnum, feather moss is more likely and may be associated with organic cryosols (Smith *et al.*, 1998). Black spruce (*Picea mariana*) is the dominant tree species in the God's Lake Ecodistrict; however, the upland portions are frequently replaced by jack pine (*Pinus banksiana*) followed by trembling aspen (*Populus tremuloides*) due to fire activity. Tamarack (*Larix laricina*) is common in fens and can be found mixed with black spruce in transitional bog peatlands. Successful mixed stands of white spruce (*Picea glauca*), balsam fir (*Abies balsamifera*), trembling aspen, and balsam poplar (*Populus balsamifera*) can be seen along rivers and lakes (Smith *et al.*, 1998).

4.2.2 The Knee Lake (360) Ecodistrict

The Knee Lake (360) Ecodistrict is restricted to a portion of the northern edge of the RAA (Figure 3), although the whole of the Knee Lake Ecodistrict forms a horseshoe-shaped area extending from Knee Lake in the south to Stevenson Lake in the north (Smith *et al.*, 1998). Mean temperatures range from a low of -25.7°C in January to a high of 15.3°C in July with an average growing season of 131 days. The mean annual precipitation is approximately 500 mm, of which more than one-third falls as snow (Smith *et al.*, 1998).

The physiography changes from undulating to ridged, (drumlins) loamy morainal plain where the drumlins have been eroded by water and may have veneer bogs on the lower slopes. Veneer bogs also appear on gently sloping glaciolacustrine blanket and veneers; whereas peat plateau bogs and patterned fens tend to be found in **depressional** terrain with clayey glaciolacustrine sediments underneath. The ecodistrict also contains sites of conspicuous eskers and esker aprons (kettled fluvioglacial deposits) which can be up to 30 m above the nearby terrain and can have eroded channels creating local relief (Smith *et al.*, 1998).

The drainage system for the northwest is the Nelson River and the south-western and eastern sections belong to the Hayes River. Lakes in this region vary from small to very large and many have shores developed in unconsolidated materials, with the smaller lakes appearing between drumlin ridges (Smith *et al.*, 1998). Much of the ecodistrict occurs on permafrost peatlands and as such the soils are organic coming from woody, forest peat, and sedge peat materials and include organic cryosols in veneer bogs and peat plateau bogs. Veneer bogs are also found in non-frozen areas and are made up of fibrisols, whereas the flat bogs and patterned fens are made up of mesisols. Knee Lake Ecodistrict has imperfectly drained mineral soils comprised of eluviated eutric brunisols on loamy to sandy calcareous till and sandy to gravelly fluvioglacial deposits and well to imperfectly drained clayey deposits in gray luvisols (Smith *et al.*, 1998). Black spruce is the predominant tree species, but well drained upland areas are dominated by jack pine well adapted to frequent fires that characterize these dry habitats. In wetter areas, such as around lakes and rivers, white spruce appears, and in bog peatlands there is black spruce, **ericaceous** shrubs, and various mosses, including sphagnum. Fens have different vegetation mostly consisting of stunted tamarack, shrubs, brown mosses, and sedges (Smith *et al.*, 1998).

4.2.3 **The Island Lake (364) Ecodistrict**

The Island Lake (364) Ecodistrict is separated into two sections, north and south; a very small portion of the RAA lies within the northeastern and southern sections of the ecodistrict (Figure 3). The ecodistrict is bordered by five other ecodistricts within the Hayes River Ecoregion. God's Lake Ecodistrict (365) to the north is the largest, and represents the division of the two Island Lake Ecodistrict sections (Smith *et al*., 1998). Mean temperatures range from a low of -22.8°C in January to a high of 17.6°C in July with an average growing season of 154 days. The mean annual precipitation is roughly 560 mm, with about one-third falling as snow (Smith *et al*., 1998).

The physiography of the southern section varies from an undulating to hummocky till plain where the uplands consist of granitoid rock outcrops, discontinuous blankets and veneers of acid to weakly calcareous, sandy, stony glacial till. Around Island Lake calcareous, clayey glaciolacustrine blankets and veneers are also common. In the remainder of the district, shallow to deep peat covers glaciolacustrine clayey sediments on level, gently sloping sites and in depressions (Smith *et al*., 1998). Permafrost in the northern section of the ecodistrict is widespread in deep peat bogs and discontinuous in veneer bogs and in the southern section it is confined to peat plateaus and veneer bogs and is often a relic (Smith *et al.,* 1998).

Soils range from well to excessively drained and consist of dystric brunisols and stony, acid sandy till to gray luvisols which are not as well drained. Large areas of very poorly drained Typic (deep) and Terric (shallow) fibrisolic and mesisolic organic soils overlying loamy to clayey glaciolacustrine sediments occur in the peatlands, which are increasingly more widespread towards the west (Smith *et al*., 1998).

Most of the Island Lake Ecodistrict falls within the Hayes River watershed, with only a small western portion lying in the Nelson River watershed. The lakes range from small to very large (Island Lake) and these lakes and associated rivers and streams are the main source of water for the ecodistrict (Smith *et al*., 1998). Jack pine and, to a lesser extent, trembling aspen are common on upland sites, due to extensive, repeated fires; however, black spruce is the dominant tree species and is especially widespread on imperfectly drained uplands and bog peatlands. In river valleys and around lakes where drainage is good, white spruce, balsam fir, and trembling aspen form mixed stands. Stunted black spruce, sphagnum, and other mosses and ericaceous shrubs are found in bog peatlands and sedges, brown mosses, shrubs, and stunted tamarack are found in fens (Smith *et al*., 1998).

4.3 Forest Cover and Vegetation

The Boreal forest within which the RAA is located forms a continuous belt from Newfoundland to the Rocky Mountains and comprises the greater part of the forested areas of Canada (Rowe, 1972). The Boreal forest is primarily coniferous with white and black spruce as characteristic species, although balsam fir and jack pine are prominent in the eastern and central portions; tamarack is only absent in the far north (LGRFN and OMNR, 2011). There is also an admixture of broadleaf trees such as white birch (*Betula papyrifera*), trembling aspen, and balsam poplar (LGRFN and OMNR, 2011).

Within the P6 RAA, the forest is further classified into the Northern Coniferous section (B.22a) (Rowe, 1972). These coniferous stands tend to have a feather moss groundcover. Bedrock outcrops have patchy tree growth with an understory of low shrubs and a groundcover of low ericaceous shrubs, mosses, and lichens. Poorly to very poorly drained fens have sedge and brown moss vegetation and may have a shrub layer, or may support a tamarack-dominated tree cover with varying components of shrubs, herbs, and sedges. Poorly drained bogs generally support open to closed stands of stunted to medium tall black spruce, with an understory of dwarf birch, ericaceous shrubs, and a moss ground cover.

Peatlands that are transitional in development from fen to bog are common and the vegetation reflects the transitional aspects in its community composition (Smith *et al.*, 1998). The *Forest Ecosystem Classification for Manitoba, Field Guide* (Zoladeski *et al.*, 1995) provides a detailed species relationship, for productive forest types, in terms of their commercial tree species compositions and common relationships for understory shrubs, herbs, and mosses. Figure 6 illustrates the forest cover habitat in the RAA.

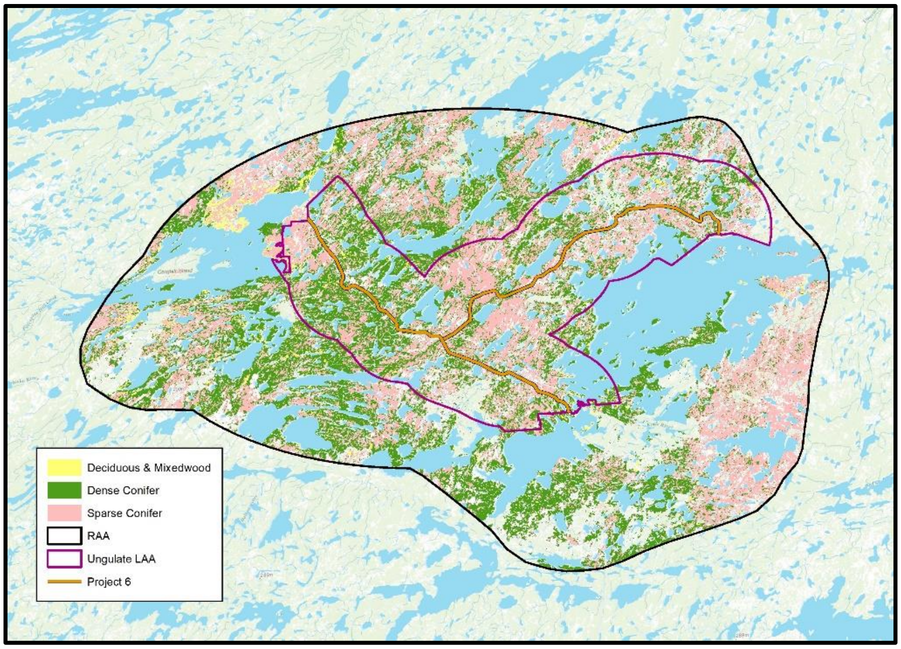

Figure 6: Distribution of deciduous and mixedwoods, sparse conifer and dense conifer within the P6 RAA

4.4 Habitat

The RAA vegetation community typically represents species mixes shaped by disturbance events and post-disturbance renewal and stand succession processes. The ability to adapt and occupy forest habitats, at various stages of succession, essentially dictate the species of wildlife that inhabit this area at any point in time as described in Section 4.5. The area is comprised of a mosaic of different aged forest stands, plant communities, and floral species that reflect the climate, topography, soils, drainage, disturbance history, and forest succession of the region. Forests provide the habitats within which wildlife live, and the degree and complexity of this structure determines the diversity of species and their respective abundance (Keenan *et al.*, 2009).

4.4.1 Fire History

The record of the fire history for the P6 RAA going back 100 years was mapped from the Canadian National Fire Database compiled by Natural Resources Canada (NRC, 2015). A lower rate of fire frequency is visible within the RAA than in areas to the west and south (Figure 7).

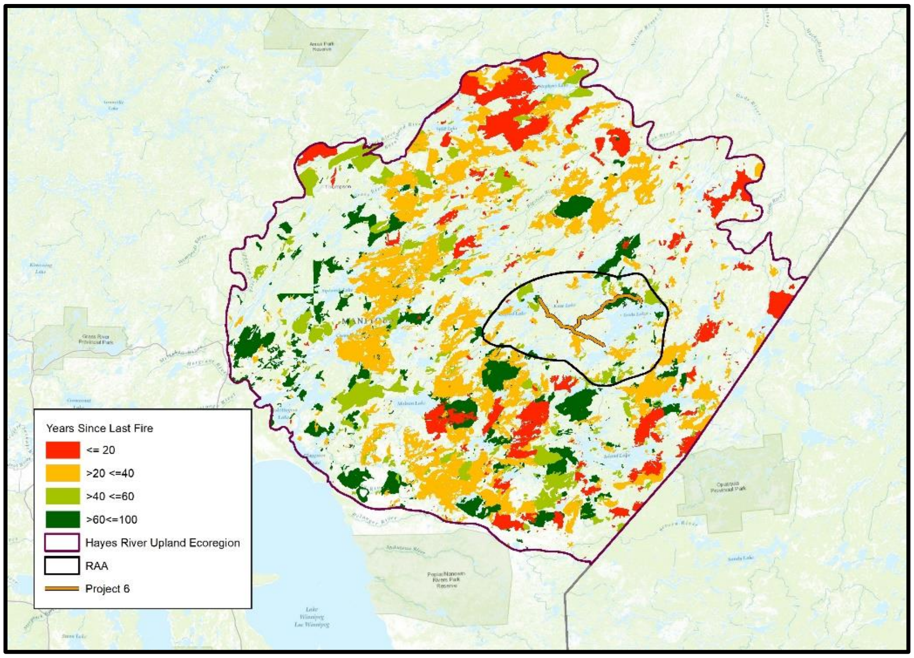

Figure 7: History of reported fires within the Hayes River Upland Ecoregion

Most fires within the ecoregion over the last century are <40 years of age (Figure 8), thereby favoring those wildlife species that may benefit from younger regenerating forest structures. However, within the RAA itself (Figure 8), a lower burn rate has resulted in a somewhat more mature forest (Figure 6).

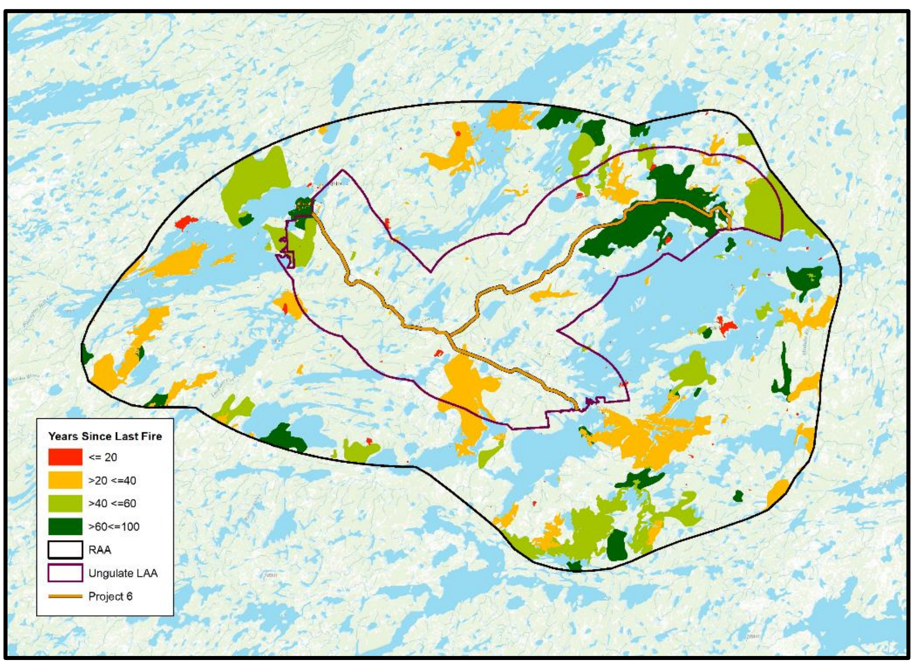

Figure 8: History of reported fires within the P6 RAA

Fire is the major disturbance factor shaping the patterns and distribution of forest age classes and communities within the Boreal Shield Ecozone. The forest landscape within the RAA does not present a highly complex forest covertype structure, but rather a classical Boreal shield forest defined by a mix of treed and open wetlands surrounded by higher elevation black spruce and jack pine forest communities in a range of age classes shaped by the patterns created by frequent natural fires.

Fire is the primary source of disturbance and the Boreal Shield Ecozone that extends across the region is generally characterized by fire events that periodically burn the landscape with varying degrees of intensity. In the case of black spruce fuel loads to carry fire can include the trees, coarse woody debris and organic materials that comprise the forest floor; the most intense fires essentially leave no woody debris on the forest floor (Dyrness and Norum, 1983).

Burton *et al.* (2008) categorized the hierarchy of scales of diversity associated with large fires in the boreal forest: (1) within the entire boreal forest of North America as a function of climatic and topographic effects on both the rates of burning leading to inter-regional and/or inter-landscape differences; (2) differences within a landscape caused by specific landscape environmental attributes and **stochasticity**; and (3) a diversity within a fire that can be described in terms of burn severity, the latter of which essentially defines the structure of the post-fire forest. Black spruce and jack pine are both fire-adapted species given their **serotiny** in which fire triggers seed release and dispersal. In the case of severe fires that also burn the forest floor, there is a rapid and dense regeneration to the dominant forest type.

Hall *et al.* (2008) viewed a broad application of burn severity maps, particularly in the assessment of the consequences of varying severity regimes for wildlife. A level of burn severity that may preclude the post-fire use of the landscape by caribou may be quite different than the level of severity that would render the area unusable by other species, e.g., marten, migratory birds, or predatory birds.

The sequences of ecological processes within the RAA are a product of the repetitive burn patterns, the severity of which is linked to the combination of fuel loads combined with a host of meteorological variables. At the ecozone level, wildlife has evolved and adapted to the broad patterns of vegetative communities that provide a constant supply of habitat types that meet the life history needs for resident species and the seasonal requirements of many transient species. The ebb and flow of how species fare at the level of discrete populations is linked to the constantly shifting spatial distributions of habitats upon which species depend. Within small evaluation areas, utilization by wildlife is a direct product of the recent fire history (<60 yrs.) that defines the complexity of mix of stand types that define the study area forest.

4.5 Wildlife in the RAA

The following sections provide an overview of important species common to the RAA. A listing of all mammals, birds, and herptiles, including species of conservation concern and species of importance to First Nations people, that may occur in the RAA is also presented in Appendices A-C, respectively.

4.5.1 Mammals

Ungulates, furbearers, and small mammals comprise the 39 species that may occur within the RAA. See Appendix A for a comprehensive list of mammals that may occur and their conservation status.

4.5.1.1 Woodland Caribou

The Pen Islands (Eastern Migratory) and Norway House (Boreal Woodland) caribou ranges/populations overlap with the P6 RAA. The animals occupying both ranges are woodland caribou (*Rangifer tarandus caribou*), but due to differences in several important life characteristics they are recognized as belonging to different ecotypes. Pen Islands caribou are categorized as the migratory ecotype, also referred to as "forest-tundra" ecotype, whereas Norway House caribou are classified as the sedentary ecotype, also referred to as "forest-dwelling" or "boreal forest" ecotype (COSEWIC, 2011a; Manitoba Boreal Woodland Caribou Management Committee or MBWCMC, 2015).

The forest-tundra ecotype is differentiated from the forest-dwelling ecotype by their migratory and calving behaviour. Forest-tundra (Pen Islands) caribou traditionally migrate and assemble in large groups near the Hudson Bay coast to calve. This is in contrast to forest-dwelling caribou that disperse and separate over large areas during calving. Forest-tundra caribou more closely resemble migration characteristics of barren-ground caribou (*Rangifer tarandus groenlandicus*), moving large distances between winter range and spring calving areas (COSEWIC, 2011a; Berglund *et al*., 2014; Pond *et al.*, 2016).

Pen Islands Eastern Migratory Caribou Range/Population (Forest-tundra)

COSEWIC (2011a) currently identifies the Pen Islands caribou range as part of Designatable Unit 4 (DU4): Eastern Migratory Caribou. COSEWIC has assessed all subpopulations of the Eastern Migratory Caribou, including the Southern Hudson Bay subpopulation (i.e. the Pen Islands range), as "Endangered" (COSEWIC 2017). MBCDC (2016a) lists the population as S4. See Appendix A for further detail/definitions on conservation status listing.

The Pen Islands caribou population has a range extending from northeastern Manitoba to northwestern Ontario within the Hudson Bay and Boreal Shield Ecozones (Magoun *et al.*, 2005; Gunn *et al.*, 2011; Abraham *et al.*, 2012; Berglund *et al*., 2014). In recent years, caribou from the Pen Islands caribou population have been observed in the same geographical area as the proposed P6 road alignment, and to the area north and east within the P6 RAA on occasion. However, the actual numbers and frequency of Pen Islands caribou occupying and/or migrating through the P6 RAA has likely varied considerably over time.

Due to the migratory nature of the Pen Islands population, the use of this area by animals has been primarily on a seasonal basis (the winter months from November through to late April), though a very small number of female caribou may have remained in the RAA during the summer months. The P6 RAA would be on the southern limit of the population's normal range. Within the RAA the animals would primarily be found in forested areas, but most commonly mature coniferous forests where quantities of lichen are available.

Norway House Boreal Woodland Caribou Range/Population (Forest-dwelling)

COSEWIC (2011a) currently identifies the Norway House caribou range as part of Designatable Unit 6 (DU6): Boreal Caribou and are assessed as "Threatened", similarily they are listed as "Threatened" under SARA. Boreal caribou are also listed as "Threatened" under MESEA and a process for developing an Action Plan for the Management Unit (MU) is provided in Manitoba's Boreal Woodland Caribou Recovery Strategy (MBWCMC, 2015. MESEA, n.d.). MBCDC (2016a) lists the population as S2S3. See Appendix A for further detail/definitions on conservation status listing.

The Norway House population range overlaps slightly with the RAA, and is restricted to the extreme western portion of the RAA. Historical information on the forest-dwelling ecotype within the P6 RAA is sporadic and limited. Current range data provided by Manitoba Sustainable Development (MSD) (2011 - 2017) have been reviewed as part of baseline wildlife monitoring. Both government reports and traditional ecological knowledge indicate the presence of caribou within the general geographical area but detailed information on historic distribution and numbers is lacking. As a result, the range delineation of this boreal caribou population has gone through several changes since the early 1990's (Johnson, 1993; Rebizant *et al*., 2000; Manitoba Conservation, 2006; MBWCMC, 2015). Currently MSD, the provincial department responsible for boreal woodland caribou management, shows the western portion of the P6 RAA as being in the Molson Lake Management Unit (MU) and a small part of the Norway House caribou range overlapping it (MBWCMC, 2015). The Norway House range lies entirely within the Boreal Shield Ecozone.

4.5.1.2 Moose

Moose (*Alces alces*) are distributed across much of forested Canada (Banfield, 1974) and are common within the boreal forest across Manitoba including the RAA. Moose are most commonly found in association with wetlands and lakes in summer feeding on both herbaceous plants and emergent aquatic vegetation rooted in mineral soils, and in winter seek woody browse provided by a variety of shrubs and young deciduous trees (Renecker and Schwartz, 1998; Gillingham and Parker, 2008). Moose tend to benefit from large stand renewal events, most of which are caused by wildfires in the Boreal Shield Ecozone. Within the RAA moose are highly valued primarily for rights-based subsistence hunting and, as the largest prey species, are an integral component of the food chain (MSD, 2016a). Moose populations in the RAA are not considered a conservation concern.

4.5.1.3 Furbearers and Small Mammals

Grey wolves (*Canis lupus*) inhabit forested areas with sufficient prey species such as moose, beaver, and snowshoe hare to sustain packs. Given the low biological productivity of the Boreal Shield ecozone, wolf home ranges tend to be large and are found throughout the RAA. Wolf populations are monitored by MI to study their movement patterns and prey selection, particularly in relation to boreal woodland caribou due to it being a threatened species listed under the federal SARA legislation. Most wolf kill sites investigated within the boreal shield on the east side of Manitoba have been comprised of moose. Wolf populations in the RAA are not considered a conservation concern.

American black bears (*Ursus americanus*) are found across most wooded habitats in North America and are relatively common through the boreal forest (Latham, 2009; Tigner *et al.,* 2014; DeMars, 2015), including the RAA. Population densities tend to be highest in diverse forests at relatively early stages of succession and lowest where soils are thinner and plant growth generally poorer (Kolenosky and Strathearn, 1987). Bears are well known significant predators of neonate ungulates in northern temperate ecosystems and may be a factor in low recruitment rates of moose and caribou (Stewart *et al.,* 1985; Bastille-Rousseau *et al.,* 2011; Latham *et al.,* 2011a). Black bear populations in the RAA are not considered a conservation concern.

Large and small furbearers of importance to trappers in the RAA include American beaver (*Castor canadensis*), American marten (*Martes americana*), American mink (*Neovison vison*), Canada lynx (*Lynx canadensis*), ermine (*Mustela erminea*), fisher (*Martes pennanti*), muskrat (*Ondatra zibethicus*), Northern river otter (*Lontra canadensis*), red fox (*Vulpes vulpes*), red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), and wolverine (*Gulo gulo*). Marten and beaver, in particular, are valued species to trappers. Marten can be found in most of Manitoba's boreal forest and generally inhabit mature coniferous or mixedwood forests. They feed on small mammals such as hares, some birds, fruit, nuts, carrion, rodents, shrews, and insects (Reid, 2006). Beaver also occur throughout Manitoba's boreal forest close to water, and feed on bark and twigs of softwood trees, along with aquatic plants and grasses (Caras, 1967). Other than wolverine, currently listed as a species of special concern by COSEWIC (2014), there are no other furbearer species of conservation concern in the RAA.

Commercial trapping of furbearers is administered by MSD through the Registered Trapline (RTL) system (MSD, 2016b). There are 51 RTLs that fall (fully or partially) within the P6 RAA and 10 RTLs specifically intersect the P6 alignment. Further detail on trapping in the P6 RAA can be found in Section 6.3.

There are several other species of small furbearers or mammals that may be residents, migrants, or incidental occasional visitors to the RAA. These include, but are not limited to, least chipmunk (*Eutamias minimus*), least weasel (*Mustela nivalis*), masked shrew (*Sorex cinereus*), meadow jumping mouse (*Zapus hudsonius*), Northern bog lemming (*Synaptomys borealis*), porcupine (*Erethizon dorsatum*), pygmy shrew (*Sorex hoyi*), raccoon (*Procyon lotor*), short-tailed shrew (*Blarina brevicauda*), silver-haired bat (*Lasionycteris noctivagans*), southern red-backed vole (*Clethrionomys gapperi*), striped skunk (*Mephitis mephitis*), and woodchuck (*Marmota monax*).

4.5.2 **Birds**

Waterbirds and forest birds comprise most of the species that are migratory in the RAA; while some non-migratory forest birds (grey jays) and upland game birds (grouse) also may occur. See Appendix B for a comprehensive list of birds that may occur in the RAA and their conservation status.

4.5.2.1 Migratory Forest Birds

A number of migratory songbird species may be located in various forest habitats within the RAA (Bezener and De Smet, 2000; Peterson and Peterson, 2002; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015); a selection of common songbirds that characterize the area include alder flycatcher (*Empidonax alnorum*), American robin (*Turdus migratorius*), blue-headed vireo (*Vireo solitaries*), cedar waxwing (*Bombycilla cedrorum*), chipping sparrow (*Spizella passerine)*, Connecticut warbler (*Oporornis agilis*), dark-eyed junco (*Junco hyemalis*), downy woodpecker (*Picoides pubescens*), fox sparrow (*Passerella iliaca*), hermit thrush (*Catharus guttatus*), least flycatcher (*Empiodnax minimus*), Lincoln's sparrow (*Melospiza lincolnii*), magnolia warbler (*Setophaga magnolia*), Nashville warbler (*Oreothlypis ruficapilla*), Northern waterthrush (*Parkesia noveboracensis*), olive-sided flycatcher (*Contopus cooperi*), orange-crowned warbler (*Oreothlypis celata*), ovenbird (*Seiurus aurocapilla*), palm warbler (*Setophaga palmarum*), ruby-kinged kinglet (*Regulus calendula*), rusty blackbird (*Euphagus carolinus*), swamp sparrow (*Melospiza georgiana*), Tennessee warbler (*Oreothlypis peregrine*), white-throated sparrow (*Calidris fuscicollis*), white-winged crossbill (*Loxia leucoptera*), Wilson's snipe (*Gallingo delicate*), Wilson's warbler (*Cardellina pusilla*), winter wren (*Troglodytes hiemalis*), yellow-bellied flycatcher (*Empidonax flaviventris*), yellow-bellied sapsucker (*Sphyrapicus varius*), and yellow-rumped warbler (*Setophaga coronate*).

4.5.2.2 Non-Migratory Forest Birds

Non-migratory forest birds that also occur in forest habitats in the RAA include: American three-toed woodpecker (*Picoides dorsalis*), black-backed woodpecker (*Picoides arcticus*), blue jay (*Cyanocitta* cristata), common raven (*Corvus corax*), downy woodpecker (*Picoides pubescens*), European starling (*Sturnus vulgaris*), evening grosbeak (*Coccothraustes vespertinus*), gray jay (*Perisoreus canadensis*), hairy woodpecker (*Picoides villosus*), pileated woodpecker (*Dryocopus pileatus*), pine grosbreak (*Pinicola enucleator*), and pine siskin (*Spinus pinu*s).

4.5.2.3 Migratory Waterbirds and Waterfowl

Many species of migratory waterbirds occur in wetlands, or along shorelines and riparian areas within the RAA. Some common examples are American bittern (*Botaurus lentiginosus*), American wigeon (*Anas americana),* Bonaparte's gull (*Chroicocephalus philadelphia*), bufflehead (*Bucephala albeola*), Canada goose (*Branta canadensis*), common loon (*Gavia immer*), Forester's tern (*Sterna forsteri*), great yellowlegs (*Tringa melanoleuca*), green-winged teal (*Anas crecca*), herring gull (*Larus argentatus*), least sandpiper (*Calidris minutilla*), mallard (*Anas platyrhynchos*), red-breasted merganser (*Mergus serrator*), ring-billed gull (*Larus delawarensis*), ring-necked duck (*Aythya collaris*), sandhill crane (*Grus canadensis*), solitary sandpiper (*Tringa solitaria*), sora (*Porzana Carolina*), and yellow rail (*Coturnicops noveboracensis)*.

4.5.2.4 Migratory Raptors

American kestrel (*Falco sparverius*), bald eagle (*Haliaeetus leucocephalus*), barred owl (*Strix varia*), boreal owl (*Aegolius funereus*), broad-winged hawk (*Buteo platypterus*), great gray owl (*Strix nebulosi*), long-eared owl (*Asio otus*), Northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), sharp-shinned hawk (*Accipter striatus*), and osprey (*Pandion haliaetus*) are some of the common non-migratory raptors that may be found in the RAA.

4.5.2.5 Non-Migratory Upland Game Birds

Sharp-tailed grouse (*Tympanuchus phasianellus*), spruce grouse (*Falcipennis canadensis*), ruffed grouse (*Bonasa umbellus*), and willow ptarmigan (*Lagopus lagopus*) are common species of non-migratory upland game birds that may occur in the RAA.

4.5.3 **Reptiles and Amphibians**

Several species of frogs and toads may occur within the RAA and include: American toad (*Bufo americanus*), boreal chorus frog (*Pseudacris triseriata maculata*), northern spring peeper (*Hyla crucifer crucifer*), northern leopard frog (*Lithobates pipiens*), and wood frog (*Lithobates sylvaticus*) (Conant and Collins, 1991). These species generally require shallow ponds and puddles for breeding and moist environments in shrubby and wooded areas for the rest of the year. The only reptile known to occur in the RAA is the red-sided garter snake and it is commonly found in moist woodlands and the edges of wetlands. None of these species are of conservation concern in the RAA. See Appendix C for further detail/definitions on their conservation status listing.

4.5.4 **Species of Conservation Concern**

Fourteen Species of Conservation Concern (SOCC), 11 birds and 3 mammal species, may occur within the RAA. These include:

Species	**SARA Listing**	**COSEWIC Assessment**	**MESEA Listing**	**MBCDC Rank***
Canada warbler (*Cardellina canadensis*)	Threatened	Threatened	Threatened	S3B
Common nighthawk (*Chordeiles minor*)	Threatened	Threatened	Threatened	S3B
Olive-sided flycatcher (*Contopus cooperi*)	Threatened	Threatened	Threatened	S3B
Short-eared owl	Special Concern	Special Concern	Threatened	S2S3B

Species	SARA Listing	COSEWIC Assessment	MESEA Listing	MBCDC Rank*
(*Asio flammeus*)				
Rusty blackbird (*Euphagus carolinus*)	Special Concern	Special Concern	Not listed	S4B
Peregrine falcon (*Falco peregrinus*)	Special Concern	Special Concern	Endangered	S1B
Yellow rail (*Coturnicops noveboracensis*)	Special Concern	Special Concern	Not listed	S3B
Bank swallow (*Riparia riparia*)	Schedule 1, Threatened	Threatened	Not listed	S5B
Barn swallow (*Hirundo rustica*)	Schedule 1, Threatened	Threatened	Not listed	S4B
Horned grebe (*Podiceps auritus*)	Schedule 1, Special Concern	Special Concern	Not listed	S4B
Eastern wood-pewee (*Contopus virens*)	Schedule 1, Special Concern	Special Concern	Not listed	S4B
Boreal woodland caribou (*Rangifer tarandus caribou*)	Schedule 1, Threatened	Threatened	Threatened	S2S3
Eastern migratory caribou (*Rangifer tarandus caribou*)	No Schedule, No Status	Endangered	Not listed	S4
Little brown bat (*Myotis lucifugus*)	Endangered	Endangered	Endangered	S2N, S5B
Wolverine (*Gulo gulo*)	No Status	Special Concern	Not listed	S3S4

*MBCDC 2016a Rank

See Appendices A-C for further detail/definitions on conservation status listing.

Ranges of several of the listed species overlap with the RAA:

- Short-eared owl inhabits open areas including grasslands, marshes, muskeg, and tundra (Bezener and De Smet, 2000);
- Olive-sided flycatcher inhabits semi-open mixed and coniferous forests near water and/or burned areas and boggy sites with standing dead conifers (Bezener and De Smet, 2000);
- Common nighthawk and barn swallow are found throughout Manitoba with exception to the extreme north. Both species select open and semi-open habitats such as fields, forest edges, meadows, lakeshores, and wetlands (Cornell Lab of Ornithology, 2015);

- Bank swallow can also be found throughout Manitoba and inhabit low areas along riverbanks with vertical cliffs or banks for nesting (Cornell Lab of Ornithology, 2015);
- Canada warbler inhabits a variety of forest types, but typically prefer wet, mixedwood forests with a well-developed shrub layer (Cornell Lab of Ornithology, 2015);
- Rusty blackbird is found throughout Manitoba and prefer swamps, marshes, and pond edges (Cornell Lab of Ornithology, 2015)
- Horned grebe and yellow rail both inhabit shallow ponds and marshes or wet meadows (Cornell Lab of Ornithology, 2015); and
- Little brown bat overwinters in hibernacula (caves/mines) and females inhabit maternity colonies such as buildings or large trees in summer; foraging occurs over water along waterways and forest edges, avoiding large open fields (COSEWIC, 2013a).

Peregrine falcon, however, is considered a potential migrant within the RAA. It is typically found in urban areas of southern Manitoba, perching or nesting on skyscrapers, water towers, cliffs, power poles, and other tall structures (Cornell Lab of Ornithology, 2015). The range of the Eastern wood-pewee also does not overlap with the RAA and occurs typically in the far southern portion of Manitoba, but has been recorded on a species listing for the Hayes River Upland Ecoregion (MBCDC, 2016b). It inhabits forested habitat, primarily deciduous forest and woodland, and smaller open woodlots (Cornell Lab of Ornithology, 2015).

4.5.5 Local and Traditional Knowledge

Local and Traditional Knowledge (TK) on wildlife was collected through several means in the RAA. MI gathered local and TK through open house sessions, workshops, and interviews within the FN communities of God's Lake, Bunibonibee, and Manto Sipi. TK on hunting, trapping, wildlife, and rare species in the RAA was incorporated where appropriate to guide the wildlife studies and assessment of effects.

Highlights of the information shared on important wildlife include:

- Local FN communities have supported the understanding of a diverse caribou population within the RAA and have described two types of caribou as identified by physical and FN communities have indicated moose to be an important source of food for local community members, with hunters sharing the moose harvested with family and community members.
- Additional species important for community foods include caribou, moose, beaver, snowshoe hare, bear, goose (in the spring), duck, lynx, and muskrat.
- FN community members have indicated that wolves are common throughout the RAA and are known to follow caribou herds and hunt moose along the winter roads. Wolves are typically not targeted for trapping by community members.
- A variety of furbearers are abundant and trapped within the RAA. FN trappers have indicated that fisher and lynx populations have been observed to be declining, while beaver, marten, and wolverine populations have been observed to be increasing. Results of a Trapper Program indicate there is a thriving marten population, followed by otter and wolverine. These population trends were confirmed either by local harvest counts or track observations.

- Waterfowl hunting primarily occurs in the spring and fall. FN communities have indicated that hunting for geese and ducks is an important community activity.
- Bald eagles are abundant in the RAA. Observations and nest locations were shared by FN community members. Local resource users indicated that eagle nests are sensitive to human disturbance and will be abandoned if even slightly disturbed.
- Spruce and ruffed grouse are commonly hunted throughout the RAA, however FN community members indicated that populations appear to be declining in the Manto Sipi Cree Nation area.
- Ravens, crows, gray jays, swallows and common nighthawks have all been observed near the communities in the RAA.

5.0 POTENTIAL EFFECTS ASSESSMENT

5.1 Valued Wildlife Components

The following section outlines the rationale and process utilized in the selection of VC species for the P6 effects assessment. The wildlife species identified as VCs are all known to occur within the RAA.

5.1.1 Data Sources

Prior to conducting the VC screening process, all existing information sources were evaluated to determine which wildlife species occur in the P6 RAA. Information on species distribution and abundance were obtained from existing sources and include published range maps, Manitoba Conservation Data Centre (MBCDC), Breeding Bird Atlas, Boreal Avian Modelling Project, and caribou data provided by Manitoba Sustainable Development (MSD). Data from baseline studies undertaken specifically for this project were also utilized and included; aerial moose and caribou surveys, multispecies aerial winter track surveys, trail camera studies, aerial spring and fall waterfowl surveys and breeding bird occurrence from ARUs.

Local and traditional knowledge (TK) provided by local First Nation resource users at focused wildlife workshops and interviews conducted in the P6 Communities (Gods Lake, Bunibonibee and Manto Sipi) on wildlife in the RAA were also considered in the process of selecting wildlife VC species.

5.1.2 Wildlife VC Selection Process

The selection of VCs considers technical guidance from the Canadian Environmental Assessment Agency (CEAA, 2014), builds on methodology/criteria suggested by KGS and examples from other environmental assessments for which CEAA has been involved. The proposed wildlife VCs complies with federal guidance, as described by CEAA (2014, 2015), e.g.:

> "*VCs refer to environmental features that may be affected by a project and that have been identified to be of concern by the proponent, government agencies, Aboriginal people, or the public. The value of a component not only relates to its role in the ecosystem, but also to the value of people place on it"*. "*The VCs will be described in sufficient detail to allow the reviewer to understand their importance and to assess for environmental effects arising from the project activities. The EIS will provide a rationale for selecting specific VCs and for excluding any VCs or information specific in these guidelines."* (CEAA, 2015).

A list of all wildlife species known or likely to occur in the RAA and their conservation status is provided in Appendices A to C. Terrestrial wildlife species likely to occur in the RAA first underwent a screening process. To be put forward as a candidate wildlife VC, the species or wildlife component first needs to be measurable for project effects over the long term (pre-construction, construction, and operation) and be identified as important in at least one category (Figure 9).

Species not considered for nomination as a VC were those that are difficult to detect or not measurable using standard scientific methods (Figure 9). SOCC species were considered for inclusion as a VC only if they met the selection criteria, i.e., having potential for project-related effects and being measurable over the long-term. Rare or listed species are typically not recommended as VCs as these species usually occur at very low densities, have low populations, have potentially limited distribution, and are difficult to observe during surveys.

In the comments on the Project 4 (P4) ASR Project, CEAA (2016) advises that SOCC be evaluated although they are typically not suitable as VCs because "…species that are rare, uncommon or associated with habitat types not prevalent in the Project Footprint do not adequately represent that Migratory Bird species which may be found within the Project Footprint during construction and operation activities" (Pg. 35). It is hard to collect sufficient data required for long-term monitoring for most SOCC and thus are generally not used for monitoring trends; however, wildlife SOCC not selected as VCs have been assessed separately to identify potential adverse effects of the propose project on SOCC and any unique mitigation required (see Section 6.6).

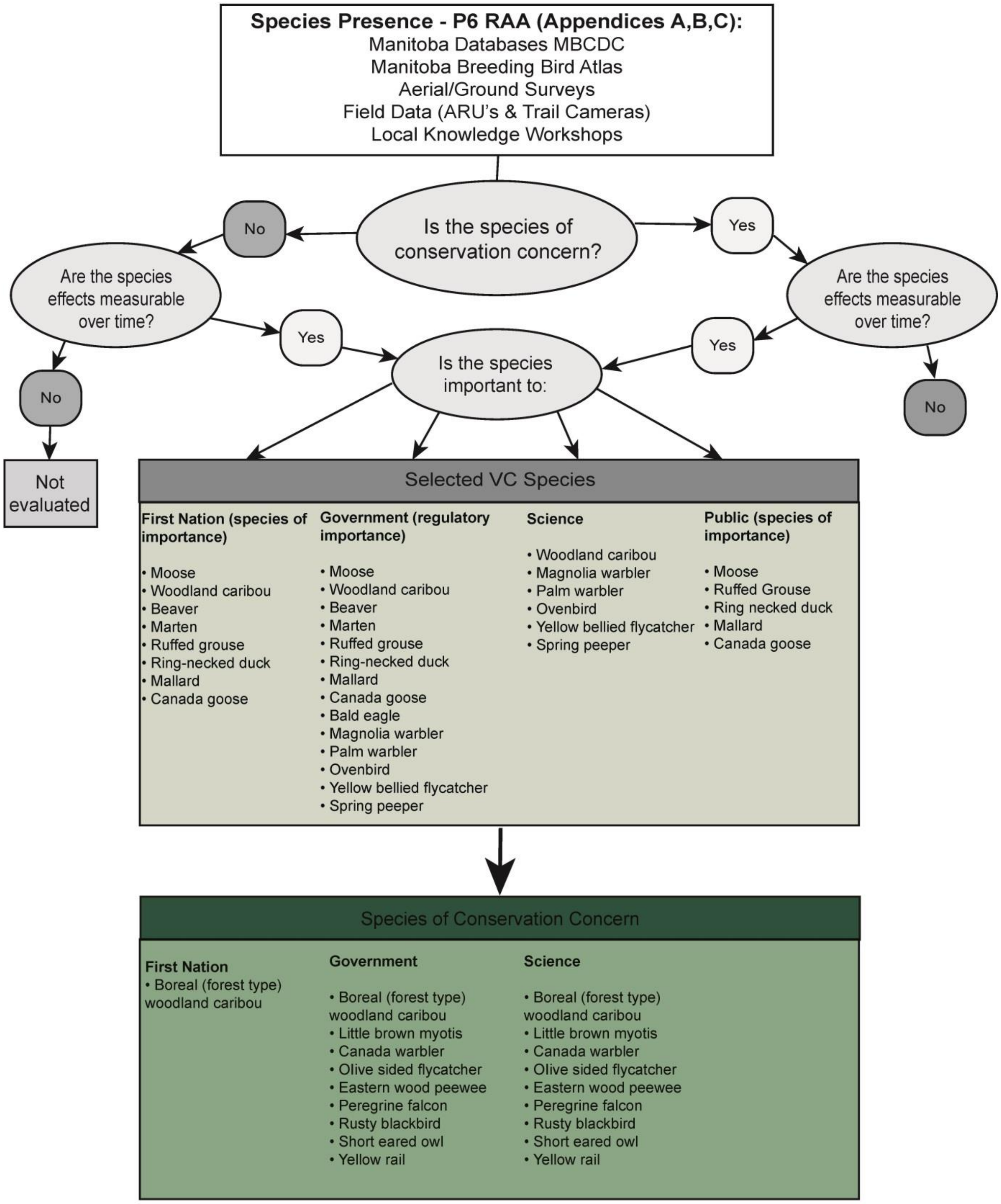

Figure 9: Pathway Process Followed in Selecting Wildlife VCs

Species that are measurable for project effects pass the first step in the screening process (shown as "yes" in Figure 9) and become a candidate wildlife VC species. While the exact nature of the project effect on the VC species may not be fully known at the time of VC selection, there needs to be a linkage (potential for effect) between the P6 development and the species. For each VC considered, the pathway of effects was assessed to determine if there are linkages between project activities and potential effects such as change in abundance or distribution. Figure 10 provides an illustration of potential project effects on ring-necked duck, mallard and Canada goose demonstrating potential project activities that could affect their habitat or distribution.

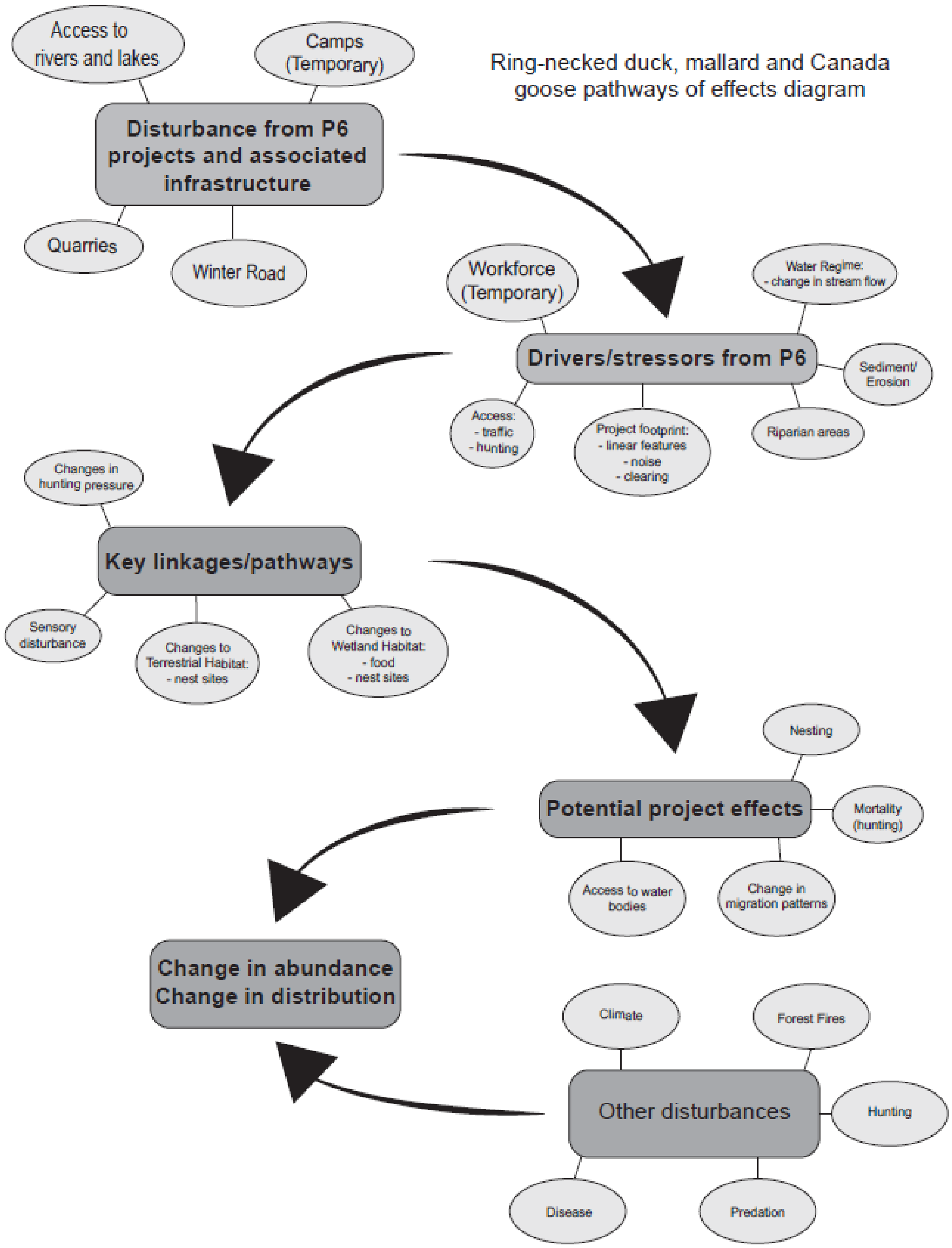

Figure 10: Example of waterfowl (ring-necked duck, mallard, and Canada goose) VC selection

The next selection criteria consider whether the wildlife component or species fulfills one or more of the following:

- Environmental component identified by local First Nations or other Aboriginal communities as having cultural, social, or economic importance.
- Environmental component identified by government regulators.
- Environmental component identified by public and stakeholders as being important.
- Environmental component identified by science – typically due to their ecosystem function and/or being representative of a broad range of species/habitat types in the RAA. Existing data, professional judgment, and habitat models commonly assist in this process.

The species that meet the abovementioned criteria remain as wildlife VCs. They are excluded only when another species from the list has similar life history and habitat characteristics and is considered a more suitable VC candidate.

The list of candidate VC species presented in Table 1 represent those terrestrial wildlife species that were selected following the process outlined in Figure 9. One of the final steps in determining the suitability for a species to be used as a VC involved an assessment of habitat preferences, as illustrated in Appendix D, to ensure major wildlife habitat types used by SOCC were represented by one or more of the proposed wildlife species VCs. Species identified in the Species-Habitat Association column of the table in Appendix D are those whose primary habitat preferences are most similar to the VC listed.

Only species known or expected to commonly occur in the RAA (based on in-field data and/or range maps provided through literature) are listed in the habitat association column of the table. These habitat preferences were then associated with the main habitat types in the RAA as identified through the Land Cover Classification of Canada (LCC) cover types (Map 4) and ALCES model (A Land and Cumulative Effects Simulator) described in Section 5.1.3 and noted in the wildlife habitat column. Consideration was also given to the landscape features associated with those habitat types in the RAA; most of the RAA is comprised of a mix of upland coniferous forests including predominantly jack pine and black spruce and lowland black spruce peatlands, such as fens, swamps and bogs.

Table 1: Candidate wildlife valued component (VC) species

VCs	Group	Importance IDd by:[1]				Indicator	Parameter	Rationale
		FN	Gv	PS	Ot			
MAMMALS								
Caribou	Ungulate	√	√		√	Distribution and abundance of caribou and habitat (including critical habitat)	Amount and locations of habitat (including critical habitat); presence/absence and density; factors contributing to Project effects (e.g., predation); trends	• Some First Nations (FNs) harvest • Regulatory need to assess critical habitat for woodland caribou. • Ecological importance/function as prey to wolf
Moose	Ungulate	√			√	Distribution and abundance of moose	Amount and locations of habitat (including important habitat);	• FNs and others hunt/ harvest

VCs	Group	Importance IDd by:[1] FN	Gv	PS	Ot	Indicator	Parameter	Rationale
						and habitat (including important habitat)	presence/absence and relative density; factors contributing to Project effects (e.g., predation); trends (e.g., habitat changes, use and mortality)	• Ecological importance/function as prey to wolf • Habitat indicator - generalist, represents habitat requirements for large species group
Beaver	Aquatic Furbearer	√			√	Distribution and abundance of habitat (including important habitat)	Amount and locations of habitat and key habitat parameters; presence /absence and lodge number/location; trends, e.g., changes in habitat, trapping and mortality	• Commercial harvest by FN and others • Keystone and representative aquatic furbearer
Marten	Furbearer	√			√	Distribution and abundance of marten and habitat (including important habitat)	Amount and locations of habitat and key habitat parameters; presence/absence and/or density of marten relating to habitat types and Project effects; changes in habitat or trapping during Project; mortality levels	• Commercial harvest for FN and others • Top-level predator characteristic of upland terrestrial environments • Important predator/prey species
BIRDS								
Bald eagle	Raptor	√	√		√	Distribution and abundance of bald eagles and habitat, e.g., nest trees	Number of bald eagles, location of active nesting trees, trends	• Culturally important species to FNs • Top predator • *Wildlife Act* for nests and nesting trees
Canada goose	Waterfowl[2]	√	√		√	Distribution and abundance of Canada geese and habitat; access	Amount and locations of habitat (including important habitat); presence/absence and relative density; factors contributing to Project effects (e.g., predation); trends (e.g., habitat	• *Migratory Birds Convention Act* (MBCA) • FN identified as important hunted species spring/fall • Hunting and license (*Wildlife Act*) and MBCA • Food web function

VCs	Group	Importance IDd by:[1] FN	Gv	PS	Ot	Indicator	Parameter	Rationale
							use and mortality and wetland productivity)	
Mallard	Waterfowl[2]: Dabbling Duck	√	√		√	Distribution and abundance of mallards and habitat; access	Number of mallards, breeding locations, trends (e.g., habitat use and mortality, and wetland productivity)	• MBCA • Boreal Conservation Region (BCR) 8 and North American Wildlife Management Plan (NAWMP) priority species (DU, 2012) • FN hunt • Migratory bird that use shallow marshes and wetlands with emergent vegetation
Ring-necked duck	Waterfowl[2]: Diving Duck	√	√		√	Distribution and abundance of ring-necked ducks and habitat; access	Number of ducks, breeding locations, trends (e.g., habitat use and mortality, and wetland productivity)	• MBCA • BCR 8 and NAWMP priority species (DU, 2012) • FN hunt • Migratory bird that use meadows adjacent to water or emergent vegetation
Ruffed grouse	Upland game bird	√	√		√	Distribution and abundance of ruffed grouse and habitat	Number of ruffed grouse, breeding locations, trends	• FN hunt • Hunting and license (*Wildlife Act*) • Prey species represent deciduous forest
Magnolia warbler	Migratory songbird		√		√	Distribution and abundance of magnolia warbler and habitat	Number of magnolia warbler, breeding locations, trends	• MBCA • Found in sufficient numbers during the MBBA surveys (2014) to monitor • Other studies to compare – Increases during spruce budworm outbreaks

VCs	Group	Importance IDd by:[1]				Indicator	Parameter	Rationale
		FN	Gv	PS	Ot			
Ovenbird	Migratory Songbird		√		√	Distribution and abundance of ovenbird and habitat	Number of ovenbird, breeding locations, trends	• MBCA • Well studied (e.g., fragmentation) • Boreal Avian Monitoring[3] (BAM) Project test case and area-sensitive species • BCR 8 strategy Priority species list for stewardship
Palm warbler	Migratory Songbird		√		√	Distribution and abundance of palm warbler and habitat	Amount and locations of habitat; presence/absence	• MBCA • Neotropical migrant songbird occupying bogs & open coniferous forests
Yellow-bellied flycatcher	Migratory Songbird		√		√	Distribution and abundance of yellow-bellied flycatcher and habitat	Number of yellow-bellied flycatcher, breeding locations, trends	• MBCA • Ground nesting • BCR8 strategy Priority species list for stewardship
AMPHIBIANS and REPTILES								
Spring peeper	Amphibian		√		√	Distribution and abundance of spring peeper and habitat	Amount and locations of habitat and important habitat parameters; presence/absence and/or density of marten relating to habitat types and Project effects	• Numerous in the RAA, characteristic of woodland ponds, near northern range, which generally extends east of Lake Winnipeg • Food web function

[1]FN=First Nations (Gods Lake, Bunibonibee and Manto Sipi); Gv=Government; PS =Public/Stakeholder; Ot=Other (e.g., science);
[2] Waterfowl (geese and ducks) suggested will cover off wetland, open water and near shore environments during the effects assessment;
[3] The Boreal Avian Modelling (BAM) Project is an international research collaboration for the ecology, management and conservation of boreal birds with multiple federal, provincial and private funding partners (BAM, n.d.).

The final step in confirming the appropriateness of the species selected for use as a VC involved determining habitat associations with other wildlife species known to occur in the RAA. A review of habitat associations for the VCs selected is found in Appendix E. This process assisted in confirming the validity of selected VCs as representative proxies for other commonly occurring species in the RAA. Species that are transient or occur in very low numbers and/or have restricted distribution are likely to be considered in the VC assessment.

Among the mammal species that were mentioned by local resource users for consideration as VCs were moose, caribou, beaver and marten. These species are of importance to local resource users for hunting and trapping. Beaver, a species that is trapped and considered locally as important; represents the habitat requirements for other aquatic furbearers, such as mink, muskrat and otter. Marten were selected as a terrestrial furbearer VC, which also represents habitat suitable for fisher. Wolverine did not qualify as a VC due to their very low numbers, extremely large home ranges, and dependence on carrion, making modelling and monitoring extremely difficult.

For bird species selected as VCs, the ring-necked duck, mallard and Canada goose were identified as important to the P6 communities for hunting. These species also represent the habitat needs of many other waterbirds found in the RAA (Appendix E). Ruffed grouse were identified as a species that are hunted by locals, and they are also representative of upland game birds. Bald eagle is culturally important to First Nations.

Each of the migratory songbirds selected as VCs represents groupings of songbirds with differing habitat requirements (see Appendix E for species associations). Magnolia warbler inhabit pure coniferous forests as well as mixed-wood forests with abundant coniferous saplings. Palm warbler breed in open habitats such as open spruce-tamarack bogs or fens and regenerating areas, where they prefer low ground-cover. Ovenbird inhabit mature forested habitats, including jack pine, mixedwood or deciduous stands with open understories. Yellow-bellied flycatcher inhabit large tracts of lowland black spruce (wetland) areas.

Selected VC species include:

- Caribou
- Moose
- Marten
- Beaver
- Bald eagle
- Canada goose
- Ring-necked duck
- Mallard
- Ruffed grouse
- Palm warbler
- Magnolia warbler
- Yellow-bellied flycatcher
- Ovenbird
- Spring peeper

5.1.3 **Habitat Evaluation and VC Modelling**

The RAA is typical of Boreal Shield ecosystems dominated by a mix of upland coniferous forests including predominantly jack pine and black spruce and lowland black spruce. Dense and sparse conifer stands together cover almost half of the total area within the RAA, while deciduous and mixed forest are found in smaller patches across the landscape (Figure 6).

5.1.3.1 Habitat Evaluation

Habitat was evaluated in the RAA utilizing the national LCC spatial database that has been harmonized across the major federal departments including Agriculture and Agri-Food Canada, the Canadian Forest Service, and the Canadian Centre for Remote Sensing (NRC, 2003). The LCC dataset provides vegetated and non-vegetated land cover classes that identify the primary ecological and vegetation or habitat conditions of an area. Analysis of information for the P6 RAA, LAA, and PF evaluation areas was also undertaken using ALCES (2017) that incorporates the LCC. The data library used in ALCES contains indicator datasets including: water and wetlands, and forest cover types. The following section provides an overview of landscape characteristics within the RAA.

Summary statistics were generated using the LCC in ALCES. A summary of major LCC covertypes and their proportional abundance within the RAA, LAA, and PF were calculated. These general habitat categories were also utilized in the planning of all field activities and monitoring for birds (ARU placement, waterfowl surveys), trail camera deployments, and the trapper program.

Coniferous forest and water together accounted for approximately 80% of the surface cover areas within the RAA, LAA, and PF compared to approximately 1% broadleaf (deciduous) and mixedwood forest combined. Wetland classes (shrub, herbaceous, and tree) were associated with approximately 17% of the LAA, 14% of the RAA, and 12% of the PF surface area. Shrub lands comprised approximately 6.5% of the RAA, 1.6% of the LAA, and 0.0% of the PF (Table 2).

The homogeneity of the landscape favours wildlife species that benefit from associations with large and small lakes, large and small rivers, and bogs and fens as represented by the wetland classification. Figure 11 demonstrates the distribution of wetland types within the RAA.

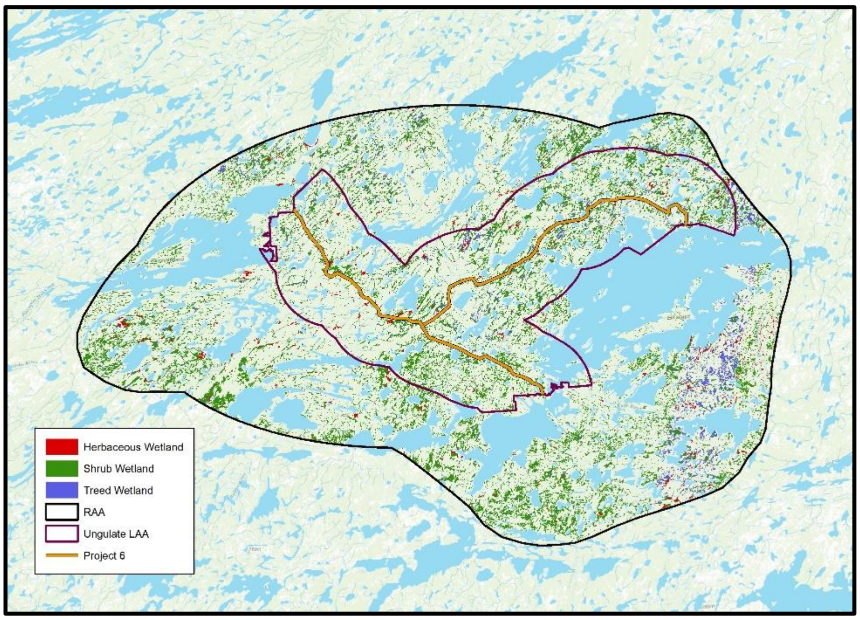

Figure 11: Distribution of herbaceous and shrub wetlands within the P6 RAA

Species that depend on more complex vegetation structures (e.g. moose) are largely restricted to wetland edges that may provide woody browse and emergent aquatic vegetation, and to younger regenerating post-fire forest areas. The major cover types as defined by the LCC database are provided in Table 2 and shown in Figure 12. These data were used in the modelling of habitat within the PF, LAA, and RAA in the assessment of effects on important wildlife species.

Table 2: LCC cover types and area of coverage within the RAA, LAA, and PF

Cover Type	RAA Area (km^2)	% Total RAA	LAA Area (km^2)	% Total LAA	PF Area (km^2)	% Total PF
Broadleaf Dense	88.01	0.98	7.87	0.59	0.18	1.28
Broadleaf Open	0.26	0.00	0.00	0.00	0.00	0.00
Coniferous Open or Sparse	2160.99	24.03	465.65	35.09	6.10	43.52
Coniferous Dense	2049.20	22.79	371.76	28.02	5.59	39.93
Barren Land	23.68	0.26	10.99	0.83	0.35	2.52
Mixedwood Dense	45.52	0.50	3.89	0.29	0.01	0.10
Shrub Tall	581.25	6.46	21.80	1.64	0.00	0.00
Water	2778.42	30.90	220.03	16.58	0.06	0.41
Wetland Herb	71.70	0.90	12.06	0.91	0.07	0.53
Wetland Shrub	1037.14	11.53	187.66	14.14	1.47	10.50
Wetland Treed	154.51	1.72	24.80	1.87	0.17	1.20
Other	0.71	0.01	0.36	0.03	0.05	0.30
Total*	**8991.4**	**100.0**	**1,326.9**	**100.0**	**14.1**	**100.0**

* Estimates of gross areas using the ALCES land classification software system.

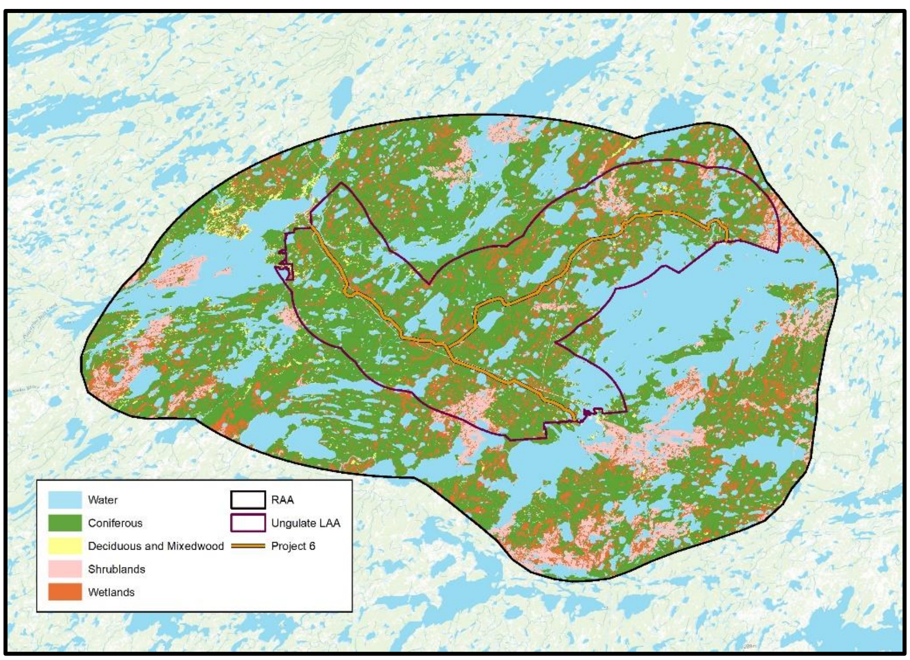

Figure 12: Distribution of major vegetation cover types in the RAA as defined by the LCC database

5.1.3.2 Habitat Modelling

Habitat Suitability Modelling in ALCES

Habitat modelling for selected VCs was undertaken using ALCES (A Landscape and Cumulative Effects Simulator). ALCES incorporates a broad suite of environmental and anthropogenic indicators into landscape spatial analysis. Land base composition and resource production attributes are translated into indicator variables using coefficients, with indicators such as wildlife habitat and populations, water quality and quantity, and biotic carbon storage (Carlson *et al*., 2010). ALCES can take the tabular and graphical output and augment the data into maps illustrating the plausible future condition of landscapes and indicators by dividing the study area into grid cells of user-defined size, and calculating the initial landscape and footprint composition within each cell (Carlson *et al*., 2010).

Habitat models were developed based on published habitat requirements, known attributes of avoidance (distance to disturbance), and professional judgement. Models are based on a raster “grid” containing 100% unity of all landscape and human footprint types. See Appendix F for a full description of attributes contained in the ALCES database. Models were developed using algorithms to best describe relationships between vegetation communities, landscape types, wetlands, water and human footprint variables. Caribou and moose habitat models utilized observational data to derive Resource Selection Models and are described in their appropriate section.

Boreal Avian Modelling Project (BAM)

For a number of bird species, models developed by the Boreal Avian Modelling Project (BAM, 2012) were provided to the P6 Project as part of a data sharing agreement. The BAM project was developed to improve the understanding of the ecology of boreal birds and their habitats, and the impact from industrial development and climate change in the boreal forest on bird populations (BAM, 2012). The BAM dataset comprises boreal bird data collated from existing inventory, monitoring and research projects provided by scientists from across Canada and the United States, and this data combined with biophysical data provided answers to questions regarding species’ life histories and habitats (BAM, 2012).

BAM plots habitat associations of species to understand habitat selection by birds. Relative density by habitat plots were created for each species using BAM’s density estimates, illustrating the relative use of habitats by a species. BAM defined their habitat categories based on the 2005 Land Cover Classification (LCC05) from Natural Resources Canada, obtained using Moderate Resolution Imaging Spectroradiometer (MODIS) imagery via satellite (Latifovic *et al*., 2009).

Current avian distributions were predicted by the BAM team using observational data (such as point count, BBS and breeding bird atlas data), mapped climates variables, and landcover information using Maxent, a powerful species-distribution modelling tool (Phillips *et al*., 2006; Phillips and Dudik, 2008). The Maxent models produces maps that estimate the probability of a species being present at a given location, of which BAM transformed into a cumulative or percentile form, with each pixel showing the proportion of all other pixels in the study region having less suitable habitat, creating “class rankings” that facilitate comparisons among species (BAM, 2012). Maxent models are bioclimatic/niche models that are meant to describe the current potential distribution of species, constrained by climate and vegetation.

Maxent models are more reliable than spatial interpolation models as they incorporate environmental conditions as well as purely spatial factors (BAM, 2012).

The resulting predictions from Maxent cannot be interpreted as occurrence probabilities, but as robust representations of relative habitat suitability. Locations with high Maxent values are on average better habitats for the modelled species (BAM, 2012). BAM constrained their background data to surveyed locations. Due to the high spatial aggregation of survey locations and the resulting potential for bias, BAM aggregated occurrence records at the 4 km by 4 km grid cell level, which corresponds to the resolution of their climate data. The modelled species was considered present in a grid cell if at least one individual of the modelled species was counted over all point-count surveys contained in the grid cell, with the model background defined as all cell having at least one survey location (BAM, 2012). These models were brought into ArcGIS and each were given a consistent scale of 1 (low) and 10 (high) for habitat suitability. These scaled values were divided into four equal (25%) quantiles with the top two quantiles (7.5 - 10, 5 - 7.5) deemed Primary and Secondary Habitat, respectively.

As BAM models are at a much coarser scale (4 km by 4 km), they likely show a higher proportion of habitat for a given species than would the ALCES model. It is likely that not all habitat within a 4 km by 4 km grid cell listed as primary is actually used, however there is sufficient habitat within the cell for it to be categorized as such.

Resource Selection Function (RSF) Modelling

Resource Selection Functions (RSFs) were utilized in the modelling of caribou calving, caribou winter and moose winter habitat selection likelihood. Modelling for boreal caribou was undertaken using telemetry data from collared female caribou in the Norway House boreal caribou range that intersects the RAA. Moose RSF modelling utilized moose locations observed from winter aerial surveys in the moose LAA. RSF analysis is based on the assumption that usage reflects the resources required during the seasons identified (Manly *et al.*, 2002).

In the analyses undertaken, “used” and “unused” sample cells were extracted from the ALCES 1 km dataframe. All grid cells not containing animal observations were considered in the full pool of “unused” cells. As there were substantially more “unused” than “used” cells in the study area, a sample of random “unused” cells were selected from the ALCES 1 km dataframe (following Manly *et al.*, 2002). For each species, a random sample of a size equal to the number of “used” cells was extracted. Table 3 provides a summary of observational data and seasons utilized in the development of RSF models for caribou and moose.

The variables used for the RSF are indicators of habitat and disturbance built into the ALCES database and are described in Appendix E. The variables were permuted using the dredge function from package MuMin (Barton, 2016) and assessed using Akaike Information Criterion (Bozdogan, 1987). Candidate models used Genralized Linear Models (glm function) with a binomial distribution. The most parsimonious model, with a ΔAIC of 0, provided coefficients for indicators that best explained the simplest model with the least assumptions and variables and the greatest explanatory power.

The coefficients generated for each RSF model were input into ALCES to produce prediction maps based on the weightings of indicator coefficients in the ALCES 1 km grid cells for the study area. For caribou likelihood, maps were generated for the Hayes River Upland Ecoregion, as well as the RAA, the Ungulate LAA and Project Footprint. Moose RSF likelihood was generated for the RAA, Ungulate LAA and Project Footprint.

Threshold values to identify suitable habitat were based on validating cell values that contained observations. Minimum and average cell values were calculated, and high likelihood habitat was determined by assessing average value of occupied cells for both caribou and moose. Symbology was based on a yellow-red 'heat' color. The bin classes were used to calculate the potential area of high quality habitat within the RAA, LAA, and Project Footprint. Comparisons of caribou calving and winter habitat were also undertaken to compare habitat quantity and quality within the RAA and LAA to the overall Molson Boreal Woodland Caribou Management Unit. Table 3 provides a summary of data used in the RSF analyses for caribou and moose.

Table 3: Summary of RSF model parameters

Parameter	Caribou Calving	Caribou Winter	Moose Winter
Season dates	April 28 - May 28, 2012 May 12 - June 26, 2013 May 6 - June 27, 2014 May 11 - June 12, 2015 May 7 - June 14, 2016	January 1 - March 21, 2012 - 2016	February 18 - 19, 2016 February 6 - 9, 2017
Number of animals	2012 = 20 2013 = 22 2014 = 30 2015 = 32 2016 = 35	2012 = 19 2013 = 15 2014 = 25 2015 = 25 2016 = 28	2016 = 63 2017 = 68
Total cells in study area	62,285 (Molson MU)	62,285 (Molson MU)	2,516 (Moose Aerial Survey Area)
Total used cells in study area	82	2,958	90

6.0 WILDLIFE VC EVALUATION

The following sections provide additional detail on data collection and analysis methods applied in the assessment of potential effects and to also identify appropriate mitigation measures where required. The purpose data collection for VC Species. (i.e., include mammals, birds, amphibians and reptiles and SOCC species) included caribou collaring, moose and caribou surveys, multispecies track surveys, trail cameras, ARUs (birds), Breeding Bird Atlas, as well as desktop studies and modeling etc. Distribution and relative abundance were assessed as well as to identify important or unique areas within the RAA and LAA to determine significance of potential effects.

6.1 Caribou (*Rangifer tarandus*)

Baseline field data were collected on woodland caribou and eastern migratory caribou (hereafter referred to as “caribou”) across the region that include two separate ecotypes of caribou as described by COSEWIC (2017). COSEWIC currently assess the Norway House caribou range as part of Designatable Unit 6 (DU6): Boreal Caribou and are assessed as “Threatened”. COSEWIC has also assessed all subpopulations of the Eastern Migratory caribou, including the Southern Hudson Bay subpopulation (i.e. the Pen Islands range), as “Endangered” (COSEWIC 2017). For the purpose of this report, caribou are described as either “forest-tundra” (Pen Islands/Eastern Migratory) or boreal (Norway House Range/Boreal) ecotypes as described in the Manitoba Boreal Woodland Caribou Strategy (2015). The RAA is located on the eastern edge of the Molson Boreal Caribou Management Unit and includes a smaller area known as the Norway House boreal caribou range.

The objectives of field data collection was to determine the spatial and temporal extent of caribou occupancy within the RAA. Baseline data collection included GPS collar telemetry, aerial multispecies winter track surveys, trail camera traps and TK gathered during the community wildlife workshops described in Section 4.5.5, Section 6.7, as well as the Project 6: Existing Environment Wildlife Report (Joro, 2017).

In contrast to other wildlife VCs with a 5 km buffer LAA, the LAA for caribou and moose was extended to include a 10 km buffer from the PF to facilitate the assessment of potential effects for these larger ranging species. Other rationale includes boundaries for baseline aerial surveys that have been approved by MSD based on sampling within a standard three-minute grid (2.5 x 5 km) for all moose surveys in Manitoba. All grid cells contained within the 10-km buffer of P6 are included in the baseline aerial moose surveys and provides for future construction and operation monitoring to confirm predicted effects of the project on moose densities, moose cohort composition and calf recruitment in the LAA. The LAA designed for moose, was considered suitable for assessing local effects on caribou, providing a larger area to assess use and occupancy during construction and operation through aerial surveys, trail camera studies and multi-species surveys.

6.1.1 Collaring

Pen Islands Caribou Range/Population (Forest-tundra)

Eight caribou from the Pen Islands population were captured and collared by MI within the God's Lake area of the RAA using a contracted helicopter net-gun capture crew under the authority of MSD annual scientific permits and MSD direction during January 31 - February 3, 2011. Joro staff were involved with collar initialization and testing, reconnaissance flights to locate target animals and groups, field logistics, and data management.

Once animal groupings were located, the capture crew targeted select animals that were netted, restrained with hobbles, and blindfolded. Caribou were fitted with collars that began to transmit data immediately post-release. GPS fixes were acquired every three hours, and data transmitted every 1.5 days via the Iridium satellite network. Collars also had very high frequency (VHF) radio beacons for relocation by radio-telemetry tracking. No immobilizing drugs were used during any capture operations. Following physical immobilization, measurements and biological samples were taken (blood, feces, and hair), satellite collars were fastened, and the animals were then released.

Additional collaring by MI beyond 2011 was not undertaken as per the direction of MSD due to the existence of historical telemetry and collaring data (2010 - 2016) for the Pen Islands population. This data was subsequently provided to MI confirming Pen Islands animals ranged near the P6 area of interest (i.e. God's Lake). All collaring data collected by MI for and made available by MSD for 39 Pen Islands caribou are found in

Table 4.

Norway House Caribou Range/Population (Forest-dwelling)

A total of 61 Norway House caribou, part of the Molson MU, were captured and collared between 2011 and 2016 using the same methods and approvals as described for the Pen Islands animals (

Table 4).

The following table provides a summary of collar deployments and data utilized. These telemetry data have been used in various analyses including: the identification of core use areas by season, identification of calving areas, and general movement patterns relative to the RAA, LAA and P6 ASR alignment.

Table 4: Total number of caribou collars annually deployed, and active collars between 2010 and 2017 in the Norway House (MI data) and Pen Islands populations (MI and MSD data)

Year	Norway House Population		Pen Islands Population	
	# Collars Deployed	# Active Collars	# Collars Deployed	# Active Collars
2010	N/A	N/A	4	4
2011	N/A	N/A	9*	13
2012	20	20	8	17
2013	11	21	10	15
2014	14	30	6	20
2015	6	32	2	17
2016	10	35	0	11
2017	0	34	N/A	N/A

N/A = MI collaring began in 2012 and ended in 2016, but some collars were still active in 2017; MSD collaring began in 2010 and the data cut-off provided was November 28, 2016

*2011 data includes eight animals collared by MI and 1 collared by MSD

6.1.2 Core Use Analysis

Spatial analysis of movement data from collared animals was performed to be utilized in evaluating potential effects that may result from the development of the P6 ASR. Volume-density kernels were created in Environmental Systems Research Institute's (ESRI) ArcGIS (ESRI, 2011) using the Home Range Tools extensions with data collected from all years (2010 - 2017) during winter telemetry surveys and GPS data in the Pen Islands and Norway House range.

For seasonal core use area analysis, five 40-day seasons were used as defined by Pond *et al*. (2016): calving (May 1st - June 9th), breeding (September 9th - October 19th), which proceeds the calving season by a 234-day gestation period (Bergerud *et al*., 2012), early winter (January 1st - February 9th), late winter (February 10th - March 21st) and summer (July 23rd - August 31st). Caribou core use areas were determined to be within the boundary of the 70% contour of the areas of caribou concentrations (i.e. 70% of the telemetry point locations are concentrated in the 70% contour of the winter and summer core use area).

6.1.3 Aerial Multispecies Surveys

Multiple aerial multispecies surveys have been conducted as part of broader baseline wildlife surveys in support of ASR planning and assessment to provide baseline data on the general distribution of caribou, moose, and furbearers during winter. Winter track surveys have been employed in assessing occupancy of large and small carnivores as well as ungulates (Stanley and Bart, 1991; Magoun *et al.*, 2007; Gardner *et al.*, 2010). Aerial multispecies surveys were conducted in portions of the RAA within a previously designated survey area for Project 6 on January 4-14, 2012; February 23-25, 2014; and February 20-21, 2016 (Map 5). Surveys were conducted during January and February, when snow and light conditions were favorable for observing tracks and larger wildlife (caribou and moose). Other wildlife occurrence included large and small carnivores through visual identification of track size and patterns. Species surveyed included moose, caribou, wolf, wolverine, martin, fisher, lynx, and fox.

Transects were spaced 5 km apart and were flown in an east-west direction using a helicopter, flying at an average speed of 90 km/hr. A crew of three biologists utilized hand-held GPS units to record locations of all tracks, animal observations, habitat type, and other notable observations such as large stick nests. Two observers on each side of the helicopter, called out track observations within a 250 m wide strip along each side of the transect line, while the third member of the team maintained detailed data sheets respecting species and location (GPS positions) of each observation, and assisted with navigation along the transect line. The data were exported to a GIS and adaptive kernels were applied to each species to map areas of relative occupancy near the ASR alignment.

Limitations included variable weather and snow conditions between years surveyed as well as inconsistent timing with the 2012 survey being conducted earlier in winter. These factors contribute to potential variation in distribution of some species. However, at the scale intended, the results provided opportunity to assess routing options relative to species distribution. The results should not be associated with species density, as kernels provide a visual representation of higher track occurrence compared to the area surveyed.

6.1.4 **Other Aerial Surveys (e.g. Pre-collaring Surveys, Group Count Surveys)**

Caribou group counts from other aerial surveys include pre-collaring reconisiance flights and telemetry surveys. Group and herd counts were random or based on tracking collared animals. Data on winter group sizes provides context to the numbers of caribou that could potentially occur in the RAA during construction and operation of Project 6. Data from surveys include:

- Group count surveys were conducted on March 27-29, 2012, March 19-21, 2013, and March 11-12, 2016.
- Aerial moose surveys on February 18-19, 2016 and February 6-9, 2017.

These surveys provided general information on approximate numbers near the RAA as well as some limited information on demographics. All observations of caribou were recorded during the survey on hand-held GPS units and on detailed data sheets, including the date, species observed, group size, age, and sex (when possible).

6.1.5 **Trail Camera Studies**

As part of a suite of baseline monitoring methods to map wildlife distribution within the RAA, trail camera studies were designed to focus on larger prey and predator species (ie; caribou, moose, wolves, and bears). Incidental observations of other small furbearers were also noted. Beginning in 2016, trail camera site selection has been based on a hexagonal sampling grid overlain over the RAA. Trail cameras were located across the RAA and LAA (Map 6).

Hexagon sampling units facilitate spatial analysis of habitat attributes that are useful in determining wildlife occupancy (Rempel *et al.*, 2012). Sampling grids are used extensively to determine wildlife occupancy through aerial and ground surveys in boreal forest settings (e.g. Gardner *et al.*, 2010; Whittington and Heuer, 2012; Hornseth and Rempel, 2016). The application of trail camera trap event (photo) data were used to support other wildlife distribution data collected from aerial multispecies surveys, total minimum count aerial moose surveys, and trapper programs.

Trail camera placements were based on a hexagon grid of approximately 21 km^2. Sample unit size was based on maximizing the detection and occupancy of mammals with large home ranges. Trail cameras were placed within individual hexagon cells with the objective of maintaining a minimum separation of 2.5 km between camera locations. Camera trap locations were also distributed across various representative habitat types based on habitat mapping using the Land Cover Classification of Canada, East Side (LCCES), an enhanced version of the LCC layer that includes the addition of the historical fire history since 1920. Camera trap sites were placed near the proposed alignment and along existing natural and anthropogenic linear features, and game trails to provide optimum opportunity to document target species that tend to use these features for travel. The presence of a suitable helicopter landing area was also a consideration to ensure effective maintenance and retrieval of cameras.

Wildlife occurrence by hexagons was summarized by species and the total number of camera trap events. The number of camera trap events often reflects multiple animals of the same species being captured in a single photograph, however, distinguishing individuals through pelage (fur patterns), size, and/or other markings was not considered feasible due to the one year duration of camera placement, given that animals shed hair and antlers. Also, bear tampering often results in cameras being tipped, resulting in only partial photographs of individuals. For camera coding and occupancy determination, multiple photos of the same animal were only counted once. Multiple animals in a single photograph were counted (for example, if a group of two moose were caught on camera in five separate new events, the number of camera trap events is 10) (Lyra-Jorge *et al.*, 2008; Rosatte, 2011).

Caribou, moose, wolves, and black bears were analyzed by season to identify seasonal occupancy of the RAA by each species. Differences in gradient scale and shading illustrated on maps is reflective of species observation rates as some species (such as caribou) are more commonly observed (including larger groups) than others (i.e. wolf). Seasonal mapping dates were based on general terrestrial and avian wildlife distribution for spring, summer, autumn, and winter. Trail camera data collected by seasons, similar to telemetry data for caribou and wolves, are mapped based on the dates provided below:

- Spring: March 21st - June 20th;
- Summer: June 21st - September 20th;
- Autumn: September 21st - December 20th; and
- Winter: December 21st - March 20th

6.1.6 Path Trajectory Analysis

Forest-tundra and forest-dwelling caribou show very different annual movement patterns, with forest-tundra caribou demonstrating extensive movement patterns, while forest-dwelling caribou make small and concentrated annual movements (Berglund *et al*., 2014). Characterization of movement patterns can identify life-history strategies and the amount of land used annually. Preliminary analysis of caribou crossings was undertaken on existing linear features associated with ASRs to provide baseline data for future comparisons of animal movement.

Caribou GPS locations were converted into path segments by connecting successive locations. Home Range Tools 2.0 (HRT) and Geospatial Modelling Environment (GME) were used for creating path trajectories for animals. Path trajectories do not reflect the exact travel route taken by an animal, but provide a good approximation useful for investigating large-scale movement patterns. Path trajectory analysis was done seasonally to account for seasonal movement patterns of caribou, as outlined in Berglund *et al*. (2014).

Caribou exhibit a substantial decrease in daily movement rates during the calving season (May and early June), with the length of this decrease varying between animals, from a few days to more than two weeks. For path trajectory analysis, five 40-day seasons were used as defined by Pond *et al*. (2016): calving (May 1st - June 9th), breeding (September 9th - October 19th), which proceeds the calving season by a 234-day gestation period (Bergerud *et al*., 2012), early winter (January 1st - February 9th), late winter (February 10th - March 21st) and summer (July 23rd - August 31st).

6.1.7 Time and Movement Analysis

Preliminary analysis of caribou crossings was undertaken on existing linear features associated with the P6 RAA to provide baseline data for future comparisons of animal movement. Caribou GPS locations were converted into path segments by connecting successive locations. Crossing events were identified when path segments intersected linear features and separated into five 40-day seasons as described in the path trajectory section above.

6.1.7.1 Identification of Calving Sites

Joro is in the process of refining methods of identifying caribou calf mortality based on Step Analysis developed by DeMars *et al.* (2013). Caribou telemetry data from reproductive-aged female caribou from the Pen Islands population and Norway House population was analyzed to determine daily movements to identify calving and calf mortality sites from April 15th - June 30th during the years of 2011 - 2016. Based on DeMars *et al.* (2013), caribou calf step lengths increase with age after birth and are similar to adults after one month and therefore mortalities cannot be detected effectively after June 30th.

Three *a priori* movement models were used: female did not calve; female calved and calf survived to four weeks; and female calved and calf did not survive to four weeks. All three models assume step lengths are exponentially distributed, and only differ in their scale parameter (i.e. mean step length). For females that did not calve, mean step length remains constant over time. For females that calved and the calf survived to four weeks of age, the mean step length abruptly drops at calving, creating a calving break point; the mean step length linearly increases after calving until the calf reaches adult movement rates, indicating the calf survived past four weeks and has reached adult movement rates. For females that calved and the calf did not survive to four weeks of age, the mean step length abruptly drops at calving, creating a calving break point; the mean step length begins to linearly increase until there is a second abrupt change, and the mean step length recovers to its pre-calving value, indicating a calf loss.

Models were run in program R (R Core Team, 2016) using script provided in the DeMars *et al.* (2013) appendices, and through personal communication with C. DeMars (2016). Movement graphs were generated to visually confirm that the statistical predictions match the animal's movement behavior. All calf mortality analyses are from model M2. The analysis is designed to find a mortality date within four weeks after calving (i.e. the calf is up to four weeks old), as after this point calves are traveling at the same speed as females, and collared females reach their pre-calving mean step length. Mortality dates were found up until June 30th as this was the last day of our data.

Note that linkages to this new analysis include the refinement of calving habitat models and potential resource selection models for calf mortality sites. Potential for evaluating and comparing resource selection of wolves and caribou during the critical calving and calf rearing period are being investigated for works that will be conducted in 2017 and 2018.

6.1.7.2 Fidelity Analysis

Caribou calving sites are a significant component of critical habitat. Understanding site fidelity for calving provides insight into the potential effect on individual caribou as a result of ASR routing or other anthropogenic linear features and disturbances. Calving behaviours also differ between forest and tundra forest ecotypes (Pen Islands caribou), with forest ecotypes (boreal woodland caribou) illustrating higher fidelity to calving locations.

Caribou calving sites were identified through ongoing baseline data collection efforts using GPS collar data from caribou collected according to the methods described previously. GPS collar data from the Pen Islands population and Norway House population gathered from 2010 to 2016 were used in assessing calving site fidelity. Fidelity analysis involved determining the distance between the annual calving locations (the date of least movement) to determine if caribou return to the same location to calve (Berglund *et al*., 2014). A box plot was used to show the median distance between calving site locations over consecutive calving years. Only data from animals that calved in consecutive years were used in this analysis.

6.1.8 **Habitat Modeling**

Although collar and survey data suggest that the Norway House caribou range is outside of the RAA, the Molson Boreal Caribou Management Unit intersects the RAA and LAA. In consideration of potential for boreal woodland caribou (forest-dwelling) occupancy (likely at very low densities), predictive habitat modeling was undertaken using existing telemetry data outside the RAA through resource selection functions (RSF's) modeling to examine potential habitat within the RAA, LAA and PF. Specific modeling methods are described in Section 5.1.3 and the following provides an overview of general habitat requirements for forest-dwelling caribou. The results of RSF modeling to predict potential calving and winter habitat occurring in the RAA are presented illustrating habitat availability and potential effects to high quality habitat.

6.1.9 **Habitat Disturbance Analysis**

The intent of the disturbance analysis is to determine total habitat disturbance within the Molson MU relative to the sustainable threshold of 65% undisturbed (35% disturbed) habitat identified by Environment Canada (2012). Disturbance was broken into two major components consistent with those described by Environment Canada (2012) and included natural disturbance (mainly fire less than 40 years old) and anthropogenic disturbance including linear features such as Winter Roads (WR), transmission lines, as well as other footprint disturbance including forestry and quarry development. It should be noted that this Cumulative Effects Assessment (CEA) analysis was based on available data.

The road layer used for this CEA consisted of the National Road Network Roads (federal data), Class 2 (year-round secondary gravel roads, graded and ditched) access roads, Class 3a (summer access high ground road, graded and gravelled when required) community roads, highways, and park roads.

Natural disturbance area was calculated from fire data derived from the LCCES provincial fire data, to include the updated 1928 - 2015 fire layer with the time period of 1975 - 2015 for the 40-year timeframe. Anthropogenic disturbance was assessed using all linear development including transmission lines and WRs. These features were buffered by 500 m on either side of the feature based on the Environment Canada (2012) approach. Using the LCCES data, areas of harvested forests within the previous 40 years were identified and an area of disturbance was calculated for each range. Drill holes, obtained from Manitoba Growth, Enterprise and Trade (2013), were assigned a buffer with a radius of 250 m for the Molson MU.

6.1.10 **Results – Caribou**

6.1.10.1 Seasonal Occupation

Core Use Analysis – From Telemetry

Pen Islands Caribou Range/Population (Forest-tundra)

The Pen Islands caribou range extends across northeastern Manitoba along the Hudson Bay coastline to northwestern Ontario, including the RAA (Map 7). Early and late winter core use areas occur inland (Maps 8 and 9), while the calving core use area extends along the Hudson Bay coastline across Manitoba and Ontario (Map 10). The Pen Islands core use area move slightly more inland during summer (Map 11), and slightly further east during breeding (Map 12). Pen Islands animals occur within the RAA during all five 40-day seasons with the largest portion of a seasonal core use area occurring in the RAA in late winter (6.24%, Table 5). Pen Islands animals overlap the LAA during early and late winter (Map 8 and 9; Table 5). Only a small proportion of its seasonal core use areas occur within the LAA, with the largest portion of a seasonal core use area occurring in the LAA in early winter (1.22%; Table 5).

Norway House Caribou Range/Population (Forest-dwelling)

The Norway House core use areas occur to the west of the RAA, with no seasonal core use areas occurring within the RAA (Map 13-17; Table 6). There is little seasonal movement in the Norway House caribou core use areas (Maps 13-17).

Table 5: Pen Islands core use area in the RAA and LAA

Season	Number of core use areas	Total core use area (km^2)	Amount of core use area in RAA (km^2)	Amount of core use area in LAA (km^2)
Early Winter	4	23144.95	1098.61 (4.75%)	446.63 (1.93%)
Late Winter	5	23876.2	1490.73 (6.24%)	467.16 (1.96%)
Calving	10	28025.97	512.19 (1.83%)	0 (0%)
Summer	10	23872.95	334.29 (1.40%)	0 (0%)
Breeding	6	28677.62	416.42 (1.45%)	0 (0%)

Table 6: Norway House core use area in the RAA and LAA

Season	Number of core use areas	Total core use area (km^2)	Amount of core use area in RAA (km^2)	Amount of core use area in LAA (km^2)
Early Winter	7	2766.53	0 (0%)	0 (0%)
Late Winter	5	2039.79	0 (0%)	0 (0%)
Calving	13	5006.98	0 (0%)	0 (0%)
Summer	16	4775.50	0 (0%)	0 (0%)
Breeding	12	5353.13	0 (0%)	0 (0%)

6.1.10.2 Caribou Observations and Relative Numbers

Pen Islands Caribou Range/Population (Forest-tundra)

Caribou observations from other surveys conducted in support of ASR development across the northern portion of the LATN area provide insight into the relative spatial and temporal distribution of the Pen Islands forest-tundra caribou in the RAA. These data augment telemetry data by providing context into the numbers of caribou potentially occurring. Observation data from surveys conducted include multispecies, group counts (of collared caribou in the Gods Lake area), and incidental observations of caribou during aerial moose surveys. These surveys were conducted on various dates from 2012 - 2017 and included areas within the RAA. Surveys included group-counts and searches for non-Pen Islands animals as part of pre-collaring surveys to determine potential areas for capture of forest dwelling caribou if present[4].

Counts of caribou ranged from 13 in 2016 to 220 in 2012. During the 2012 multispecies survey, caribou observations were most evident in the north half of the survey area, with a small concentration found to the west of Bunibonibee Cree Nation (Map 18). Similar distributions were found during the 2014 multispecies survey, with a small concentration found north of God's Lake First Nation (Map 19). During the 2016 multispecies survey, caribou tracks and observations were distributed north and west of God's Lake (Map 20). Caribou observations during moose surveys were constrained to the moose survey area which is described in Section 6.2.1.1.

These variable results are expected due to unpredictability in the timing of Pen Islands caribou migration. The results from all aerial multispecies surveys aerial caribou group count and moose surveys are found in Table 7, and provide context to the numbers of forest-tundra caribou that migrate through the RAA.

[4] Pre-collaring flights in 2012 and 2013 were intended to locate potential forest-dwelling caribou prior to Pen Islands caribou migration into the RAA for collaring as there were no provincial approvals to collar additional Pen Islands caribou. No forest-dwelling caribou could be verified as Pen Islands animals were present and no additional collaring beyond Gods Lake caribou collaring in 2011.

Table 7: Norway House caribou observations during northern multispecies surveys and other aerial surveys from 2011 - 2016

Survey Year	Tracks	Number of observed caribou	Number of observed caribou in the RAA
January 2012 Multispecies survey	-	94	33
March 2012 Group count survey	-	437	220
March 2013 Group count survey	-	148	24
February 2014 Multispecies survey	283	42	31
March 2015 Multispecies survey	726	315	116
February 2016 Multispecies survey	235	59	13
March 2016 Group count survey	-	107	0
February 2016 Moose survey	21	15	15
February 2017 Moose survey	-	142	122

6.1.10.3 Trail Camera Studies

A total of 98 trail cameras were deployed in the RAA (includes LAA) as described in Section 6.1.5. Of those deployed, 48 hexagons were sampled in the LAA. A total of 238 caribou camera trap events were recorded, of which 212 (89%) recorded caribou occurrences in the LAA. The majority of observations were recorded in the spring with 87-96%, however each camera trap does not represent separate individual caribou as there is low confidence in individual identification. The data do suggest more caribou activity during the winter. Caribou occupancy within the LAA and RAA on the hexagons sampled indicates higher levels of caribou activity in winter and spring, however, the differences in seasonal occupation cannot be statistically substantiated due to the low frequency of observations and numbers of hexagons occupied.

Results of caribou occupancy in the RAA and LAA are illustrated in Maps 21-23. Table 8 provides a summary of the percentage of camera traps events for those hexagons that were occupied for spring, summer, autumn and winter.

Study Area	Number of Camera Trap Events by Season*				
	Spring	Summer	Autumn	Winter	Total
LAA	204 (96%)	2 (1%)	0 (0%)	6 (3%)	**212**
RAA	207 (87%)	17 (7%)	0 (0%)	14 (6%)	**238**

*Spring = March 21st - June 20th; Summer = June 21st - September 20th; Autumn = September 21st - December 20th; Winter = December 21st - March 20th

Table 9 provides a breakdown of the number of hexagons and percentage of total hexagons sampled within the RAA along with separate totals for the LAA. Most caribou trail camera occurrences during the spring occurred on cameras near Manto Sipi Cree Nation (Map 21), with large numbers of caribou captured together in groups. Fewer caribou were observed during the summer months, with most caribou camera occurrences occurring southeast of God's Lake First Nation (Map 22). Several cameras throughout the northern portion of the RAA caught caribou during winter, with several cameras near Manto Sipi Cree Nation and cameras east of Bunibonibee Cree Nation capturing caribou (Map 23).

Table 8: Trail camera data for caribou in the P6 LAA and RAA, March 1, 2016 – August 15, 2017

Study Area	Number of Camera Trap Events by Season*				
	Spring	Summer	Autumn	Winter	Total
LAA	204 (96%)	2 (1%)	0 (0%)	6 (3%)	**212**
RAA	207 (87%)	17 (7%)	0 (0%)	14 (6%)	**238**

*Spring = March 21st - June 20th; Summer = June 21st - September 20th; Autumn = September 21st - December 20th; Winter = December 21st - March 20th

Table 9: Trail camera hex distribution for caribou in the P6 LAA and RAA, March 1, 2016 – August 15, 2017

Study Area	Hexes with Cameras	Number of Hexes with Trap Events by Season*			
		Spring	Summer	Autumn	Winter
LAA	48	10 (59%)	2 (12%)	0 (0%)	5 (29%)
RAA	98	12 (48%)	3 (12%)	0 (0%)	10 (40%)

*Spring = March 21st - June 20th; Summer = June 21st - September 20th; Autumn = September 21st - December 20th; Winter = December 21st - March 20th

6.1.11 **Movements**

6.1.11.1 Annual Movement Patterns

Pen Islands Caribou

Path trajectory data were generated for those Pen Islands animals that had sufficient annual movement locational data to determine annual movement patterns. Of 42 collared Pen Islands caribou, a total of 32 animals had sufficient data for estimating annual measures, representing a total of 70 caribou-years of data. Pen Islands caribou travel large distances over the annual cycle with the average annual minimum path length estimated at 3,536 km (Std. Deviation 920 km) (Table 10). Maps 24-28 illustrate these large movements and overall annual seasonal movement patterns of Pen Islands caribou.

Results of the path trajectory analysis indicate that Pen Islands caribou gradually move inward from the Hudson Bay coast during November and December, reaching the farthest inland from the coast by mid-January and February (Map 24), then slowly returning to the Hudson Bay coast in March (Map 25) and arriving at calving grounds in April (Abraham and Thompson, 1998; Berglund *et al*., 2014). During the calving season, Pen Islands caribou migrate large distances towards the Hudson Bay coast to calve (Map 26). Caribou continue to approach the coast during summer but do not aggregate on the coast (Map 27; Abraham *et al*., 2012; Berglund *et al*., 2014). During the breeding season, Pen Islands caribou are found at the edge of the Hudson Bay Lowlands boundary (Map 28; Abraham and Thompson, 1998).

Norway House Caribou

Of 60 collared Norway House caribou, 50 individuals had sufficient data for estimating annual measures of movement representing a total of 100 caribou-years (collective number of years monitored for the 60 caribou). Norway House caribou show smaller scale seasonal movement patterns than Pen Islands caribou and move independently (Berglund *et al*., 2014). Norway House caribou calve farther from the Hudson Bay coast than Pen Islands caribou and move from winter aggregations (Maps 29 and 30) to calve in isolation (Map 31). The average annual path length for these animals was 1,520 (Std. Deviation 297 km) (Table 10). Maps 29-33 show the annual seasonal movement patterns of Norway House caribou.

Table 10: Average annual movement path lengths for Pen Islands and Norway House caribou

Population	Number of Caribou	Total caribou-years	Average annual path length (km)
Pen Islands	32	70	3536.36 (± 919.76)
Norway House	50	100	1520.07 (± 297.38)

6.1.11.2 Time and Movement Analysis

Crossing event analysis utilized path trajectory data from the Pen Islands and Norway House populations to assess frequency of potential crossings of linear features in the RAA, including the proposed Project 6 ASR alignment, winter roads, and transmission lines (Table 11 to Table 13). Travel paths of the Norway House caribou range did not intersect the RAA, although they were observed to cross winter roads and transmission lines throughout the year within their main range. Pen Islands caribou only crossed the proposed ASR alignment and winter road during early and late winter (Table 11 and Table 12), and most caribou crossing events for the transmission line occurred in early and late winter, with two crossings occurring during the calving season (Table 13). Linear crossings occurred by only a few caribou, with a maximum of seven animals crossing transmission lines during early winter, with only one or two caribou crossing linear features seasonally.

Table 11: Project 6 proposed ASR crossing events by Pen Islands caribou from 2011 - 2016

Season	Crossing Events	Caribou with Crossings	Average Crossings per Caribou
Early Winter	11	5	2.2
Late Winter	8	2	4

Table 12: Project 6 Winter Road crossing events by Pen Islands caribou from 2011 - 2016

Season	Crossing Events	Caribou with Crossings	Average Crossings per Caribou
Early Winter	12	5	2.4
Late Winter	4	2	2

Table 13: Project 6 Transmission line crossing events by Pen Islands caribou from 2011 - 2016

Season	Crossing Events	Caribou with Crossings	Average Crossings per Caribou
Early Winter	12	7	1.7
Late Winter	1	1	1
Calving	2	1	2

Pen Islands caribou were primarily present in the RAA during early and late winter, spending an average of 10.4 and 16.7 days of the 40-day seasons in the RAA, respectively (Table 14). One Pen Islands caribou, animal “GODS05”, was present in the eastern fringe of the RAA during all five seasons and was the only collared animal present during the calving, summer, and breeding seasons.

Table 14: Time spent in the Regional Assessment Area by Pen Islands caribou from 2011 - 2016

Season	Number of Caribou	Total caribou-years	Average Number of Days spent in RAA
Early Winter	10	11	10.4 (± 8.9)
Late Winter	10	12	16.7 (± 11.8)
Calving*	1	2	22.8 (± 24.3)
Summer*	1	1	40.0
Breeding*	1	1	40.0

*Indicates that only one animal of the original ten recorded in the winter seasons during the five-year time period spent time in the RAA during the calving, summer and breeding seasons. Note that Norway House caribou were not observed to cross any linear features in the RAA as it is on the fringe of the known range.

6.1.11.3 Calving Behaviours

Identification of Calving Site Analysis

Figure 13 provides an example of the individual-based method of inferring parturition and offspring survival status in female woodland caribou described in DeMars *et al.* (2013). The black line illustrates the daily movement pattern of animal "Pen37" from May 15 to June 30, 2013 (the caribou calving period), who gave birth (May 25, 2013) and lost her calf (June 8, 2013). The red horizontal line represents the mean step length. The vertical dashed red lines represent the estimated break points in the time series. Animal "Pen37" has two break points, indicating that the female calved and then lost the calf. The lower mean step length between the two vertical lines represents the depression in mean step length while the female is with her calf, as the mean step length of a calf is significantly lower than an adult female.

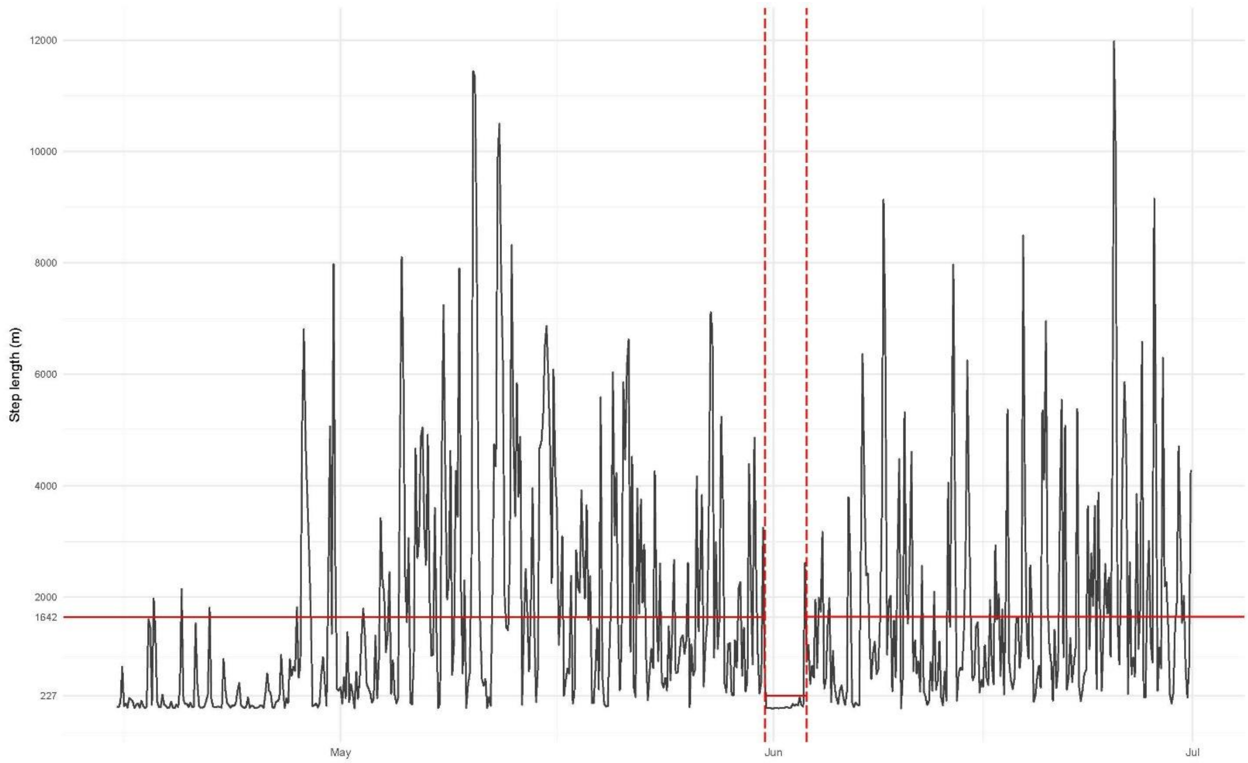

Figure 13: Total daily step length (m) for animal "Pen37" from May 15 - June 30, 2013

Figure 14 illustrates an example of a female caribou that had a calf that survived past four weeks. Animal "NorwayHouse51" has only one break point, indicating that the female calved and the calf survived past four weeks. After four weeks of age, mean step length of the calf is the same as the female. The lower mean step length after the vertical line represents the depression in mean step length while the female is with her calf, with the mean step length gradually increasing until mean step length with the calf returns to the pre-calving daily movement rate and calf mortality can no longer be detected.

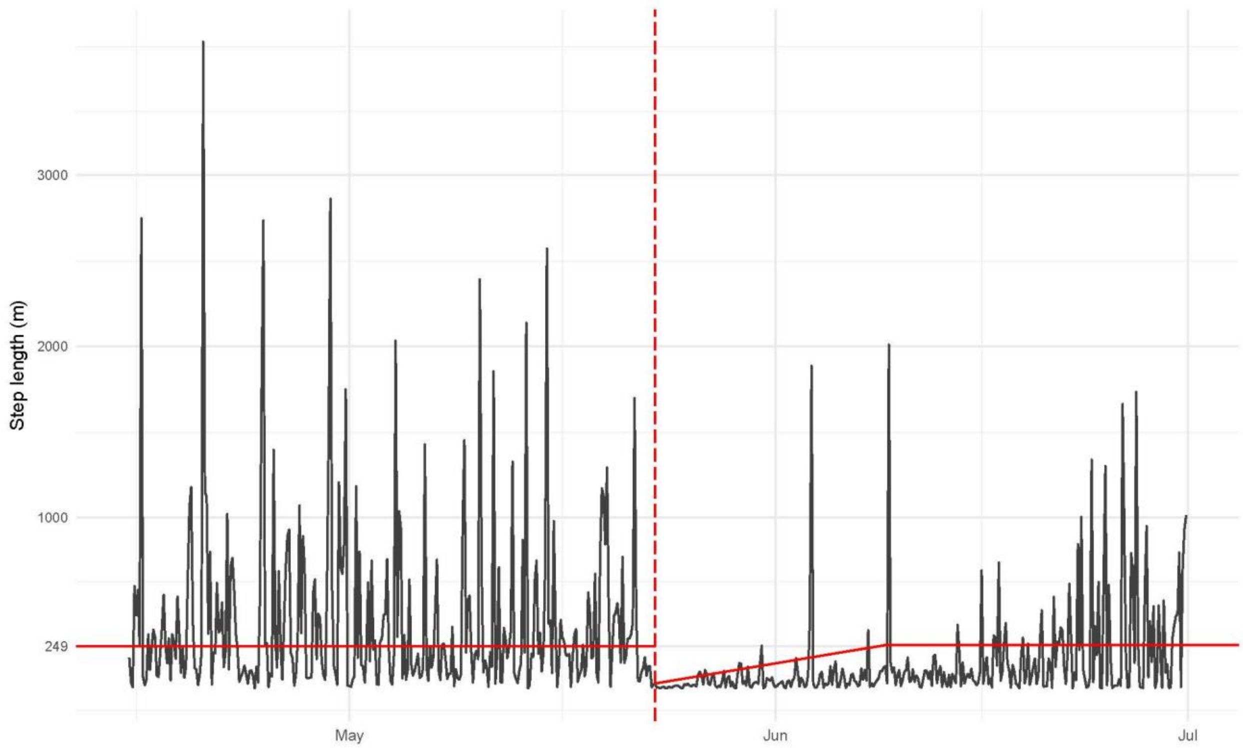

Figure 14: Total daily step length (m) for animal "NorwayHouse51" from May 15 - June 30, 2015

From 2010 - 2016, 60 female caribou were modeled from the Pen Islands population and 112 from the Norway House population. Of these 60 females, seven caribou did not calve, 12 females calved and the calf survived past four weeks of age, and 41 calved with the calf not surviving past four weeks of age (Table 15). The mean calving date for Norway House was on or within five days of May 17th each year, while the mean calving date for Pen Islands was on or within four days of May 23rd each year. Only one female was shown to calve in the RAA, with one caribou calving in the RAA in 2011. Map 34 depicts the spatial locations of modeled calving sites across both the Pen Islands and Norway House ranges. The yearly calving model results from 2010 - 2016 are shown in Table 15 illustrating that the average calving date for forest-tundra animals was later (3 - 8 days, depending on year) than forest-dwelling animals.

Table 15: Caribou calving model results from 2010 - 2016

Population	M0	M1	M2	Total	Mean calving date
Pen Islands	7	12	41	60	May 23
Norway House	17	34	61	112	May 17
Total	24	46	102	172	May 19

M0 = females did not calve; M1 = calves survived past four weeks; M2 = females calved lost within four weeks

6.1.11.4 Fidelity Analysis

The distance between calving locations in successive years was consistently smaller for Norway House caribou (Figure 15). The distances between successive calving locations for the Pen Islands and Norway House are summarized in Figure 15 and Norway House only in Figure 16. The median, minimum and maximum distances between consecutive calving sites for Pen Islands and Norway House are shown in Table 16. 27 of 31 Pen Islands caribou had calving sites more than 10 km away from previous calving sites, with only one caribou having consecutive calving sites under 1 km away from its previous calving site (Table 17). 31 of 41 Norway House caribou had calving sites less than 10 km away from previous calving sites, with 12 of those calving sites occurring under 1 km away from previous calving sites (Table 17).

This data indicates that forest-dwelling (Norway House) caribou show some degree of site fidelity. Forest-tundra (Pen Islands) caribou do not show the same degree of site fidelity, but the larger distances between calving sites may reflect the scale at which forest-tundra caribou perceive and use the landscape (Schaefer *et al*., 2000; Berglund *et al*., 2014). Forest-tundra caribou travel considerably longer distances to reach their traditional calving grounds, meaning 50 km may well be considered high fidelity when compared to the spatial extent of their whole range (Schaefer *et al*., 2000).

Table 16: Median, minimum and maximum distances between consecutive calving sites for Pen Islands and Norway House caribou

	Pen Islands (n = 31)	Norway House (n = 41)
Median Distance	92.70 km	8.23 km
Minimum Distance	0.98 km	0.004 km
Maximum Distance	277.58 km	51.95 km

Table 17: Distance of consecutive year calving sites for Pen Islands and Norway House caribou from 2010 - 2016

	Pen Islands		Norway House	
Distance between consecutive calving sites	Number of calving sites	Number of animals	Number of calving sites	Number of animals
<1 km	1	1	12	10
1-2 km	0	0	4	3
2-10 km	3	3	15	12
>10 km	27	17	10	8

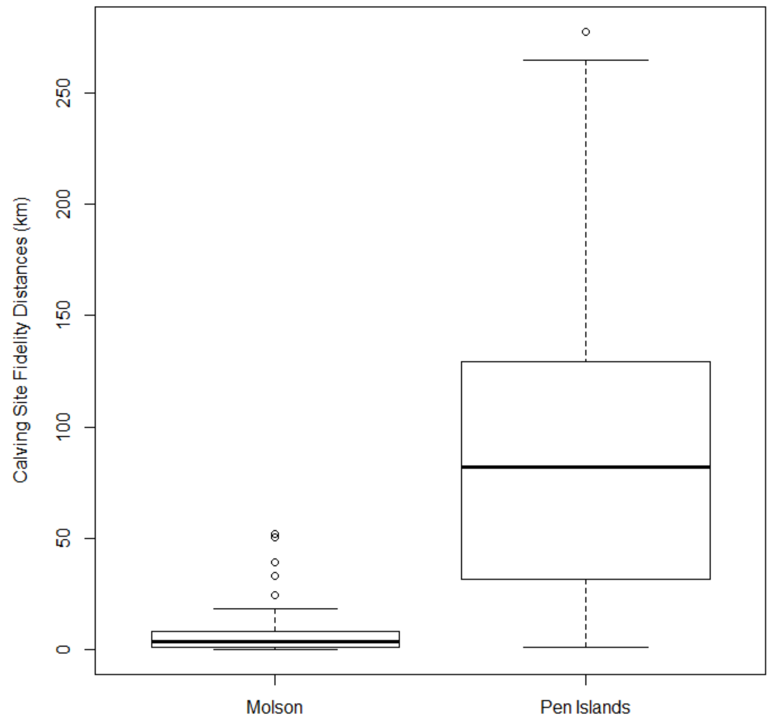

Figure 15: Calving site fidelity from 2010 - 2016 for the Pen Islands and Norway House caribou on the east side of Manitoba; boxplots showing the median distance between consecutive year calving locations

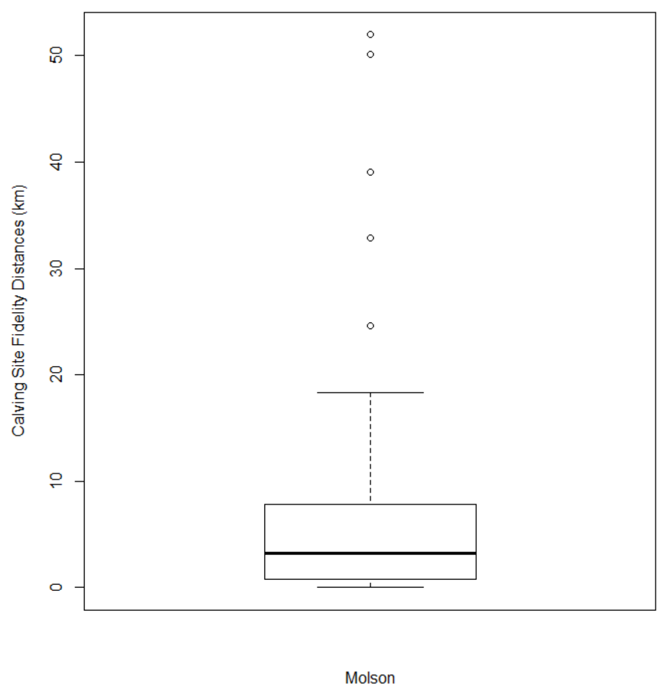

Figure 16: Calving site fidelity from 2012 - 2016 for the Norway House caribou on the east side of Manitoba; boxplots showing the median distance between consecutive year calving locations

6.1.12 **Habitat Modeling**

Habitat Requirements

Boreal woodland caribou are typically found in large, un-fragmented tracts of mature coniferous dominated boreal forest with low densities of interspecific competitors and their predators (Holt, 1977; Wittmer *et al.,* 2005b; Latham, 2009; Boutin *et al.*, 2012). Various boreal forest caribou habitat studies, specific to Manitoba and similar ecoregions in Saskatchewan, have revealed winter habitat selection in mature upland spruce and/or pine forests supporting arboreal and/or terrestrial lichens and multi-season association with open and treed spruce peatlands while avoiding deciduous forest (Rettie and Messier, 1998; Rettie and Messier, 2000; Brown *et al*., 2000; Lander, 2006; Schindler, 2006; Metsaranta and Mallory, 2007). Boreal woodland caribou occur at very low densities across landscapes, congregate into small groups during winter in traditional wintering areas, but during a period spanning late-April to mid-May, parturient females individually 'space-out' within lowlands in search of isolated calving and rearing sites (Bergerud *et al.*, 1990).

Calving sites are frequently associated with nutrient poor fens that support an early flush of herbaceous plants including bogbean (*Menyanthes trifoliata*), three-leafed False Soloman's Seal (*Maianthemum trifolium*), horsetails (*Equisetum spp.*) sedges (*Carex lasiocarpa*), bog willow (*Salix pedicellaris*) and bog birch (*Betula pumila*) (Cumming and Beange, 1987). Calving females have also been observed to use small islands in addition to large peatlands as isolated calving and rearing sites in northwestern Manitoba (Shoesmith and Storey, 1977; Hillis *et al*., 1998, Armstrong *et al*., 2000; Pearce and Eccles, 2004; Lander, 2006). Cows with calves tend to maintain their pattern of isolation until mid- to late- summer, after which they begin to search for conspecifics forming small groups (Malasiuk, 1999; Metsaranta and Mallory, 2007). During winter, caribou select lichen rich mature upland spruce and pine stands and/or treed muskeg and avoid deciduous forests (Hillis *et al*., 1998; Malasiuk, 1999; Armstrong *et al*., 2000; Pearce and Eccles, 2004; Metsaranta and Mallory, 2007).

Results

The variables used for the RSFs included habitat and landcover data contained in the LCC (Appendix E), as well as natural and anthropogenic disturbance (winter roads, transmission lines, etc.). Candidate models used Generalized Linear Models (glm function) with a binomial distribution. The most parsimonious mode, l with a ΔAIC of 0, provided coefficients for indicators that best explained the simplest model with the least assumptions and variables and the greatest explanatory power. The coefficients generated for each RSF model were then input into ALCES to produce prediction maps based on the weightings of indicator coefficients.

For caribou likelihood, illustrations were developed for the Hayes River Upland Ecoregion to provide a broader illustration of caribou habitat suitability across the Molson MU and a portion of the Pen Islands range. To assess the potential effect of Project 6 on habitat availability during the calving season and critical winter period, grid cell values generated from the model coefficients were categorized into three equal quantiles (bins). Area and proportion of high quality habitat (higher likelihood) within the RAA, LAA and PF were then calculated and illustrated in the tables below.

Table 18 and Table 19 illustrate the indicators (i.e., mixed forest and coniferous sparse forests) and associated weighting coefficients that represent the most parsimonious RSF model in CranR applied in ALCES to generate likelihood maps and habitat values for evaluation and assessment. Maps 35-36 illustrate the distribution of boreal caribou calving and winter habitat for the Hayes River Upland Ecoregion in relation to the Molson MU, RAA and LAA. Large areas of high likelihood boreal caribou calving habitat occurs primarily in the southern and western portions of the Hayes River Ecoregion, while there are small areas of high likelihood boreal caribou calving habitat spread throughout the RAA (Map 35). The majority of the Hayes River Ecoregion consists of high likelihood boreal caribou winter habitat, with the northern and eastern portions of the RAA containing large areas of high likelihood habitat (Map 36).

Table 18: Boreal woodland caribou RSF calving model indicators and coefficients

LCC Class	Criteria
Mixedwood Forest	-0.7094
Conifer Sparse	0.1958
Water	0.1762

Table 19: Boreal woodland caribou winter model indicators and coefficients

LCC Class	Criteria
Conifer Dense	-0.0551
Conifer Sparse	0.5416
Deciduous Forest	-0.3812
Mixedwood Forest	-0.0868
Shrubland	-0.1598
Wetland	0.6834

Results of RSF modelled habitat for boreal (forest dwelling ecotype) are illustrated in Table 20 and 21. The data illustrates the relative proportion of habitat within the Hayes River Upland Ecoregion and within the Molson Management Unit to the RAA and LAA as well as PF.

Table 20: Area and relative proportions of modeled caribou calving habitat within the Hayes River Upland Ecoregion, Molson MU, RAA, LAA and PF

Assessment Area Region	Hayes River Upland Ecoregion	Molson MU	RAA	LAA	PF
Total Area (km^2)	115,555 km^2	61,369 km^2	9,005 km^2	1,329 km^2	14 km^2
Primary Habitat (km^2)	14,752 km^2	7,867 km^2 [a]	804 km^2	250 km^2	1.57 km^2
% in Hayes River Upland Ecoregion	12.76%	6.81%	0.70%	0.22%	0.001%
% in Molson MU	NA	12.82%	0.76%[b]	0.19%[c]	NA
% in RAA	NA	NA	8.93%	2.78%	0.02%
% in LAA	NA	NA	NA	18.81%	0.12%

[a] The northern portion of the Molson Management Unit (50,754 km^2) overlaps with the Hayes River Upland Ecoregion. Within the overlap, 7,867 km^2 are primary calving habitat for caribou.

[b] Only the western portion of the RAA overlaps with the Molson Management Unit. Within that overlap, 466 km^2 are primary calving habitat for caribou.

[c] Only a small portion on the west end of the LAA overlaps with the Molson Management Unit. Within that overlap, 118 km^2 are primary calving habitat for caribou.

Table 21: Area and relative proportions of modeled caribou winter habitat within the Hayes River Upland Ecoregion, Molson MU, RAA, LAA and PF

Assessment Area Region	Hayes River Upland Ecoregion	Molson MU	RAA	LAA	PF
Total Area (km^2)	115,555 km^2	61,369 km^2	9,005 km^2	1,329 km^2	14 km^2
Primary Habitat (km^2)	43,087 km^2	15,695 km^2 [a]	2,636 km^2	968 km^2	5.9km^2
% in Hayes River Upland Ecoregion	37.29%	13.58%	2.28%	0.84%	0.005%
% in Molson MU	NA	25.57%	0.76%[b]	0.19%[c]	NA
% in RAA	NA	NA	29.27%	10.75%	0.07%
% in LAA	NA	NA	NA	72.84%	0.44%

[a] The northern portion of the Molson Management Unit (50,754 km^2) overlaps with the Hayes River Upland Ecoregion. Within the overlap, 15,695 km^2 are primary winter habitat for caribou.

[b] Only the western portion of the RAA overlaps with the Molson Management Unit. Within that overlap, 594 km^2 are primary winter habitat for caribou.

[c] Only a small portion on the west end of the LAA overlaps with the Molson Management Unit. Within that overlap, 102 km^2 are primary winter habitat for caribou.

Due to limited data on the Pen Islands/Eastern Migratory caribou range, the analysis on relative proportions of modelled habitat within the RAA and LAA could not be completed. The Pen

Islands/Eastern Migratory caribou population only use a small portion of the RAA as wintering habitat, as such the percentages of wintering habitat lost is expected to be negligible.

6.1.13 **Habitat Disturbance**

Pen Islands Caribou Range/Population (Forest-tundra)

There is currently no sustainable threshold of undisturbed habitat identified by Environment Canada for eastern migratory caribou. Environment Canada (2012) identified a sustainable threshold of 65% undisturbed (35%) disturbed habitat for boreal woodland caribou population, which was used for the disturbance assessment for the eastern migratory Pen Islands population. Disturbance was broken into two major components consistent with those described by Environment Canada (2012) and included natural disturbance (mainly fire less than 40 years old) and anthropogenic disturbance including linear features such as WRs, transmission lines, as well as other footprint disturbance including forestry, borrow pits and quarry development. It should be noted that this CEA analysis was based on available data.

The total area (including water) for the Pen Islands range of available data was 113,151 km^2. For disturbance analysis, we used the total area not including water, which was 90,971 km^2. The Pen Islands range has a total disturbance of 23% in 2015. The disturbance threshold within the Pen Islands range is below the 35% disturbance threshold identified by Environment Canada (2012) for boreal woodland caribou. Based on these analyses, the overall loss of habitat due to the P6 ASR footprint is a small contributor to the overall effect with fire being the greatest contributor to disturbance. Table 22 illustrates the disturbance factors and extent of disturbance of the Pen Islands range (based on available data).

Norway House Caribou Range/Population (Forest-dwelling)

The boreal woodland caribou MU included in this effects assessment is the Molson MU. The analysis conducted provides an assessment of total habitat disturbance within the MU relative to the sustainable threshold of 65% undisturbed (35% disturbed) habitat identified by Environment Canada (2012). Disturbance was broken into two major components consistent with those described by Environment Canada (2012) and included natural disturbance (mainly fire less than 40 years old) and anthropogenic disturbance including linear features such as WRs, transmission lines, as well as other footprint disturbance including forestry, borrow pits and quarry development. It should be noted that this CEA analysis was based on available data.

The total area (including water) of the Molson MU was 61,391 km^2. For disturbance analysis, we used the total area not including water, which was 51,775 km^2. The Molson MU has a total disturbance of 28% in 2015. The disturbance threshold within the Molson MU is below the 35% disturbance threshold identified by Environment Canada (2012). Based on these analyses, the overall loss of habitat due to the P6 ASR footprint is a small contributor to the overall effect with fire being the greatest contributor to disturbance.

Table 23 illustrates the disturbance factors and extent of disturbance of the Molson MU (based on available data).

Table 22: Disturbance factors and extent of disturbance of the Pen Islands range (based on available data)

Land Cover Category	Area (km^2)		Difference (km^2) (Scenario 2 - Scenario 1)	Difference as a percentage of Total Non-Water Area
	Scenario 1: Existing Winter Road	Scenario 2: New P6 ASR		
Fires	18,396	18,395	-1.10	-0.001%
Forest Harvest (less than 40 years)	0	0	0	0%
Drill Holes (less than 40 years)	222	221	-0.82	-0.001%
Mines	0.76	0.76	0	0%
Rail Active	183	183	0	0%
Transmission Line	901	853	-48	-0.052%
Roads Minor	367	501	134	0.147%
Roads Major	245	245	0	0%
Winter Road	173	93	-80	-0.088%
Disturbed Total	**20,488 (23%)**	**20,492 (23%)**	**4.23**	**0.005%**
Undisturbed Area, Non-Water	70,483	70,478	-4.23	-0.005%
Total Area, Non-Water	90,971	90,971	0	0.000%

Table 23: Disturbance factors and extent of disturbance of the Molson Management Unit (based on available data)

Land Cover Category	Area (km^2) Scenario 1: Existing Winter Road	Area (km^2) Scenario 2: New P6 ASR	Difference (km^2) (Scenario 2 - Scenario 1)	Difference as a percentage of Total Non-Water Area
Fires	12,893.87	12,893.86	-0.01	0%
Forest Harvest (less than 40 years)	61.21	61.21	0	0%
Drill Holes (less than 40 years)	173.27	172.56	-0.71	-0.001%
Mines	1.97	1.97	0	0%
Rail Active	19.69	19.69	0	0%
Transmission Line	410.32	399.51	-10.81	-0.02%
Roads Minor	99.15	119.05	19.90	0.04%
Roads Major	163.36	163.36	0	0%
Winter Road	763.15	747.73	-15.43	-0.03%
Disturbed Total	**14,586 (28%)**	**14,579 (28%)**	**-7.05**	**-0.01%**
Undisturbed Area, Non-Water	37,189	37,196	7.05	0.01%
Total Area, Non-Water	51,775	51,775	0	0%

6.1.14 **Summary of Caribou Study Results**

The following provides a summary of the study and survey results for both forest dwelling and forest-tundra caribou in the RAA. Evaluation of effects are provided in Section 7 (Potential Effects Assessment):

- Results of telemetry, aerial surveys, assessment of core use areas, and modeled calving sites, confirms that the RAA is on the fringes of both the Norway House and Pen Islands caribou ranges. Additionally:
    - The RAA and LAA intersect a very small portion of Pen Islands caribou core areas defined by telemetry and aerial multi species surveys.
    - No core areas of Norway House caribou intersect the RAA.
- Telemetry data indicates winter use by Pen Islands caribou during the winter, which is supported by kernel analysis from multispecies surveys conducted within the RAA.
- TK, telemetry and trail camera data indicate episodic migrations of Pen Islands caribou into the northeastern portion of the RAA during winter and low densities during other seasons.
- Both Pen Islands and Norway House caribou have low site fidelity during calving, potentially providing opportunities for calving in other areas, such as those identified through RSF modeling.
- Results of trail camera studies, aerial multispecies surveys and information from the local trapper program indicate low densities of predators (bears and wolves).
- Potential for increased populations of white tailed deer, and exposure to parasites and disease are extremely low and not expected with a high degree of confidence due to the northern limit of white-tailed deer persistence being greater than 350 km south of the RAA.
- Evidence of caribou calving is limited to one potential occurrence in 2012 of a suspected Pen Islands animal within in the RAA that occurred east of Gods Lake, well outside the LAA (10 km buffer).TK and trail camera studies confirm summer occupation at low densities in the LAA. Studies could not determine if these were forest-dwelling or forest-tundra ecotypes. Also, no calves were captured on any trail cameras in the RAA.
- Calving habitat is not limiting in the LAA, RAA or within the Molson Management Unit based on habitat modeling results, which conclude that:
    - The LAA contains 2.8% of the high-quality calving habitat within the RAA.
    - The LAA contains 0.19% of the high-quality calving habitat within the Molson MU
    - The RAA contains 0.76% of the high-quality calving habitat within the Molson MU
- Winter habitat is not limiting in the LAA, RAA or within the Molson Management Unit based on habitat modeling, which conclude that:
    - The LAA contains 10.7% of the high-quality winter habitat within the RAA.
    - The LAA contains 0.17% of the high-quality winter habitat within the Molson MU.
    - The RAA contains 1.0% of the high-quality winter habitat within the Molson MU.
- Although disturbance thresholds are not applied to eastern migratory caribou, as a precautionary evaluation we assessed Pen Islands caribou based on the 35% disturbed threshold identified by Environment Canada (2012) for boreal woodland caribou. The current overall disturbance is 23% for the Pen Islands range, with 0.005% disturbance contributed to the P6 ASR.

- For boreal woodland caribou (forest-tundra) the total disturbance regime in the Pen Islands range remains under the Environment Canada threshold (35%), and the P6 Project accounts for a small percentage of the overall disturbance in the Pen Islands range (<1%) with natural disturbance being the major factor (20%).
- The current overall disturbance is 28% for the Molson MU, which falls below the 35% disturbed threshold identified by Environment Canada (2012) for boreal woodland caribou. Additionally:
    - The LAA and the Project Footprint do not intersect the Norway House range.
    - Within the Molson MU, the combination of winter road decommissioning and the reduction of minor roads resulted in a slight decrease (-0.01%) in the overall disturbance (no change).
- For boreal woodland caribou (forest dwelling) the total disturbance regime in the Molson Management Unit remains under the Environment Canada threshold (35%), and the P6 Project accounts for a small percentage of the overall disturbance in the Molson Management Unit (<1%) with natural disturbance being the major factor (25%).

6.2 Moose

The purpose of baseline data collection on moose was to determine pre-project density estimates of moose near Project 6 and to understand the distribution, relative numbers and to assess the potential effects on moose (Section 7). Data gathered on moose were derived from a combination of sources including aerial total minimum count moose surveys, aerial multispecies winter track surveys, and trail camera seasonal occupancy studies as well as the incorporation of TK information. In contrast to other wildlife VCs with a 5 km buffer LAA, the LAA for moose evaluation was a 10 km buffer extending from the PF based on expected effects and home range characteristics of moose as well as consultation with Manitoba Sustainable Development.

6.2.1 **Distribution and Abundance**

6.2.1.1 Aerial Moose Surveys

Total minimum count aerial moose surveys were conducted in the winter of 2016 and 2017 to acquire baseline information on areas of high moose concentration and provide an estimate of the moose population count (Map 37). Moose surveys were conducted on February 18-19, 2016 and February 6-9, 2017 within a 2,430 km^2 survey area. Kernel density methodology was used to identify high use areas near the ASR alignments.

Surveys were based on MSD’s standard three-minute grid used for aerial moose surveys; grid blocks measured 3.5 x 5.0 km and extended 10 km on each side of the proposed P6 ASR alignments. Each survey was flown at 100 percent coverage in a north/south direction using a Bell Long Ranger, along transects spaced 1 km apart, at an altitude of approximately 120 m above ground level. The average air speed for the surveys was 100 km/hr. The survey team was comprised of three biologists (i.e. two observers and one recorder). When fresh moose tracks were encountered, a reasonable effort was made to find the animal(s). The number of individuals, age classification, and gender were recorded for all animals.

6.2.1.2 Aerial Multispecies Survey

Multispecies aerial surveys to record moose distribution in the RAA were conducted in the manner described for caribou in Section 6.1.

6.2.1.3 Trail Camera Studies

Trail camera occupancy studies to determine moose distribution in the RAA were conducted according to the methods described for caribou in Section 6.1.

6.2.1.4 Access Density

Roads are known to affect wildlife movement by providing human access to previously remote areas (Heckbert *et al*., 2010). There are both positive and negative aspects of increased access. Roads provide opportunities for sustainable traditional and recreational activities. Although moose have been extensively studied, there is little research on access or disturbance thresholds. Salmo *et al.* (2004) identified a target threshold for linear disturbance on a landscape scale at 0.4 km/km^2 and a critical threshold of 0.9 km/km^2 for moose based on studies across Canada. Beazley *et al.* (2004) identified a road density threshold of 0.6 km/km^2 for moose in Nova Scotia.

Other examples include thresholds developed for sustainable forestry. A similar linear disturbance threshold was identified by the Greater Fundy Ecosystem Research Group (2005) for active roads as a criteria and indicator of sustainability. A similar threshold of 0.58 km/km^2 was developed for Forest Management Licence Area (FMLA) 1, through the Manitoba Model Forest initiative to identify indicators of sustainability in forest management (Keenan and Munn, 2008).

The density of access (winter and all-weather roads) was calculated in ALCES, to illustrate the degree of fragmentation for several Game Hunting Areas (GHAs) in Eastern Manitoba and the P6 RAA using all available data for linear development and included; major roads, minor roads, winter roads and transmission lines.

The results of past moose surveys conducted by MSD provides additional context regarding the distribution of moose in Manitoba in comparison with the P6 RAA. An examination of historical moose surveys in Eastern Manitoba provide a comparison of moose densities within the P6 area to other areas in Eastern Manitoba. Lower densities of moose are similarly observed at more northerly latitudes in Ontario, as indicated within the Ontario Ministry of Natural Resources (OMNR) ecological framework on policy advice that addresses cervid (deer family, including moose) management at the landscape scale (OMNR, 2009). In northern latitudes, (similar to the P6 RAA), moose are considered to exist at lower densities compared to more southerly latitudes.

6.2.1.5 Modeling

Modeling of habitat was conducted to assess habitat availability and distribution across the RAA and the 10 km LAA to determine potential effects of habitat loss on moose. Modeling was based on winter observation data from winter surveys conducted in 2016 and 2017. Moose observations were incorporated into the resource selection function (RSF) model as per methods described in Section 5.1.3, to identify high through low likelihood areas of winter habitat quality. Calculations and proportions of the amount of high quality habitat within the PF, LAA (10 km buffer) and the RAA provided data to assess the magnitude of effect on habitat through removal or loss of functional habitat.

6.2.2 **Results - Moose**

Results presented below describe the results of total count aerial moose surveys within the baseline survey area as well as general distribution and abundance of moose within the RAA through aerial transect multispecies surveys.

6.2.2.1 Aerial Total Count Moose Surveys

Results of the February 18-19, 2016 and February 6-9, 2017 aerial moose surveys in the P6 RAA are presented in Table 24, and Maps 38 and 39. Total moose counts in each year were 63 and 68, respectively, and illustrate little variation between the two total count estimates, which provides confidence in the data. Also illustrated are the cohort classification counts and estimates for cow/calf ratios, as well as the density of moose per km^2.

Table 24: Results from the February 2016 and February 2017 aerial moose surveys in the P6 RAA

Year	Cows	Bulls	Calves	Total Count	Calf-Cow Ratio (CCR)	CCR Standard Error	Calves Per Adults (CPA)	CPA Standard Error	Density Per Km^2
2016	30	23	10	63	0.33	0.09	0.19	0.05	0.02
2017	33	11	24	68	0.73	0.08	0.55	0.08	0.04

6.2.2.2 Regional Aerial Multispecies Survey

Moose track and observation data collected during the four aerial multispecies surveys conducted in 2012, 2015, and 2016 were used to overview the distribution of moose concentrations within the Project 6 assessment areas. General distribution of moose in the RAA was determined through kernel density estimates of moose and track observations for data in, and adjacent to, the RAA.

The following provides a summary of the data utilized in mapping areas of moose use and relative density in the RAA. The general distribution of moose for each survey are illustrated in Maps 40-42. The results for 2012 and 2014 shows higher densities of moose in the southeast portion of the P6 RAA and an even distribution throughout the western portion of the RAA. Conversely, the 2016 multispecies survey illustrates a higher density in the central region of the P6 LAA. A summary of observations of moose and tracks are provided in Table 25 below.

Table 25: Moose observations during multispecies surveys from 2012, 2015 and 2016

Survey Year	Tracks	Number of observed moose
January 2012 Multispecies survey	108	16
March 2015 Multispecies survey	27	4
February 2016 Multispecies survey	240	0

6.2.2.3 Trail Camera Studies

A total of 98 trail cameras were deployed in the RAA (includes LAA) as described in Section 6.1.5. Of those deployed, 48 hexagons were sampled in the LAA. A total of 87 moose camera trap events were recorded, of which 67 recorded moose occurrences in the LAA. The majority of observations were recorded during summer with 69-70% of camera trap events occurring during summer, however, each camera trap event does not represent separate individual moose as there is low confidence in individual identification. The data do suggest more moose activity during the summer. Moose occupancy within the LAA and RAA on the hexagons sampled, do indicate higher levels of moose activity in summer, however the differences in seasonal occupation cannot be statistically substantiated due to the low frequency of observations and numbers of hexagons occupied.

Results of moose occupancy in the RAA and LAA are illustrated in Maps 43-46. During spring and summer, moose were observed on several cameras throughout the RAA, with several cameras south of Bunibonibee Cree Nation in close proximity of each capturing high numbers of moose (Maps 43-44). Few moose were observed on cameras in autumn and winter, with all moose captured during winter observed in the central region of the RAA (Maps 45-46). Table 26 provides a summary of the percentage of camera traps events for those hexagons that were occupied for spring, summer, autumn, and winter. Table 27 provides a breakdown of the number of hexagons and percentage of total hexagons sampled within the RAA, and separate totals for the RAA.

Table 26: Trail camera data for moose in the P6 LAA and RAA, March 1, 2016 - March 31, 2017

Study Area	Percent of Camera Trap Events by Season*				
	Spring	Summer	Autumn	Winter	Total
LAA	11 (16%)	46 (69%)	4 (6%)	6 (9%)	67
RAA	15 (17%)	61 (70%)	5 (6%)	6 (7%)	87

*Spring = March 21st - June 20th; Summer = June 21st - September 20th; Autumn = September 21st - December 20th; Winter = December 21st - March 20th

Table 27: Trail camera data for moose in the P6 LAA and RAA, March 1, 2016 - March 31, 2017

Study Area	Hexes with Cameras	Number of Hexes with Trap Events by Season*			
		Spring	Summer	Autumn	Winter
LAA	48	4 (8%)	6 (13%)	3 (6%)	3 (6%)
RAA	98	7 (7%)	12 (12%)	4 (4%)	3 (3%)

*Spring = March 21st - June 20th; Summer = June 21st - September 20th; Autumn = September 21st - December 20th; Winter = December 21st - March 20th

6.2.2.4 Moose Densities and Access

Table 28 illustrates the relative densities of moose across eastern Manitoba, indicating generally lower densities at more northern latitude Game Hunting Areas (GHAs) shown on Map 47. Note that survey and sampling methods varied among the years reported, which could conflict comparisons of densities between areas and years. However, these data provide a general overview of moose densities across the region, allowing for comparisons to fragmentation described below.

Table 28: Summary of moose densities in eastern Manitoba based on aerial surveys conducted from 1995 - 2017

GHA	Years	Moose/km^2
17 South*	1995 - 1996	0.0969
17 North*	1996 - 1997	0.1196
Average Density		**0.1083**
17A	2011	0.1493
17A	1999 - 2000	0.1770
17A	2006 - 2007	0.1460
Average Density		**0.1574**
26	1999 - 2000	0.2430
26	2006	0.2234
Average Density**		**0.2332**
26	2010	0.1069
26	2013	0.1677
Average Density***		**0.1373**
P6 Moose Aerial Survey	2016	**0.02**
P6 Moose Aerial Survey	2017	**0.04**
Average Density		**0.03**

* Due to the size of the area, surveys were flown in subsequent years
**Pre-population decline period
***Moose recovery period
Source: Personal Communication: Kelly Leavesley, Regional Wildlife Manager, Eastern Region, Manitoba Conservation and Water Stewardship (February 2016)

Fragmentation

Results of the analysis are presented in Table 29 and Figure 17, and illustrate the low density of roads in the RAA compared to other more southerly GHAs in eastern Manitoba. The results indicate that the more northerly areas have less disturbance than southern areas, thereby supporting a less diverse foraging opportunity for moose, generally translating into lower population densities typical of harsh northern climates with less productive ranges and shorter growing seasons (Schwartz and Renecker, 1998; OMNR, 2009; Stewart and Komers, 2012). Therefore, moose densities are not necessarily linked to disturbance, but more so to habitat productivity and climate.

Table 29: Comparison of linear footprint densities in eastern Manitoba Game Hunting Areas

GHA	Linear Footprint Density km/km^2
RAA	**0.06**
17 (>200 km south of the RAA)	**0.05**
17-B (>200 km south of the RAA)	**0.09**
17-A (>300 km south of the RAA)	**0.18**
26 (>400 km south of the RAA)	**0.26**

Figure 17 provides a visual context to the linear density analysis in the RAA.

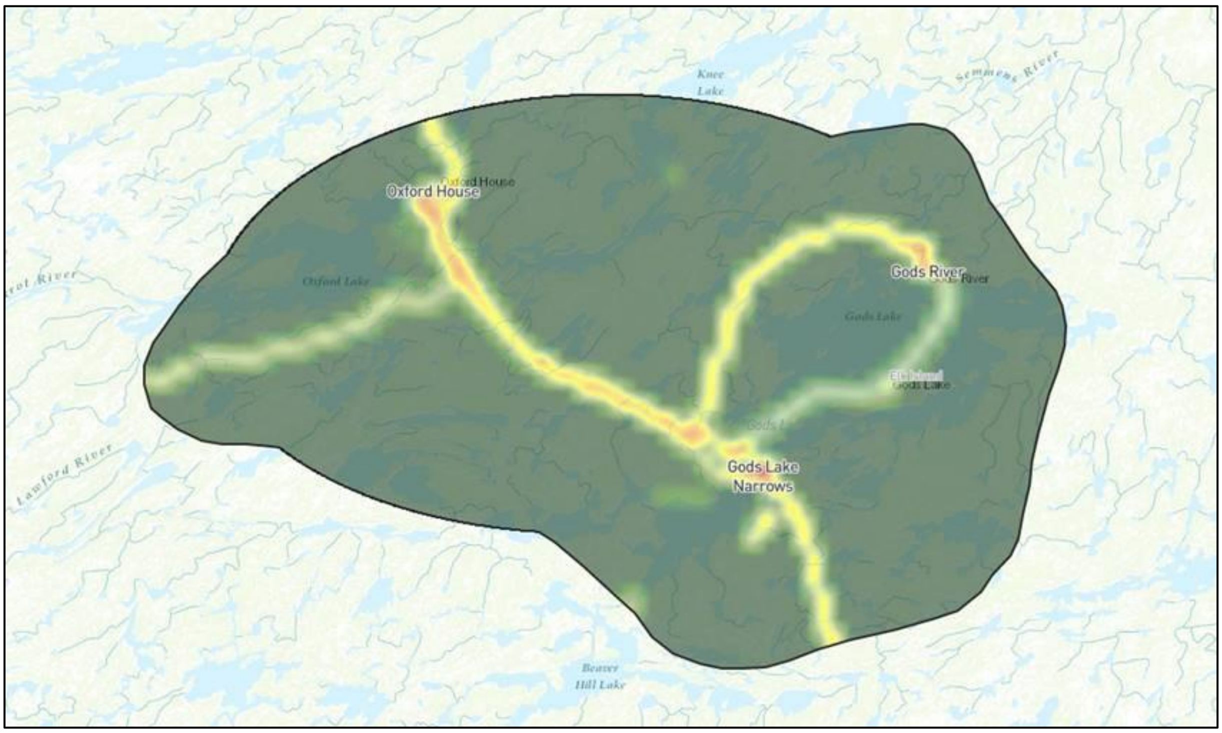

Figure 17: Linear Density Analysis in the RAA

6.2.3 **Habitat Modeling**

Habitat Requirements

Moose are generalist ruminant herbivores and consume large quantities of a wide variety of plant material of relatively low nutritional value; total forage consumption is limited only by digestive rate and rumen volume. Digestible energy and crude protein are considered to be the most frequently limiting food elements supplied by forage (Timmerman and McNicol, 1988).

Spring and Summer Habitat

The green period is a time when leaf material is available to moose and is highly variable depending on the dates of plant emergence, or green up in the spring and leaf drop in the fall. During summer, moose eat three to four times as much and the food is higher in digestible nutrients and crude protein than in winter. Energy requirements of pregnant cows and calves may triple or quadruple typical dietary needs. During this season, pregnant cows and calves may ingest more than 200% the energy required for maintenance. This surplus provides the energy demands of lactation, growth and maturation, antler development, breeding, and essential stores of body fat to supplement poor quality winter diets. Aquatics plants are used proportionally to their availability, and therefore, proximity to water with those resources weights highly to habitat selections by moose in the late spring and early summer months (Timmerman and McNicol, 1988).

Winter Habitat

Moose typically balance food consumption against energy expenditure. Between leaf abscission in the fall and spring green up, moose subsist on a low protein, low energy diet resulting in a state of negative energy balance. In late fall and early winter, prior to snow accumulation, moose are free to move among the best food patches (regenerating stands, riparian areas, etc.), but as winter progresses, moose may be restricted to mature coniferous stands that provide thermal cover and refugia from predators (Timmerman and McNicol, 1988).

Results

The amount of habitat removal is 5.5 km^2 which represents 0.4% within the LAA and 0.06% within the RAA. The results indicate that habitat is not limiting in the RAA and is also distributed across the RAA. Map 48 provides a representation of the spatial distribution of high likelihood/quality habitat. The mapping does illustrate that areas of potentially high-quality habitat are found throughout the LAA and RAA. The results of the analysis of moose habitat within the RAA, LAA, and PF are presented in Table 30 below.

Table 30: Evaluation of moose habitat illustrating area and proportion of habitat in the RAA, LAA, and PF

Assessment Area Region	**RAA (km^2/%)** **9,005 km^2**	**LAA (km^2/%)** **1,329 km^2**	**PF (km^2/%)** **14 km^2**
Habitat Value	Area and % RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	1987 (22.1%)	495 (5.5%)	5.5 (0.4%) (0.06%)
Secondary	1726 (19.2%)	331 (3.7%)	3.1 (0.2%) (0.03%)
Total	3713 (41.2%)	826 (9.2%)	8.6 (0.6%) (0.09%)

6.2.4 Summary of Moose Study Results

The following provides a summary of the study and survey results for both forest dwelling and forest-tundra caribou in the RAA. Evaluation of effects are provided in Section 7 (Potential Effects Assessment).

- The proportion of habitat loss within the RAA was found to be 0.06 percent of available modeled high-quality habitat, suggesting habitat is not limiting.
- No unique or critical moose areas were observed during baseline studies in the LAA or RAA.
- Conducting clearing and construction activities in winter will mitigate potential impacts to calving moose during the parturition period.
- Baseline population estimate for moose was calculated and provides opportunity for monitoring potential effects.
- Moose densities are low compared to more southerly GHA observed densities. As there are very low road densities in the RAA (0.06 km/km^2), compared to the access density thresholds discussed, effects of fragmentation on moose in the RAA is expected to be negligible.
- Aerial multispecies surveys illustrate a broad distribution of moose across the RAA at low densities.
- Results of trail camera studies further confirm the general broad distribution of moose near the PF and within the LAA, suggesting mitigation will be required (described in Section 7).
- Results from local trapper program indicate low densities of predators (bears and wolves). Increased predation on moose is not expected to result from development of the P6 project.
- No white-tailed deer were observed during any field surveys, on trail cameras, or reported by local resource users, suggesting that exposure to parasites and disease as a result of deer expansion north from the current range of persistence is not expected.

6.3 Furbearers

Baseline data were gathered for a number of furbearer species of interest, including those important to local resource users within the P6 RAA. For the purpose of this assessment, marten was selected as the terrestrial furbearer VC and beaver as an aquatic furbearer VC. Information on other furbearers is found in the Existing Environment Report. Data on marten and beaver were gathered using a combination of sources including aerial multispecies winter track surveys, trail camera studies, and from observations provided by trappers and other local resource users.

6.3.1 Aerial Multispecies Survey

Multispecies aerial surveys to record furbearer distribution in the RAA were conducted as per methods described for caribou in Section 6.1.3.

6.3.2 Trail Camera Studies

Although trail camera studies were not specifically conducted to determine furbearer distribution in the RAA, incidental furbearer observations were recorded. Trail camera occupancy studies were conducted according to the methods described for caribou in Section 6.1.5.

6.3.3 Trapper Program

The P6 RAA falls mainly within portions of the God's Lake section (380) and Oxford Lake section (370) trapping areas within the Northern RTL Area 6 (Map 49). The Trapper Program (TP) was developed to study the potential effects of ASR construction in the RAA on trapline harvest and furbearer abundance and distribution. Its main goals were to initiate trapper involvement, acquire baseline data through local and regional furbearer distribution, determine habitat preferences, record current and traditional land-uses by community members, and promote collaboration with the local trapping community. Fall/winter 2016/2017 was the first year the TP was initiated with P6 trappers.

6.3.4 Modeling

Occurrence and Distribution

Modeling of marten and beaver habitat was conducted to assess habitat availability and distribution across the RAA and the LAA to determine potential effects of habitat loss. Modeling was undertaken as described in Section 5.1.3 based on habitat requirements and professional opinion. Calculations and proportions of the amount of high quality habitat within the PF, LLA and the RAA provided data to assess the magnitude of effect on habitat as a result of removal or disturbance resulting in a potential loss of functional habitat.

6.3.5 Results – Furbearers

Aerial Multispecies Survey

Marten track and beaver lodge observation data collected during the four aerial multispecies surveys conducted in 2012, 2014, 2015, and 2016 were analyzed to assess distribution concentrations or known locations relative to the Project 6 assessment areas, including the final alignment.

General distribution of beaver in relation to the LAA and RAA is illustrated in Map 50. Beaver dams and lodges occur throughout the northern and eastern portions of the RAA and occur throughout the eastern portion of the LAA (Map 50).

General distribution of marten in the RAA was determined through kernel density estimates of tracks. The general distribution of marten for each survey are illustrated in Maps 51-53. The results of the 2012 multispecies survey (Map 51) show high densities of marten in the central and western portions of the RAA and an even distribution throughout the LAA. Marten distribution during the 2014 multispecies survey were localized in the northeastern portion of the LAA and RAA near Manto Sipi Cree Nation (Map 52). Conversely, the 2016 multispecies survey showed marten distribution was primarily in the northern and central portions of the RAA and spread throughout the LAA (Map 53).

Beaver lodges and dams were found to be distributed across the RAA during surveys conducted in 2014 through to 2016. Beaver dam and lodge counts ranged from 131 in 2014 to 41 in 2016. Results of aerial multispecies surveys for furbearers in the P6 RAA are presented in Appendix G.

Trail Camera Studies

Trail camera studies designed for larger species (i.e.; moose, caribou, bear, etc.), provided incidental observation data that verified the presence of both marten and beaver within the RAA and LAA. One marten was captured in the LAA during the study period (March 2016 - March 2017). Results of trail camera studies for furbearers in the P6 RAA are presented in Appendix H.

Trapper Program

The result of the trapper harvest and other wildlife observations/tracks are provided in Table 31. Marten were the most abundant species trapped, with 71 animals harvested, followed by otter with 18 animals harvested; the remaining species were harvested in totals of five or less. Trappers also recorded wildlife observations or tracks. Marten, otter, and wolverine tracks were observed equally, with ten tracks each; moose (8) and mink (7) observations closely followed. The remaining species were observed in totals of five or less. A single skunk was also harvested in the Oxford House section. See Appendix I for all trapper harvest data.

Table 31: Trapper program species summary - Oxford House/God's Lake

Species	Scientific Name	Total Harvest	Track Observation
Marten*	*Martes americana*	71	10
Otter	*Lontra canadensis*	18	10
Beaver*	*Castor canadensis*	5	--
Fisher	*Martes pennanti*	3	2
Mink	*Neovison vison*	3	7
Lynx	*Lynx canadensis*	2	4
Muskrat	*Ondatra zibethicus*	1	--
Hare	*Lepus americanus*	1	--
Skunk	*Mephitis mephitis*	1	--
Caribou	*Rangifer tarandus caribou*	--	1
Moose	*Alces alces*	--	8
Fox	*Vulpes vulpes*	--	5
Wolf	*Canis lupus*	--	5
Weasel	*Mustela nivalis*	--	1
Wolverine	*Gulo gulo*	--	10
Total		105	63

* VC species

6.3.6 **Habitat Modelling**

6.3.6.1 Beaver

Habitat Requirements

Beaver are wholly dependent on water situated in close proximity to preferred food sources (Vincent, 2010). Beavers can exploit habitats where their preferred food is lacking, but they cannot survive in areas where the water supply fluctuates or is fast moving (Novak, 1987). Beavers will colonize aquatic habitats where water depth and stability can be controlled and where the water supply is permanent, but where these factors cannot be controlled (e.g., large rivers or lakes), beavers can only find refuge in isolated protected bays and islands adjacent to suitable riparian or deciduous forest stands (Allen, 1982). Stream gradient is the principal factor governing occupation of riverine habitats, and gradients greater than 15% render streams unsuitable for beaver (Retzer *et al.*, 1956). Allen (1982) also suggested that a minimum area of 0.8 km of stream length of 1.3 km^2 of either lakes or marshland were prerequisites for their consideration as beaver habitat.

Preferred food resources include trembling aspen (*Populus tremuloides*), paper birch (*Betula papyifera*), a variety of willows (*Salix* spp.), and numerous other woody shrubs as food and/or construction materials for dams and lodges (Allen, 1982; Gallant *et al.*, 2004). The foraging requirements of beaver extends beyond requirements for food in that beaver also must process woody vegetation for construction of lodges, dams, and winter food storage. However, during the growing season, more than 55% of their annual diet is comprised of aquatic vegetation (floating and emergent). As a Central Place Forager (CPF), an animal that gathers food and bring it to a central place for later consumption or use, they must balance the benefit of foraging in any particular area against the costs of energy expenditure and increased risks of predation (Severud *et al.,* 2013).

Model Development

A model for beaver was developed using ALCES as described in Section 5.1.3. Beaver require water in close proximity to deciduous trees and/or shrubs for habitat, with an assumption that these forage resources should be within 200 m of the edge of suitable water (Manitoba Forestry Wildlife Management Project, 1994). Each habitat class presented in

Table 32 was assigned a coefficient in the model.

Table 32: LCC and criteria used for beaver model

LCC Class	Criteria
Deciduous Forest Mixedwood Forest Shrub Land Wetland Shrub Wetland Treed	Include areas of LCC class types that are located within 200 m of lakes, and large and small rivers

Results

The results of the analysis of beaver habitat within the RAA, LAA and PF are presented in Map 54 and Table 33. Primary beaver habitat is found in small patches throughout the LAA near water, and larger concentrations of habitat occur in the eastern portions of the RAA (Map 54).

Table 33: Distribution of beaver habitat within the RAA, LAA, and PF

Assessment Area Region	**RAA (km^2/%)** **9,005 km^2**	**LAA (km^2/%)** **1,329 km^2**	**PF (km^2/%)** **14 km^2**
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	598 (6.6%)	57 (0.6%)	0.23 (0.02%) (0.002%)
Secondary	430 (4.8%)	72 (0.8%)	0.53 (0.04%) (0.005%)
Total	1,028 (11.4%)	129 (1.4%)	0.76 (0.06%) (0.008%)

6.3.6.2 Marten

Habitat Requirements

Marten are frequently associated with dense coniferous forests with more than 60% crown cover. In an occupancy study in Ontario, Hodson *et al.* (2004) challenged the idea that marten were a habitat specialist locked into mature coniferous forest habitats and demonstrated that deciduous forest cover types were primarily used. An additional study in British Columbia examined a stable marten population (moderate-density and low mortality rate), exploiting 30 to 40-year-old regenerating stands of trembling aspen (Poole *et al.*, 2004). The small home ranges of 3.3 km^2 for males and 2.0 km^2 for females was indicative of good habitat, a fidelity that was maintained even following the removal of 17% of the mature overstory. While there was still an obvious preference for mature coniferous stands and avoidance of non-forested habitats, marten utilized all mature forest types regardless of the tree species mixture. Mature coniferous forests provide access to subnivean habitat for winter food, thermal cover and refugia from predators. In summer, marten tend to exploit the forest canopies that provide resting sites safe from most terrestrial predators. Conversely, open and disturbed areas are generally avoided despite the availability of food and debris, particularly during the winter months (Steventon and Major, 1982).

Marten, as opportunistic foragers of small mammals, amphibians, and insects, are dependent on the coarse woody debris that creates hunting habitat below the snow layer. It accrues from broken tree limbs, logs, and stumps; the amount of which is related to both cover type and age of the forest. Small mammal prey adaptation to predator avoidance is another factor important to governing habitat selection by martens. Andruskiw *et al.* (2008) demonstrated that voles responded behaviorally to habitat-mediated vulnerability to predation by exercising caution about foraging in more open areas than under cover.

The RAA is typical of boreal shield forest, defined by a rather simple mix of treed and open wetlands, and surrounded by higher elevation stands of black spruce and jack pine with a range of age classes. Wildfire is the dominant factor driving the forest species composition and age class structure within the boreal shield ecozone (Stocks *et al.*, 2002). As there is a mix of mature forest with regenerating forests and wetlands, a relatively low proportion of area is the RAA is suitable habitat for Marten.

Model Development

A model for marten was developed using ALCES as described in Section 5.1.3. Marten are associated with mature coniferous stands and, to a lesser extent, mid-aged coniferous stands that provide less downed woody debris. Mature mixedwood and deciduous stands also serve as habitat for marten and their prey, but not to the extent that would be expected for the mature coniferous stands. Each habitat class, presented in Table 34, was weighted to reflect marten's association with mature coniferous stands.

Table 34: LCC and criteria used for marten model

LCC Class	Weight
Conifer dense (Greater than 80 years of age)	1
Conifer dense (Between 60 and 80 years of age)	0.75
Conifer dense (Between 40 and 60 years of age)	0.5
Deciduous dense (Greater than 80 years of age)	1

Results

The results of the analysis of marten habitat within the RAA, LAA and PF are presented in Map 55 and

Table 35. Small patches of primary marten habitat occurred throughout the RAA, with larger concentrations of marten habitat occurring in the central and southern portions of the RAA (Map 55).

Table 35: Distribution of marten habitat within the RAA, LAA, and PF

Assessment Area Region	RAA (km^2/%) 9,005 km^2	LAA (km^2/%) 1,329 km^2	PF (km^2/%) 14 km^2
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	227 (2.5%)	30 (0.33%)	0.2 (0.02%) (0.002%)
Secondary	875 (9.7%)	167 (1.9%)	2.3 (0.18%) (0.03%)
Total	1,102 (12.2%)	197 (2.2%)	2.5 (0.19%) (0.028%)

6.3.7 Summary of Beaver and Marten Study Results

- Results of multispecies surveys, trapper program, TK, and incidental trail camera data, confirm general beaver and marten occupancy within the LAA and RAA. The proportion of habitat loss within the RAA was found to be 0.008% and 0.028% percent of available modeled high-quality habitat for beaver and marten respectively, suggesting habitat is not limiting.
- Multispecies surveys and trapper program data support occupancy and areas of high use by marten across the RAA.
- Trappers indicate beaver are plentiful, with pelt prices being a constraint to harvest.

6.4 Birds

The purpose of baseline data collection on birds was to determine pre-project occurrence and relative distribution and abundance of birds and to assess the potential effects from the P6 Project that are described in Section 7. Field sampling was undertaken for bird species of interest within the P6 RAA, including bald eagle, Canada goose, mallard, ring-necked duck, ruffed grouse, palm warbler, magnolia warbler, ovenbird, and yellow-bellied flycatcher, using a combination of sources for data including autonomous recording units (ARUs), aerial waterfowl surveys, and breeding bird survey data collected thorough the Manitoba Breeding Bird Atlas. TK gained from wildlife workshops also contributed to the understanding of bird presence and the selection of bird VCs for this project.

Autonomous Recording Units

ARUs are an effective tool used to detect vocalizations from bird and amphibian species to supplement on-site surveys. During deployment, ARUs offer the capability of determining presence of bird and amphibian species in the P6 RAA survey areas, over a daily cycle and for extended periods (many months). The use of ARUs for sampling enabled a more comprehensive assessment of birds and amphibians within the area. The goals for this survey technique were to:

- Supplement field studies by sampling species that breed as early as March and as late as August or September;
- Target provincial and federal SOCC;

- Sample species during various active periods through the day such as; diurnal (e.g., songbirds/passerines), crepuscular (e.g., common nighthawks), and nocturnal (e.g., owls); and
- Sample remote locations that are logistically difficult and expensive to sample with point counts.

ARUs were deployed in the RAA between March and July 2016 within pre-selected habitat types (Appendix J: Table J-3) and retrieved from the field by October 2016 (Map 56, see Appendix J for further detail). Aerial reconnaissance surveys were undertaken to assist in the selection and verification of forest covertypes prior to placement of the ARUs. Key criteria governing the placement of ARUs included:

- ARUs deployed along/adjacent to proposed road infrastructure;
- Habitats were selected using existing habitat information (LCCES); and
- Potential sites selected were mapped using LCCES data at a 1:10,000 scale.

The field team determined exact ARU deployment locations based on stand level habitat characteristics and logistics, where ARUs were typically set up within or near clearings close to suitable habitat to facilitate timely deployment and maintenance visits.

Expected species associations with various habitat types are found in Appendix J: Table J-1. Each ARU (model SM2+, supplied by Wildlife Acoustics Inc.) was encased in a weather-proof enclosure with four D-cell batteries, up to four 16-gigabyte memory cards, and two external microphones. Detection range of the ARU units are influenced by many factors, including humidity, temperature, source volume and directionality, and surrounding clutter. Additionally, no two microphones have the same sensitivity (Agranat, 2014). The recording units were scheduled for specific start and shut off times (Appendix J: Table J-3) to capture peak bird and amphibian call times over the breeding season. ARUs were programmed to record low frequency sounds down to 3 Hz (at a gain of 48 dB) to capture all possible vocalizations. The units were scheduled to record daily at different times of day based on the species being sampled: from March to May, in the evening and night when owls and amphibians are potentially calling; and from May to September, during the morning, evening and night when various songbirds and other species are calling (Appendix J: Table J-1).

For sample data processing and collection, sound files were downloaded and interpreted using Song Scope™ software (Wildlife Acoustics Inc.) to identify recorded birds and amphibians to species.

Detailed methods for ARU deployment and sample data protocol can be found in Appendix J.

Manitoba Breeding Bird Atlas

The Manitoba Breeding Bird Atlas (MBBA) completed a series of bird surveys in the summer of 2014 and recorded bird observations within survey grid blocks contained within 100 m x 100 m survey squares (MBBA, n.d.). These survey blocks encompassed the P6 RAA as described in the *Manitoba Breeding Bird Atlas: Report to ESRA 2014 Surveys* (MBBA, 2014b; Map 57). Species abundance was determined through point-count surveys to provide a rough measure of how many birds were in each survey block (i.e., where they are breeding). Each point count involved standing in a pre-determined location (usually along the ROW, but a small number of off-road sites in different habitat types were also completed), waiting a 1-minute calming period prior to the survey, and recording all birds heard or seen in an exact 5-minute period (MBBA, n.d.). All point count raw data for P6 was submitted to MI (MBBA, 2014a).

Aerial Waterfowl Surveys

An aerial waterfowl survey was conducted within the P6 RAA during the period of waterfowl breeding (June 16-17, 2016) and brooding (July 20-21, 2016). Aerial waterfowl surveys, using a helicopter, were conducted along and within 5 km on either side of the alignment (Map 58). The helicopter travelled at 30-40 m above the ground, with a ground speed of approximately 80-100 km/hr. Three biologists scanned the areas surveyed for all waterfowl as well as large stick nests; one of the biologists recorded the information collected onto data sheets. Survey data collection sites were recorded using hand-held GPS devices and imported to GIS software for mapping and analysis. While survey design followed Canadian Wildlife Service protocol for surveying waterfowl, other species of birds and wildlife were observed.

A reconnaissance survey was conducted within the P6 RAA on October 12-14, 2016, during the period of fall waterfowl migration (Map 59). The objective of this survey was to document general areas of migratory waterfowl staging. The area of reconnaissance was similar to the June and July survey, where flight transects along major waterbodies were surveyed within the RAA. Staging waterfowl (typically rafts of diving species) were documented and mapped, providing additional qualitative data pertaining to potential waterfowl staging areas near the P6 alignment.

Table 36: Number of birds observed along flight lines during the aerial waterfowl survey of P6, June 15-17, 2016

Species	Project Footprint (1 km buffer)	LAA	Total P6 Survey Area
Bald Eagle	2	17	23
Blue-winged Teal	0	7	17
Bufflehead	0	0	6
Canada Goose	15	63	58
Common Loon	17	24	26
Common Merganser	1	49	137
Golden Eagle	0	2	3
Greater Yellow Legs	0	19	19
Green-winged Teal	1	2	6
Mallard	9	65	106
Northern Pintail	0	11	11
Ring-necked Duck	15	248	276
Sandhill Crane	0	21	31
Scaup spp.	2	13	17
Shore bird (unknown)	0	1	1
Swainson's Hawk	0	0	1
Swan spp.	0	1	9
Unknown duck	0	0	2
Wigeon	0	0	1
Wilson's Snipe	0	0	1

Table 37: Number of birds observed along flight lines during the aerial waterfowl survey of P6, July 16, 2016

Species	Project Footprint (1 km buffer)	LAA	Total P6 Survey Area
Bald Eagle	3	4	10
Canada Goose	13	45	45
Common Loon	2	10	15
Common Merganser	0	6	7
Greater Yellow Legs	0	3	3
Green-winged Teal	0	4	4
Mallard	6	17	26
Ring-necked Duck	20	108	110
Sandhill Crane	3	5	6
Tundra Swan	2	4	6
Tern spp.	0	0	10
Unknown duck	6	55	75

Avian Desktop Studies

As part of desktop studies, BAM models were used along with ALCES to model VC songbird species, as described in Section 5.1.3, provides existing bird data, density estimates, and habitat suitability modeling. BAM models provide existing bird data, density estimates, and habitat suitability models. MBCDC species occurrence listing and conservation status ranking for the Hayes River Upland Ecoregion was also reviewed during bird desktop studies and VC modelling as indicated in Sections 3.1.1 and 5.1.1, respectively.

6.4.1 General Bird Observations and Occurrence

Of the total 6,760 individual bird observations from MBBA, ARU’s, and waterfowl surveys, the majority of birds were observed in wetland shrub (28.5%) or coniferous open (25.4%) habitat (

Table 38; see Appendix J for the raw data).

Table 38 shows the number of birds observed during all surveys. Due to different methods of collection data during the different surveys, the numbers cannot be directly compared, but are included to show the relative number of species observed during surveys in the P6 RAA.

Table 38: Total number of bird observations by habitat type

Habitat Type	ARU	MBBA Incidental Observations	MBBA Point Count Survey	Waterfowl Surveys	Total	Number of Species	Percent of Observations
Broadleaf Dense	146	0	11	11	168	37	2.20%
Broadleaf Open	0	0	0	0	0	0	0.00%
Coniferous Dense	316	240	298	188	1042	83	13.67%
Coniferous Open	329	543	749	169	1790	88	23.48%
Coniferous Sparse	72	68	366	24	530	58	6.95%
Exposed Land	0	0	32	1	33	20	0.43%
Mixedwood Dense	0	0	0	0	0	0	0.00%
Shrub Tall	0	61	0	3	64	17	0.84%
Water	21	128	43	1481	1673	57	21.95%
Wetland Herb	128	92	40	53	313	55	4.11%
Wetland Shrub	541	184	882	268	1875	95	24.60%
Wetland Treed	0	0	127	8	135	32	1.77%
Grand Total	1553	1316	2548	2206	7623	-	100.00%

The most frequently observed birds during MBBA surveys (incidental and point count) were chipping sparrow, white throated sparrow, ruby-crowned kinglet, hermit thrush and Tennessee warbler. SOCC observed during MBBA surveys include common nighthawk, olive-sided flycatcher, yellow rail and rusty blackbird,

For the June waterfowl survey, the most frequently observed species were ring-necked duck, common merganser and mallard, while during the July survey the most frequently observed species were ring-necked duck, Canada goose and mallard. During the October waterfowl surveys, bufflehead and goldeneye were most frequently observed. No SOCC were observed during waterfowl surveys.

The birds most frequently recorded on the ARSs include sandhill crane, Canada goose, Wilson's snipe, ruby-crowned kinglet and common raven. As all of these birds have loud vocalizations and can be heard from further distances than many other species, their relative abundance may be exaggerated compared to quieter species. The migratory forest birds most frequently recorded on the ARUs include ruby-crowned kinglet, chipping sparrow, hermit thrush, Connecticut warbler and alder flycatcher. SOCC recorded on the ARUs include short-eared owl, common nighthawk and olive-sided flycatcher.

6.4.2 **Non-Migratory Raptors**

6.4.2.1 Bald Eagle

Occurrence and Distribution

During aerial waterfowl surveys, 33 bald eagles were observed, one was observed during MBBA point count surveys along with two MBBA incidental observations (Map 60) (see Appendix J for the raw data). Bald eagles were primarily observed on rivers and the shores of small lakes in coniferous habitat during the MBBA point count survey and aerial waterfowl surveys, and incidental observations occurred in the west-central region of the RAA (Map 60).

Habitat Requirements

Results of literature review indicate that bald eagles select areas with a suitable nesting and roosting forest structure, accessibility to prey, low human disturbance, and close proximity to water (Johnsgard, 1990; Buehler, 2000). They use mature and old-growth forests (e.g. conifers), with open canopies and habitat edges or high degrees of foliage-height diversity to allow easy access to nest trees (Buehler, 2000). The size of the forest stand surrounding the nest tree may not be as important as distance from human disturbance (Andrew and Mosher, 1982; Livingston *et al*., 1990; Koonz, 2003); in most cases, the distance to human disturbance is more than 500 m (Buehler, 2000), while the distance to water varies (Buehler, 2000). Eagles are often located within 200 m of shorelines (Peterson, 1986), and nest or roost optimally along or near shallow streams where they can forage for live fish. Territory sizes in boreal regions of Manitoba are 5-10 km^2 (Koonz, 2003).

Model Development

A model for bald eagle breeding habitat was developed using ALCES as described in Section 5.1.3. Bald eagles prefer riparian habitats that are old enough to have large trees for nesting and perching opportunities. Forests within 200 m of lakes and large rivers greater than 70 years of age were selected in ALCES. Each habitat class was assigned a coefficient as presented in Table 39. For this model, habitat was determined as to be yes (suitable) or not and is referred to as a Boolean model approach. The results of the analysis of bald eagle habitat within the RAA, LAA and PF are presented in Table 40 and

Map 61. Primary bald eagle breeding habitat occurs throughout the LA and RAA along the shores of lakes and large rivers (Map 61).

Table 39: Model criteria for bald eagle

LCC Class	Criteria
Forest (Greater than 70 years of age)	Include total forest at least 70 years of age within 200 m of lakes and large rivers

Results

The results of the analysis of bald eagle habitat within the RAA, LAA and PF are presented in Map 61 and Table 40. Primary habitat for bald eagles makes up 23.2% of the P6 RAA, occurring through the RAA, LAA, and PF near lakes and rivers. No secondary habitat for bald eagle was found in the RAA. (Table 40, Map 61).

Table 40: Distribution of bald eagle habitat within the RAA, LAA, and PF

Assessment Area Region	RAA (km^2/%) 9,005 km^2	LAA (km^2/%) 1,329 km^2	PF (km^2/%) 14 km^2
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	2,086.4 (23.2%)	309.2 (3.4%)	2.0 (0.15%) (0.02%)
Total	2,086.4 (23.2%)	309.2 (3.4%)	2.0 (0.15%) (0.02%)

6.4.3 Migratory Waterfowl

6.4.3.1 Canada Goose

Occurrence and Distribution

During aerial waterfowl surveys, 103 Canada geese were observed, 20 were recorded during MBBA point count surveys along with 20 MBBA incidental observations, and 112 total were identified in 16 of 45 ARU sampling sites (Map 62) (see Appendix J for the raw data). Canada geese were observed near rivers and small lakes in wetland and coniferous habitat during the MBBA point count survey and aerial waterfowl surveys, and MBBA incidental observations occurred south of Bunibonibee Cree Nation and east of Manto Sipi Cree Nation. Canada geese occurred on ARUs throughout the LAA (Map 62).

Habitat Requirements

Canada geese are found in a wide variety of habitats near water, including open and forested areas; prairies and parklands; flat, featureless arctic coastal plains and high mountain meadows; as well as a variety of managed refuge conditions and areas of human habitation (Mowbrey *et al*., 2002). They nest individually or semi-colonially on the ground; nests are large open cups made from plant material and lined with down. The birds tend to place their nests on sites with good visibility on lakes, ponds, marshes, muskegs, wet hummocky areas and larger streams (Mowbray *et al*., 2002). Nest site microhabitats vary among subspecies. River, stream, pond, slough and mudflat habitats used by Canada goose broods are characterized by sloping shorelines and abundant plant food (reviewed by Mowbray *et al.*, 2002).

During migration, Canada geese are typically found in open areas adjacent to waterbodies, including lakes, slow-moving rivers, freshwater marshes, coastal salt marshes, bays and shallow brackish ponds; they also commonly use agricultural fields, upland heath and grassy fields (Godfrey, 1986; Sedinger and Bollinger, 1987; Reed *et al*., 1996a summarized in Mowbray *et al*., 2002).

Canada geese are herbivores. The foods consumed, and foraging areas are dependent on seasonal variation in both availability and nutritional quality of potential foods as well as on changing nutritional requirements of the birds (Mowbray *et al*., 2002). During the breeding season and spring migration, Canada geese feed predominantly on grasses, sedges, and berries (Mowbray *et al*., 2002). Studies of diet during brood-rearing are limited: goslings of the Mississippi Valley population feed almost exclusively on green leaves of grasses, sedges and rushes (Bruggink *et al*., 1994). Following fledging and during fall migration, geese tend to switch to berries and seeds (Mowbray *et al*., 2002). Agricultural crops are an important part of the diet when available.

Model Development

A model for Canada goose breeding habitat was developed using ALCES as described in detail in Section 5.1.3. Canada goose nest around lakes, rivers, ponds and small islands. Forest types within 100 m of lakes and large rivers were considered to be most favorable as was selected in ALCES. Each habitat class was assigned a coefficient as presented in Table 41. For this model, habitat was determined as to be yes (suitable) or not and is referred to as a Boolean model approach.

The results of the analysis of Canada goose habitat within the RAA, LAA and PF are presented in Map 63 and Table 42. Primary habitat for Canada goose makes up 14.9% of the P6, occurring through the RAA, LAA, and PF. No secondary habitat for Canada goose was found in the RAA. Very little Canada goose habitat will be lost within the PF and is widely available in the RAA.

Table 41: Model criteria for Canada goose

LCC Class	Criteria
Forest	Include total forest within 100 m of lakes and large rivers

Results

Table 42: Distribution of Canada goose habitat within the RAA, LAA, and PF

Assessment Area Region	**RAA (km^2/%)** **9,005 km^2**	**LAA (km^2/%)** **1,329 km^2**	**PF (km^2/%)** **14 km^2**
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	1,340.0 (14.9%)	194.0 (2.2%)	0.5 (0.03%) (0.01%)
Total	1,340.0 (14.9%)	194.0 (2.2%)	0.5 (0.03%) (0.01%)

6.4.3.2 Mallard

Occurrence and Distribution

During aerial waterfowl surveys, 132 mallards were observed, there was one MBBA incidental observation, and nine total were identified in four of 45 ARU sampling sites (Map 64) (see Appendix J for the raw data). Mallards were observed throughout the LAA and the western portion of the RAA in dense coniferous, wetland shrub and water habitat during aerial waterfowl surveys. Mallards occurred on ARUs deployed near small rivers (Map 64).

Habitat Requirements

Mallards use a diversity of habitats that vary across the species' range (Drilling *et al*., 2017). Drilling *et al*. (2017) note that the success of the mallard is a reflection of its habitat preference plasticity and tolerance to cold climates. In the Ontario boreal forest, mallards tend to use fertile vegetated wetlands with areas of open water (Merendino and Ankney, 1994). A study of mallards in forested regions of Minnesota reported that females are typically found in temporary wetlands and bogs and along lake edges with emergent or overhanging vegetation (Gilmer *et al*., 1975; Kirby *et al*., 1985). The females roosted in river channels amidst dense vegetation. Mallard broods generally use edges or shallow water areas of wetlands that have emergent vegetation and open water (Gilmer *et al.,* 1975). During migration, mallards are typically found on shallow ponds and marshes as well as on flooded agricultural fields (Boreal Songbird Initiative, 2017).

Mallards nest in marshes, bogs, river floodplains, grasslands and dikes as well as a number of habitats associated with agriculture such as pastures and cropland; dense cover and proximity to water are critical attributes (Lokemoen *et al*., 1984). Upland nests are generally found within 150 m of water (Dzus and Clark, 1996; Clark and Shutler, 1999). In Manitoba, most mallards nest on dry ground, but some use over-water nests (Baydack and Taylor, 2003). Baydack and Taylor (2003) note that mallards in Manitoba "readily use enclosed over-water nest platforms as well as old stick nests in willow shrubs".

Mallards are dabblers that feed on a wide variety of foods at or just below the water surface. During the breeding season, mallards forage in shallow wetlands, shallow areas of deeper wetlands and in shoreline vegetation (Drilling *et al*., 2017). During spring migration, they feed in standing water in stubble or sprouting grain fields (Baydack and Taylor, 2003). During fall migration, they are often found feeding in croplands.

Mallards are omnivorous generalists. They shift from predominantly animal foods (insects, aquatic invertebrates and earthworms) during the breeding season to mainly vegetation (seeds from moist-soil plants, aquatic vegetation, cereal crops and acorns) during the rest of the year (Drilling *et al*., 2017).

Model Development

A model for mallard breeding habitat was developed using ALCES as described in detail in Section 5.1.3. Mallards nest around waterbodies. Habitat within 100 m of small waterbodies was selected in ALCES. Each habitat class was assigned a coefficient as presented in Table 43. Primary habitat was derived from Boolean model results are determined as to be yes (suitable) or not. Small lakes were selected and habitat including the small lakes was included. Mallard habitat was considered less suitable on larger lakes.

Table 43: Model criteria for mallard

LCC Class	Criteria
Lake	Habitat within 100 m of small waterbodies <0.5km^2 in size

Results

The results of the analysis of mallard habitat within the RAA, LAA and PF are presented in Map 65 and Table 44. Primary habitat for mallards makes up 18.1% of the P6 RAA, occurring through the RAA, LAA and PF near lakes and rivers (Table 44, Map 65). No secondary habitat for mallard was found in the RAA.

Table 44: Distribution of mallard habitat within the RAA, LAA, and PF

Assessment Area Region	RAA (km^2/%) 9,005 km^2	LAA (km^2/%) 1,329 km^2	Project Footprint (km^2/%) 14 km^2
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	1,628 (18.1%)	264 (2.9%)	4.0 (0.30%) (0.04%)
Total	1,628 (18.1%)	264 (2.9%)	4.0 (0.30%) (0.04%)

6.4.3.3 Ring-necked Duck

Occurrence and Distribution

During aerial waterfowl surveys, 386 ring-necked duck were observed. Ring-necked ducks were identified inone of 45 ARU sampling sites (Map 66) (see Appendix J for the raw data). Ring-necked ducks were observed throughout the LAA and the western portion of the RAA in dense coniferous, wetland shrub, and water habitats along rivers during aerial waterfowl surveys. Ring-necked ducks occurred on one ARU deployed in sparse coniferous habitat west of Manto Sipi Cree Nation (Map 66).

Habitat Requirements

Roy *et al*. (2012) describe ring-necked duck habitat as “freshwater wetlands, especially marshes, fens, and bogs that are generally shallow (depth <1.5 m) and acidic to near-neutral (pH 5.0-8.8), with fringes of flooded or floating emergents, predominantly sedges (*Carex* spp.) interspersed with other herbaceous vegetation and shrubs; also open-water zones vegetated with abundant submerged or floating aquatic plants (e.g., water lilies, Stoudt, 1940; Mendall, 1958; Shelfox, 1977)”. Impoundments are also used (Holland and Taylor, 2003a; Stevens *et al*., 2003). Wetlands used by ring-necked ducks tend to have “relatively stable water levels, low specific conductivity (18–66 µ siemens/cm), low to moderate alkalinity (5.6–369 µ equivalents/liter), and high organic content in water” (McCauley, 1986; Eberhardt and Riggs, 1995 cited in Roy *et al*., 2012). Although the birds use wetlands with 5-75% open water in boreal regions (Rempel *et al*., 1997), they prefer small wetlands with more open water (Brown *et al*., 1996). In northern Alberta, ring-necked ducks tend to be found in fishless lakes (Paszkowski and Tonn, 2000).

Analyses of data from boreal and southern Canada identified associations between ring-necked duck abundance and amounts of deciduous forest, open water, and shoreline; other relevant factors influencing their abundance were Gross Primary Productivity (GPP), variability in minimum June temperature, and water body density (Barker *et al*., 2014). In Manitoba during the breeding season, ring-necked ducks are predominantly observed in wooded habitat on “marshy sloughs and backwaters, slow-flowing rivers, beaver ponds and lake fringes” (Holland and Taylor, 2003a); they are also found on sewage lagoons and gravel pits.

Postbreeding habitats are similar to breeding habitats and are wetlands with “fringes of flooded or floating emergents and open-water zones vegetated with abundant submerged or floating plants” (Roy *et al*., 2012). In southern boreal lakes in Manitoba, the main emergent vegetation includes hard-stem bulrush (*Scirpus acutus*) and broad-leafed cattail (*Typha latifolia*) and the predominant submergent vegetation includes of fennel-leaf pondweed (*Potamogeton pectinatus*), widgeon grass (*Ruppia occidentalis*), and muskgrass (*Chara* spp.; Bailey, 1983).

Model Development

A model for ring-necked duck breeding habitat was developed using ALCES as described in detail in Section 5.1.3. Ring-necked ducks use forest and wetland habitats near bodies of water for nesting and rearing. Each habitat class was assigned a coefficient as presented in

Table 45. Primary and secondary habitat were derived from model results, with the top 25% quartile (76-100%) representing primary habitat, and the second 25% quartile (51-75%) representing secondary habitat.

Table 45: Model criteria for ring-necked duck nesting habitat

LCC Class	Criteria
Deciduous Dense Deciduous Sparse Wetland Shrub Wetland Undifferentiated Wetland Herb Mixedwood Forest Wetland Treed Shrubland	Include areas of all LCC class types that are located within 100 m of lakes and small rivers.

Results

The results of the analysis of ring-necked duck habitat within the RAA, LAA and PF are presented in Map 67 and Table 46. Primary habitat for ring-necked ducks makes up 22.8% of the P6 RAA, occurring through the RAA, LAA and PF near lakes and rivers (Table 46, Map 67). No secondary habitat for of ring-necked duck was found in the RAA.

Table 46: Distribution of ring-necked duck nesting habitat within the RAA, LAA, and PF

Assessment Area Region	**RAA (km^2/%)** **9,005 km^2**	**LAA (km^2/%)** **1,329 km^2**	**Project Footprint (km^2/%)** **14 km^2**
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	2,053.2 (22.8%)	407.5 (4.5%)	4.0 (0.3%) (0.04%)
Secondary	0	0	0
Total	2,053.2 (22.8%)	407.5 (4.5%)	4.0 (0.3%) (0.04%)

6.4.4 Non-Migratory Upland Game Birds

6.4.4.1 Ruffed Grouse

Occurrence and Distribution

Observations of ruffed grouse were limited during all bird related studies. They are considered to exist at low densities across the RAA and are also exhibit cycles in populations, which is consistent with local resource users and TK knowledge in the area. One ruffed grouse was recorded during MBBA point count surveys and identified on three of 45 ARU sampling sites (Map 68) (see Appendix J for the raw data).

Habitat Requirements

Ruffed grouse are mainly found in early-successional deciduous and mixed-wood forests and are less abundant in mature forests and in coniferous forests; thick understory and small (<0.4 ha) clearings are important attributes (Sharp, 1963; Rusch *et al*., 2000), while areas with very thick ground cover are not used. Evidence shows that large contiguous areas of forest are preferred to small or fragmented areas (Rusch *et al.,* 2000).

Ruffed grouse was found in all regenerating habitats and forest age classes in the Manitoba Model Forest and had high relative densities in all habitat types except harvested black spruce and jack pine stands (Wildlife Resource Consulting Services MB Inc and Silvitech Consulting, 1996).

Ruffed grouse nest on the ground in areas with little ground cover but dense overstory (Rusch *et al*., 2000). The nest is a shallow depression, often under a bush or at the base of a tree, stump or rock and is lined with vegetation (Rusch *et al*., 2000; Holland and Taylor, 2003b). Nests may also be built in brush piles, or in the bases of partially open, hollowed-out stumps (Cornell Lab of Ornithology, 2017).

The diet of ruffed grouse varies throughout the year. The summer diet is more varied and incorporates insects and seeds as well as deciduous leaves, buds and fruit (Rusch *et al*., 2000). Chicks forage mainly on insects and other invertebrates (Bump *et al*., 1947). In Manitoba, birds feed on high-bush cranberries (*Viburnum opulus*) in the fall (Holland and Taylor, 2003b). Important winter foods in Canada include twigs, buds and catkins of aspen, willows (*Salix spp.*) and birches (*Betula spp.*), especially aspen (Rusch *et al*., 2000). In Manitoba, ruffed grouse pick up grit from roadsides in all seasons (Holland and Taylor, 2003b).

Model Development

A model for ruffed grouse was developed using BAM as described in detail in Section 5.1.3. Primary and secondary habitat were derived from model results, with the top 25% quartile (76-100%) representing primary habitat, and the second 25% quartile (51-75%) representing secondary habitat.

Results

The results of the analysis of ruffed grouse habitat within the RAA, LAA and PF are presented in Map 69 and Table 47. No primary habitat for ruffed grouse occurs within the P6 RAA, LAA or PF while secondary habitat covers 8.4% of the RAA (Table 47, Map 69).**Error! Reference source not found.**

Table 47: Distribution of ruffed grouse habitat within the RAA, LAA, and PF

Assessment Area Region	RAA (km²/%) 9,005 km²	LAA (km²/%) 1,329 km²	PF (km²/%) 14 km²
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Secondary	548.8 (8.4%)	6.7 (0.1%)	0
Total	548.8 (8.4%)	6.7 (0.1%)	0

6.4.5 Migratory Forest Birds

6.4.5.1 Palm Warbler

Occurrence and Distribution

Palm warblers were recorded 135 times during MBBA point count surveys along with 51 MBBA incidental observations (Map 70) (see Appendix J for the raw data). Palm warblers were primarily observed in wetland shrub habitat and coniferous forests in the eastern portion of the LAA and in the central and southern portion of the RAA during MBBA point count surveys and MBBA incidental observations (Map 70).

Habitat Requirements

Palm warblers are typically found in open coniferous forest, bogs and partly open habitat with scattered trees (Wilson, 2013). Across British Columbia, Albert and Minnesota, palm warblers are typically found in black spruce bogs with tamarack, alder and willow (Semenchuk, 1992; Wilson, 2013; Zlonis *et al*., 2017). Areas near water and with dense shrub cover (1-2 m tall) are typically selected (Godfrey, 1986) and birds are commonly observed in large peatlands as compared to small, isolated ones (Calmé and Desrochers, 2000). Palm warblers are insectivorous typically feeding on the ground, in shrubs or in trees (Bent, 1953; Wilson, 2013).

In Manitoba, nesting habitats include "open spruce tamarack bogs and fens, coniferous scrub and regenerating areas of cut or burned coniferous forest" (Holland *et al*., 2003a). Palm warblers nest on the ground with grass nests typically positioned in *Sphagnum* moss near the edges of bogs (Wilson, 2013), often located at the base of a shrub or small conifer tree (Wilson, 2013; Boreal Songbird Initiative, 2017).

Model Development

A model for palm warbler was developed using BAM as described in detail in Section 5.1.3. Primary and secondary habitat were derived from model results, with the top 25% quartile (76-100%) representing primary habitat, and the second 25% quartile (51-75%) representing secondary habitat.

Results

The results of the analysis of palm warbler habitat within the RAA, LAA and PF are presented in Map 71 and Table 48. Primary habitat for palm warblers covers 39.2% of the P6 RAA, occurring throughout the

RAA, LAA and PF (Table 48, Map 71). Secondary habitat for palm warblers covers 29.6% of the RAA, for a total of 68.8% of the RAA being suitable habitat for palm warblers. Almost all the PF and LAA are suitable palm warbler habitat, with 84.6% of the LAA and 98.6% of the Project Footprint being primary or secondary habitat (Table 48, Map 71).

Table 48: Distribution of palm warbler habitat within the RAA, LAA, and PF

Assessment Area Region	**RAA (km^2/%)** **9,005 km^2**	**LAA (km^2/%)** **1,329 km^2**	**PF (km^2/%)** **14 km^2**
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	3,525.3 (39.2%)	871.1 (9.7%)	11.1 (0.8%) (0.1%)
Secondary	1,947.2 (29.6%)	253.0 (2.8%)	2.7 (0.2%) (0.03%)
Total	5,472.5 (68.8%)	1,124.0 (12.5%)	13.8 (100%) (0.2%)

6.4.5.2 Magnolia Warbler

Occurrence and Distribution

Sixty-one magnolia warblers were recorded during MBBA point count surveys along with one MBBA incidental observation, and none identified on ARU recordings (Map 72) (see Appendix J for the raw data). Magnolia warblers were observed in wetland shrub habitats and coniferous forests during MBBA point count surveys throughout the LAA and in the southern portion of the RAA. MBBA incidental observations occurred south of Bunibonibee Cree Nation and in the central and southern portions of the RAA (Map 72).

Habitat Requirements

Magnolia warblers are primarily found in areas of dense young understory, mixed wood forests with abundant young conifers and pure stands of young conifers (Holland *et al*., 2003b; Dunn and Hall, 2010). Young second growth spruce are known to support the highest concentrations of birds (Hall, 1984). A preference for contiguous forest has also been observed (Hobson and Bayne, 2000b). A study in central Saskatchewan indicated the species to be abundant in white spruce-dominated stands while absent from black spruce and jackpine stands (Hobson and Bayne, 2000a).

Magnolia warblers in the Manitoba Model Forest occupied all five primary habitat types, but preferred harvested aspen mixed-woods and harvested black spruce (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting, 1996). In the Boreal Conservation Region (BCR) 8 of Manitoba, survey results indicate that magnolia warblers are associated with closed mature deciduous forest, closed young mixed forest and closed mature mixed forest (BAM, 2016).

Nests in the northern portion of the species' range are located in dense small spruce or balsam fir with the majority of nests built near the trunk at a height of less than 3 m above the ground (Dunn and Hall, 2010). Nests are typically constructed with twigs and grass (Boreal Songbird Initiative, 2017).

During the breeding season, magnolia warblers' main foraging habitats are dense conifer foliage and dense broad-leaved shrubs, foraging at mid-tree height in conifers and in low bushes close to the ground (Dunn and Hall, 2010; Boreal Songbird Initiative, 2017). Primary food items include arthropods and caterpillars with beetles and other insects also consumed (Dunn and Hall, 2010). Magnolia warblers opportunistically feed extensively on spruce budworm (*Choristoneura* sp.) during epidemics (Crawford *et al.*, 1983).

Model Development

A model for magnolia warbler was developed using BAM as described in detail in Section 5.1.3. Primary and secondary habitat were derived from model results, with the top 25% quartile (76-100%) representing primary habitat, and the second 25% quartile (51-75%) representing secondary habitat.

Results

The results of the analysis of magnolia warbler habitat within the RAA, LAA and PF are presented in Map 73 and Table 49. Very little primary habitat occurs within the P6 RAA, with only 0.4% of the RAA considered primary habitat, and no primary habitat occurring in the LAA or PF (Table 49, Map 73). Secondary habitat for magnolia warblers covers 35.7% of the RAA, with most secondary habitat occurring in the southern portion of the RAA (Table 49, Map 73).

Table 49: Distribution of magnolia warbler habitat within the RAA, LAA, and PF

Assessment Area Region	RAA (km^2/%) 9,005 km^2	LAA (km^2/%) 1,329 km^2	PF (km^2/%) 14 km^2
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	39.6 (0.4%)	0	0
Secondary	2,348.6 (35.7%)	275.4 (3.0%)	3.4 (0.3%) (0.04%)
Total	2,388.2 (36.1%)	275.4 (3.0%)	3.4 (0.3%) (0.04%)

6.4.5.3 Ovenbird

Occurrence and Distribution

Thirty-one ovenbirds were recorded during MBBA point count surveys along with 13 MBBA incidental observations and identified on 10 of 45 ARU sampling sites (Map 74) (see Appendix J for the raw data). Ovenbirds were primarily observed in wetland shrub habitat and coniferous forests south of Bunibonibee Cree Nation and west of God's Lake Narrows during MBBA point count surveys along with MBBA incidental observations. Ovenbirds occurred on ARUs deployed in the central portion of the RAA (Map 74).

Habitat Requirements

Ovenbirds primarily occur in large contiguous tracts of deciduous or mixed deciduous/coniferous forest typically in areas with canopy heights of 16-22 m and percent canopy closure of 60-90% (Porneluzi *et al*., 2011). Avoiding wet or swampy habitats, ovenbirds typically occur in areas with considerable open forest floor, thicker leaf litter layer and higher prey biomass than average (Porneluzi *et al*., 2011).

Ovenbirds require large areas of forest with the minimum requirements varying by region; a study in southern Ontario indicated that ovenbirds need an area greater than 500 ha as a minimum habitat requirement (Burke and Nol, 2000). Ovenbirds are negatively affected by forest edges and fragmentation as displayed through numerous studies examining the impacts of forest fragmentation. Studies in Saskatchewan and Ontario have shown that adult annual survival and productivity, respectively, are higher in contiguous forest than in large or small fragments (Burke and Nol, 1998; Bayne and Hobson, 2002). In contrast, fragmentation in mainly forested landscapes in New Brunswick did not impact density and nesting success (Porneluzi *et al*., 2011).

In the BCR 8 region of Manitoba, survey results indicate that ovenbirds are associated with closed young mixed forests, closed mature deciduous forests, closed mature mixed forests and mixed forest/crop habitat (BAM, 2017).

The habitat of ovenbirds during the breeding season is well-described over much of the species' range. In Alberta, ovenbirds breed in deciduous forests or mixed-woods comprised of extensive aspen or poplar with sparse undergrowth (Semenchuk, 1992). Cumming and Diamond (2002) reported higher abundance in 50-90 year old mixed-wood forest stands than in 100-140 year old stands in Central Saskatchewan. In Manitoba, they are found in a range of mature forest habitats with little understory (Holland *et al*., 2003c).

Ovenbirds are ground-nesters and tend to situate their nests in areas with deep leaf litter on relatively open forest floors with high canopy cover while avoiding areas of dense woody understory (Burke and Nol, 1998; Porneluzi *et al*., 2011).

Foraging primarily on the ground in leaf litter (Stenger, 1958), ovenbird prey include leaf-litter arthropods, forest insects and other invertebrates; adults feed nestlings carabid beetles and larvae (Porneluzi *et al*., 2011). During outbreaks of spruce budworm, the birds may shift to foraging in trees to take advantage of the unusual food source (Zach and Falls, 1975).

Model Development

A model for ovenbird was developed using BAM as described in detail in Section 5.1.3. Primary and secondary habitat were derived from model results, with the top 25% quartile (76-100%) representing primary habitat, and the second 25% quartile (51-75%) representing secondary habitat.

Results

The results of the analysis of ovenbird habitat within the RAA, LAA and PF are presented in Map 75 and Table 50. No ovenbird primary habitat occurs within the P6 RAA (Table 50). Very little ovenbird secondary habitat occurs within the RAA, with only 0.22% of the RAA comprised of secondary habitat, and no secondary habitat occurring in the Project Footprint or LAA (Table 50, Map 75).

Table 50: Distribution of ovenbird habitat within the RAA, LAA, and PF

Assessment Area Region	**RAA (km^2/%)** **9,005 km**		
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Secondary	14.5 (0.22%)	0	0
Total	14.5 (0.22%)	0	0

6.4.5.4 Yellow-Bellied Flycatcher

Occurrence and Distribution

Seventy-four yellow-bellied flycatchers were recorded during MBBA point count surveys along with 31 MBBA incidental observations, and none were identified on ARU records (Map 76) (see Appendix J for the raw data). Yellow-bellied flycatchers were primarily observed in open coniferous and wetland shrub areas throughout the LAA and in the southern portion of the RAA during MBBA point count surveys along with MBBA incidental observations (Map 76).

Habitat Requirements

In Canada, yellow-bellied flycatchers typically use well-stratified spruce, fir or mixed forests, peatlands, and on some occasions drier coniferous forests (Gross and Lowther, 2011). Forest habitats are characterized by open canopy, dense understory, thick moss groundcover and cool, moist conditions (Gross and Lowther, 2011; Boreal Songbird Initiative, 2017). In addition, Burris and Haney (2005) noted the importance of coarse woody debris.

Yellow-bellied flycatchers are commonly found in black spruce peatlands in Saskatchewan and Alberta (Semenchuk, 1992; Smith, 1996). In Newfoundland, yellow-bellied flycatchers were significantly more common in interior forest than in riparian zones (Darroch and Montevecchi, 1997). The results from a study in lowland conifer forests in northern Minnesota suggest that yellow-bellied flycatchers are somewhat of a habitat generalist (Zlonis *et al*., 2017). According to Errington (1933), densities of yellow-bellied flycatchers were higher in medium-mature to mature coniferous forests than in young forests in Wisconsin. In the BCR 8 region of Manitoba, survey results indicate that yellow-bellied flycatchers are primarily associated with closed mature deciduous and open northern habitats; lower relative densities are found in poorly drained/riparian, mixed forest/crop and closed mature coniferous habitats (BAM, 2017).

Yellow-bellied flycatcher's nests, built primarily of moss or rootlets, are typically on or near the ground in flat or poorly drained areas of forests, bogs, swamps and muskegs (Gross and Lowther, 2011). Vegetation in the centre of the territory is dense and the nest site is cool, moist and shady (Gross and Lowther, 2011). Yellow-bellied flycatchers feed primarily in the low dense understory, in conifers and shrubs foraging on plant leaves or by catching prey, flying insects and arthropods, in the air (Gross and Lowther, 2011).

Model Development

A model for yellow-bellied flycatcher was developed by BAM as described in detail in Section 5.1.3. Primary and secondary habitat were derived from model results, with the top 25% quartile (76-100%) representing primary habitat, and the second 25% quartile (51-75%) representing secondary habitat.

Results

The results of the analysis of yellow-bellied flycatcher habitat within the RAA, LAA and PF are presented, Map 77 and Table 51. No yellow-bellied flycatcher primary habitat occurs within the P6 RAA (Table 51). Secondary habitat for yellow-bellied flycatchers covers 34.5% of the RAA, with a large concentration of secondary habitat occurring in the southeast corner of the RAA (Table 51, Map 77).

Table 51: Distribution of yellow-bellied flycatcher habitat within the RAA, LAA, and PF

Assessment Area Region	**RAA (km^2/%)** **9,005 km^2**	**LAA (km^2/%)** **1,329 km^2**	**PF (km^2/%)** **14 km^2**
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Secondary	2,267.8 (34.5%)	416.7 (4.6%)	5.3 (0.06%) (0.4%)
Total	2,267.8 (34.5%)	416.7 (4.6%)	5.3 (0.06%) (0.4%)

6.4.6 Summary of Bird Study Results

Raptors

- Presence of bald eagles confirmed to occur across the LAA and RAA.
- Total of one nest documented within the LAA in proximity to the Project Footprint requiring attention during environmental protection planning.
- The proportion of habitat loss within the RAA was found to be less than 0.02% of available modeled high-quality habitat for bald eagle, illustrating that potential habitat availability in the RAA and LAA is not limited to the PF.

Migratory Waterfowl

- Canada geese are confirmed to be both resident (during summer) and migratory/staging during spring and fall (based on TK, aerial waterfowl surveys and ARU data), with many of the staging areas identified by through local resource users and TK are away from the PF and LAA.
- Mallard and ringed-neck duck are among the waterfowl species confirmed to nest during spring and stage in the RAA during spring and fall migrations.
- Habitat modelling indicates that nesting habitat is not limiting across the LAA or RAA, providing opportunity for nesting and staging by waterfowl.
- The proportion of habitat loss within the RAA was found to be less than 0.01% of available modeled high-quality habitat for Canada goose, 0.02% for mallard, and 0.04% for ring-necked duck, illustrating that potential habitat availability in the RAA and LAA is not limited to the PF.

Non-migratory Forest Birds

- Ruffed grouse is confirmed through ARUs, Breeding Bird Atlas field work, TK and incidental observations as occurring in the RAA at generally low densities.
- The lower quality habitat found in the RAA may be limiting this species abundance.
- Populations are known to be cyclical and may benefit from natural or other habitat disturbance.
- Modeled ruffed grouse habitat was found to be outside the Project Footprint, illustrating that potential habitat availability in the RAA and LAA is not limited to the PF.

Migratory Forest Birds

- Presence of VC migratory forest birds (song birds) is confirmed through ARUs, Breeding Bird Atlas field work, TK and incidental observations.
- General observations of birds throughout the baseline field studies illustrates the diversity and distribution of many species.
- The proportion of habitat loss within the RAA was found to be less than 0.2% of available modeled high-quality habitat for palm warbler, 0.04% for magnolia warbler, and 0.4% for yellow-bellied flycatcher.
- Modeled ovenbird habitat was found to be outside the Project Footprint, illustrating that potential habitat availability in the RAA and LAA is not limited to the PF.

6.5 Reptiles and Amphibians

Field sampling was undertaken for amphibian species of interest within the P6 RAA, including spring peeper, using one source for data: ARUs. Reptile species, such as the red-sided garter snake potentially found in the RAA, were searched for during other field activities to document incidental occurrences when discovered and included site sweeps during trail camera deployment and maintenance activities. Information from local resource users and TK also provided confirmation that red-sided garter observations have occurred in the RAA. Desktop research was also undertaken to determine any known areas of importance such as hibernaculum/den sites.

Autonomous Recording Units

The prime focus of ARU studies was to identify presence/absence of bird and amphibian species that were listed under COSEWIC, SARA, MESEA and MBCDC (also see Appendix B for further information respecting conservation status listing), and to tailor the deployment of the ARUs to those habitats sensitive to detection of the selected species as described in Appendix J: Table J-10. ARUs were deployed in the RAA between March and July 2016 within pre-selected habitat types (Appendix J: Table J-3) and retrieved from the field by October 2016 (Map 56, see Appendix J for further detail). Northern leopard frog, known to potentially be found in the RAA, were considered in the design of the habitat-based placement of the ARUs.

The eastern population of the northern leopard frog is known to occur in the RAA is ranked as S4 by the MBCDC (2016a) and breeds in permanent ponds lacking large fish. The RAA is well north of the expected breeding locales of most rare species of amphibians in Manitoba, but habitat sampling protocol was designed to permit the detection of species such as the green frog (*Lithobates clamitans*, S1/S2), a shallow water, late spring breeder that has been reported as far north as Nopiming Provincial Park (Nature North, 2017), and the mink frog (*Lithobates septentrionalis,* S3) is a late spring breeder resident to bogs, large cold permanent ponds, lakes, and slow moving rivers with abundant vegetation.

While no leopard frogs were recorded by the ARUs sampled in the P6 LAA, several other amphibian species were observed. Spring peeper was selected for a closer examination as a VC partly because it is not as widely distributed across habitats throughout Manitoba as with the boreal chorus frog (*Pseudacris maculata*) and wood frog but located primarily in regions east of Lake Winnipeg. It prefers forested habitats near shallow ponds and other wetlands and are most frequently found east of Lake Winnipeg in southeastern Manitoba (Nature North, 2017).

The timing and location of ARU deployment assumed that amphibians in the region would initiate vocalizations in late April and early May following snow melt and warming temperatures.

A more detailed summary respecting of the deployment of ARUs is provided in Appendix J.

6.5.1 Distribution

Data collection respecting information regarding populations and/or distribution of amphibians was limited to recorded vocalizations obtained from ARU stations. Of five potential species of amphibians identified as possible residents within the region (Appendix C), four were recorded as present within the RAA (Table 52; see Appendix J for the raw data).

Four amphibians were recorded with ARUs within the RAA in the spring of 2016, including the boreal chorus frog, Eastern American toad (*Anaxyrus americanus*), the spring peeper, and wood frog. Wood frogs were the most commonly recorded species, and Eastern American toad, the least observed. The RAA is at the northwest extent of the range of the Eastern American toad.

Table 52: Number of ARU sampling sites where amphibian species were identified

Amphibian Species	ARU Station Recording
Boreal chorus frog	8
Eastern American toad	1
Spring peeper	11
Wood frog	20

6.5.2 Amphibian VC - Spring Peeper

Occurrence and Distribution

Spring peepers were identified on 11 of 45 ARU sampling sites (Table 52; Map 78).

Habitat Requirements

Spring peepers are typically found associated with small wetlands in forested habitats but may occur in a wide range of habitats avoiding floodplain forest and not tolerating extensive urbanization (Frog Watch, 2014; Largett *et al*., 2017). In the Manitoba Model Forest, peeper calls often come from shallow marshy areas or near freshwater pools and ponds (Lees *et al*., 2008). In Indiana, the optimal habitat was found to be moist, upland woods with shallow ponds with the occurrence of spring peepers in forest patches related to the degree of wetland permanency (Kolozsvary and Swihart, 1999; Minton, 2001). Additionally, a landscape-level study in Maine found no association between spring peeper and the amount of forested land (Guerry and Hunter, 2002).

Spring peepers are usually found on the ground or in leaf litter (Largett *et al*., 2017). Although they are able to climb, they are rarely found more than a meter above the ground (Ontario Nature, 2016). Spring peepers undergo short distance migrations, but individuals tend to breed, feed and hibernate within the vicinity of forested wetlands (Butterfield *et al*., 2005). During fall and winter, spring peepers hibernate under logs, behind loose bark and in tree- or knot-holes (Frog Watch, 2014; Ontario Nature, 2016).

The frogs require marshes, ponds or swamps to provide an aquatic environment for their eggs and tadpoles. During the breeding season, spring peepers are found primarily in forests and regenerating woodlands near temporary or semi-permanent freshwater wetlands (including swamps, temporary pools, marshes, ponds and flooded ditches) in which they lay their eggs (Ontario Nature, 2016; Largett *et al*., 2017).

Adult spring peepers are primarily insectivores feeding in low vegetation on small invertebrates such as beetles, ants, flies, and spiders (Largett *et al*., 2017). Diet is based on prey availability and ease of capture rather than on preference (Oplinger, 1967). Spring peeper larvae (tadpoles) are suspension feeders that graze on algae, detritus, and micro-organisms (Oplinger, 1967; Butterfield *et al*., 2005).

Model Development

A model for spring peeper was developed using ALCES as described in detail in Section 5.1.3. Spring Peeper habitat was modeled to capture all forest area within a 99 m buffer of small rivers and wetland habitats developed at a resolution of 1 km^2. Each habitat class was assigned a coefficient as presented in

Table 53.

Table 53: Model criteria for spring peeper

LCC Class	Criteria
Forest	Include total forest within 99 m of small rivers/wetlands

Results

The results of the analysis of spring peeper habitat within the RAA, LAA and PF are presented in Map 79 and Table 54. Primary habitat for spring peeper covers 40.7% of the P6 RAA, occurring throughout the RAA, LAA, and PF (Table 54, Map 79).

Table 54: Distribution of spring peeper habitat within the RAA, LAA, and PF

Assessment Area Region	RAA (km^2/%) 9,005 km^2	LAA (km^2/%) 1,329 km^2	PF (km^2/%) 14 km^2
Habitat Value	Area and % of RAA	Area and % of RAA	Area and % of LAA and RAA
Primary	2,677.7 (40.7%)	563.0 (47.9%)	8.1 (0.6%) (0.09%)
Secondary	2,028.4 (30.8%)	416.8 (4.6%)	5.0 (0.4%) (0.06%)
Total	2,353.0 (71.6%)	979.9 (52.2%)	13.1 (0.99%) (0.15%)

6.5.3 Summary of Spring Peeper Study Results

- Results of ARU’s indicate spring peepers are present in the LAA.
- Habitat area associated with the PF represents less than 1% of available habitat in the LAA.

6.6 Species of Conservation Concern

All provincially and federally listed wildlife species potentially occurring in the P6 RAA, described in Section 4.5.4, were assessed. Species accounts regarding habitat, life history, and any potential issues relative to critical habitat were developed for all 14 SOCC as listed below. Field sampling was undertaken for all SOCC birds within the P6 RAA, using a combination of sources for data including ARUs, aerial waterfowl surveys, and breeding bird point count surveys.

- Bank swallow
- Barn swallow
- Canada warbler
- Common nighthawk
- Eastern wood-pewee
- Horned grebe
- Olive-sided flycatcher
- Peregrine falcon
- Rusty blackbird
- Short-eared owl
- Yellow rail
- Little brown bat
- Wolverine
- Norway House Boreal Woodland Caribou
- Pen Islands Caribou (Eastern Migratory)

Potential project associated effects were considered and described for each SOCC species with known ranges within the P6 RAA. Appendix D, and Table D-1 provides a list of the terrestrial SOCC, along with their current conservation status, a brief description of preferred habitat, potential occurrence, potential effects, mitigation opportunities, and conclusions regarding assessment in the summary of effects description has been included to verify effects assessment results in the RAA.

6.6.1 Bank Swallow

Occurrence and Distribution

No bank swallows were observed during aerial waterfowl surveys, MBBA point count surveys, MBBA incidental observations, and none identified on ARU records.

Habitat Requirements

Bank swallows breed in a variety of low-elevation natural and artificial man-made habitats such as lake and ocean bluffs, stream and river banks, reservoirs, sand and gravel pits, road cuts, sand piles, topsoil, sawdust, coal ash, and other materials (Peck and James, 1987; Garrison, 1999; Grieef, 2003a; COSEWIC, 2013b). Nest burrows are almost always in vertical or near-vertical cliffs, banks and bluffs (at least 0.75 m high with a slope between 75˚ and 105˚) in alluvial, friable soils (Hjertaas, 1984; Garrison, 1999). Bank swallows also nest in drain pipes and nesting structures specifically design for bank swallows (Garrison, 1999; Grieef, 2003a; Gulickx *et al*., 2007).

A large proportion of nesting locations occur in artificial sites across Canada; they were the dominant nesting habitat in British Columbia (87%; Erskine, 1979); while in the Maritimes, only 25% of nests were in artificial sites (Erskine, 1979). The Prairie provinces (including Manitoba) were more similar, with 43% of nests in artificial sites (Erskine, 1979). Artificial islands created at Oak Hammock Marsh in Manitoba for waterfowl breeding provide nesting sites for hundreds of bank swallows (Grieef, 2003a). Bank swallows tend to avoid woodlands, deserts, montane areas, and alpine areas due to scarcity of suitable nesting habitat (Garrison, 1999; Grieef, 2003a). Bank swallow breeding density and distribution is correlated to the distribution of exposed unconsolidated deposits of glacial lacustrine origin, such as in large areas were post-glacial lakes existed, especially in areas with thick sediment deposits (Garrison, 1999).

Bank swallows require eroding, vertical banks composed of unconsolidated substrates such as silty fine sands for nesting (Silver and Griffin, 2009; COSEWIC, 2013b). Substrate penetrability and the proportions of substrate particle sizes are imperative for burrowing (Garrison, 1999). Bank swallows use wide banks composed of well-drained, very fine sands (<900 μm) such as fine sandy loam soils (Hjertaas, 1984; Lind *et al*., 2002; Heneberg, 2003; Heneberg, 2009; Silver and Griffin, 2009). Bank swallow colony sizes are generally larger in areas with the greatest proportion of silt to sand (Hjertaas, 1984; Garrison, 1999).

Bank swallows are locally abundant breeders occurring throughout Manitoba, but with few northern breeding locations (Grieef, 2003a). Bank swallows are a common and locally distributed summer resident of southern Manitoba (Thompson, 1890; Grieef, 2003a).

6.6.2 **Barn Swallow**

Occurrence and Distribution

No barn swallows were observed during aerial waterfowl surveys, MBBA point count surveys, MBBA incidental observations, and none identified on ARU records.

Habitat Requirements

Prior to European settlement, barn swallows nested in natural features such as caves, crevices, holes, and ledges associated with rocky cliff faces (Speich *et al.*, 1986; Peck and James, 1987; Grieef, 2003b; COSEWIC, 2011b). With the rapid expansion of the human population post-European settlement, barn swallows have shifted from natural to artificial nesting sites, with it being suggested that only 1% of barn swallows in Canada using natural nesting sites (Speich *et al.*, 1986; Erskine, 1979; COSEWIC, 2011b). Barn swallows may continue to nest in traditional natural situations but are more closely associated with human situations in rural areas, nesting on a variety of artificial structures that provide a horizontal nesting surface (such as a ledge) or a vertical face with an overhang that provides shelter (COSEWIC, 2011b). Barn swallows will nest in and around open barns, garages, sheds, boat houses, bridges, road culverts, verandahs and wharfs, and on beams, posts, light fixtures, and ledges over windows and doors

(Brown and Brown, 1999; Grieef, 2003b; COSEWIC, 2011b). Barn swallows require wet sites with a nearby body of water that provides mud for nest-building (Brown and Brown, 1999).

Barn swallows were relatively rare in southern Manitoba in the late 19th century; their range now extends over nearly the entire province (Thompson, 1890; Grieef, 2003b). Barn swallows are now widespread throughout Manitoba in agricultural regions, locally common in inhabited areas of the boreal forest, and rare in or near northern communities (Brown and Brown, 1999; Grieef, 2003b).

6.6.3 **Canada Warbler**

Occurrence and Distribution

No Canada warblers were observed during MBBA point count surveys, MBBA incidental observations, and none were identified on ARU records.

Habitat Requirements

Canada warblers inhabit a wide range of deciduous, coniferous, and mixed forests with well-developed shrub layers and structurally complex forest floors (Conway, 1999; COSEWIC, 2008a; Reitsma *et al.*, 2010; Environment Canada, 2016a). They are often found in shrub marshes, cedar stands, coniferous swamps dominated by black spruce (*P. mariana*) and tamarack (*L. laricina*), red maple (*Acer rubrum*) stands, moist spruce-birch (*Betula* spp.) forests, and larch and riparian woodlands along rivers and lakes, often on steep brushy slopes and ravines near these habitats (Peck and James, 1987; Brauning, 1992; Semenchuk, 1992; Larue *et al*., 1995; Cooper *et al*., 1997; Wildlife Resource Consulting Service MB Inc. and Silvitech Consulting, 1997; Conway, 1999; Drapeau *et al*., 2000; Reitsma *et al.*, 2010). Suitable habitat often has a developed layer of moss with an uneven forest floor (Reitsma *et al.*, 2010).

Canada warblers breed in mature upland forests, with canopy gaps that have a well-developed shrub layer (Schieck *et al*., 1995; Enns and Siddle, 1996; Cooper *et al*., 1997; Hobson and Bayne, 2000a; Schieck and Hobson, 2000; Hannon *et al*., 2004; Lambert and Faccio, 2005). They can also be locally abundant throughout their breeding range in regenerating forests (6-30 years post-disturbance) following forest fires or anthropogenic disturbances (Wildlife Resource Consulting Service MB Inc. and Silvitech Consulting, 1997; Schieck and Hobson, 2000; Hobson and Bayne, 2000b; Reitsma *et al.*, 2010).

Female Canada warblers select nesting areas consisting of dense shrubs that provide high concealment, and coarse woody debris and higher tree stem density are main structural features (Peck and James, 1987; Conway, 1999; Reitsma *et al.*, 2010). Canada warblers nest on or near the ground, often on slopes, knolls, in earthen banks, rotting tree stumps, holes of root masses, clumps of grass, or rocky areas (Peck and James, 1987; Reitsma *et al.*, 2010; Environment Canada, 2016a).

6.6.4 Common Nighthawk

Occurrence and Distribution

No common nighthawks were observed during aerial waterfowl surveys, one was recorded during MBBA point count surveys along with two MBBA incidental observations, and 11 total identified on two of 45 ARU sampling sites (see Appendix J for the raw data).

Habitat Requirements

Common nighthawks require open ground or clearings for nesting, and breed in a variety of open habitats including open forests (such as mixedwood and coniferous stands, burns, and clearcuts), grasslands (such as short-grass prairies, pastures, and grassy plains), sandy areas (such as eskers, dunes and beaches), sagebrush, wetlands (such as bogs, marshes, lakeshores and riverbanks), gravelly or rocky areas (such as outcrops, barrens, gravel roads, gravel rooftops, railway beds, quarries, mines, bare mountain tops and ridges) and cultivated or landscaped areas (Campbell *et al.*, 2006; COSEWIC, 2007a; Brigham *et al.*, 2011; Environment Canada, 2016b).

Common nighthawk nests have been observed near other common nighthawk nests (25 to 75 m apart), suggesting that small patches of suitable nesting habitat are not limited to only one breeding pair (Sutherland, 1963). Common nighthawks do not make nests, but eggs are laid on the ground on sand, gravel, or rock in shaded areas with low or no vegetation, adequate camouflage from predators (Godfrey, 1986; Lohnes, 2010; Allen and Peters, 2012).

Common nighthawks forage for flying insects in open areas during crepuscular periods, and sometimes foraging during the day. Foraging habitat needs are met in a wide range of habitats, but open water and artificial lighting are favoured, attracting flocks as large as several hundreds of individuals (Campbell *et al.*, 2006; COSEWIC, 2007a). Tree limbs, the ground, fenceposts, and rooftops with adequate shade and camouflage from predators are suitable roost sites (Fisher *et al.*, 2004; Campbell *et al.*, 2006).

6.6.5 Eastern Wood-pewee

Occurrence and Distribution

No eastern wood-pewees were observed during aerial waterfowl surveys, MBBA point count surveys, MBBA incidental observations, and none identified on ARU records. However, the eastern wood-pewee is a SOCC in the Hayes River Upland Ecoregion.

Habitat Requirements

In Canada, eastern wood-pewees primarily breed in mature and intermediate-age deciduous and mixed forests having an open understory, occasionally selecting more open coniferous woodland (Godfrey 1986; Peck and James, 1987; Falconer, 2010; Burke *et al.*, 2011). Eastern wood-pewees are often associated with sugar maple (*Acer saccharum*), elm (*Ulmus* sp.) and oak (*Quercus* sp.) forests and are often associated with forest clearings and edges near nesting sites (Hespenheide, 1971; Peck and James, 1987; McCarty, 1996; COSEWIC, 2012). Eastern wood-pewee select territory with fewer trees and greater forest openness, allowing for bouts of aerial foraging activity (Falconer, 2010; COSEWIC, 2012). Although often found in riparian areas in the Midwest, eastern wood-pewees reach higher breeding densities in upland sites than lowland forests, and nesting in wet forests likely reflects preference for open space near the nest site (Murray, 1969; Peck and James, 1987; McCarty, 1996; Newell and Rodewall, 2011; COSEWIC, 2012).

The size of forest fragments likely is not an important factor in habitat selection, but eastern wood-pewees occur less frequently in woodlots surrounded by residential development than in woodlots without houses (Stauffer and Best, 1980; Blake and Karr, 1987; Robbins *et al.*, 1989; Keller and Yahner, 2007; COSEWIC, 2012).

The northwestern range limit of the eastern wood-pewee is southern Manitoba and extreme southeastern Saskatchewan and is a fairly common breeder in the southern fifth of the province (Holland *et al*., 2003d).

6.6.6 **Horned Grebe**

Occurrence and Distribution

No horned grebes were observed during aerial waterfowl surveys, MBBA point count surveys, MBBA incidental observations, and none were identified on ARU records.

Habitat Requirements

Horned grebes primarily breed in temperate zones such as parklands and prairies but can also be found in boreal and subarctic zones (COSEWIC, 2009a). Nesting occurs in freshwater (and occasionally in brackish water) on small ponds, shallow bays and marshes on lake borders (Faaborg, 1976; Kantrud and Stewart, 1984; Holland and Taylor, 2003c). Horned grebes select ponds in both open and forested areas (Godfrey, 1986). Horned grebes that inhabit the prairies prefer lakes and permanent or semi-permanent natural ponds lasting until autumn, as well as artificial ponds and reservoirs created by road excavation for construction, river damming, or for retaining rain (Stedman, 2000; COSEWIC, 2009a). Horned grebes prefer small- to moderate-sized but will use a broad range of pond sizes (some as large as 18.2ha), and ponds need to contain large areas of open water (over 40%) and beds of emergent vegetation (Godfrey, 1986; Ulfvens, 1988; Fournier and Hines, 1999; Stedman, 2000; Holland and Taylor, 2003c).

Horned grebes construct a nest comprised of a floating or emergent mass of plant material in the fringes of emergent vegetation in shallow water (Godfrey, 1986; Ulfvens, 1988; Fournier and Hines, 1999). Horned grebes primarily use eutrophic environments, but they can also successfully breed in oligotrophic ponds (Ulfvens, 1988).

6.6.7 Olive-sided Flycatcher

Occurrence and Distribution

No olive-sided flycatchers were observed during aerial waterfowl surveys, 36 were recorded during MBBA point count surveys along with eight MBBA incidental observations, and 13 total identified on three of 45 ARU sampling sites (see Appendix J for the raw data).

Habitat Requirements

Olive-sided flycatchers are widely observed in open coniferous or mixed-coniferous forests, open to semi-open forest stands, and forest edges near natural openings such as wetlands (Holland *et al*., 2003e; COSEWIC, 2007b; Altman and Sallabanks, 2012; Environment Canada, 2016c). Tall snags and residual live trees are essential for foraging, nesting and advertising territory (Godfrey, 1986; Holland *et al*., 2003e; Altman and Sallabanks, 2012).

Olive-sided flycatchers prefer open areas such as post-burn areas or wetlands for foraging, often occurring where standing dead trees are present and natural edge habitat occurs, such as wooded shores of streams, lakes, rivers, beaver ponds, bogs, and muskegs (Hutto, 1995; Kotliar *et al.*, 2002; Altman and Sallabanks, 2012). In the boreal forest portion of its range, olive-sided flycatchers are most common in open habitats of muskegs, swamps and bogs that are dominated by spruce (*Picea* spp.) and tamarack (*L. laricina*) (Altman and Sallabanks, 2012).

The highest densities of olive-sided flycatchers are supported in mature conifer stands within patchy landscapes that have been influenced by natural disturbance (Haché *et al.*, 2014). Although wet areas have a positive effect on olive-sided flycatcher density on a landscape scale, it has a negative effect at a local scale (Haché *et al*., 2014).

Olive-sided flycatchers place nests near the tip of coniferous branches and are constructed of twigs, rootlets, and arboreal lichens and may be lined with pine needles and grasses (Altman and Sallabanks, 2012).

6.6.8 Peregrine Falcon

Occurrence and Distribution

No peregrine falcons were observed during aerial waterfowl surveys, MBBA point count surveys, MBBA incidental observations, and none identified on ARU records.

Habitat Requirements

Peregrine falcons occur in a wide range of habitats, from Arctic tundra to coastal islands, desert canyons and major urban centres (COSEWIC, 2007c; Environment Canada, 2015a). During the breeding season, peregrine falcons generally nest on cliff ledges or crevices (ranging from 50 to 200 m high) near good foraging areas (Sliworsky and Nero, 2003; COSEWIC, 2007c; Environment Canada, 2015a). Peregrine falcons can nest on several different sites, including escarpments, in quarries, open-pit mines, in trees, common raven (*Corvus corax*) nests, and anthropogenic features such as transmission towers, churches, bridges, skyscrapers, open-pit mines, and industrial stacks (Cade *et al.*, 1996; White *et al.*, 2002; COSEWIC 2007c). Peregrine falcons primary feed on birds captured in the air, and will select sites near seabird colonies, shorebird and waterfowl staging and nesting areas, and areas with large numbers of songbirds or pigeons (Environment Canada, 2015a). Peregrine falcons have been known to feed on small mammals in Labrador (Environment Canada, 2015a).

Peregrine falcons are considered a potential transient migrant within the RAA. The peregrine falcon has never been a common breeder in Manitoba; Thompson (1890) recorded most observations during the fall migration period. A pair of peregrine falcons were observed nesting in Churchill in 1957, and the species was considered to be a fairly common transient and summer resident in Churchill in the 1930s (Taverner and Sutton, 1934; Jehl and Smith, 1970; Sliworsky and Nero, 2003). During migration, peregrine falcons use a broad array of habitats (including urban areas), using leading lines such as barrier islands, sea coasts, lake edges, or mountain ranges (White *et al.*, 2002). Peregrine falcons are commonly seen near concentrations of shorebirds and waterfowl during migration (Sliworsky and Nero, 2003).

6.6.9 **Rusty Blackbird**

Occurrence and Distribution

No rusty blackbirds were observed during aerial waterfowl surveys, 13 were recorded during MBBA point count surveys along with six MBBA incidental observations, and none identified on ARU records (see Appendix J for the raw data).

Habitat Requirements

The breeding range of rusty blackbirds corresponds with the boreal forest and taiga terrestrial ecozones (Godfrey, 1986; COSEWIC, 2006). Rusty blackbird habitat is generally characterized by conifer forest wetlands, frequenting fens, muskegs, beaver ponds, alder (*Alnus*)-willow (*Salix*) bogs, and other forest openings such as swampy shores along streams and lakes (Godfrey, 1986; COSEWIC, 2006; Avery, 2013). Rusty blackbirds are generally not present in wetlands in regions above the tree line (such as the alpine tundra and Arctic tundra), and is uncommon in high mountain wetlands (COSEWIC, 2006, Environment Canada, 2015b). Rusty blackbirds use strictly riparian habitat in forested areas, rarely using the forest interior (Whitaker and Montevecchi, 1999). They are primarily observed in wetlands associated with recent burns, peat bogs with or without ponds, wooded heathland, riparian scrub, open moss- and lichen-spruce woodlands, sedge meadows, alder and willow thickets, marshes, and estuaries (COSEWIC, 2006; Environment Canada, 2015b).

Rusty blackbirds select breeding sites in areas with a combination of freshwater bodies that have shallow water and emergent vegetation for foraging, adjacent to wetlands with conifers or tall shrubs with cover for nesting (Matsuoka *et al.*, 2010a; Matsuoka *et al.*, 2010b; Environment Canada, 2015b). Nesting occurs in low conifers, living and dead trees, and atop stumps, at heights usually less than 3 m, generally near water (Godfrey, 1986; Avery, 2013).

6.6.10 **Short-eared Owl**

Occurrence and Distribution

No short-eared owls were observed during aerial waterfowl surveys, MBBA point count surveys, MBBA incidental observations, and two total identified on two of 45 ARU sampling sites (see Appendix J for the raw data).

Habitat Requirements

Short-eared owls breed in a variety of open habitats including grasslands, taiga, bogs, marshes, old pastures, Arctic tundra, coastal wetlands, coastal barrens, estuaries and grasslands dominated by sand-sage (*Artemisia filifolia*) (COSEWIC, 2008b; Environment Canada, 2016d). Short-eared owls are often associated with open habitats that support cyclic small animals (such as voles and lemmings) (Wiggins *et al*., 2006). The density of prey populations is the primary indicator of short-eared owl habitat occupancy; the meadow vole (*Microtus pennsylvanicus*) is a primary prey item of short-eared owls and prefers natural prairie or meadows with large areas of vegetative cover (Peles and Barrett, 1996; Lin and Batzli, 2001; Environment Canada, 2016d). A mosaic of grasslands and wetlands provide optimal breeding and foraging habitats, with medium-to-tall grasses (higher than 30 cm), some dry upland for nesting, and hunting perches are all characteristics of sites occupied by short-eared owls (Clark, 1975; Clayton, 2000; Wiggins *et al*., 2006; Keyes, 2011).

In Manitoba, short-eared owls primarily breed in southern farmland and northern tundra, rarely lingering in the intervening forest during migration, but likely breed in extensive marshes and fens in the boreal plains (Holland and Taylor, 2003d). Short-eared owls select areas with small willows in the tundra of Churchill, Manitoba (Jehl, 2004). Clark (1975) identified the mean territory size of short-eared owls in Manitoba as 74 and 121 ha in successive years, with smaller territories in years with higher food abundance. Nests from multiple breeding pairs may be clustered in areas where food resources are abundant (Clark, 1975; Environment Canada, 2016d).

Short-eared owls nest on the ground, with females scraping out nest bowls and lined with grasses and downy features (Clark, 1975; Holt, 1992; Wiggins *et al.*, 2006; COSEWIC, 2008b; Environment Canada, 2016d). In wet nesting areas, short-eared owls build their nests on a small rise or knoll (COSEWIC, 2008b). Short-eared owls select areas to nest where the previous year’s residual vegetation is dead and matted down (Holt, 1992).

6.6.11 **Yellow Rail**

Occurrence and Distribution

No yellow rails were observed during aerial waterfowl surveys, one was recorded during MBBA point count surveys, there were no MBBA incidental observations, and none were identified on ARU records.

Habitat Requirements

Yellow rails inhabit shallow wetlands and other wet areas with extensive short, grassy vegetation, usually sedges (Cyperaceae, especially *Carex* spp.) as well as grasses (Poaceae) and rushes (Juncaceae) (COSEWIC, 2009b; Environment Canada, 2013; Leston and Bookhout, 2015). Yellow rails breed in various wetland habitats, including damp hay fields, damp meadows, floodplains, bogs, sedge meadows, salt marshes, upper levels of estuaries, shallow prairie wetlands, and wet montane meadows (Peabody, 1922; Alvo and Robert, 1999; Popper and Stern, 2000; COSEWIC, 2009b).

Yellow rails typically nest in sites with less than 15 cm of standing water but may breed in areas with up to 50 cm of standing water (COSEWIC, 2009b; Environment Canada, 2013; Leston and Bookhout, 2015). Yellow rail abundance varies dramatically year to year due to the yellow rails' narrow tolerance for shallow water levels (Robert and Laporte, 1999; Lindgren, 2001). Yellow rail breeding habitat requires an overlying layer of dead grass-like vegetation in order to create roofing over the nest, and for hiding movements from predatory birds (Robert and Laporte, 1999; COSEWIC, 2009b; Environment Canada, 2013).

Yellow rails are uncommon and local breeders in wetlands throughout Manitoba (Holland and Taylor, 2003e). The species' range extends northeastward to Churchill and the Hudson Bay coast (Holland and Taylor, 2003e).

6.6.12 **Little Brown Bat**

Occurrence and Distribution

No little brown bat were observed during aerial waterfowl surveys, MBBA point count surveys, MBBA incidental observations, and none identified on ARU records.

Habitat Requirements

Little brown bats' habitat requirements vary by season. The species requires overwintering habitat (hibernacula) for hibernation and overwinter survival; summering habitat including roosting habitat and foraging habitat (Sasse and Perkins, 1996; Norquay *et al.*, 2013); and swarming habitat in late summer and early fall for mating and socialization (Fenton, 1969; Randall and Broders, 2014; Environment Canada, 2015c). Swarming sites are typically used as hibernacula as well (Fenton, 1969; Randall and Broders, 2014).

As little brown bats are year-round residents, overwintering habitat is necessary for little brown batssurvival in regions where ambient temperature declines and insects are not available in winter (Environment Canada, 2015c). Hibernating bats are able to decrease their metabolic rate and body temperature within a few degrees of the hibernaculum ambient temperature (Henshaw and Folk, 1966). Underground openings such as caves, abandoned mines, wells, and tunnels with an ambient temperature range from 2˚C and 10˚C and relative humidity levels greater than 80% are used as hibernacula (Fenton, 1970; Anderson and Robert, 1971; Cryan *et al.*, 2010; Vanderwolf *et al.*, 2012). Structural features such as the number of openings, cave length and size, and angle of chambers can influence the stability of the hibernacula and the levels humidity and temperature (Raesly and Gates 1987). Little brown bat will use hibernacula year after year due to the specific, stable microclimates required for overwintering habitat (Environment Canada, 2015c).

Little brown bat' congregate in swarming habitat (often in and around entrances of hibernacula) in late summer and early fall, with swarming habitat functioning as mating sites, stopover locations during migration, social sites for information transfer, and allow individuals to assess potential sites for overwintering (Fenton, 1969; Randall and Broders, 2014; Environment Canada, 2015c).

Roosts provide shelter from weather and predation, thermal regulation, and provide social interaction (Environment Canada, 2015c). Selection of roosting habitat occurs at several spatial scales (Fabianek *et al.*, 2011). At the scale of the roosting structure, tree species, height, diameter, stage of decay, sun exposure, and availability of roosting medium affect roost selection (Garroway and Broders, 2008; Slough, 2009; Olson and Barclay, 2013). At the stand scale, roosting habitat selection may be a function of number of available snags, tree density, proximity to water, and canopy gaps (Garroway and Broders, 2008; Environment Canada, 2015c). Forest age, composition, and degree of fragmentation are all factors of roost selection at the landscape scale (Henderson and Broders, 2008; Fabianek *et al.*, 2011). Little brown bat may also use forested areas and man-made structures in urban and suburban areas for roosting; little brown bat is one of the few bat species that uses buildings and other anthropogenic features (such as bridges, barns and bat boxes) to roost (Environment Canada, 2015c). Little brown bat' preferentially roost in older forest stands over young forests as they likely provide increased snag availability for roosting and foraging habitat (Crampton and Barclay, 1996; Krusic *et al.*, 1996).

Foraging habitat for little brown bat is associated with open habitat such as ponds, roads, open canopy forests, and vegetation along lake and stream margins (Ratcliffe and Dawson, 2003; Jung *et al.*, 2014; Segers and Broders, 2014; Environment Canada, 2015c). Little brown bat is a short-distance migrant. In Manitoba and Ontario, little brown bat migrated regional 35 to 554 km (Fenton, 1970; Norquay *et al.*, 2013).

6.6.13 **Wolverine**

Occurrence and Distribution

Two wolverines (*Gulo gulo*) were observed on trail cameras in the RAA, one wolverine track observed during the 2012 multispecies survey in the RAA, one wolverine track was observed during the 2014 multispecies survey, and ten tracks were observed during the trapper program (see Appendix I for the raw trapper data).

Habitat Requirements

Wolverines use a wide variety of forested and tundra habitats at all elevations that contain an adequate year-round supply of small prey such as rodents and snowshoe hare, as well as carcasses of moose and caribou (COSEWIC, 2014). Wolverines are associated with wolves, caribou, and grizzly bears (*Ursus arctos*), as viable populations of large carnivores are an important source of ungulate carrion (COSEWIC, 2014).

Female wolverines require snow-covered rocks, logs or snow tunnels for denning, and reproduce in areas with snow cover persisting until April (COSEWIC, 2014). Dens can be constructed in talus boulders, along eskers, under deadfall and logs, and snow tunnels in higher elevations (Copeland, 1996; Magoun and Copeland, 1998; Cardinal, 2004; Inman *et al.*, 2007; COSEWIC, 2014). Male wolverines primarily select habitat based on summer and winter food availability, while females select habitat based on food, predation risk, and disturbance (Krebs *et al.*, 2007; COSEWIC, 2014).

Adequate snow cover is critical for wolverine denning, as snow cover needs to be deep enough (i.e. greater than one metre deep) to provide adequate insulation late into spring (Magoun and Copeland, 1998). Female wolverines leave their kits for long foraging trips and will select denning sites in talus, avalanche debris, or snowdrifts which are typically found in ravines and leeward slopes; dens with spring snow cover allow thermoregulation for kits, provide protection from predators, and have an abundance of small-mammal prey (Magoun, 1985; Copeland, 1996; Inman *et al.*, 2007). Wolverines are known to reoccupy denning sites for several consecutive years (Magoun, 1985).

6.6.14 **Norway House Boreal Woodland Caribou**

Occurrence and Distribution

Occurence and Distribution of the Boreal Caribou is detailed in section 6.1.10.

Habitat Requirements

Boreal woodland caribou require large, undisturbed tracts of habitat. They prefer mature to old-growth coniferous forests with abundant lichens, or peatland mixed with upland areas and tend to avoid disturbed habitats or those at early successional stages (Environment Canada 2012). They generally have large ranges and low-population densities, which reduces predation risk (Environement Canada 2012). Boreal caribou select habitat with abundant food supply where they feed on terrestrial and arboreal lichens. During calving, cows travel to isolated and relatively predator free areas (e.g. islands, peatlands, muskegs, lakeshores) where there is nutritious forage, as degraded or inadequate habitat reduces calving success (Environment Canada 2012). Further detail on habitat requirements for Boreal Woodland Caribou are detailed in section 6.1.12.

6.6.15 **Pen Islands Caribou (Eastern Migratory)**

Occurrence and Distribution

Occurence and Distribution of the Pen Islands caribou is detailed in section 6.1.10.

Habitat Requirements

COSEWIC (2011a) currently identifies the Pen Islands caribou range as part of Designatable Unit 4 (DU4): Eastern Migratory Caribou. COSEWIC has assessed all subpopulations of the Eastern Migratory Caribou, including the Southern Hudson Bay subpopulation (i.e. the Pen Islands range), as “Endangered” (COSEWIC 2017). MBCDC (2016a) lists the population as S4. See Appendix A for further detail/definitions on conservation status listing. The Pen Islands caribou population has a range extending from northeastern Manitoba to northwestern Ontario within the Hudson Bay and Boreal Shield Ecozones (Magoun *et al.*, 2005; Gunn *et al.*, 2011; Abraham *et al.*, 2012; Berglund *et al*., 2014). Pen Islands caribou perform long bi-annual migrations, spending the calving and summer seasons in tundra with sparse vegetation and migrating to boreal forest for the fall and winter seasons (COSEWIC 2016). During calving and in the summer, they select habitat in peatland complexes which is rich in graminoids and deciduous shrubs (COSEWIC 2016). Cows migrate to calve together as an anti-predator defence strategy. With high density of prey in one location, there is a lower probability for individuals to lose calves to predators (COSEWIC 2016).

6.7 Species of Importance to First Nations

Resource users with the P6 FN communities of God's Lake, Bunibonibee, and Manto Sipi shared local knowledge on hunting, trapping, wildlife, and rare species in the RAA. Information included detail on VC species including caribou, moose, beaver, marten, eagle, Canada goose, mallard, ringed-neck duck, and grouse. This information was incorporated where appropriate to guide the wildlife studies that were conducted as well as being incorporated into the assessment of effects. Sites of importance (IE known dens sites) were identified and used in the assessment to ensure these were avoided, however, no critical sites were found in proximity to the PF. For additional detail on local and traditional knowledge see the P6 Existing Environment Report (Joro, 2017).

Caribou

Caribou are known to be an important hunted species for a number of community members in the P6 RAA. Caribou are known to move southward from Churchill and Shamattawa First Nation in the winter to the P6 RAA, typically maintaining the same route annually. Community members indicated that caribou typically move from northwest to southeast, with large herds (tens to hundreds) migrating across God's Lake in January and February.

Smaller herds of migrating caribou (Pen Islands caribou) are known to stay behind and overwinter, staying near the P6 communities throughout the summer. These summering herds re-connect with the larger herd in the following spring migration. Caribou calving is known to occur along the eastern edge of Edmund Lake and northwest towards Knee Lake.

Local FN communities have supported the understanding of a diverse caribou population within the RAA and have described two types of caribou as identified by physical and behavioural characteristics. Community members distinguish between resident and migratory caribou. Resident caribou tend to be larger as opposed to migratory herds observed in the region. These resident caribou are typically observed in herds of only six to eight animals with a maximum herd size of approximately 15 animals.

Moose

As with caribou, moose are an important species hunted by community members in the P6 RAA. Moose are typically hunted in the fall; however, hunting occurs opportunistically year-round. Moose are typically found inland from the shoreline of lakes and other waterbodies. Moose are known to thrive in old burn and re-growth areas that provide good foraging habitat and use the habitat along the winter roads in the RAA. Community members have noted that as compared to historic moose hunting effort, present day moose hunting requires travel further away from their communities and further inland from shorelines. Community members mentioned that at present there are fewer moose and an overabundance of hunters. The perceived decline in moose population has been observed over the last 20 years.

Furbearers

Although trapping is an important activity for resource users in the P6 RAA, only a number of Registered Trap Lines (RTL) are well used in the P6 RAA. Fur pelts currently sell for much less as compared to in the past, decreasing the interest in trapping.

Beaver, muskrat, and otter are trapped from spring (May) through to fall (August) as the fur is still prime. Community members indicated that despite their high population, beaver are not actively trapped due to the large amount of work and very low pelt price. Beaver play a key role in children experiencing and getting involved with trapping and occasionally trapped for Elders to eat. Although otter are historically one of the most important species trapped, primarily based on fur value, participants indicated there is currently no market for pelts.

Community members indicated that the mink population is abundant and stable, yet the market for mink pelts has been decreasing, and as such, the species is not typically trapped.

Marten were historically not observed in the P6 RAA until the 1970's when they moved into the area and significantly decreased the rabbit population. In present day, marten are abundant, easy to trap, and the pelt prices are good (higher than otter), which leads them to be one of the most important species trapped. Predator and prey dynamics may affect the marten population. Current predator populations appear to be low, while prey, including squirrel and rabbit, are high, resulting in an abundant marten population.

Although previously low, lynx population numbers in the P6 RAA area have returned, likely as a result of limits put on trapping. Reproducing quickly and having up to three litters a year, rabbits provide an important food source for lynx and marten.

Historically a common observation, wolf tracks are now a rare sighting throughout the P6 RAA. Wolf pack observations tend to be cyclic in nature lending to an assumption that they are following big game movement. Wolves are currently not trapped, however, denning site locations, travel corridors, and hunting patterns were shared by community members. Community members noted that wolves are hunting caribou more so than in the past. They suggested that this may be a result of the decreasing moose population.

Birds

Waterfowl hunting, an important activity for resource users, is typically a spring and fall activity for the communities. Community participants indicated that geese and ducks are frequently in abundance in key habitat areas associated with waterbodies such as creeks and lakes. Geese typically congregate near rapids, close to open water in the spring, and will pass by these same areas in the fall and find alternate locations to stage. Community members typically hunt mallard ducks in nearby creek habitats. Community members suggested that duck populations are declining possibly due to the lack of wild rice growing on the local lakes.

Loons and gulls are frequently observed near the communities. Loons may be hunted for food, and gull eggs are occasionally harvested and eaten by community members. Community members indicated that bittern is harvested for eating with tundra swan, and blue heron being typically eaten by Elders in the community.

Grouse, including ruffed, spruce, and sharp-tailed, are abundant in the RAA. They can be heard drumming in swampy habitat and are often observed and hunted in the fall on islands in nearby lakes. Ptarmigan, also referred to locally as white chickens, prefer muskeg habitat and have historically had large winter populations in the RAA. Participants indicated that although ptarmigan have been observed the RAA, populations are considered to be decreasing.

During discussions on raptors, workshop participants mentioned that bald eagles maintain a healthy population along lakes and rivers in the RAA. Eagles migrate and return to the area every spring to breed, preferring shoreline habitat where fish are available as a valuable food source for young. A number of community members mentioned having observed golden eagles near the communities. Ospreys have also been observed by community members; however, sightings are less frequent than in the past. Peregrine falcons are only occasionally observed along riverbanks. Owl populations in the RAA have decreased over the past several years. Participants would historically hear owls calling every night – this no longer happens. Snowy owls are often observed in the winter, great horned owls and short-eared owls have been sighted in multiple locations near communities, and northern saw-whet owls are often heard calling.

Rare Wildlife

Community members shared observations of rare wildlife, including brown bat sightings. Participants also mentioned that they have observed an increase in the skunk and vulture populations over the last few years. Community participants shared a rare sighting of a Bonaparte's gull or a black tern. Other noted observations shared by participants include olive-sided flycatchers, short-eared owls, flying squirrels, leopard frogs, brown frogs, lizards and salamanders, and red-sided garter snakes. Rare wildlife observed in the region also included skunks, raccoons, porcupine, and polar bear.

7.0 POTENTIAL EFFECTS ASSESSMENT

Potential environmental effects on the Wildlife VC's were based on extensive baseline wildlife data gathered in support of ASR development in the northern portion of the LATN as well as caribou telemetry data including forest-dwelling (Norway House range) and forest-tundra (Pen Islands caribou) from studies conducted from 2011 to 2017. Other information sources included Manitoba Breeding Bird Atlas, desktop studies including MBCDC data, information from community wildlife workshops and local trappers. Other desktop research and habitat modeling provided quantitative assessment of effects on habitat that are incorporated into the overall assessment.

The following sections provide a summary assessment for the identified potential effects associated with each wildlife VC. The wildlife assessment criteria and effects assessment tables in Appendix K provide the associated rankings of significance before and after proposed mitigation. This assessment defines effects that are a result of changes to the environment resulting from the project, and identifies mitigation measures to avoid, and minimize adverse environmental effects. Note that in some cases below, multiple effects are dealt with simultaneously based on linkages between effects, literature and study results supporting the conclusions on residual effects.

Table 55 provides a list of the VC's assessed in the following sections. Species of Conservation Concern are dealt with in Section 7.6, and their associated assessments are also included in Appendix K.

Table 55: Listing of wildlife VC's and associated effects assessment

Mammals	Birds
Caribou	**Raptors** • Bald eagle
Moose	**Migratory Waterfowl** • Canada goose • Ring-necked duck • Mallard
Furbearer • Marten (representing terrestrial furbearers) • Beaver (representing aquatic furbearers)	**Non-Migratory Game Birds** • Ruffed grouse
	Migratory Forest Birds • Palm warbler • Magnolia warbler • Yellow-bellied flycatcher • Ovenbird
	Amphibians • Spring Peeper

7.1 Caribou

Potential effects of the project were identified based on past environmental assessments in Manitoba, literature, field studies and professional judgement regarding the potential effects of an all-season road on caribou These effects were identified as; habitat loss/alteration, sensory disturbance and displacement, increased mortality due to vehicle collisions, hunting and predation and the possible introduction of parasites from white-tailed deer expansion (i.e., Brainworm [*P. tenuis*] *and liver fluke [Fascioloides magna]*). These potential effects were evaluated for relevance to the P6 Project and the following section provides the rationale for the determination of level assigned to each CEAA criteria as described in Appendix K as a result of the P6 Project.

For the purpose of this assessment, forest-dwelling (Norway House/Molson MU boreal caribou) and forest-tundra (Pen Islands caribou/Eastern Migratory) were assessed as one VC. As described in this report, the RAA is on the fringes of both the Norway House and Pen Islands caribou ranges and intersect a very small portion of known core areas defined by telemetry and aerial multi species surveys for both ecotypes. Results of studies suggest low densities of caribou occupying the RAA during all seasons with TK and telemetry data indicating episodic migrations of Pen Islands caribou into the northeastern portion of the RAA during winter. Evidence of Norway House caribou occupation is weak, however, there is evidence of all season occupation of caribou at low densities in the RAA.

Range based disturbance assessments were undertaken on both ecotypes, as well as habitat modeling and assessments of potential caribou habitat loss associated with the project. The following sections provide a summary of potential effects and summarize residual effects after mitigation. Detailed assessments and significance rankings are found in Appendix K (Wildlife Assessment Criteria and Effects Assessment).

Habitat Loss/Alteration/Fragmentation

Based on the results of multi-species surveys and the acquired telemetry data, the RAA is on the fringe of both the Norway House boreal caribou range and the Pen Islands caribou range. The location of seasonal core areas as defined by kernel analysis indicate approximately 1.4-6.24% of the total area of use for the Pen Islands range and 0% of the total area of use for the Norway House range overlap the RAA. Based on the results of telemetry, trail camera and TK information, a small number of woodland caribou have been observed in the RAA during summer. These data indicate primarily winter use by the Pen Islands animals in the northeast corner of the RRA, and winter occupation of the Norway House animals in a small fraction of the north-west portion of the RAA (Maps 8 to 17).

Based on the results of the calving and winter habitat modeling, high quality habitat is not limiting in the RAA or across the larger region including the Molson Boreal Woodland Caribou Management Unit (MU) and the Hayes River Upland Ecoregion. The Molson MU overlaps with the western portion of the RAA and LAA, with 594 km^2 of high quality caribou winter habitat occurring in the area of overlap with the RAA, and 102 km^2 of high quality winter habitat occurring in the overlap with the LAA (Table 21). Of the high-quality caribou calving habitat, 466 km^2 overlaps with the RAA, and 119 km^2 of high quality caribou calving habitat occurs in the overlap with the LAA (

Table 20).

Habitat disturbance in the Molson MU and Pen Islands caribou range are both below the 35% disturbed habitat threshold for boreal woodland caribou identified by Environment Canada (2012). As there is currently no disturbance threshold defined for eastern migratory caribou, the boreal woodland caribou disturbance threshold was used for Pen Islands habitat disturbance analysis. The Pen Islands range has a total disturbance of 23% and the Molson MU has a total disturbance of 28%, with natural disturbance from fires being the greatest contributors to overall disturbance (Table 22 and

Table 23).

Proposed mitigation measures to minimize effects on habitat loss and alteration include:

- Clearing and grubbing of the road and ROW will be avoided during normal parturition times (i.e. May 18 to June 28) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Conducting wildlife habitat features pre-construction surveys and utilize telemetry collar data to identify if calving areas are present.
- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Limiting clearing and construction to designated areas within the Project Footprint and Local Assessment Area (e.g. quarries and borrow pits) as per ES130.17 – Clearing and Grubbing.
- Prohibiting equipment and limiting access outside the designated cleared area throughout construction as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Decommissioning temporary access routes, trails, and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES130.8 – Designated Areas and Access.
- Undertaking ROW (i.e. brushing and clearing), bridge, and culvert maintenance activities during fall and winter to the extent feasible to avoid parturition times (i.e. May 10 to June 15).

In summary, the effects of the project on habitat loss are minor in nature with proposed mitigation measures. Additionally, providing some protection to important habitat features such as mineral licks, if discovered, as well as minimizing the footprint during construction and operation will also mitigate potential project effects.

7.1.1 **Sensory Disturbance**

Behaviour strategies and avoidance of anthropogenic disturbance, including sensory, are known to be associated with predator avoidance. Leclerc *et al.* (2014) found that female caribou that calved near cutovers with associated high road densities had fewer calves than those that calved away from these features. However, results of fidelity analysis also illustrates that female caribou exhibit large movements between calving site selection from year to year, and if present, would select other potential high quality calving habitat available throughout the RAA and LAA. Modeled caribou calving habitat is not limiting as described above, and there is only one known calving site within the RAA in 2011.

Results of the Path Trajectory Analysis (annual movement), illustrates that the Pen Islands caribou travel on average more than 3,500 km per year, which is approximately 2.3 times the annual movements calculated for the Norway House boreal caribou population. This is consistent with recorded movement data for the Pen Island caribou, indicating the migratory nature of this herd (Abraham *et al*., 2012; Berglund *et al*., 2014). This, in combination with the analysis of time all collared Pen Island caribou were found in the RAA (27.1 days), provides rationale for the low predicted effect for sensory disturbance and displacement. It should be noted that one female caribou was suspected of calving in the RAA well outside the LAA south and east of Gods Lake, which is not unexpected, given the RAA borders the Molson Boreal Woodland Caribou Management Unit intersecting the RAA.

The following mitigation measures to minimize sensory disturbance effects include:

- Staging construction activities (sections) such as clearing, grubbing, and construction to limit noise disturbance to defined areas.
- Scheduling to avoid construction ROW clearing and quarry blasting during normal parturition times in habitats known to be high quality caribou calving habitats (i.e. May 18 to June 28) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Using existing access routes, trails, or cut lines where feasible and keep new access routes, trails, or cut lines as short and narrow as feasible as per ES130.6 – General and ES130.8 – Designated Areas and Access and 130.15.3.4 Disturbance to Stream beds and Stream Banks
- Limiting clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.
- Prohibiting equipment and limit access outside the designated cleared area throughout construction as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Appling feasible noise and dust suppression techniques as per ES130.11- Dust and Particulate Control and ES130.12 – Noise and Noise Limitations.

The presence and use of the winter road for several decades has generally coincided with the timing of annual caribou migration through the area. Seasonal occupation of caribou in the RAA is low based the studies conducted and is confirmed through the information gathered through the wildlife workshops and TK. Given the overall low density of roads in the project area and absence of other disturbances in the LAA, effects of increased access on sensory disturbance is not expected. The mitigation measures outline also contribute to minimizing this effect during construction as well as operation.

7.1.2 **Increased mortality due to vehicle collisions**

The predicted effect of increased access may result in higher rates of mortality on caribou. However, caribou/vehicle collisions can be mitigated through reduced speeds in known migration areas during times when migration occurs, through appropriate signage. Construction equipment will also be traveling at low speeds which will further minimize the risk of wildlife collision (Jaarsma *et al.,* 2006; van Langevelde and Jaarsma, 2009). Presence of highway salts can also increase incidence of ungulate vehicle collisions but can be mitigated with the reduction or removal of salt pool deposits (Grosman *et al.*, 2009).

Mitigation measures intended to minimize effects of vehicle collisions include:

- Staging construction activities during clearing, grubbing, and construction to limit disturbance to defined areas.
- Limiting vegetation clearing within the right-of-way to the removal of trees and tall shrubs (to maintain line of sight safety requirements).
- Restricting access to the ASR corridor to construction personnel as per ES130.6 – General and ES130.8 – Designated Areas and Access.

- Designing road to optimize line of sight.
- Providing information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions.
- Installing crossing and/or speed reduction signs where necessary (i.e. detected problem areas) to reduce the potential of wildlife-vehicle collisions.
- Avoid using wildlife-attracting road salts.

The residual effect of increased vehicle collisions is considered to be minor and not measurable at the population level. The application of mitigation measures including no use of highway salts, signage and reduced speeds where needed will further minimize any observable effect.

7.1.3 **Increased Harvest**

Results of baseline surveys and TK workshops indicate that caribou are important as a seasonal domestic food source and are culturally important to First Nations communities throughout the RAA. Based on the TK gathered as part of this study, caribou hunting occurs mainly in winter and in proximity to existing winter roads. Caribou are known to migrate through the area, however, there are years when the Pen Islands caribou do not occupy areas near Gods Lake (Trim, *pers com*., 2017).

The following mitigation measures, which will minimize potential of overharvest during periods of construction and operation include:

- Staging construction activities (sections) during clearing, grubbing, and construction to limit disturbance to defined areas.
- Prohibiting hunting by employees and agents of MI and employees, agents and contractors while working on the construction or maintenance of the road as per ES130.19 – Wildlife.
- Prohibiting possession of firearms by workers in camps and at work sites to reduce caribou mortality due to hunting during road construction.
- Limiting road access during construction to reduce hunting opportunities as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Designing road designed with no pullouts or parking areas.
- Promoting stewardship and caribou conservation with construction staff.
- Decommissioning temporary access routes, trails, and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES130.8 – Designated Areas and Access.
- Implementing access controls at quarry sites during the operation and maintenance phase to limit access and reduce hunting opportunities as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Liaising with Manitoba Sustainable Development and participate on committees and working groups (e.g., caribou committees) to which they are invited and will share wildlife information obtained through monitoring efforts.

The likelihood of major increased harvest of caribou as a result of the new ASR is not expected as hunting access during winter currently exists. The overall predicted effects of the project on caribou mortality through increased hunting is not considered significant given the time portions of the herd spend in the RAA, and the potential harvest relative to the population of the Pen Island caribou which is estimated at approximately greater than 16,000 (COSEWIC, 2017).

7.1.4 **Predation**

Various studies have illustrated that linear corridors can increase a wolf's travel speed, increasing interactions with prey species, distribution and travel routes (Thomas, 1995; James and Stuart-Smith, 2000; Courbin *et al*., 2009). This change in landscape can result in decreased search times for prey, increased predation efficiency and increase access to areas where prey were previously safe due to low access (Thomas, 1995). The threat of mortality to wolves from vehicles, human shooting and trapping can also reduce wolf use of roads (Mech *et al*., 1998) which could counteract wolf activity along the road. James and Stuart –Smith (2000), found that increases in linear disturbance, resulting in an increase in predation by wolves caused an increase in caribou mortality, however, this was observed in a highly fragmented landscape.

Despite a potential increase in wolves using the P6 ASR, there is counter evidence that prey tend to avoid these linear features (usually by 250 m (Dyer *et al*., 2001)), potentially minimizing the effects of wolf use, though they may on occasion use the corridors for ease of travel, and high quality forage (James and Stuart-Smith, 2000; Latham *et al*., 2011b). This is also consistent with ongoing MI monitoring in areas south of the RAA, where wolf predation monitoring has shown that caribou are not a major prey species with mostly moose kill sites found near natural linear features where moose habitat exists (Johnstone, 2016; Joro, 2017). Ongoing monitoring of collared wolves in other ASR projects has not illustrated evidence of wolf predation on caribou near ASRs or other linear features (Johnstone, 2016; Joro, 2017). The density of linear disturbance in the RAA is not expected to result in similar effects to predator/prey dynamics, such as increased mortality on caribou.

In addition to the standard wildlife mitigation measures described in Appendix K, potential increased predation effects will be mitigated by applying the following key mitigation measures, which include:

- Decommissioning temporary access routes, trails, and existing winter road required for road construction, operation and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES130.8 – Designated Areas and Access. This practice will also reduce wolf mobility and subsequent predation risk.

In summary, increased predation on caribou in the RAA is not expected to be measurable due to the very low density of linear features, combined with their short duration of occupancy and movement through the RAA.

7.1.5 **Disease Transmission**

The occurrence of Brainworm and giant liver fluke are associated with the sympatric presence of white tailed deer (WTD). Results of base line surveys conducted from 2011 – 2017, as well as TK information from resource users, no WTD have been observed in the RAA. Longer winters and deeper snow compared to conditions found in southern Manitoba make it unlikely for the northern extent of WTD persistence to extend near the RAA in any foreseeable future. Mitigation to reduce the potential for white-tailed deer occupancy includes:

- Use existing access routes, trails, or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and 130.8 – Designated Areas and Access.
- Decommission temporary access routes, trails, and existing winter road required for road construction, operation and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES130.8 – Designated Areas and Access.

Potential for increased transmission of parasites including brainworm and liver fluke are not expected and extremely unlikely.

7.2 Moose

Potential effects on moose include, habitat loss/alteration, disturbance, fragmentation, mortality (vehicle collisions, predation and hunting), and potential for introduction of parasites e.g. Brainworm and liver flukes from expanding white-tailed deer populations. These potential effects were evaluated for relevance to the P6 project and the following section provides the rationale for the determination of level assigned to each CEAA criteria as described in Appendix K as a result of the P6 Project.

7.2.1 **Habitat Loss/Alteration/Fragmentation**

The results of habitat modeling estimate the amount of winter habitat removal is 5.5 km^2 which represents 0.4 % of habitat within the LAA and 0.1 % of available habitat within the RAA. The results indelicate that habitat is not limiting in the RAA and is also distributed across the RAA. Map 48 provides a representation of the spatial distribution of high likelihood/quality habitat. The mapping does illustrate that areas of potentially high-quality habitat are found within the LAA with concentrations located throughout the RAA.

Estimates of moose densities determined through aerial surveys of 0.02 moose/km^2 (2016) and 0.04 moose/km^2 (2017) in the LAA are relatively low compared to more southerly moose populations. This combined with the low road density after construction (0.04 km/km^2), as described in Section 6.2.1, is not expected to result in any measurable effect on the moose population within the RAA. However, there is some uncertainty to the degree of effect within the 10 km LAA for moose. Also considering the low moose densities described above, effects on individual animals would be expected, however at an infrequent rate that would not be measurable.

Issues related to fragmentation relate to moose avoidance of roads resulting in habitat or range fragmentation. However there is evidence that moose will cross roads regularly. Laurian *et al*. (2008), who conducted telemetry studies on moose to examine road crossings and avoidance, found that moose avoid highways at a course scale, and use them at a finer scale, and in some cases to acquire road-side salts. Moose are also known to be attracted to linear feature ROWs due to improved forage opportunities resulting from vegetation disturbance and increased forage (Ballard *et al.,* 1981; Ricard and Doucet, 1999).

Based on the assessment of potential fragmentation in Section 6.2.1, it is illustrated that overall road densities in the RAA and within GHA 3A are very low, and well below the published suggested thresholds of access density. Fragmentation affecting the moose population is not expected based on the overall low density of roads. The predicted fragmentation effects on moose is expected to be minor as moose will adapt to the presence of the road, likely avoiding or moving across the road to avoid vehicles.

Mitigation described for caribou to minimize potential effects on habitat loss/alteration/fragmentation are applicable to moose. The results of habitat modeling illustrate that the amount of habitat being removed is minimal and will not affect habitat availability in the LAA or RAA. Due to the remote nature of this area and the inherently low densities of linear features in the RAA (below identified thresholds), effects of fragmentation are very low within the RAA.

7.2.2 **Sensory Disturbance**

Given that the existing winter road has been part of the LAA landscape for several decades, moose are likely accustomed to the present and level of activities associated with traffic and hunting during winter. Sensory effects would include moose avoidance of high quality habitats near the ROW during construction and to a lesser extent during operation. Clearing during winter could result in limited displacement of moose, however, as described above, the low densities of moose observed during winter would suggest that a low number of individual animals would potentially be affected. During operation, access normally restricted to winter would result in year-round traffic, however, at anticipated low levels. Typically, winter traffic volumes are higher due to the linkage with other winter roads when much of the larger truck traffic hauling goods would occur. Other activities such as increase ATV traffic or access to lakes or rivers for fishing may result in higher rates of disturbance in proximal moose habitat that are accessed from the ASR. Mitigation described for caribou to minimize potential effects on sensory disturbance are applicable to moose.

7.2.3 **Increased mortality due to vehicle collisions**

As described in Section 7.2.1, moose may avoid roads at a course scale but do cross roads, resulting in potential for vehicle collisions. Laurian *et al*. (2008), show that both forestry roads and highways were crossed by a small fraction of collared moose, mostly between May and July indicating that moose tend to avoid road corridors, which in the long term likely reduces their chance of mortality by way of wolves, hunters and vehicles (Laurian *et al*., 2008; Shanley and Pyare, 2011).

The predicted effect of increased access that may result in higher rates of mortality is reduced due to the combination of low moose densities and overall low road density in the LAA. Moose/vehicle collisions can be mitigated through reduced speeds in areas where moose have been observed through appropriate signage. Construction equipment will also be traveling at low speeds which will further minimize the risk of wildlife collision (Jaarsma *et al*., 2006; van Langevelde and Jaarsma, 2009). Presence of highway salts can possibly increase incidence of moose vehicle collisions (Grosman *et al.*, 2009).

The mitigation measures described for minimizing effects of vehicle collisions for caribou are applicable to moose. The potential effects of vehicle collisions on moose is expected to be very low and not measurable due to signage, speed reductions where necessary and no use of road salts.

7.2.4 Increased mortality due to changes in hunting access

Mortality to moose because of increased hunting access has been well documented, and in some areas, has resulted in high rates of overharvest. In consideration of the discussion regarding the existing winter road being in operation for decades, local hunters have had ongoing access to moose for traditional and domestic use. During summer and fall, there would be opportunities for local resource users to gain better access to rivers and lakes, which may provide additional hunting opportunities away from Project 6. Information from wildlife workshops and the trapper program also verify that moose hunting does occur across the RAA and LAA and the rivers and lakes are currently important hunting areas during open water periods,

Due to the remoteness of the area, and that the P6 Project is not linking to year-round all-weather access outside the RAA, influxes of hunters from other areas is not expected. There is little licensed harvest of moose in the area, and the combination of low moose densities and overall low fragmentation as described above is not expected to result in a significant increase of moose in the RAA.

The mitigation measures to minimize hunting mortality described for caribou are applicable to moose.

The likelihood of major increased harvest of moose resulting in declining populations in GHA 3 as a result of the new ASR would not result due to the large geographic area. Moose populations in the RAA are likely to not be impacted, however the degree to which moose numbers in the LAA respond to long term harvest near the ASR are unknown.

7.2.5 Increased mortality due to changes in predation

The potential effect described for caribou is applicable to moose. In addition, the results of trail camera studies and multispecies surveys verified general distribution of moose and predators in the RAA and LAA. The mitigation measures described for caribou are also applicable to moose.

In summary, moose, wolves and bears were observed at low frequencies and increased predation as a result of wolves utilizing the new ASR is predicted to be minimal. Increased predation on moose in the RAA is not expected to be measurable due to the very low density of linear features. Mortality due to increased predator mobility and higher than normal rates of predation are not expected to affect local moose numbers in the LAA.

7.2.6 Introduction of disease from white-tailed deer

Please see parasite section for caribou above. No effects are likely.

7.3 Beaver

Beaver were selected as a VC to represent aquatic furbearers. Potential effects include habitat loss/alteration/fragmentation from changes in local drainage, sensory disturbance, mortality due to vehicle collisions and winter water drainage and problem wildlife removal. These potential effects were evaluated for relevance to the P6 Project and the following section provides the rationale for the determination of level assigned to each CEAA criteria as described in Appendix K as a result of the P6 Project.

7.3.1 Habitat loss/alteration/fragmentation

The results of habitat modeling illustrate the subsequent loss of habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 0.23 km^2 of primary or high-quality habitat being removed or altered within the project footprint represents 0.02% of available habitat within the LAA (1,329 km^2) and 0.002% percent of overall habitat contained in the RAA (9,005 km^2).

Key mitigation measures aimed at minimizing potential effects on habitat loss and alteration for beaver include:

- Scheduling to avoid construction ROW clearing during normal parturition times (i.e. April to June months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Conducting wildlife habitat feature pre-construction surveys prior to any clearing to identify if lodges are present.
- Lodges and Dams found during pre-construction surveys that require removal shall be removed gradually and with authorization with MSD as per ES130.15.10 – Beaver Dam Removal.
- Following standards for MSD protocols for problem beaver.
- Aligning the all-season road to avoid wetland habitat including lakes, rivers, streams, and ponds or locate a minimum of 100 m from waterbodies except when crossing a watercourse, where feasible.
- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Limiting clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.
- Maintaining a vegetated buffer zone between construction, operation and maintenance activities and lakes, rivers, streams, and ponds throughout operation of the road as per ES130.15 – Working within or near water.
- Retaining a vegetated buffer zone in riparian areas between construction activities and lakes, rivers, streams and ponds throughout construction as per ES130.15 – Working within or near water.

Effects of construction on beaver habitat is considered negligible due to the small area and mitigation measures to protect beaver habitat including standards for MDS protocols for problem beaver.

7.3.2 Sensory Disturbance and Mortality

Results of trapping program and information from local resource users indicate that low pelt prices provide little incentive to commercially harvest beaver. However, beaver is a valued component of the ecosystem and indicator for other aquatic furbearers including otter, mink and muskrat. Mitigation activities that reduce disturbance on beavers include construction activities, development of drainage (ditches) and borrow areas as well as clearing and blasting that occurs during construction which could result in disturbance to beavers, removal of dams and lodges resulting in winter freeze outs and mortality. Removal of problem beavers will also occur during 0perational activities that include maintenance of culverts and water crossings.

Important mitigation measures that will minimize sensory disturbance on beaver are outlined below. Other standard wildlife mitigation measures will also augment protection to beaver, and include:

- Staging construction activities (sections) during clearing, grubbing, and construction to limit disturbance to defined areas.
- Limiting riparian vegetation clearing within the right-of-way to the removal of trees and tall shrubs (to maintain line of sight safety requirements) beyond road and ditching.
- Maintaining existing water flow patterns, levels, and wetland hydrologic regimes as per ES130.15.3 – Disturbance to Stream Beds and Stream Banks and design and install equalization culverts
- Retaining a vegetated buffer zone in riparian areas between the cleared ASR ROW and lakes, rivers, streams and ponds throughout construction, operation and maintenance as per ES130.15 – Working within or near water.
- Restricting access to the ASR corridor to construction personnel as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Providing information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions.
- Dams found during pre-construction surveys that require removal shall be removed gradually, but not in winter, and with authorization with MSD as per ES130.15.10 – Beaver Dam Removal.
- Where feasible, problem beaver will be trapped.

Beavers are a very adaptable and prolific species. It is anticipated that beavers will occupy areas near the PF when construction and operation occur. With the application of the mitigation measures described, the effect of sensory disturbance and associated potential mortality (such as draining dams during winter) is minimal and will not affect populations in the LAA or near the project footprint.

7.4 Marten

Marten were selected as the representative terrestrial furbearer and potential effects include habitat loss/alteration/fragmentation and sensory disturbance. These potential effects were evaluated for relevance to the P6 Project and the following section provides the rationale for the determination of level assigned to each CEAA criteria as described in Appendix K as a result of the P6 Project.

7.4.1 Habitat Loss and Fragmentation

The results of habitat modeling illustrate the subsequent loss of marten habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 0.20 km^2 of primary or high-quality habitat being removed or altered within the project footprint which represents 0.02% of available habitat within the LAA (1,329 km^2) and 0.002% percent of overall habitat contained in the RAA (9,005 km^2).

Research on marten fragmentation and habitat use provides insight into potential project effects. Fryxell *et al.* (2004) presented evidence from a multi-year study that challenges the long-standing observation (Novak, 1987) that marten were habitat specialists. Fryxell *et al.* (2004) observed that the abundance of marten harvested by trappers remained unchanged, despite a 50-year landscape scale habitat change due to industrial logging throughout much of the marten trapping area in Ontario. The study demonstrated significant post-logging use of regenerating stands by marten, and that such post-logged areas met life requisites for sustainable marten populations. These observations disprove the notion that martens require mature forest to survive and reproduce successfully. A low amount of ancillary access and lack of other intensive industrial activities such as forestry within the P6 RAA leaves the landscape relatively intact for marten habitat.

Results of multispecies surveys and information obtained through the trapper program as well as information from resource users illustrates that marten are wide spread and abundance across the RAA. Although results of kernel analysis indicate areas of relative high occupancy compared to other areas, annual variation in marten distribution is likely related to snow conditions and prey distribution (Wiebe *et al.,* 2014). Marten populations are also known to be cyclic, which would also contribute to annual variation Fryxell *et al.* (2004). Less than half of 1% of the total marten habitat within the RAA is predicted to be located within the 200 m buffer centred on the project footprint. It is not anticipated that marten populations will be negatively impacted by the physical process and associated activity to construct an all-season road (ASR).

The following mitigation measures have been identified to further minimize the effects of the project include:

- Avoiding clearing and construction of road and ROW during normal denning and parturition times (i.e. late March to April months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife where feasible
- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Limiting clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.
- Decommissioning temporary access routes, trails, and existing winter road required for road construction, operation and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES130.8 – Designated Areas and Access.

The P6 Project will result in a negligible effect on overall habitat removal/alteration or fragmentation as the RAA has very low road and linear feature density as described in the moose section. Mitigation described further minimizes habitat loss at the local level and reduces overall potential effects of fragmentation.

7.4.2 Sensory Disturbance

In disturbed forests, human activities have been found to result in higher rates of mortality, assumingly due to sensory disturbance. Johnson *et al.* (2009) compared mortality rates for marten dispersing from natal den sites located within regenerating and mature forest areas, and observed that juveniles of both sexes faced mortality rates twice of those animals dispersing from the uncut landscape. They hypothesized that immature animals dispersing from regenerating landscapes were less able to cope with the higher energetic demands of life in the disturbed forest. As there is no commercial forestry in the area, the additional energetic demands resulting from construction or operation of the project are not expected to have an effect on individuals.

Mitigation on sensory disturbance are similar to those described above. Sensory disturbance effects may be neutral during winter given the pre-existing clearing of rights-of-way associated with the winter roads that have been in use for decades. Also given that a winter road currently exists, additional effects of an all-season road are considered incremental and primarily associated with increased annual use of the road, particularly during the non-winter months. There may be some associated impact should the ASR increase access of trappers to the area thereby resulting in higher trapping pressure on the resource, but there is no evidence nor reason to speculate that martens will be negatively impacted to any measurable extent.

7.5 Birds

The following sections provides the potential effects assessment for birds as described above. For the purpose of this assessment, birds have been assessed by category as described in the VC Selection 5.1. The VC birds have been assessed within individual categories and have been amalgamated by group. Habitat models for all individual species have been developed to compare high quality habitat in the PF to both the LAA and RAA. The following birds and categories have been included. These potential effects were evaluated for relevance to the P6 Project and the following section provides the rationale for the determination of level assigned to each CEAA criteria as described in Appendix K as a result of the P6 Project.

7.6 Raptors

The bald eagle was selected as the raptor VC for this project. The potential project effects examined include habitat loss/ alteration, fragmentation, loss of nests, mortality to young, and sensory disturbance near nests. The following provides results for the potential effects assessment on bald eagle. The main threat to bald eagles relates to destruction of nesting and roosting trees near suitable foraging habitat, which is typically near rivers and lakes (Buehler, 2000). The P6 road project may impact bald eagles if road construction or operation activities impact these important habitats. Results of aerial surveys determined that there are no known nesting sites near the PF. Although many bald eagle nests are generational, it is possible that new nests could be established near the PF prior to or during construction.

7.6.1 Habitat loss/alteration/fragmentation, loss of nest and mortality to young, and sensory disturbance

The results of habitat modeling for bald eagle illustrate the subsequent loss of habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 2.0 km^2 of primary or high-quality habitat being removed or altered within the project footprint represents 0.15% of available habitat within the LAA (1,329 km^2) and 0.02% percent of overall habitat contained in the RAA (9,005 km^2).

Multi-species aerial surveys conducted in 2015 documented resulted in the seven stick nests observations within the RAA, and one within the PF. Surveys conducted for spring staging waterfowl during June 15-17, 2016, resulted in a single incidental nest observation and 36 individual eagles. A fall waterfowl staging survey on October 12-14, 2016 yielded no observations of bald eagles.

Eagles make seasonal movements during fall and winter and their abundance would decline during this period. Winter occupation would be sporadic and occur only if open water and a food source were available (Manitoba Avian Research Committee, 2003); there were no observations of bald eagles during winter surveys nor were winter bald eagle observations mentioned by local resource users interviewed at the Wildlife Workshops and ATK meetings conducted in the communities. Similarly, trappers did not report presence of bald eagle during winter.

Direct loss of bald eagle nests and potential mortality to young could occur during construction. However, by applying the following mitigation measures, it is unlikely that any effects would be anticipated. Bald eagle nests are typically easy to detect during pre-construction surveys and the application of set back distances will result in little or no mortality to young eagles.

The following are the key migration measures determined to minimize potential effects on bald eagle habitat, minimize sensory disturbance (nest abandonment) and mortality to young include:

- Scheduling to avoid and/or suspend ROW clearing, bridge, and culvert maintenance activities during normal breeding and nesting times (i.e. April to June months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Stage construction activities during clearing, grubbing, and construction to limit disturbance to defined areas.
- Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES130.6 – General and 130.8 – Designated Areas and Access.
- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Limiting clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.

- Maintaining existing water flow patterns, levels, and wetland hydrologic regimes as per ES130.15.3 – Disturbance to Stream Beds and Stream Banks and design and install equalization culverts
- Decommissioning temporary access routes, trails, and existing winter road required for road construction, operation and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES130.8 – Designated Areas and Access.
- Apply feasible noise and dust suppression techniques as per ES130.11 – Dust and Particulate Control and ES130.12 – Noise and Noise Limitations.

Mitigation and guidelines for eagles will also benefit other species of raptors, if stick nests are discovered during monitoring or other project activities. Baseline data on bald eagles collected for the P6 Project are consistent with literature and current knowledge and suggest populations within the RAA are within normal expected levels. Timing of clearing and construction, the application of set back and timing restrictions are expected to minimize or eliminate any potential project effects. Mitigation and guidelines for eagles will also benefit other species of raptors, if stick nests are discovered during monitoring or other project activities.

7.7 Migratory Waterfowl

Baseline data for waterfowl were collected during spring and fall migration surveys as well as through TK workshops and other incidental observations. Waterfowl of interest included the **Canada goose**, which is hunted during spring and fall migrations, however, some resident geese are known to breed in the RAA. Species of VC duck included the **mallard** (dabbler) and the **ring-necked duck** (diver) and are known as both migratory to the RAA as well as breeding residents. Community members expressed interest in “fall ducks” on larger lakes and rivers during spring and fall that provide opportunities for domestic harvest. Potential Project effects examined included increased harvest, habitat loss/ alteration, fragmentation, loss of nests, mortality to young and mortality from collisions.

7.7.1 Habitat loss/alteration/fragmentation

7.7.1.1 Mallard

The results of habitat modeling illustrate the subsequent loss of mallard habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 2.3 km^2 of primary or high-quality habitat being removed or altered within the PFrepresents 0.17% of available habitat within the LAA (1,329 km^2) and 0.02% percent of overall habitat contained in the RAA (9,005 km^2).

7.7.1.2 Canada goose

The results of habitat modeling illustrate the subsequent loss of Canada goose habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 0.05 km^2 of primary or high-quality habitat being removed or altered within the project footprint represents 0.01% of available habitat within the LAA (1,329 km^2) and 0.03% percent of overall habitat contained in the RAA (9,005 km^2).

7.7.1.3 Ring-necked duck

The results of habitat modeling illustrate the subsequent loss of habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 4 km^2 of primary or high-quality habitat being removed or altered within the project footprint represents 0.3% of available habitat within the LAA (1,329 km^2) and 0.04% percent of overall habitat contained in the RAA (9,005 km^2).

Mitigation measures to minimize effects on nesting and staging habitat include:

- Avoiding and/or suspend ROW clearing, bridge, and culvert maintenance activities during normal breeding and nesting times (i.e. May to July months) as per ES130.17 – Clearing and Grubbing and ES130.19 - Wildlife.
- Aligning all-season road to avoid wetland habitat where feasible.
- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Limiting clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.
- Maintaining existing water flow patterns, levels, and wetland hydrologic regimes as per ES130.15.3 – Disturbance to Stream Beds and Stream Banks and design and install equalization culverts.
- Retain a vegetated buffer zone in riparian areas between construction, operation and maintenance activities and lakes, rivers, streams and ponds throughout construction as per ES130.15– Working within or near water.

The results of habitat modelling for Canada goose, mallard and ringed-neck duck all demonstrate the P6 Project will not impact habitat availability within the LAA or RAA. Timing of clearing and construction and the application of setback restrictions during the breeding and nesting season are expected to minimize or eliminate any potential project effects on waterfowl. Mitigation and guidelines for waterfowl will also serve to mitigate effects for waterbird species that share similar habitat associations

7.7.2 **Loss of nests, mortality to young**

Although the nesting habits may vary between Canada goose, mallard and ring-neck ducks, the potential for loss of nests and mortality to young would occur during construction and during the nesting period. Canada geese nest earlier than other waterfowl and nests are generally easy to detect during pre-construction surveys. Mallards are an adaptable nester and could be expected in a variety of habitats, but typically nest in uplands. Ring-necked ducks will be found along the edges of water associated with sedge and cattail found in shallow lakes and streams.

The following key mitigation measures will minimize potential impacts on nests and survival of young birds include:

- Staging construction activities (sections) during clearing, grubbing, and construction to limit disturbance to defined areas.
- Avoiding and/or suspend ROW clearing, bridge, and culvert maintenance activities during normal breeding and nesting times (i.e. May to July months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.6 – General and 130.8 – Designated Areas and Access.
- Maintaining existing water flow patterns, levels, and wetland hydrologic regimes as per ES130.15.3 – Disturbance to Stream Beds and Stream Banks and design and install equalization culverts
- Retaining a vegetated buffer zone in riparian areas between construction activities and lakes, rivers, streams and ponds throughout construction as per ES130.15– Working within or near water.

Loss of nests and mortality to young waterfowl requires the application of the mitigation measures described above. Based on the timing of clearing and construction restrictions, setbacks from wetlands will result in little to no mortality on nesting waterfowl, eggs or young birds. Project effects are likely not measurable and expected to be negligible.

7.7.3 **Sensory Disturbance**

Sensory disturbance could occur in areas of high activity near wetlands and waterbodies where nesting or staging occur (spring and fall). Disturbance could result in local abandonment or avoidance of wetlands near active areas. The following mitigation measures proposed to minimize potential effects of sensory disturbance include:

- Staging construction activities (sections) during clearing, grubbing, and construction to limit disturbance to defined areas.
- Avoiding and/or suspend ROW clearing, bridge, and culvert maintenance activities during the normal breeding and nesting times (i.e. May to July months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and 130.8 – Designated Areas and Access.
- Limiting clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.
- Prohibiting equipment and limit access outside the designated cleared area throughout construction as per ES130.6 – General and 130.8 – Designated Areas and Access.
- Applying feasible noise and dust suppression techniques as per ES130.11 – Dust and Particulate Control and ES130.12 – Noise and Noise Limitations.

Results of habitat modeling above illustrate habitat is not limited to areas near the PF and LAA. If displaced due to disturbance, waterfowl are adaptable and will find refuge throughout the LAA and RAA. The mitigation measures described will minimize local effects. Overall there is potential for occasional sensory disturbance near areas being utilized by waterfowl, with potential short term periodic effects of waterfowl movement away from project activities.

7.7.4 Increased mortality due to project infrastructure and vehicle collisions

A review of reported non-hunting mortality in waterfowl (Stout and Cornwell, 1976) estimated collision mortality (vehicles, powerlines, buildings, etc.) represented 0.1% of the total annual mortality. Roads that pass within 1 km of waterbird concentrations increase the mortality risk, however, a survey of utility companies (Stocek, 1981) found that most transmission line-related mortality is never reported, and this is likely the case with road-related collisions as well. Given the low traffic volumes, and other mitigations including aquatic and riparian buffers, this effect is not expected to be a measurable impact on local or regional waterfowl populations. A recommended mitigation item beyond the standard measures found in Appendix K include providing information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions.

7.7.5 Increased harvest

Waterfowl are potentially vulnerable to intensive hunting (overharvest) and ingesting spent lead shot which may cause toxicity. Increasing the accessibility of the region by improving the quality of roads may increase hunting pressure on waterfowl, however, DeStefano *et al.* (1995) suggested that although lead exposure was still an indirect cause of hunting mortality, exposure should decrease as hunters switched to steel shot. As the P6 Project is in a remote area, in combination with an alignment that avoids aquatic wetlands, the potential for this effect is minimal.

With increased access during the spring and summer staging periods, increased local resource use of waterfowl could potentially occur. However, current access to waterfowl lakes and rivers is restricted and with the presence of the ASR, opportunities for increased harvest and benefit to local resource users is possible. With the availability of habitat throughout the RAA and LAA, any effects on waterfowl related to overharvest are expected to be minor.

7.8 Non-Migratory Upland Game Birds – Ruffed Grouse

Ruffed grouse are considered an important game bird species and are valued by local communities and resource users. Baseline data for ruffed grouse is limited, however, their presence was validated through observations from trail cameras, ARU's, Breeding Bird Atlas, incidental observations and through TK workshops. Potential Project effects examined included increased harvest, habitat loss/alteration, fragmentation, loss of nests, mortality to young and mortality.

7.8.1 Habitat loss/alteration/fragmentation

The results of habitat modeling illustrate the subsequent loss of ruffed grouse habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. There is no primary or high-quality habitat located within the project footprint. The RAA (9,005 km^2) contains 0.22% of the primary habitat for ruffed grouse.

Ruffed grouse are also known to be cyclic in nature and are most abundant in early-succession forests (Zimmerman and Gutierrez, 2008; Zimmerman *et al.,* 2009). Roadside habitat created by the P6 Project will also have a positive impact on grouse through disturbances that promote aspen and other early-succession species. Mitigation measures include:

- Limit clearing and construction to designated areas within the Project Footprint and Local Assessment Area (quarries) as per ES 130.17 – Clearing and Grubbing.
- Undertake ROW (i.e. brushing, and clearing), bridge, and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. April 1 to September 1).

7.8.2 Loss of nests, mortality to young

Potential for loss of nests and mortality to young would occur during the nesting period with construction and ROW maintenance. Although the LAA does not have large areas of high quality habitat grouse nesting could occur in microhabitats that contain deciduous forest near the PF.

The following key mitigation measures will minimize potential impacts on nests and survival of young birds. These mitigation activities are applied to all nesting bird species and generally apply to ruffed grouse as well include:

- Staging construction activities during clearing, grubbing, and construction to limit disturbance to defined areas.
- Avoiding and/or suspend ROW clearing, bridge, and culvert maintenance activities during normal breeding and nesting times (i.e. May to June months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.

Loss of nests and mortality to young waterfowl requires the application of the mitigation measures described above. If applied, mortality to young and or destruction to nests is likely not measurable and is expected to be negligible.

7.8.3 Sensory Disturbance and Increased mortality due to project infrastructure and vehicle collisions

In Manitoba, Ruffed Grouse are frequently killed by vehicles as they fly low across roads (Holland and Taylor, 2003b). A study in Minnesota found a negative relationship between road density and grouse density (Kouffeld *et al.,* 2013). The authors suggested that grouse numbers were affected either by hunting pressure along roads or changes in cover associated with the roads. However, these studies relate to regions of high road density and traffic volume. Given the low density of roads within the LAA and RAA, road mortality is not expected to have any effect on local populations.

7.8.4 Increased Harvest

Increased accessibility of as a result of the P6 Project may increase hunting opportunity for grouse hunters and may provide an economic benefit for local communities (Knoche and Lupi, 2013). In contrast, Rusch *et al*. (2000), suggests that ruffed grouse populations are not usually limited by hunting, but rather by forest succession. Habitat conditions near the PF are likely to improve and attract ruffed grouse and would likely benefit local resource users. The remote nature of the RAA in combination with the low density of linear features and access, impacts to populations in the LAA or RAA would not be measurable. The cyclic nature of ruffed grouse populations is likely to result in fluctuating hunting opportunities as populations climb and decline through time, which was verified through local knowledge and resource users participating in the wildlife workshop.

7.9 Migratory Forest Birds

Baseline data for migratory forest birds (song birds) was obtained from the Breeding Bird Atlas, ARU deployments, incidental observations and TK. Results of baseline studies and TK substantiated the presence of VC songbirds. This VC was evaluated as a specific species group and project effects examined included habitat loss/alteration, fragmentation, loss of nests, mortality to young and vehicle collisions.

7.9.1 Habitat loss/alteration/fragmentation

Habitat loss, alteration and potential fragmentation was evaluated through the modeling described in Section 5. The following provides a summary of the potential habitat loss associated with the construction and operation of the project.

7.9.1.1 Magnolia warbler

Sixty-one magnolia warblers were recorded during MBBA point count surveys along with one MBBA incidental observation, and none identified on ARU recordings (Map 72). Magnolia warblers were observed in wetland shrub habitats and coniferous forests during MBBA point count surveys throughout the LAA and in the southern portion of the RAA. The MBBA incidental observation occurred south of Bunibonibee Cree Nation and in the central and southern portions of the RAA.

The results of habitat modeling illustrate the subsequent loss of habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 3.4 km^2 of primary or high-quality habitat being removed or altered within the PF represents 0.3% of available habitat within the LAA (1,329 km^2) and 0.04% percent of overall habitat contained in the RAA (9,005 km^2).

7.9.1.2 Ovenbird

Thirty-one ovenbirds were recorded during MBBA point count surveys along with 13 MBBA incidental observations and identified on 10 of 45 ARU sampling sites (Map 74). Ovenbirds were primarily observed in wetland shrub habitat and coniferous forests south of Bunibonibee Cree Nation and west of God's Lake Narrows during MBBA point count surveys along with MBBA incidental observations. Ovenbirds occurred on ARUs deployed in the central portion of the RAA.

Habitat modeling illustrate the subsequent loss of habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. There is no primary or high-quality habitat located within the PF. The RAA (9,005 km^2) contains 0.22% of the primary habitat for ovenbird.

7.9.1.3 Palm warbler

Palm warblers are numerous with 135 observations during MBBA point count surveys along with 51 MBBA incidental observations (Map 70). Palm warblers were primarily observed in wetland shrub habitat and coniferous forests in the eastern portion of the LAA and in the central and southern portion of the RAA during MBBA point count surveys and MBBA incidental observations.

The results of habitat modeling illustrate the subsequent loss of habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 11.1 km^2 of primary or high-quality habitat being removed or altered within the PF represents 0.8% of available habitat within the LAA (1,329 km^2) and 0.1% percent of overall habitat contained in the RAA (9,005 km^2).

7.9.1.4 Yellow-bellied flycatcher

Seventy-four yellow-bellied flycatchers were recorded during MBBA point count surveys along with 31 MBBA incidental observations, and none were identified on ARU records (Map 76). Yellow-bellied flycatchers were primarily observed in open coniferous and wetland shrub areas throughout the LAA and in the southern portion of the RAA during MBBA point count surveys along with MBBA incidental observations.

Habitat modeling illustrates the subsequent loss of habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. There is no primary or high-quality habitat located within the PF. A total of 0.22% of the RAA (9,005 km^2) consists of primary habitat.

Although habitat for the VC migratory forest birds is generally abundant, mitigation on habitat and fragmentation is intended to minimize impacts near the PF and in the LAA. These mitigation measures include:

- Avoiding and/or suspend ROW clearing, bridge, and culvert maintenance activities during normal breeding and nesting times (i.e. May to July months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Aligning all-season road to avoid/minimize the loss of habitat where feasible.

- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and ES130.8 – Designated Areas and Access.
- Limiting clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.
- Maintaining existing water flow patterns, levels, and wetland hydrologic regimes as per ES130.15.3 – Disturbance to Stream Beds and Stream Banks and design and install equalization culverts.
- Decommissioning temporary access routes, trails, and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES130.8 – Designated Areas and Access.

When considering the effects of habitat loss or alteration, the localized extent of clearing required for the P6 Project is minimal, and effects on habitat in the LAA or RAA is well below that of any expected impact. Edge characteristics currently exist along the winter road. However, the clearing for the ASR will be wider, with similar edge metrics (length of edge). This edge effect could negatively affect some forest songbirds' species, while positively affecting others (e.g. generalist and edge species).

Localized low level habitat impacts are anticipated and within the physical ROW, however, habitat availability with the LAA and RAA are abundant. Also, the overall density of linear features and other landscape disturbances is very low. With the mitigation measures implemented, overall effects on habitat and fragmentation would be considered a local effect, but not affecting habitat at the LAA scale.

7.9.2 **Loss of nests, mortality to young**

Although the nesting habits may vary between song bird species, the potential for loss of nests and mortality to young would occur during constructing and during the nesting period. Based on the timing of clearing and construction restrictions, pre-construction nest sweeps and setbacks from wetlands will result in little to no mortality on nesting birds, eggs or young. The following key mitigation measures will minimize potential impacts on nests and survival of young birds:

- Staging construction activities (sections) during clearing, grubbing, and construction to limit disturbance to defined areas.
- Avoiding and/or suspend ROW clearing, bridge, and culvert maintenance activities during normal breeding and nesting times (i.e. May to July months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Conducting pre-construction and nest sweep surveys prior to any clearing necessary during critical nesting periods as described above to identify if nesting areas are present.
- Using existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and 130.8 – Designated Areas and Access.

7.9.3 Sensory Disturbance

Sensory disturbance could occur in areas of high activity in all habitat types during the breeding and nesting period. Disturbance and noise could result in disruption to local breeding bird territories and local abandonment or avoidance nesting or feeding areas. The following mitigation measures are proposed to minimize potential effects of sensory disturbance:

- Stage construction activities (sections) during clearing, grubbing, and construction to limit disturbance to defined areas.
- Avoid and/or suspend ROW clearing and quarry blasting during the normal breeding and nesting times (i.e. May to July months) as per ES130.17 – Clearing and Grubbing and ES130.19 – Wildlife.
- Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and 130.8 – Designated Areas and Access.
- Limit clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.
- Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES130.6 – General and 130.8 – Designated Areas and Access.
- Apply feasible noise and dust suppression techniques as per ES130.11 – Dust and Particulate Control and ES130.12 – Noise and Noise Limitations.

Increased mortality due to project infrastructure and vehicle collisions Effects related to vehicle mortality are not expected to be measurable due to low traffic volumes and construction restrictions during the breeding and nesting season that may result in disorientation of breeding male territories. Mitigation and guidelines for this VC will also serve to mitigate effects for other songbirds that share similar habitat associations. The overall effect of the project on sensory disturbance is minor in nature. The overall density of roads and other linear features in the RAA will also serve to reduce this effect on local and regional populations.

7.10 Reptiles and Amphibians – Spring Peeper

Baseline data for spring peeper were acquired through ARU deployments, incidental observations and TK. Results of baseline studies verified the presence of this VC throughout the LAA. Project effects examined included habitat loss/alteration and potential winter mortality through compaction of soils in potential spring peeper habitat.

7.10.1 Habitat loss/alteration

The results of habitat modeling illustrate the subsequent loss of habitat as a result of the project are insignificant due to the amount of habitat available within the LAA and RAA. Approximately 8.1 km^2 of primary or high-quality habitat being removed or altered within the PF represents 0.6% of available habitat within the LAA (1,329 km^2) and 0.09% percent of overall habitat contained in the RAA (9,005 km^2).

7.10.2 Winter mortality through soil compaction

There is a potential for mortality during winter through compaction and freezing of soils in habitat where amphibians (spring peeper) may be over wintering. The following mitigation measures, which will result in the reduction of potential for both habitat loss and mortality as a result of winter compaction include:

- Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES130.6 – General and 130.8 – Designated Areas and Access.
- Limit clearing and construction to designated areas within the Project Footprint as per ES130.17 – Clearing and Grubbing.
- Prohibit equipment and limit access outside the designated cleared area throughout construction, operation and maintenance as per ES130.6 – General and 130.8 – Designated Areas and Access.
- Retain and maintain a vegetated buffer zone in riparian areas between construction activities and lakes, rivers, streams and ponds throughout construction, operatations and maintenance as per ES130.15– Working within or near water.
- Retention of some slash piles and coarse woody debris (i.e. snags and logs) on the forest floor during construction would potentially benefit spring peepers by providing cover. This is temporary until the slash can be burned. Note that slash will not be left on the ground.

In summary, some local effects may be expected, and mortality will be reduced and considered minor, however, the extent to which mortality would occur is uncertain. Habitat loss as a result of the project is also minimal and will not affect populations within the RAA.

7.11 Species of Conservation Concern

In Appendix D, Table D-1 provides a list of the terrestrial Species of Conservation Concern, along with their current conservation status, a brief description of preferred habitat, and potential occurrence in the RAA. The potential Species of Conservation Concern were reviewed in terms of their known range and any identified critical habitat with the RAA. Potential presence was determined based on field studies conducted in the area; review of habitat data, COSEWIC reports, Manitoba Avian Research Committee (2003), Manitoba Breeding Bird Atlas (MBBA, 2014a), Cornell Lab of Ornithology (2015), Manitoba Conservation Data Center (2016b), Manitoba Endangered Species and Ecosystems Act (MESEA, 2017) and the Species at Risk Public Registry (2017); and professional knowledge and experience in the area.

In Appendix K, Tables K-2 and Table K-12 provide information on how SOCC potentially occurring in the RAA are potentially affected by the Project, including the assessment criteria used to determine level of effect and the proposed mitigation to avoid potential adverse effects to those species. No critical habitat as defined in Recovery Strategies and Action Plans developed as required under the federal *Species at Risk Act* were identified within or near the RAA, with the exception of a small portion of the Molson Boreal Caribou Management Unit and the Norway House range contained in the RAA. Caribou effects and disturbance assessments are found in Section 7.1. Mitigation described within available Recovery Strategies and Action Plans are important tools that form an integral component of the proposed mitigation for the protected Species at Risk and their critical habitat potentially affected by the Project, as described in Appendix K, Table K-12.

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APPENDIX A: LIST OF POTENTIAL MAMMALS FOR THE P6 REGIONAL ASSESSMENT AREA

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
American beaver[2,3]	*Castor canadensis*			S5	
American black bear[3]	*Ursus americanus*			S5	
American deer mouse	*Peromyscus maniculatus*			S5	
American marten[2,3]	*Martes americana*			S5	
American mink[2,3]	*Neovison vison*			S5	
American water shrew	*Sorex palustris*			S5	
Arctic shrew	*S. arcticus*			S5	
Boreal caribou* (woodland)[1,2,3]	*Rangifer tarandus caribou*	THR	THR	S2S3,	THR
Boreal caribou* (eastern migratory)[1,2,3]	*Rangifer tarandus caribou*		END	SNR	
Canada lynx[2,3]	*Lynx canadensis*			S5	
Coyote[3]	*Canis latrans*			S5	
Eastern heather vole	*Phenacomys ungava*			S5	
Ermine (short-tailed weasel)	*Mustela erminea*			S5	
Fisher[2,3]	*Martes pennanti*			S5	
Gray wolf[2,3]	*Canis lupus*			S5	
Hoary bat	*Lasiurus cinereus*			S3B	
House mouse	*Mus musculus*			SNA	
Least chipmunk[3]	*Neotamias minimus*			S5	
Least weasel[2,3]	*Mustela nivalis*			S3S4	
Little brown bat[3]	*Myotis lucifugus*	END	END	S2N,S5B	END
Masked shrew[3]	*Sorex cinereus*			S5	
Meadow jumping mouse	*Zapus hudsonius*			S5	
Meadow vole	*Microtus pennsylvanicus*			S5	
Moose[2,3]	*Alces alces*			S5	
Muskrat[2,3]	*Ondatra zibethicus*			S5	
North American porcupine[3]	*Erethizon dorsatum*			S5	
Northern bog lemming	*Synaptomys borealis*			S5	
Northern flying squirrel[3]	*Glaucomys sabrinus*			S5	
Northern river otter[2,3]	*Lontra canadensis*			S5	
Pygmy shrew	*Sorex hoyi*			S5	
Raccoon[3]	*Procyon lotor*			S5	
Red fox[2,3]	*Vulpes vulpes*			S5	
Red squirrel	*Tamiasciurus hudsonicus*			S5	

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Short-tailed shrew	*Blarina brevicauda*			S5	
Snowshoe hare[2,3]	*Lepus americanus*			S5	
Southern red-backed vole	*Clethrionomys gapperi*			S5	
Star-nosed mole	*Condylura cristata*			S3	
Striped skunk[2,3]	*Mephitis mephitis*			S5	
Wolverine (western pop.)[2,3]	*Gulo gulo*	No status	SC	S3S4	Not listed
Woodchuck	*Marmota monax*			S5	

Sources: Banfield, 1974; Caras, 1967; COSEWIC, 2017; MBCDC, 2016a; MESEA, n.d., SARA, 2017; Smithsonian (n.d.)

Bolded species are Species of Conservation Concern: **THR** – Threatened, **SC** – Special Concern, **END** – Endangered; NAR – Not at Risk

*The P6 RAA includes the woodland (forest-dwelling) and coastal (forest-tundra) populations of boreal caribou in Manitoba; woodland caribou are listed as threatened while coastal caribou are not listed.

[1]Species occurrence listed on the Manitoba Conservation Data Centre for the Hayes River Upland Ecoregion, [2]Observation during Joro Field Programs, [3]Species of First Nation Interest

MBCDC (2016c) Definitions for Status Listing:

1 Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.

2 Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.

3 Uncommon throughout its range or in the province (21 to 100 occurrences).

4 Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (> 100 occurrences).

5 Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.

U Possibly in peril, but status uncertain; more information needed.

H Historically known; may be rediscovered.

X Believed to be extinct; historical records only, continue search.

SNR A species not ranked. A rank has not yet assigned or the species has not been evaluated.

SNA A conservation status rank is not applicable to the element.

S#S# Numeric range rank: A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species.

? Inexact or uncertain; for numeric ranks, denotes inexactness.

B Breeding status of a migratory species. Example: S1B, SZN - breeding occurrences for the species are ranked S1 (critically imperilled) in the province, nonbreeding occurrences are not ranked in the province.

N Non-breeding status of a migratory species. Example: S1B, SZN - breeding occurrences for the species are ranked S1 (critically imperilled) in the province, nonbreeding occurrences are not ranked in the province.

Q Taxonomic questions or problems involved, more information needed; appended to the global rank.

T Rank for subspecific taxon (subspecies, variety, or population); appended to the global rank for the full species.

A modifier to SX or SH; the species has been reintroduced but the population is not yet established.

SARA (2017) Definitions for Status Listing:

Schedule 1: the official list of species that are classified as extirpated, endangered, threatened, and of special concern.

Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

Schedule 3: species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

Special Concern: a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Threatened: a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

COSEWIC (2017) Definitions for Status Listing:

Extinct: A wildlife species that no longer exists.

Extirpated: A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.

Endangered: A wildlife species facing imminent extirpation or extinction.

Threatened: A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

Special Concern: A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Not At Risk: A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

MESEA (2017) Definitions for Status Listing:

Extirpated: A species formerly indigenous to Manitoba no longer exists in the wild in Manitoba but exists elsewhere.

Endangered: A species threatened with imminent extirpation or with extinction throughout all or a significant portion of its Manitoba range.

Threatened: A species indigenous to Manitoba that is either: a) likely to become endangered; or b) is, because of low or declining numbers in Manitoba, particularly at risk if the factors affecting its vulnerability do not become reversed.

Special Concern: A species indigenous to Manitoba is at risk of becoming a threatened or endangered species because of a combination of biological characteristics and identified threats to the species.

APPENDIX B: LIST OF POTENTIAL BIRDS FOR THE P6 REGIONAL ASSESSMENT AREA

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Alder flycatcher[1,2,3]	*Empidonax alnorum*			S5B	
American bittern[1,2,6]	*Botaurus lentiginosus*			S5B	
American black duck[1,2, 6]	*Anas rubripes*			S3B	
American crow[1,2,3,6]	*Corvus brachyrhychos*			S5B SUN	
American golden-plover[1,2]	*Pluvialis dominica*			S4B SUM	
American goldfinch[1,2]	*Spinus tristis*			S5B	
American kestrel[1,2]	*Falco sparverius*			S4B	
American pipit[1,2]	*Anthus rubescens*			S3B	
American redstart[1,2]	*Setophaga ruticilla*			S5B	
American robin[1,2,3]	*Turdus migratorius*			S5B	
American three-toed woodpecker[3]	*Picoides dorsalis*			S5	
American tree sparrow[1,3]	*Spizella arborea*			S5B SUM	
American white pelican[1,2,6]	*Pelecanus erythrorhynchos*			S4B	
American wigeon[1,2,5]	*Anas americana*			S4B	
Baird's sandpiper[1]	*Calidris bairdii*			SUM	
Bald eagle[1,5,6]	*Haliaeetus leucocephalus*			S5B SUN	
Bank swallow[1,6]	*Riparia riparia*	THR	THR	S5B	Not listed
Barn swallow[1,4,6]	*Hirundo rustica*	THR	THR	S4B	Not listed
Barred owl[1,4]	*Strix varia*			S4	
Bay-breasted warbler[1,]	*Setophaga castanea*			S5B	
Belted kingfisher[1,2]	*Megaceryle alcyon*			S5B	
Black scoter[1,6]	*Melanitta americana*			S4B	
Black tern[1,5,6]	*Childonias niger*			S4B	
Black-and-white warbler[1,2]	*Mniotilta varia*			S5B	
Black-backed woodpecker[2]	*Picoides arcticus*			S5	
Black-bellied plover[1]	*Pluvialis squatarola*			SUM	
Black-capped chickadee[1,2,3]	*Poecile atricapillus*			S5	
Black-throated green warbler[1]	*Setophaga virens*			S4B	

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Blackburnian warbler[1,2]	*Setophaga fusca*			S5B	
Blackpoll warbler[1,2]	*Setophaga striata*			S5B SUM	
Blue jay[3]	*Cyanocitta cristata*			S5	
Blue-headed vireo[1,2,3]	*Vireo solitarius*			S5B	
Blue-winged teal[1,5]	*Anas discors*			S4B	
Bohemian waxwing[1]	*Bombycilla garrulus*			S4B SUN	
Bonaparte's gull[1,2,6]	*Chroicocephalus philadelphia*			S5B	
Boreal chickadee[1,3]	[2]*Poecile hudsonicus*			S4	
Boreal owl[1,6]	*Aegolius funereus*			S4	
Broad-winged hawk[1]	*Buteo platypterus*			S5B	
Brown creeper[1,2,3]	*Certhia americana*			S5B	
Bufflehead[1,5]	*Bucephala albeola*			S4B	
Cackling goose[1]	*Branta hutchinsii*			S5B	
Canada goose[1,2,3,5,6]	*Branta canadensis*			S5B	
Canada warbler[1,4,6]	*Cardellina canadensis*	THR	THR	S3B	THR
Cape May warbler[1,2]	*Setophaga tigrina*			S5B	
Cedar waxwing[1,2,3]	*Bombycilla cedrorum*			S5B SUN	
Chipping sparrow[1,2,3]	*Spizella passerina*			S5B	
Clay-colored sparrow[1,2]	*Spizella pallida*			S5B	
Cliff swallow[1]	*Petrochelidon pyrrhonota*			S4B	
Common goldeneye[1,5]	*Bucephala clangula*			S5B SUN	
Common grackle[1,2,3]	*Quiscalus quiscula*			S5B	
Common loon[1,2,3,5,6]	*Gavia immer*			S5B	
Common merganser[1,5,6]	*Mergus merganser*			S5B	
Common nighthawk[1,2,3,4,6]	*Chordeiles minor*	THR	THR	S3B	THR
Common raven[2,3,6]	*Corvus corax*			S5	
Common redpoll[1,3]	*Acanthis flammea*			S4B S5N	
Common tern[1,5]	*Sterna hirundo*			S5B	
Common yellowthroat[1,2]	*Geothlypis trichas*			S5B	
Connecticut warbler[1,2,3]	*Oporornis agilis*			S4B	
Dark-eyed junco[1,2,3]	*Junco hyemalis*			S5B SUN	
Double-crested cormorant[1,6]	*Phalacrocorax auritus*			S5B	
Downy woodpecker[2,3]	*Picoides pubescens*			S5	
Dunlin[1]	*Calidris alpina*			S3B SUM	
Eastern kingbird[1,2]	*Tyrannus tyrannus*			S4B	
Eastern phoebe[1]	*Sayornis phoebe*			S5B	

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Eastern wood-pewee[1,4]	*Contopus virens*	Schedule 1, SC	SC	S4B	Not listed
European starling	*Sturnus vulgaris*			SNA	
Evening grosbeak[3]	*Coccothraustes vespertinus*			S3	
Forster's Tern[1,2]	*Sterna forsteri*			S4B	
Fox sparrow[1,2]	*Passerella iliaca*			S5B S4M	
Gadwall[1]	*Anas strepera*			S5B	
Golden eagle[1,5,6]	*Aquila chrysaetos*		NAR	S1B S4N	
Golden-crowned kinglet[1]	*Regulus satrapa*			S4B	
Gray catbird[1,3]	*Dumetella carolinensis*			S5B	
Gray jay[2,3,6]	*Perisoreus canadensis*			S5	
Gray-cheeked thrush[1]	*Catharus minimus*			S5B S5M	
Great blue heron[1,4,6]	*Ardea herodias*			S5B	
Great gray owl[1,2,3]	*Strix nebulosa*			S4	
Great horned owl[1,6]	*Bubo virginianus*			S4	
Greater scaup[1,5,6]	*Aythya marila*			S5B SUM	
Greater white-fronted goose[1]	*Anser albifrons*			SUM	
Greater yellowlegs[1,2,5]	*Tringa melanoleuca*			S5B SUM	
Green-winged teal[1,5]	*Anas crecca*			S4B	
Gyrfalcon[1]	*Falco rusticolus*		NAR	SUN	
Hairy woodpecker[3]	*Picoides villosus*			S5	
Harris's sparrow[1,3]	*Zonotrichia querula*			S4B S5M	
Hermit thrush[1,2,3]	*Catharus guttatus*			S5B	
Herring gull[1,2,6]	*Larus argentatus*			S4B	
Hoary redpoll[1,3]	*Acanthis hornemanni*			S3B S5N	
Hooded merganser[1]	*Lophodytes cucullatus*			S5B	
Horned grebe[4]	*Podiceps auritus*	SC	SC	S4B	Not listed
Horned lark[1]	*Eremophila alpestris*			S3B SUM	
House sparrow[1]	*Passer domesticus*			SNA	
Killdeer[1]	*Charadrius vociferus*			S5B	
Lapland longspur[1]	*Calcarius lapponicus*			S4B SUM SUN	
Le Conte's sparrow[1,2,3]	*Ammodramus leconteii*			S5B	
Least flycatcher[1,2]	*Empiodnax minimus*			S5B	
Least sandpiper[1,2]	*Calidris minutilla*			S4B SUM	
Lesser scaup[1,5,6]	*Aythya affinis*			S5B	
Lesser yellowlegs[1,3]	*Tringa flavipes*			S4B SUM	
Lincoln's sparrow[1,2,3]	*Melospiza lincolnii*			S5B	
Long-eared owl[1]	*Asio otus*			S4B	

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Long-tailed duck[1,6]	*Clangula hyemalis*			S4B	
Magnolia warbler[1,2]	*Setophaga magnolia*			S5B	
Mallard[1,2,3,5,6]	*Anas platyrhynchos*			S5B	
Merlin[1,2]	*Falco columbarius*		NAR	S5B SUN	
Nashville warbler[1,2,3,5]	*Oreothlypis ruficapilla*			S5B	
Northern flicker[1,2,3]	*Colaptes auratus*			S5B	
Northern goshawk[1]	*Accipiter gentilis*			S4B S5N	
Northern harrier[1,2,5]	*Circus cyaneus*			S5B	
Northern hawk owl[1]	*Surnia ulula*			S4	
Northern pintail[1,5]	*Anas acuta*			S5B	
Northern shoveler[1]	*Anas clypeata*			S5B	
Northern shrike[1]	*Lanius excubitor*			S3B S5N SUM	
Northern waterthrush[1,2]	*Parkesia noveboracensis*			S5B	
Olive-sided flycatcher[1,2,3,4,6]	*Contopus cooperi*	THR	THR	S3B	THR
Orange-crowned warbler[1,2,3]	*Oreothlypis celata*			S5B	
Osprey[1,6]	*Pandion haliaetus*			S4B	
Ovenbird[1,2,3]	*Seiurus aurocapilla*			S5B	
Palm warbler[1,2]	*Setophaga palmarum*			S5B	
Pectoral sandpiper[1]	*Calidris melanotos*			S4M	
Peregrine falcon[1,6]	*Falco peregrinus*	SC	SC	S1B	END
Philadelphia vireo[1]	*Vireo philadelphicus*			S4B	
Pied-billed grebe[1,2,3]	*Podilymbus podiceps*			S5B	
Pileated woodpecker[2,3]	*Dryocopus pileatus*			S5	
Pine grosbeak[3]	*Pinicola enucleator*			S4	
Pine siskin[2]	*Spinus pinus*			S5	
Purple finch[1,2]	*Haemorhous purpureus*			S5B	
Red crossbill[1,3]	*Loxia curvirostra*			S4B SUN	
Red-breasted merganser[1,2]	*Mergus serrator*			S4B	
Red-breasted nuthatch[1,2,3]	*Sitta canadensis*			S5	
Red-eyed vireo[1,2]	*Vireo olivaceus*			S5B	
Red-necked phalarope[1]	*Phalaropus lobatus*			S4B SUM	
Red-tailed hawk[1,2]	*Buteo jamaicensis*			S5B	
Red-throated loon[1]	*Gavia stellata*			S3B, SUM	
Red-winged blackbird[1,2,3,6]	*Agelaius phoeniceus*			S5B	
Ring-billed gull[1,3]	*Larus delawarensis*			S5B	
Ring-necked duck[1,3,5]	*Aythya collaris*			S5B	

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
Rose-breasted grosbeak[1,3]	*Pheucticus ludovicianus*			S5B	
Ross's goose[1]	*Chen rossii*			S3S4B S4M	
Rough-legged hawk[1]	*Buteo lagopus*		NAR	S3B SUM	
Ruby-crowned kinglet[1,2,3]	*Regulus calendula*			S5B	
Ruddy turnstone[1]	*Arenaria interpres*			SUM	
Ruffed grouse[2,3,5,6]	*Bonasa umbellus*			S4S5	
Rusty blackbird[1,2,4,6]	*Euphagus carolinus*	SC	SC	S4B	Not listed
Sanderling[1]	*Calidris alba*			SUM	
Sandhill crane[1,2,3,5,6]	*Grus canadensis*			S5B	
Savannah sparrow[1,2]	*Passerculus sandwichensis*			S5B	
Semipalmated plover[1]	*Charadrius semipalmatus*			S4B SUM	
Semipalmated sandpiper[1,6]	*Calidris pusilla*			S3B SUM	
Sharp-shinned hawk[1]	*Accipter striatus*			S4B	
Sharp-tailed grouse[5,6]	*Tympanuchus phasianellus*			S5	
Short-billed dowitcher[1]	*Limnodromus griseus*			S4B	
Short-eared owl[1,3,6]	*Asio flammeus*	SC	SC	S2S3B	THR
Smith's longspur[1]	*Calcarius pictus*			S3B SUM	
Snow bunting[1]	*Plectrophenax nivalis*			S4N SUM	
Snow goose[1,6]	*Chen caerulescens*			S5B S5M	
Snowy owl[1,6]	*Bubo scandiacus*			S4N	
Solitary sandpiper[1,2]	*Tringa solitaria*			S4B SUM	
Song sparrow[1,2]	*Melospiza melodia*			S5B	
Sora[1,3]	*Porzana carolina*			S5B	
Spotted sandpiper[1]	*Actitis macularius*			S5B	
Spruce grouse[3,5,6]	*Falcipennis canadensis*			S4	
Stilt sandpiper[1]	*Calidris himantopus*			S4B SUM	
Surf scoter[1]	*Melanitta perspicillata*			S3B	
Swainson's thrush[1,3,5]	*Catharus ustulatus*			S5B	
Swamp sparrow[1,3]	*Melospiza georgiana*			S5B	
Tennessee warbler[1,2,3]	*Oreothlypis peregrina*			S5B	
Tree swallow[1,6]	*Tachycineta bicolor*			S4B	
Tundra swan[1,5,6]	*Cygnus columbianus*			S4B SUM	
Turkey vulture[1,6]	*Cathartes aura*			S4B	
Vesper sparrow[1]	*Pooecetes gramineus*			S5B	
White-crowned sparrow[1,3]	*Zonotrichia leucophrys*			S5B	

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
White-rumped sandpiper[1]	*Calidris fuscicollis*			SUM	
White-throated sparrow[1,2,3]	*Zonotrichia albicollis*			S5B	
White-winged crossbill[1,2,3]	*Loxia leucoptera*			S5	
White-winged scoter[1]	*Melanitta fusca*			S4B	
Willow ptarmigan[1,6]	*Lagopus lagopus*			S4B SUN	
Wilson's snipe[1,2,3,5,6]	*Gallingo delicata*			S5B	
Wilson's warbler[1,2]	*Cardellina pusilla*			S5B SUM	
Winter wren[1,2,3]	*Troglodytes hiemalis*			S5B	
Yellow rail[1,2]	*Coturnicops noveboracensis*	SC	SC	S3B	Not listed
Yellow warbler[1,2,3]	*Setophaga petechia*			S5B	
Yellow-bellied flycatcher[1,2]	*Empidonax flaviventris*			S5B	
Yellow-bellied sapsucker[1,2,3]	*Sphyrapicus varius*			S5B	
Yellow-rumped warbler[1,2,3]	*Setophaga coronata*			S5B	

Sources: Manitoba Avian Research Committee, 2003; MBBA, 2014b; Cornell Lab of Ornithology, 2015; COSEWIC, 2017; Joro, 2017; MBCDC, 2016a; MESEA, 2017, SARA, 2017.

Bolded species are Species of Conservation Concern: **THR** – Threatened, **SC** – Special Concern, **END** – Endangered; NAR – Not at Risk

[1]Species is a migrant (summer-breeding) or non-breeding visitor in the RAA; [2]Observation during the Manitoba Breeding Bird Atlas Surveys, [3]Observation heard on ARU recordings, [4]Species occurrence listed on the Manitoba Conservation Data Centre for the Hayes River Upland Ecoregion [5]Observation during Joro Field Programs, [6]Species of First Nation Interest

MBCDC (2016c) Definitions for Status Listing:

1 Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.

2 Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.

3 Uncommon throughout its range or in the province (21 to 100 occurrences).

4 Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (> 100 occurrences).

5 Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.

U Possibly in peril, but status uncertain; more information needed.

H Historically known; may be rediscovered.

X Believed to be extinct; historical records only, continue search.

SNR A species not ranked. A rank has not yet assigned or the species has not been evaluated.

SNA A conservation status rank is not applicable to the element.

S#S# Numeric range rank: A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species.

? Inexact or uncertain; for numeric ranks, denotes inexactness.

B Breeding status of a migratory species. Example: S1B, SZN - breeding occurrences for the species are ranked S1 (critically imperilled) in the province, nonbreeding occurrences are not ranked in the province.

N Non-breeding status of a migratory species. Example: S1B, SZN - breeding occurrences for the species are ranked S1 (critically imperilled) in the province, nonbreeding occurrences are not ranked in the province.

Q Taxonomic questions or problems involved, more information needed; appended to the global rank.

T Rank for subspecific taxon (subspecies, variety, or population); appended to the global rank for the full species.

A modifier to SX or SH; the species has been reintroduced but the population is not yet established.

SARA (2017) Definitions for Status Listing:

Schedule 1: the official list of species that are classified as extirpated, endangered, threatened, and of special concern.

Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

Schedule 3: species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

Special Concern: a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Threatened: a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

COSEWIC (2017) Definitions for Status Listing:

Extinct: A wildlife species that no longer exists.

Extirpated: A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.

Endangered: A wildlife species facing imminent extirpation or extinction.

Threatened: A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

Special Concern: A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Not At Risk: A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

MESEA (2017) Definitions for Status Listing:

Extirpated: A species formerly indigenous to Manitoba no longer exists in the wild in Manitoba but exists elsewhere.

Endangered: A species threatened with imminent extirpation or with extinction throughout all or a significant portion of its Manitoba range.

Threatened: A species indigenous to Manitoba that is either: a) likely to become endangered; or b) is, because of low or declining numbers in Manitoba, particularly at risk if the factors affecting its vulnerability do not become reversed.

Special Concern: A species indigenous to Manitoba is at risk of becoming a threatened or endangered species because of a combination of biological characteristics and identified threats to the species.

APPENDIX C: LIST OF POTENTIAL REPTILES AND AMPHIBIANS FOR THE P6 REGIONAL ASSESSMENT AREA

Common Name	Scientific Name	SARA	COSEWIC	MBCDC	MESEA
American toad	*Anaxyrus americanus*			S4S5	
Boreal chorus frog	*Pseudacris maculata*			S5	
Northern leopard frog (Eastern population)*[2]	*Lithobates pipiens*		NAR	S4	
Northern spring peeper[2]	*Pseudacris crucifer*			S5	
Wood frog	*Lithobates sylvaticus*			S5	
Red-sided garter snake[1,2]	*Thamnophis sirtalis parietalis*			S4	

Sources: Preston, 1982; Canadian Herpetological Society, 2016; Nature North, 2017; COSEWIC, 2017; Joro, 2017; MBCDC, 2016a; MESEA, n.d., SARA, 2017

**COSEWIC (2009c) indicates the western population (that is Special Concern under COSEWIC and SARA) is west of the Project 6 RAA*

Bolded species are Species of Conservation Concern: THR – Threatened, SC – Special Concern, END – Endangered; NAR – Not at Risk

[1]Species occurrence listed on the Manitoba Conservation Data Centre (2016b) for the Hayes River Upland Ecoregion, [2] Species of First Nation Interest

MBCDC (2016c) Definitions for Status Listing:

1	Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.
2	Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.
3	Uncommon throughout its range or in the province (21 to 100 occurrences).
4	Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (> 100 occurrences).
5	Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.
U	Possibly in peril, but status uncertain; more information needed.
H	Historically known; may be rediscovered.
X	Believed to be extinct; historical records only, continue search.
SNR	A species not ranked. A rank has not yet assigned or the species has not been evaluated.
SNA	A conservation status rank is not applicable to the element.
S#S#	Numeric range rank: A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species.
?	Inexact or uncertain; for numeric ranks, denotes inexactness.
B	Breeding status of a migratory species. Example: S1B, SZN - breeding occurrences for the species are ranked S1 (critically imperiled) in the province, nonbreeding occurrences are not ranked in the province.
N	Non-breeding status of a migratory species. Example: S1B, SZN - breeding occurrences for the species are ranked S1 (critically imperiled) in the province, nonbreeding occurrences are not ranked in the province.
Q	Taxonomic questions or problems involved, more information needed; appended to the global rank.
T	Rank for subspecific taxon (subspecies, variety, or population); appended to the global rank for the full species.
#	A modifier to SX or SH; the species has been reintroduced but the population is not yet established.

SARA (2017) Definitions for Status Listing:

Schedule 1: the official list of species that are classified as extirpated, endangered, threatened, and of special concern.

Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

Schedule 3: species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

Special Concern: a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Threatened: a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

COSEWIC (2017) Definitions for Status Listing:

Extinct: A wildlife species that no longer exists.

Extirpated: A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.

Endangered: A wildlife species facing imminent extirpation or extinction.

Threatened: A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

Special Concern: A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Not At Risk: A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

MESEA (2017) Definitions for Status Listing:

Extirpated: A species formerly indigenous to Manitoba no longer exists in the wild in Manitoba but exists elsewhere.

Endangered: A species threatened with imminent extirpation or with extinction throughout all or a significant portion of its Manitoba range.

Threatened: A species indigenous to Manitoba that is either: a) likely to become endangered; or b) is, because of low or declining numbers in Manitoba, particularly at risk if the factors affecting its vulnerability do not become reversed.

Special Concern: A species indigenous to Manitoba is at risk of becoming a threatened or endangered species because of a combination of biological characteristics and identified threats to the species.

APPENDIX D: REGULATORY AND ECOLOGICAL CONTEXT FOR SPECIES OF CONSERVATION CONCERN THAT POTENIALLY OCCUR IN THE P6 REGIONAL ASSESSMENT AREA

Table D-1: Regulatory and Ecological Context for Species of Conservation Concern that Potentially occur in the P6 Region

Species Common Name	Scientific Name	Species Status (Federal and Provincial)					Ecological Context / Habitat Description	Is Critical Habitat in RAA?	Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)
		SARA	COSEWIC	MBCDC	MESEA	Recovery Strategy Plan			
Forest Birds									
Bank swallow	*Riparia riparia*	Schedule 1, Threatened	Threatened	S5B	Not listed	COSEWIC Status report only	Occurs most commonly across grassland, aspen parkland, and plains ecoregions. It occurs throughout other regions (e.g., Boreal forest) of these provinces, but is recorded infrequently.	No – Environment Canada (EC) does not identify specific critical habitat.	Low Potential: May occur in RAA but the species were not observed during field studies (Appendix J: Table J-10).
Barn swallow	*Hirundo rustica*	Schedule 1, Threatened	Threatened	S4B	Not listed	COSEWIC Status report only	Barn Swallows typically select nesting and foraging sites close to open habitats such as farmlands of various description, wetlands, road rights-of-way, large forest clearings, cottage areas, islands, sand dunes, and subarctic tundra.	No - EC does not identify specific critical habitat.	Low Potential: May occur in RAA but the species was not observed during field studies (Appendix J: Table J-10).

Species Common Name	**Scientific Name**	**Species Status (Federal and Provincial)**					**Ecological Context / Habitat Description**	**Is Critical Habitat in RAA?**	**Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)**
		SARA	**COSEWIC**	**MBCDC**	**MESEA**	**Recovery Strategy Plan**			
Canada Warbler	*Cardellina canadensis*	Schedule 1, Threatened	Threatened	S3B	Threatened	Yes (2016)	Canada Warbler breeds in various habitats across its range, but is almost always associated with moist forests with a dense, deciduous shrub layer, complex understory, and available perch trees. Nests are built on or near the ground (Reitsma *et al*., 2010). They are placed on moss and raised hummocks, within holes of root masses, rotting tree stumps, clumps of grass, rock cavities, etc. (Reitsma *et al.,* 2010).	No - Recovery strategy says information lacking with schedule determined in future.	Low Potential: May occur in the RAA but the species were not observed during field studies (Appendix J: Table J-10).

Species Common Name	Scientific Name	Species Status (Federal and Provincial)					Ecological Context / Habitat Description	Is Critical Habitat in RAA?	Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)
		SARA	COSEWIC	MBCDC	MESEA	Recovery Strategy Plan			
Common Nighthawk	*Chordeiles minor*	Schedule 1, Threatened	Threatened	S3B	Threatened	Yes (2016)	Common Nighthawks require open ground or clearings for nesting. The species breeds in a wide range of open habitats including sandy areas (e.g., dunes, eskers, and beaches), open forests (e.g., mixedwood and coniferous stands, burns, and clearcuts), grasslands (e.g., short-grass prairies, pastures, and grassy plains), sagebrush, wetlands (e.g., bogs, marshes, lakeshores, and riverbanks), gravelly or rocky areas (e.g., outcrops, barrens, gravel roads, gravel rooftops, railway beds, mines, quarries, and bare mountain tops and ridges), and some cultivated or landscaped areas (e.g., parks, military bases, airports, blueberry fields, orchards, cultivated fields) (Hunt, 2005; Campbell *et al.,* 2006; COSEWIC, 2007a).	No - Recovery strategy indicates information lacking with schedule determined in future.	High Potential: No species were observed during aerial waterfowl surveys however 1 was recorded during MBBA point count surveys along with 2 MBBA incidental observations, and 11 total identified on 2 of the 45 ARU sampling sites (Appendix J: Table J-10).

Species Common Name	Scientific Name	Species Status (Federal and Provincial)					Ecological Context / Habitat Description	Is Critical Habitat in RAA?	Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)
		SARA	COSEWIC	MBCDC	MESEA	Recovery Strategy Plan			
Eastern Wood-pewee	*Contopus virens*	Schedule 1, Special Concern	Special Concern	S4B	Not listed	COSEWIC Status report only	In Canada, the Eastern Wood-Pewee breeds mostly in mature and intermediate-age deciduous and mixed forests (less often in coniferous forest) having an open understory (Ouellet, 1974; Godfrey, 1986; Peck and James, 1987; Gauthier and Aubry, 1995; Falconer, 2010; Burke *et al*., 2011). It is often associated with forests dominated by Sugar Maple (Acer saccharum), elm (Ulmus sp.) and oak (Quercus sp.; Graber *et al*., 1974). It is usually associated with forest clearings and edges within the vicinity of its nest (Hespenheide, 1971; Peck and James, 1987).	No - EC does not identify specific critical habitat; RAA on northern fringe of range - COSEWIC	Low Potential: May occur in RAA however, the species was not observed during field studies (Appendix J: Table J-10).
Olive-Sided Flycatcher	*Contopus cooperi*	Schedule 1, Threatened,	Threatened	S3B	Threatened	Yes (2016)	In Canada, Olive-sided Flycatcher breeds primarily in boreal, sub-boreal, interior, and coastal forest regions of the country.	No - EC does not identify specific critical habitat.	Moderate Potential: The RAA is within the range maps for the species, and habitat occurs in the LAA. No species were observed during aerial waterfowl surveys however 36 were recorded during MBBA point count surveys along with 8 MBBA incidental observations, and 13 total identified on 3 of the 45 ARU sampling sites (Appendix J: Table J-10).

Species Common Name	Scientific Name	Species Status (Federal and Provincial)					Ecological Context / Habitat Description	Is Critical Habitat in RAA?	Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)
		SARA	COSEWIC	MBCDC	MESEA	Recovery Strategy Plan			
Peregrine Falcon	*Falco peregrinus*	Schedule 1, Special Concern	Special Concern	S1B	Endangered	Management plan (2015)	Peregrine Falcons generally nest on cliff ledges or crevices. Cliffs ranging from 50 to 200 m high are preferred (Cade 1960; White and Cade 1971). The species is highly adaptable in nest site selection.	No – Known to migrate through the area; Management Plan illustrates breeding range.	Low Potential: Expected to be an occasional transient (not breeding) migrant within the RAA. May occur in the RAA but the species were not observed during field studies (Appendix J: Table J-10).
Rusty Blackbird	*Euphagus carolinus*	Schedule 1, Special Concern	Special Concern	S4B	Not listed	Management plan (2015)	Rusty Blackbird has been observed in many riparian habitats including (but not limited to) wetlands associated with recent burns, peat bogs, riparian scrub, open moss- and lichen-spruce woodlands, sedge meadows, marshes, alder and willow thickets, and estuaries (COSEWIC 2006).	No - EC does not identify specific critical habitat.	Moderate Potential: May occur in RAA. No species were observed during aerial waterfowl surveys however 13 were recorded during MBBA point count surveys along with 6 MBBA incidental observations, and none total identified on ARU records (Appendix J: Table J-10).
Short-eared Owl	*Asio flammeus*	Schedule 1, Special Concern	Special Concern	S2S3B	Threatened	No - Management plan (2016)	Short-eared owls occur in a variety of open native habitats: grasslands, Arctic tundra, taiga, bogs, marshes, coastal wetlands, coastal barrens, estuaries and grasslands dominated by sand-sage (Artemisia filifolia). There is little specific information regarding habitat preferences at the landscape scale, but a mosaic of grasslands and wetlands provides optimal breeding and foraging habitats (Wiggins, 2004).	No - EC does not identify specific critical habitat.	High Potential: Migrate through the RAA in low numbers. No species were observed during aerial waterfowl surveys, MBBA point count surveys or through MBBA incidental observations, however 2 total were identified on 2 or 45 ARU sampling sites (Appendix J: Table J-10).
Waterbirds									

Species Common Name	Scientific Name	Species Status (Federal and Provincial)					Ecological Context / Habitat Description	Is Critical Habitat in RAA?	Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)
		SARA	**COSEWIC**	**MBCDC**	**MESEA**	**Recovery Strategy Plan**			
Horned Grebe	*Podiceps auritus*	Schedule 1, Special Concern	Special Concern	S4B	Not listed	COSEWIC Status Report only	In Manitoba, the Horned Grebe breeds throughout the province with the exception of certain eastern regions. It is probably more common in the Minnedosa region, but its abundance in the Prairie region fluctuates according to the water level. The species is generally less abundant in summer in the southeastern part of the province. Some individuals breed in Churchill, mainly in marshes near Akudlik and in the Goose Creek region (Holland and Taylor, 2003).	No - EC does not identify specific critical habitat.	Moderate Potential: May occur in RAA in low numbers. The species were not observed during field studies (Appendix J: Table J-10).

Species Common Name	Scientific Name	Species Status (Federal and Provincial)					Ecological Context / Habitat Description	Is Critical Habitat in RAA?	Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)
		SARA	COSEWIC	MBCDC	MESEA	Recovery Strategy Plan			
Yellow Rail	*Coturnicops noveboracensis*	Schedule 1, Special Concern	Special Concern	S3B	Not listed	No - Management plan	Yellow Rails inhabit shallow wetlands and other wet areas with grass-like vegetation. Breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes (Bookhout 1995, Alvo and Robert 1999, COSEWIC 2009b), shallow prairie wetlands, and wet montane meadows (Peabody 1922, Sherrington 1994, Popper and Stern 2000). Preferred wetlands are generally dominated by short, fine-stemmed herbaceous vegetation, especially sedges, as well as other graminoid vegetation of the families Cyperaceae, Poaceae, and Juncaceae. Vegetation structure (e.g. short, grass-like, and dense) is likely more important than its taxon (Robert *et al*. 2000). Breeding habitats may have up to 50 cm of standing water, but typically nesting sites are less than 15 cm deep (Bookhout 1995, Robert *et al*. 2000, Wilson 2005). The species' narrow tolerance for shallow water levels likely explains why its abundance at any given site varies dramatically annual (Robert and Laporte 1999, Kehoe *et al*. 2000, Lindgren 2001).	No- EC does not identify specific critical habitat.	Very Low Potential: May breed in the low numbers in RAA. The species were not observed during field studies (Appendix J: Table J-10).

Species Common Name	Scientific Name	Species Status (Federal and Provincial)					Ecological Context / Habitat Description	Is Critical Habitat in RAA?	Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)
		SARA	COSEWIC	MBCDC	MESEA	Recovery Strategy Plan			
Mammals									
Boreal woodland caribou	*Rangifer tarandus caribou*	Schedule 1, Threatened	Threatened	S2S3	Threatened	Yes (2012)	Boreal caribou require large range areas comprised of continuous tracts of undisturbed habitat. In general, boreal caribou prefer habitat consisting of mature to old-growth coniferous forest (e.g. jack pine (Pin*us banksiana*), black spruce (*Picea mariana*)) with abundant lichens, or muskegs and peat lands intermixed with upland or hilly areas (Stuart-Smith *et al*., 1997; Rettie and Messier, 2000; Courtois, 2003; Brown *et al*., 2007; Boreal Caribou ATK Reports, 2010-2011).	Yes - A small portion of the Molson Boreal Caribou Management Unit and the Norway House range are contained in the RAA. Caribou effects and disturbance assessments are found in Section 7.1.	Very Low Potential: Differentiation between boreal woodland caribou and eastern migratory caribou observations could not be confirmed. Low potential for boreal woodland caribou occurrence as the Norway House population range only overlaps slightly with the RAA.
Eastern migratory caribou	*Rangifer tarandus caribou*	No Schedule, No Status	Endangered	SNR	Not listed	COSEWIC Status report only (2017)	Eastern migratory caribou primarily use tundra during the calving and summer periods, while using taiga and boreal forest during the winter.	Yes – The majority of the RAA and the entire LAA are included in the Pen Islands caribou range. Caribou effects and disturbance assessments are found in Section 7.1.	High potential: Pen Islands caribou occur within the RAA during all five 40 day seasons with the largest portion of seasonal core use area occurring in the RAA in late winter. Only a small proportion of its seasonal core use area occur within the LAA, with the largest portion of a seasonal core use are occurring in the LAA in early winter.

Species Common Name	Scientific Name	Species Status (Federal and Provincial)					Ecological Context / Habitat Description	Is Critical Habitat in RAA?	Potential Occurrence in Local Assessment Area (LAA) or Regional Assessment Area (RAA)
		SARA	COSEWIC	MBCDC	MESEA	Recovery Strategy Plan			
Little Brown Myotis (Bat)	*Myotis lucifugus*	Schedule 1, Endangered	Endangered	S2N,S5B	Endangered	Yes - combined for little brown, northern myotis and tricolord bat (2015)	Typically, hibernacula for these species are subterranean features, such as caves, abandoned mines, hand-dug wells, cellars, or tunnels where light and noise levels are low; typically contain sections that have relatively stable temperatures (2-10 ˚C) and stable, high humidity levels (>80 %). Hibernacula generally identified in MB, but none identified in the RAA.	No critical habitat in RAA (Recovery Strategy); closest is concentrated in the northwest of Lake Winnipeg, north of Grand Rapids.	Low Potential: Very low potential for hibernacula in RAA. Some potential to be used during the summer as roosting sites within the forested areas; habitat exists but there were no sightings of the species or hibernacula.
Wolverine	*Gulo gulo*	No schedule, no status	Special concern	S3S4	Not listed	N/A	A wide variety of forested and tundra vegetation associations are used by wolverines. Habitats must have an adequate year-round supply of food, mainly consisting of smaller prey such as rodents and snowshoe hares, and the carcasses of large ungulates, like moose, caribou, and muskox. Females den under snow-covered rocks, logs or within snow tunnels. Wolverines reproduce in areas where snow cover persists at least into April.	No - EC does not identify specific critical habitat.	High Potential: May occur in very low numbers dispersed in the RAA. Four species observations and nine track observations were recorded through aerial multispecies surveys during 2011 – 2016 field studies (Appendix G – Table G-1). The trapper program (2016/2017) also recorded 10 occurrences of wolverine tracks within the RAA (Section 6.3.5).

APPENDIX E: VC SELECTION

Table E-1: Habitat Preference for Candidate Valued Component (VC) Species and Other Wildlife

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
MAMMALS				
Caribou	Ungulate	Boreal woodland caribou are typically found in large, un-fragmented tracts of mature coniferous-dominated boreal forest with inherently low ecological diversity and low predator densities (Manitoba Hydro, 2011b). Forests containing a mixture of jackpine and treed muskeg provide good overall caribou habitat and are often associated with spruce stands (Schindler, 2006).	Mixedwood Coniferous	American black bear, Northern flying squirrel, silver haired bat, American tree sparrow, Lincoln's sparrow, rusty blackbird, swamp sparrow, black backed woodpecker, boreal owl, Cooper's hawk, great grey owl, Northern saw-whet owl, sharp-shinned hawk, spruce grouse, alder flycatcher, American goldfinch, American redstart, least flycatcher, long-eared owl, merlin, Nashville warbler, Northern hawk owl, palm warbler, pileated woodpecker, pine grosbeak, pine siskin, purple finch, red-breasted nuthatch, red-eyed vireo, red-tailed hawk, ruby-crowned kinglet, sharp-tailed grouse, snowy owl, song sparrow, Swainsons' thrush, Tennessee warbler, turkey vulture, white-throated sparrow, winter wren, yellow-rumped warbler, blackburnian warbler, blackpoll warbler, bohemian waxwing, boreal chickadee, broad-winged hawk, Cape May warbler, cedar waxwing, common nighthawk, dark-eyed junco, downy woodpecker, Eastern phoebe, Eastern wood-pewee, evening grosbeak, fox sparrow, hairy woodpecker, Harris's sparrow, hermit thrush, hoary redpoll, American robin, American three-toed woodpecker, American tree sparrow, bald eagle, barred owl, bay-breasted warbler, black-and-white warbler, black-throated green warbler, American deer mouse, Canada lynx, Eastern heather vole, ermine, gray wolf

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
Moose	Ungulate	Typically found in forested areas and edges, with tall shrubs and re-generating vegetation for browse (Manitoba Hydro, 2011a; 2011b). Moose often occur near streams and rivers and edges of shallow lake. In the summer they prefer cool, moist lowland habitat providing suitable forage and escape cover. They often travel further inland to rut and feed on shrubs in the fall. In late winter, they typically use dense coniferous forest (Austman, 2015).	Wetland Shrubland Coniferous (Dense)	American black bear, Canada lynx, North American porcupine, raccoon, gray wolf, wolverine, alder flycatcher, American kestrel, American redstart, black-and-white warbler, black-capped chickadee, blue jay, chipping sparrow, common raven, downy woodpecker, gray tree frog, wood frog, American black duck, American goldfinch, killdeer, least sandpiper, lesser scaup, lesser yellowlegs, Lincoln's sparrow, long-eared owl, merlin, Northern harrier, Northern shoveler, Northern waterthrush, pine siskin, purple finch, red-eyed vireo, red-necked phalarope, red-tailed hawk, red-throated loon, red-winged blackbird, rose-breasted grosbeak, ruby-crowned kinglet, ruddy turnstone, rusty blackbird, semipalmated plover, sharp-tailed grouse, snow bunting, snowy owl, solitary sandpiper, song sparrow, spotted sandpiper, Swainsons' thrush, Tennessee warbler, tree swallow, turkey vulture, white-crowned sparrow, willow ptarmigan, Wilson's warbler, winter wren, yellow-rumped warbler, blue-headed vireo, blue-winged teal, Cape May warbler, cedar waxwing, clay-colored sparrow, common yellowthroat, Eastern phoebe, Eastern wood-pewee, fox sparrow, golden eagle, gray-cheeked thrush, great blue heron, great gray owl, Harris's sparrow, hermit thrush, hoary redpoll, American three-toed woodpecker, American tree sparrow, American white pelican, American wigeon, Baird's sandpiper, bald eagle, bank swallow, barn swallow, barred owl, belted kingfisher, black tern, American beaver, American marten, American mink, fisher, gray wolf, red-sided garter snake
Beaver	Aquatic Furbearer	Prefer riparian areas including lakes, creeks, rivers, and other water bodies with nearby forests used to build dams and lodges (Manitoba Hydro 2011a). Prefer habitat containing willows, aspen, and other deciduous trees along with mixedwood forests with trees large enough for browse and building material (Kunke and Watkins, 1999).	Wetland Deciduous Mixedwood	Masked shrew, meadow vole, American mink, pygmy shrew, Northern river otter, American water shrew, yellow warbler, great blue heron, lesser yellowlegs, Northern waterthrush, sora, yellow rail, boreal chorus frog, wood frog, Northern leopard frog, alder flycatcher, American bittern, American black duck, American gold finch, American kestrel, American pipit, American redstart, killdeer, least

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
				sandpiper, lesser scaup, Lincoln's sparrow, long-eared owl, Northern harrier, Northern hawk owl, Northern shoveler, pileated woodpecker, pine siskin, purple finch, red-eyed vireo, red-necked phalarope, red-tailed hawk, red-throated loon, red-winged blackbird, ring-billed gull, rose-breasted grosbeak, rough-legged hawk, ruddy turnstone, rusty blackbird, sanderling, Savannah sparrow, semipalmated plover, sharp-shinned hawk, Smith's longspur, snow bunting, snowy owl, solitary sandpiper, spotted sandpiper, Tennessee warbler, tree swallow, white-crowned sparrow, white-throated sparrow, willow ptarmigan, yellow-bellied sapsucker, blackpoll warbler, blue-winged teal, broad-winged hawk, common loon, common merganser, common nighthawk, common yellowthroat, downy woodpecker, dunlin, Eastern wood-pewee, Forster's tern, fox sparrow, golden eagle, great gray owl, hairy woodpecker, Harris's sparrow, hoary redpoll, horned grebe, American tree sparrow, American white pelican, American wigeon, Baird's sandpiper, bald eagle, bank swallow, barn swallow, barred owl, belted kingfisher, black tern, black-and-white warbler, black-capped chickadee, American black bear, American deer mouse, American marten, fisher, gray wolf, red-sided garter snake
Marten	Furbearer	Prefer old growth forests for denning (Manitoba Hydro, 2011a). Mature coniferous forests (especially undisturbed) featuring structural complexity - high canopy closure and vertical and horizontal woody structure, (Kunke and Watkins, 1999).	Coniferous	Ermine, fisher, American black bear, North American porcupine, silver-haired bat, red squirrel, wolverine, gray wolf, American three-toed woodpecker, spruce grouse, ruby crowned kinglet, Northern hawk owl, gray jay, boreal owl, common redpoll, American black duck, American kestrel, American redstart, least flycatcher, long-eared owl, Magnolia warbler, Nashville warbler, olive-sided flycatcher, palm warbler, pileated woodpecker, pine grosbeak, pine siskin, purple finch, red crossbill, red-breasted nuthatch, red-tailed hawk, ruby-crowned kinglet, sharp-tailed grouse, Swainsons' thrush, Tennessee warbler, white-throated sparrow, white-winged crossbill, yellow-rumped

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
				warbler, blackpoll warbler, bohemian waxwing, boreal chickadee, brown creeper, Cape May warbler, cedar waxwing, dark-eyed junco, downy woodpecker, evening grosbeak, hairy woodpecker, Harris's sparrow, hermit thrush, hoary redpoll, American robin, bald eagle, barred owl, bay-breasted warbler, black-backed woodpecker, black-throated green warbler, American beaver, American deer mouse, American mink, Canada lynx, gray wolf, hoary bat
BIRDS				
Bald eagle	Raptor	Nests are commonly found in mature forests, usually within 200 m of a water body (Manitoba Hydro 2011c). Common near lakes, reservoirs, rivers, marshes, and coasts. Nest in trees near water (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015).	Wetland Coniferous	Common snapping turtle, Brewer's blackbird, double-crested cormorant, great crested flycatcher, hooded merganser, killdeer, northern pintail, osprey, ovenbird, red-breasted merganser, hoary bat, little brown bat, raccoon, alder flycatcher, American bittern, American black duck, American goldfinch, American kestrel, American redstart, least sandpiper, lesser scaup, lesser yellowlegs, long-eared owl, merlin, Northern harrier, Northern shoveler, Northern waterthrush, olive-sided flycatcher, pectoral sandpiper, peregrine falcon, pine siskin, purple finch, red-tailed hawk, red-throated loon, rose breasted grosbeak, rough-legged hawk, ruby-crowned kinglet, ruddy turnstone, rusty blackbird, sanderling, semipalmated plover, snow bunting, snow goose, solitary sandpiper, surf scoter, tree swallow, white-throated sparrow, blackburnian warbler, cliff sparrow, common loon, common merganser, common nighthawk, evening grosbeak, golden eagle, great blue heron, greater scaup, greater yellowlegs, American three-toed woodpecker, American tree sparrow, American white pelican, American wigeon, Baird's sandpiper, bank swallow, barn swallow, barred owl, belted kingfisher, black tern, black-bellied plover, black-throated green warbler, American deer mouse, American water shrew, gray wolf, hoary bat, red-sided garter snake

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
Canada geese	Waterfowl	Often near lakes, rivers, ponds, or other small or large bodies of water (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015).	Wetland	Wood frog, boreal chorus frog, Northern spring peeper, Northern leopard frog, bufflehead, common goldeneye, lesser yellowlegs, sandhill crane, short-billed dowitcher, short-eared owl, white-winged scoter, yellow rail, northern bog lemming, southern bog lemming, American bittern, American black duck, American golden plover, American goldfinch, American kestrel, American pipit, killdeer, least sandpiper, lesser scaup, long-tailed duck, mallard, Northern pintail, Northern shoveler, pectoral sandpiper, pied-billed grebe, red-breasted merganser, red-throated loon, red-winged blackbird, ring-billed gull, ring-necked duck, Ross's goose, ruddy turnstone, sanderling, semipalmated plover, snow goose, solitary sandpiper, spotted sandpiper, stilt sandpiper, tree swallow, tundra swan, white-rumped sandpiper, blue-winged teal, Bonaparte's Gull, cackling goose, Canada goose, cliff sparrow, common grackle, common loon, common merganser, common tern, dunlin, Forster's tern, gadwall, greater scaup, greater white-fronted goose, greater yellow legs, green-winged teal, herring gull, hooded merganser, horned grebe, American tree sparrow, American white pelican, American wigeon, Baird's sandpiper, bald eagle, bank swallow, barn swallow, barred owl, belted kingfisher, black scoter, black tern, black-bellied plover
Mallard	Waterfowl	Breed near small or large bodies of water; where open water is limited in spring, will frequent large rivers and marshes (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015).	Wetland	Wood frog, boreal chorus frog, Northern spring peeper, Northern leopard frog, bufflehead, common goldeneye, lesser yellowlegs, sandhill crane, short-billed dowitcher, short-eared owl, white-winged scoter, yellow rail, northern bog lemming, southern bog lemming, American bittern, American black duck, American golden plover, American goldfinch, American kestrel, American pipit, American redstart, killdeer, least sandpiper, lesser scaup, long-tailed duck, Northern pintail, Northern shoveler, pectoral sandpiper, red-breasted merganser, red-throated loon, red-winged blackbird, ring-billed gull, ring-necked duck, Ross's goose, ruddy

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
				turnstone, sanderling, semipalmated plover, snow goose, solitary sandpiper, spotted sandpiper, stilt sandpiper, tree swallow, tundra swan, white-rumped sandpiper, Wilson's snipe, blue-winged teal, Bonaparte's Gull, cackling goose, Canada goose, common grackle, common loon, common merganser, common tern, dunlin, Forster's tern, gadwall, great blue heron, greater scaup, greater white-fronted goose, greater yellow legs, green-winged teal, herring gull, hooded merganser, horned grebe, American tree sparrow, American white pelican, American wigeon, Baird's sandpiper, bald eagle, bank swallow, barn swallow, barred owl, belted kingfisher, black scoter, black tern, black-bellied plover
Ring-necked Duck	Waterfowl	Like wet meadow, swamp, shallow water/ pond & marsh. Common on smaller bodies of water than other diving ducks, e.g., beaver ponds and small lakes. Breed in freshwater marshes, bogs, and other shallow, often acidic wetlands (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015).	Wetland	American wigeon, blue-winged teal, green-winged teal, gadwall, horned grebe, lesser scaup, Northern harrier, pied-billed grebe, ruddy duck, Wilson's phalarope, American bittern, American black duck, American golden plover, American goldfinch, American kestrel, American redstart, killdeer, least sand piper, lesser yellowlegs, mallard, Northern harrier, Northern pintail, Northern shoveler, pectoral sandpiper, red-breasted merganser, red-necked phalarope, red-throated loon, red-winged blackbird, ring-billed gull, Ross's goose, ruddy turnstone, sanderling, sandhill crane, semipalmated plover, short-billed dowitcher, snow goose, solitary sandpiper, spotted sandpiper, stilt sandpiper, tree swallow, tundra swan, white-rumped sandpiper, Wilson's snipe, Bonaparte's Gull, bufflehead, cackling goose, Canada goose, common grackle, common loon, common merganser, common tern, dunlin, Forster's tern, greater scaup, greater white-fronted goose, greater yellow legs, herring gull, hooded merganser, horned grebe, American tree sparrow, American white pelican, American wigeon, Baird's sandpiper, bald eagle, bank swallow, barn swallow, barred owl, belted kingfisher, black scoter, black tern, black-bellied plover

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
Ruffed grouse	Upland game bird	Occupy mixed deciduous and coniferous forest interiors with scattered clearings. They also live along forested streams and in areas growing back from burning or logging (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015). Ruffed grouse inhabit deciduous and mixedwoods forests and coniferous forests (Manitoba Hydro, 2011c).	Mixedwood Decidouous Wetland Coniferous	American goldfinch, American tree sparrow, black-capped chickadee, blue jay, Canada warbler, chipping sparrow, clay-coloured sparrow, Connecticut warbler, Eastern kingbird, Eastern wood-pewee, golden-winged warbler, gray catbird, great crested flycatcher, great horned owl, Lincoln's sparrow, long-eared owl, northern saw-whet owl, Northern waterthrush, red-eyed vireo, song sparrow, yellow-bellied flycatcher, yellow warbler, American beaver, ermine, fisher, masked shrew, meadow vole, American mink, Northern river otter, pygmy shrew, silver-haired bat, star-nosed mole, American water shrew, Alder flycatcher, American bittern, American black duck, American golden plover, American kestrel, American pipit, American redstart, killdeer, lesser scaup, long-eared owl, merlin, Nashville warbler, Northern flicker, Northern goshawk, Northern harrier, Northern hawk owl, Northern shrike, olive-sided flycatcher, palm warbler, peregrine falcon, pileated woodpecker, pine grosbeak, pine siskin, purple finch, red-breasted nuthatch, red-tailed hawk, red-throated loon, rose-breasted grosbeak, rough-legged hawk, ruby-crowned kinglet, ruddy turnstone, rusty blackbird, sandhill crane, savannah sparrow, sharp-shinned hawk, sharp-tailed hawk, Smith's longspur, snow bunting, snowy owl, spotted sandpiper, Swainsons' thrush, Tennessee warbler, tree swallow, turkey vulture, vesper sparrow, white-crowned sparrow, white-throated sparrow, Wilson's snipe, winter wren, yellow-bellied sapsucker, yellow-rumped warbler, blackburnian warbler, blackpoll warbler, bohemian waxwing, brown creeper, Cape May warbler, cedar waxwing, common nighthawk, common yellowthroat, dark-eyed junco, downy woodpecker, Eastern phoebe, Eastern wood-pewee, European starling, fox sparrow, golden eagle, great gray owl, gyrfalcon, hairy woodpecker, Harris's sparrow, hoary redpoll, horned lark, coyote, arctic shrew, American robin, American three-toed woodpecker,

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
				American tree sparrow, American white pelican, American wigeon, Baird's sandpiper, bald eagle, bank swallow, barn swallow, barred owl, black-and-white warbler
Magnolia Warbler	Migratory songbird	Breed in small conifers, especially young spruces, in purely coniferous stands or mixed forest (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015).	Coniferous	Common snapping turtle, Brewer's blackbird, double-crested cormorant, great crested flycatcher, hooded merganser, killdeer, osprey, ovenbird, red-breasted merganser, hoary bat, little brown bat, raccoon, alder flycatcher, American black duck, American kestrel, American redstart, least flycatcher, long-eared owl, Nashville warbler, Northern shrike, olive-sided flycatcher, pileated woodpecker, pine grosbeak, pine siskin, purple finch, red-breasted nuthatch, red-tailed hawk, ruby-crowned kinglet, sharp-tailed grouse, Swainsons' thrush, Tennessee warbler, white-throated sparrow, white-winged crossbill, winter wren, yellow-bellied sapsucker, yellow-rumped warbler, blackburnian warbler, blackpoll warbler, bohemian waxwing, boreal chickadee, brown creeper, Cape May warbler, cedar waxwing, dark-eyed junco, downy woodpecker, hairy woodpecker, Harris's sparrow, hermit thrush, hoary redpoll, American robin, American three-toed woodpecker, American tree sparrow, bald eagle, barred owl, bay-breasted warbler, black-backed woodpecker, black-throated green warbler
Ovenbird	Migratory Songbird	Breed in closed-canopy forests, particularly deciduous and mixed deciduous-coniferous woods. They avoid wet or swampy areas (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015).	Deciduous Mixedwood	Common snapping turtle, American kestrel, bald eagle, Brewer's blackbird, killdeer, magnolia warbler, osprey, orange-crowned warbler, hoary bat, little brown bat, racoon, alder flycatcher, American crow, American goldfinch, American redstart, lapland longspur, Le conte's sparrow, least flycatcher, long-eared owl, merlin, Nashville warbler, Northern flicker, Northern goshawk, Philadelphia vireo, pileated woodpecker, pine grosbeak, pine siskin, purple finch, red-eyed vireo, red-necked phalarope, red-tailed hawk, rough-legged hawk, ruby-crowned kinglet, savannah sparrow, sharp-shinned hawk, sharp-

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
				tailed grouse, Smith's longspur, snow bunting, snowy owl, song sparrow, Tennessee warbler, turkey vulture, vesper sparrow, white-crowned sparrow, white-throated sparrow, willow ptarmigan, winter wren, yellow-bellied sapsucker, yellow-rumped warbler, blackburnian warbler, blackpoll warbler, bohemian waxwing, boreal chickadee, broad-winged hawk, cedar waxwing, clay-colored sparrow, cliff sparrow, dark-eyed junco, downy woodpecker, Eastern wood-pewee, fox sparrow, gray-cheeked thrush, great gray owl, hairy woodpecker, Harris's sparrow, hermit thrush, hoary redpoll, house sparrow, American robin, American three-toed woodpecker, American tree sparrow, barred owl, black-and-white warbler, black-capped chickadee, house mouse, Eastern heather vole
Palm warbler	Migratory Songbird	Breed in bogs, open boreal coniferous forest, and partly open situations with scattered trees and heavy undergrowth, usually near water (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015).	Wetland Coniferous	Boreal chorus frog, Northern spring peeper, Northern waterthrush, sharp tailed grouse, spruce grouse, yellow-rumped warbler, ermine, fisher, Alder flycatcher, American bittern, American black duck, American goldfinch, American redstart, least sandpiper, lesser scaup, lesser yellowlegs, long-eared owl, merlin, olive-sided flycatcher, pine siskin, purple finch, red-breasted merganser, red-tailed hawk, red-throated loon, ring-necked duck, rose-breasted grosbeak, rough-legged hawk, golden-crowned kinglet, rusty blackbird, tree swallow, white-throated sparrow, common nighthawk, common yellowthroat, American white pelican, American wigeon, Baird's sandpiper, bald eagle, barred owl, red-sided garter snake
Yellow-Bellied flycatcher	Migratory Songbird	Breed in boreal coniferous forests and peatlands. Nests in cool, moist forests, bogs, swamps, and muskegs (Kunke and Watkins, 1999; Manitoba Avian Research Committee, 2003; Cornell Lab of Ornithology, 2015).	Wetland Coniferous	American goldfinch, American tree sparrow, black-capped chickadee, blue jay, Canada warbler, chipping sparrow, clay-coloured sparrow, Connecticut warbler, Eastern kingbird, Eastern wood-pewee, golden-winged warbler, gray catbird, great crested flycatcher, great horned owl, Lincoln's sparrow, long-eared owl, northern saw-whet owl, northern waterthrush, red-eyed vireo, ruffed grouse, song sparrow, yellow warbler, American beaver, ermine,

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
				fisher, masked shrew, meadow vole, American mink, northern river otter, pygmy shrew, silver-haired bat, star-nosed mole, American water shrew, alder flycatcher, American bittern, American black duck, American kestrel, American redstart, least sandpiper, lesser scaup, lesser yellowlegs, Northern water thrush, pine siskin, purple finch, red-breasted merganser, red-tailed hawk, red-throated loon, rose breasted grosbeak, rough-legged hawk, golden-crowned kinglet, rusty blackbird, semipalmated plover, Swainsons' thrush, tree swallow, white-throated sparrow, blue-winged teal, bufflehead, common merganser, common yellowthroat, great blue heron, American white pelican, American wigeon, Baird's sandpiper, bald eagle, barred owl, black tern, red-sided garter snake
AMPHIBIANS and REPTILES				
Spring peeper	Amphibian	Associated with a wide range of wet habitats: characteristic of temporary woodland ponds. Peepers reach their highest density in brushy secondary growth or cutover woodlands. They apparently cannot withstand extensive urbanization (Nature North, 2017).	Wetland Mixedwood Shrubland	Wood frog, boreal chorus frog, Northern leopard frog, sandhill crane, alder flycatcher, American tree sparrow, Canada goose, Wilson's snipe, Connecticut warbler, great horned owl, horned grebe, mallard, marsh wren, northern saw-whet owl, Northern shoveler, Northern waterthrush, olive-sided flycatcher, red-winged blackbird, ring-necked duck, rusty blackbird, short-eared owl, sora, swamp sparrow, yellow rail, yellow-headed blackbird, American beaver, masked shrew, American mink, muskrat, southern bog lemming, star-nosed mole, American water shrew, American black duck, American golden plover, American goldfinch, American kestrel, American pipit, American redstart, killdeer, lapland longspur, Le conte's sparrow, lesser scaup, lesser yellowlegs, Lincoln's sparrow, long-eared owl, Northern hawk owl, orange-crowned warbler, Philadelphia vireo, pileated woodpecker, pine siskin, purple finch, red-necked phalarope, red-tailed hawk, red-throated loon, ring-billed gull, rose-breasted grosbeak, golden-crowned kinglet, ruddy turnstone, savannah sparrow, semipalmated plover, sharp-shinned hawk, snow

VCs	Group	Habitat Preference*	Wildlife Habitat	Species-Habitat Associations
				bunting, snowy owl, Tennessee warbler, tree swallow, turkey vulture, vesper sparrow, white-crowned sparrow, white-throated sparrow, willow ptarmigan, Wilson's warbler, winter wren, yellow-bellied sapsucker, yellow-rumped warbler, blackburnian warbler, blackpoll warbler, boreal chickadee, broad-winged hawk, brown creeper, cedar waxwing, clay-colored sparrow, cliff sparrow, common nighthawk, dark-eyed junco, downy woodpecker, Eastern phoebe, Eastern wood-pewee, gray-cheeked thrush, Hairy woodpecker, Harris's sparrow, Hermit thrush, Hoary redpoll, house sparrow, American robin, American tree sparrow, American white pelican, American wigeon, Baird's sandpiper, barn swallow, barred owl, belted kingfisher, red-sided garter snake

APPENDIX F: ALCES

Indicators		
Footprint Types		
Airstrips	Rail Abandoned	Small Pits - Gravel sites, dugouts
Developed Land	Rail Active	Town City
Industrial - Includes Processing Plants, Refineries, Electrical Facilities, Penitentiary, Military Base, lagoons, waste sites, landfills	Recreation	Tracks - Curlines, Seismic lines, recreational trails, fencelines (the 20k data indicates trails and tracks but does not associate any of the features as recreational. Seismic and cutline data is not available or does not exist)
Mineral Mines	Roads Major	Transmission Line
Peat Mines	Roads Minor - Non-paved Roads, agricultural roads, wellsite, access roads	Water Management Structure
Pipelines	Rural Residential - acreages and farmyards	Wellsites
Landscape Types		
Barren Land Undifferentiated	Deciduous Sparse	Wetland Herb
Bryoids	Grassland	Wetland Shrub
Conifer Dense	Mixedwood Forest	Wetland Treed
Conifer Sparse	Shrub Land	Wetland Undifferentiated
Deciduous Dense	Undefined Landcover	
Water and Wetlands		
Canal	Marine	Rivers Small
Dugouts	Reservoir	Water Undifferentiated
Lakes	Rivers Large	
Manitoba - Geology and Soils		
Soil Development Class - Black Chernozemic	Soil Development Class - Mesisol	Surficial Geology - Fine Grained (Glacio) Lacustrine

Indicators		
Soil Development Class - Black Solonetzic	Soil Development Class - Not Applicable	Surficial Geology - Fine Grained (Glacio) Marine
Soil Development Class - Brunisolic Static Cryosolic	Soil Development Class - Organic Cryosolic	Surficial Geology - Glaciofluvial Complex
Soil Development Class - Dark Gray Chernozemic or Dark Gray Luvisolic	Soil Development Class - Orthic Turbic Cryosolic	Surficial Geology - Glaciofluvial Plain
Soil Development Class - Dystric Brunisolic	Soil Development Class - Regosolic	Surficial Geology - Marine Mud
Soil Development Class - Eutric Brunisolic	Soil Development Class - Turbic Cryosolic	Surficial Geology - Marine Sand
Soil Development Class - Fibrisol	Surficial Geology - Alluvial Deposits	Surficial Geology - Organic Deposits
Soil Development Class - Gleysolic	Surficial Geology - Coarse Grained (Glacio) Lacustrine	Surficial Geology - Till Blanket
Soil Development Class - Gleysolic Turbic Cryosolic	Surficial Geology - Coarse Grained (Glacio) Marine	Surficial Geology - Till Veneer
Soil Development Class - Gray Luvisolic	Surficial Geology - Eolian Deposits	Surficial Geology - Undivided

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APPENDIX G: FURBEARER AERIAL MULTISPECIES SURVEY DATA

Table G-1: Furbearer Aerial Multispecies Survey Data Collected Within RAA, from 2012 to 2016

		2012			2014			2015			2016			Total		
Species	**Scientific name**	**Tracks**	**Animals**	**Total**	**Tracks**	**Animals**	**Total**	**Tracks**	**Animals**	**Total**	**Tracks**	**Animals**	**Total**	**Tracks**	**Animals**	**Tracks + Animals**
Snowshoe Hare	*Lepus americanus*	464	0	464	120	0	120	60	0	60	173	0	173	817	0	817
Marten*	*Martes americana*	353	0	353	53	0	53	61	0	61	344	0	344	811	0	811
Otter	*Lontra canadensis*	139	0	139	37	0	37	27	0	27	130	0	130	333	0	333
Beaver (lodge, dams)*		N/A	N/A	N/A	0	131	131	4	73	77	0	41	41	4	4	249
Wolf	*Canis lupus*	12	3	15	5	0	5	11	0	11	192	0	192	220	3	223
Lynx	*Lynx canadensis*	21	0	21	23	0	23	3	0	3	205	0	205	252	0	252
Fox	*Vulpes vulpes*	2	0	2	0	0	0	0	0	0	132	0	132	134	0	134
Fisher	*Martes pennanti*	8	0	8	1	0	1	2	0	2	51	0	51	62	0	62
Mink	*Neovison vison*	0	0	0	0	0	0	0	0	0	4	0	4	4	0	4
Wolverine	*Gulo gulo*	1	0	1	1	0	1	0	0	0	0	0	0	2	0	2

* VC species

APPENDIX H: TRAIL CAMERA DATA

Table H-1: Trail camera trap events for wolf by season in the P6 LAA and RAA, March 1, 2016 to March 31, 2017

Study Area	Number of Camera Trap Events by Season				
	Spring	Summer	Autumn	Winter	Total
LAA	47.4% (9)	36.8% (7)	15.8% (3)	0% (0)	19
RAA	40.9% (9)	40.9% (9)	13.6% (3)	4.5% (1)	22

Table H-2: Number of hexes with trail camera trap events for wolf in the P6 LAA and RAA, March 1, 2016 to March 31, 2017

Study Area	Hexes with Cameras	Number of Hexes with Camera Trap Events by Season			
		Spring	Summer	Autumn	Winter
LAA	48	6.3% (3)	6.3% (3)	4.2% (2)	0% (0)
RAA	98	3.1% (3)	5.1% (5)	2.0% (2)	1.0% (1)

Table H-3: Trail camera trap events for black bear by season in the P6 LAA and RAA, March 1, 2016 to March 31, 2017

Study Area	Number of Camera Trap Events by Season				
	Spring	Summer	Autumn	Winter	Total
LAA	100% (4)	0% (0)	0% (0)	0% (0)	4
RAA	52.0% (13)	36.0% (9)	8.0% (2)	4.0% (1)	25

Table H-4: Number of hexes with trail camera trap events for black bear P6 LAA and RAA, March 1, 2016 to March 31, 2017

Study Area	Hexes with Cameras	Number of Hexes with Camera Trap Events by Season			
		Spring	Summer	Autumn	Winter
LAA	48	4.2% (2)	0% (0)	0% (0)	0% (0)
RAA	98	4.1% (4)	5.1% (5)	2.0% (2)	1.0% (1)

Table H-5: Number of trail camera trap events and hexes for furbearers in the P6 LAA and RAA, March 1, 2016 to March 31, 2017

Species	Hexes with cameras in the LAA	Hexes with cameras in the RAA	Camera Trap Events - All Seasons in the LAA	Camera Trap Events - All Seasons in the RAA	Number of Hexes with Trap Events
Snowshoe Hare	48	98	10	10	1
Wolverine	48	98	1	2	2
Marten*	48	98	1	1	1
Lynx	48	98	0	1	1
Otter	48	98	0	1	1

* VC species

APPENDIX I: TRAPPER PROGRAM METHODS AND FURBEARER DATA

A local Community Coordinator (CC) was selected by Chief and Council within each P6 community to collaborate and identify active trapper participants, coordinate meetings and workshops, assist with the collection of field results, liaise between trappers and the Chief and Council, and review draft reports and mapping. The CC, with the advice of the Chief and Council, selected trappers within their communities based on the geographic location of their RTL with respect to the P6 ASR Project and the RTL recent harvest history, and willingness to participate in the program. Compliance with humane trapping standards and use of approved humane trapping equipment was outlined as a critical component of participation in the TP. In return for their participation, trappers were paid a daily honorarium. Table H-1 shows the RTLs within the RAA that were used to assist with trapper selection. Of note, there are a total of 51 RTLs which occur fully or partially within the RAA, but only a small number (i.e. 4) were sampled by participating trappers in 2016 - 2017 (Table I-2).

Table I-1: Registered traplines within the RAA potentially used in trapper selection

District	Section Name	RTLs
Northern RTL District	Oxford House	52, 54, 55, 64
	God’s Lake	2,3, 4, 5, 6, 8, 9, 10 and 12

Table I-2: Registered traplines sampled in the RAA in the 2016-2017 season

District	Section Name	RTLs
Northern RTL District	Oxford House	54,64
	God’s Lake	2,3

Participating trappers were asked to be involved in several activities such as trapper journal recordings, track/sign surveys, and scat and hair sample collection for stable isotope analysis (SIA). At the beginning of the trapping season, trappers were provided a trapper kit which included a digital pocket camera, SD memory card, hand-held GPS unit, extra batteries, USB cord, instruction manuals, laminated maps of their RTL (ortho or topo), labelled sample bags, trapper journal, pencils and sharpener, and permanent markers within a waterproof, hard-shell case.

The trapper journal was used to record trapping catches and observations (i.e. furbearer activity, tracks, and signs including scat) along their RTLs during the trapping season. Trapper journal data collected included the date, weather description, type of traps or snares used, what species and sex was caught, what type of samples were collected, location, and/or any other wildlife observations/tracks. A comment section also detailed any other significant observations made during the visits to the traplines. Completed journals were returned to Joro at the end of the trapping season and reviewed with the trapper (or the

CC) for clarification. The hand-held GPS unit, digital pocket camera, and RTL maps on ArcGIS (ESRI, 2012) were used to record locations of traps and furbearer observations.

The trapper survey was designed to gain insights into trapper perspectives and knowledge regarding furbearer abundance and distribution in the RAA. Survey materials were distributed to trappers at the beginning of the trapping season and collected once trapping activities ended in approximately in mid-February (at the end of marten season). To augment information respecting wolf/prey relationships within the RAA, trappers were requested to collect hair samples from wolves, any wolf/bear feces, as well as hair or fecal samples of other prey species (smaller furbearers) along their traplines. Table I-3 demonstrates all harvest data collected by individual trappers.

Table I-3: Trapper Program Results

RTL #	Section	DATE	Waypoint	Trap	Trap type	sample number	TEMP °C	Snow Depth	Snowing	Raining	Cloudy	Sunny	Species	Sex	hair/scat
2	God’s Lake		003	2	120	1	-27	n/a	no	no	no	yes	marten	male	Hair
2	God’s Lake		4	3	120	12	0	n/a	no	no	yes	yes	marten	male	Hair
2	God’s Lake	Jan 28,2017	5	4	330	22	-20	n/a	no	no	yes	no	marten	male	Hair
2	God’s Lake	Jan 26,2017	6	5	120	20	-10	n/a	no	no	no	yes	marten	female	Hair
2	God’s Lake		10	9	120	19	0	n/a	no	yes	yes	no	marten	male	Hair
2	God’s Lake		13	12		2	-27	n/a	no	no	yes	yes	marten	female	Hair
2	God’s Lake		20	19		3	-19	1"	yes	no	yes	no	marten	male	Hair
2	God’s Lake		25	24	120	9	-26		no	no	no	yes	marten	n/a	Hair
2	God’s Lake		25	24	120	10	-26		no	no	no	yes	marten	n/a	Scat
2	God’s Lake	Feb 19,2017	25	24	120	25	-8		no	no	yes	no	marten	female	Hair
2	God’s Lake	Jan 20 2017	39	37	120	13	-3		no	no	yes	no	marten	male	Hair
2	God’s Lake	Jan 20 2017	39	37	120	14	-3		no	no	yes	no	marten	male	Hair
2	God’s Lake		48	46		5	-31		no	no	no	yes	marten	male	Hair
2	God’s Lake		49	47	120	15	-3		no	no	yes	yes	marten	male	Hair
2	God’s Lake		50	48	120	6	-31		no	no	yes	no	marten	male	Hair
2	God’s Lake	Feb 19,2017	52	50	120	26	-8		no	no	yes	no	marten	male	Hair

RTL #	Section	DATE	Waypoint	Trap	Trap type	sample number	TEMP °C	Snow Depth	Snowing	Raining	Cloudy	Sunny	Species	Sex	hair/scat
2	God's Lake		54	52	120	7	-31		no	no	yes	no	marten	male	Hair
2	God's Lake	Jan 20,2017	54	52	120	16	-3		no	no	yes	no	marten	male	Hair
2	God's Lake		057	55	120	8	-31		NO	no	no	yes	marten	female	Hair
2	God's Lake	Jan 22,2017	57	55	120	18	0		no	yes	yes	no	marten	male	Hair
2	God's Lake		57	55	120	27	-8		no	no	yes	no	fisher	female	Hair
2	God's Lake		58	56	120	11	-7	1"	no	no	no	yes	marten	female	Hair
2	God's Lake	Jan 20,2017	66	60	120	17	-3		no	no	yes	no	fisher	female	Hair
2	God's Lake	Feb 6,2017	66	60	120	23	-34		no	no	no	yes	marten	female	Hair
2	God's Lake	Feb 12,2017	66	60	120	24	-15		no	no	yes	yes	marten	female	Hair
2	God's Lake		67	61		4	-19	1"	yes	no	yes	no	marten	male	hair
2	God's Lake	Jan 26,2017	72	64	120	21	-10		no	no	no	yes	marten	female	Hair
54	Oxford House	Feb 1,2017	003	trap									marten	male	Hair
54	Oxford House	Jan 7,2017	005	trap									marten	male	Hair
54	Oxford House	Jan 21,2017	5	trap									marten	male	Hair
54	Oxford House	Jan 2,2017	011	trap									otter	male	Hair
54	Oxford House	Dec 31,2016	11	trap									marten	female	Hair
54	Oxford House	Dec 31,2016	11	trap									otter	female	Hair

RTL #	Section	DATE	Waypoint	Trap	Trap type	sample number	TEMP °C	Snow Depth	Snowing	Raining	Cloudy	Sunny	Species	Sex	hair/scat
54	Oxford House	Jan 16,2017	016	trap									otter	male	Hair
54	Oxford House	Jan 3,2017	017	trap									otter	female	Hair
54	Oxford House	Feb 17,2017	018	trap									marten	male	Hair
54	Oxford House	Jan 2,2017	019	trap									beaver	n/a	Hair
54	Oxford House	Feb 17,2017	020	trap									beaver	n/a	Hair
54	Oxford House	Feb 1,2017	20	trap									beaver	n/a	Hair
54	Oxford House	Jan 21,2017	021	trap									marten	male	Hair
54	Oxford House	Jan 25,2017	21	trap									marten	male	Hair
54	Oxford House	Feb 17,2017	024	trap									otter	female	Hair
54	Oxford House	Feb 7,2017	24	trap									otter	male	Hair
54	Oxford House	Feb 17,2017	026	trap									marten	male	Hair
54	Oxford House	Jan 11,2017	26	trap									otter	male	Hair
54	Oxford House	Jan 21,2017	029	trap									marten	male	Hair
54	Oxford House	Feb 17,2017	031	trap									marten	male	Hair
54	Oxford House	Jan 21,2017	31	trap									marten	male	Hair
54	Oxford House	Jan 25,2017	032	trap									marten	male	Hair
54	Oxford House	Jan 16,2017	035	trap									marten	male	Hair

RTL #	Section	DATE	Waypoint	Trap	Trap type	sample number	TEMP °C	Snow Depth	Snowing	Raining	Cloudy	Sunny	Species	Sex	hair/scat
54	Oxford House	Dec 31,2016	036	trap									marten	female	Hair
54	Oxford House	Jan 25,2017	36	trap									marten	male	Hair
54	Oxford House	Dec 28,2016	037	trap									otter	male	Hair
54	Oxford House	Feb 17,2017	078	trap									mink	female	hair
54	Oxford House	Feb 17,2017	080	trap									beaver	n/a	Hair
54	Oxford House	Feb 17,2017	80	trap									beaver	n/a	Hair
54	Oxford House	Feb 1,2017	047	trap									marten	female	Hair
54	Oxford House	Jan 16,2017	050	trap									marten	male	Hair
54	Oxford House	Feb 17,2017	051	trap									marten	male	Hair
54	Oxford House	Jan 25,2017	51	trap									Skunk	N/a	Hair
54	Oxford House	Jan 21,2017	51	trap									marten	male	Hair
54	Oxford House	Jan 21,2017	052	trap									marten	male	Hair
54	Oxford House	Jan 21,2017	053	trap									marten	female	Hair
54	Oxford House	Feb 17,2017	055	trap									muskrat	female	Hair
54	Oxford House	Jan 25,2017	55	trap									otter	male	Hair
64	Oxford House	Feb 4,2017	251	trap									marten	n/a	Hair
64	Oxford House	Feb 4,2017	253	trap									otter	n/a	Hair

RTL #	Section	DATE	Waypoint	Trap	Trap type	sample number	TEMP °C	Snow Depth	Snowing	Raining	Cloudy	Sunny	Species	Sex	hair/scat
64	Oxford House	Jan 29,2017	123	trap									marten	n/a	Hair
64	Oxford House	Jan 06,2017	124	trap									marten	n/a	Hair
64	Oxford House	Jan 11,2017	165	trap									marten	n/a	Hair
64	Oxford House	Jan 20,2017	200	trap									marten	n/a	Hair
64	Oxford House	Jan 19,2017	200	trap									otter	male	Hair
64	Oxford House	Jan 20,2017	211	trap									marten	n/a	Hait
64	Oxford House	Jan 20,2017	213	trap									marten	n/a	Hair
64	Oxford House	Jan 21,2017	221	trap									marten	n/a	Hair
64	Oxford House	Jan 15,2017	230	trap									otter	n/a	Hair
64	Oxford House	Jan 28,2017	235	trap									otter	n/a	Hair
64	Oxford House	Jan 19,2017	243	trap									otter	n/a	Hair
64	Oxford House	Jan 28,2017	243	trap									marten	n/a	Hair
64	Oxford House	Dec 29,2017	019	trap	snare	4	-26	10''	no	no	no	yes	Lynx	male	hair/meat
64	Oxford House	Dec 29,2017	020	trap	120	10	-26	10''	no	no	no	yes	Fisher	male	hair/meat
64	Oxford House	Jan 19,2017	022	trap									marten	n/a	hair
64	Oxford House	Dec 29,2016	036	trap	120	16	-26	10''	no	no	no	yes	marten	male	hair/meat
64	Oxford House	Dec 29,2017	041	trap	280	1	-24	10''	yes	no	yes	yes/am	otter	female	Hair

RTL #	Section	DATE	Waypoint	Trap	Trap type	sample number	TEMP °C	Snow Depth	Snowing	Raining	Cloudy	Sunny	Species	Sex	hair/scat
64	Oxford House		41	trap	280	13	-24	10"	yes	no	yes	yes/am	otter	female	Hair
64	Oxford House	Dec 29,2016	043	trap	120	43	-26	10"	no	no	no	yes	marten	male	hair/meat
64	Oxford House	Feb 5,2017	047	trap									marten	n/a	Hair
64	Oxford House	Feb 12,2017	47	trap									lynx	n/a	Hair
64	Oxford House	Feb 12,2017	47	trap									otter	n/a	Hair
64	Oxford House	Jan 29,2017	247	trap									otter	n/a	Hair
64	Oxford House	Dec 30,2016	049	trap	280	5	-24	10"	yes	no	yes	yes/am	marten	male	Hair
64	Oxford House	Jan 4,2017	49	trap									mink	n/a	Hair
64	Oxford House	Jan 15,2017	058	trap									marten	male	Hair
64	Oxford House	Jan 8,2017	58	trap									marten	n/a	Hair
64	Oxford House	Jan 6,2017	059	trap									marten	n/a	Hair
54	Oxford House	Feb 12,2017	255	trap									marten	n/a	Hair
3	God’s Lake	Dec 27,2016	015	trap		1	-23	5"	no	no	yes	no	marten	male	n/a
3	God’s Lake	Dec 27,2016	010	trap		2	-23	5"	no	no	yes	no	marten	male	n/a
3	God’s Lake	Dec 30,2016		trap		n/a	-20	5"	no	no	yes	no	marten	male	n/a
3	God’s Lake	Jan 15,2017		trap			n/a	8"	yes	no	yes	yes	marten	n/a	n/a
3	God’s Lake	Jan 25 ,2017		trap			-12	1"	no	no	no	yes	marten	n/a	n/a

RTL #	Section	DATE	Waypoint	Trap	Trap type	sample number	TEMP °C	Snow Depth	Snowing	Raining	Cloudy	Sunny	Species	Sex	hair/scat
3	God's Lake	Jan 29,2017		trap			-19	1"	no	no	yes	no	marten	n/a	n/a
3	God's Lake	Jan 29,2017		trap			-19	1"	no	no	yes	no	mink	n/a	n/a
3	God's Lake	Jan 29,2017		trap			-19	1"	no	no	yes	no	rabbit	n/a	n/a
3	God's Lake	Feb 05,2017		trap			-24	1"	no	no	yes	yes	marten	n/a	n/a

APPENDIX J: ARU METHODS AND BIRD DATA

Scoping of Target Species

Determination of the methods to be followed prior to the first deployment of Autonomous Recording Units (ARUs) in March 2016 initially involved the scoping of target species. Information on preferred breeding habitats and mating schedules were identified after determining that the prime focus of ARU studies as being to identify presence/absence of species listed under COSEWIC, SARA, MESEA and MBCDC (Appendix B).

While the field priority was initially focused on SAR, other birds and amphibians were expected to be recorded by ARUs within the suite of habitat types sampled. Spring peeper and northern leopard frogs were amongst the amphibian species targeted through the habitat-based placement of ARUs. The timing and location of ARU deployment assumed that amphibians in the region would initiate vocalizations in late April and early May following snow melt and warming temperatures. Bird vocalizations were sampled at various times and locations based on known breeding cycles of diurnal (e.g., passerines), crepuscular (e.g., common nighthawks), and nocturnal (e.g., owls) species that breed as early as March and as late as late August or September.

A list of bird and amphibian species initially targeted for sampling by ARUs in 2016 is given in Table J-1. While these include species of conservation concern listed under federal and/or provincial legislation, their habitats overlap those of several other species; e.g., mixedwood and coniferous forests sampled in March and April potentially support breeding populations of both great gray owls and boreal owls.

Table J-1: Bird and amphibian species of interest in the P6 RAA

Species (Scientific Name)	Habitat Preference	Mating Call Period (Dates/Times)
BIRDS		
Bank swallow (*Riparia riparia*)	Vertical sandy banks near water (rivers/streams)	Likely N/A; mid-May to mid-August
Barn swallow (*Hirundo rustica*)	Marshy areas with structures for nesting	Mid-May to late Sept; Sunrise-10:30
Barred owl (*Strix varia*)	Mature boreal and riparian forests; mature hardwood-dominated stands, especially in low-lying areas near marsh and rivers	First mild nights in March to June; nocturnal
Canada warbler (*Cardellina canadensis*)	Deciduous or mixed-wood, often on sloping terrain near lake in dense shrubbery	Mid-May to August (June peak); Pre-Sunrise-10:30
Common nighthawk (*Chordeiles minor*)	Forests with extensive rock outcrops, clearings or burns	Early June-mid August; crepuscular late afternoon/evening
Horned grebe (*Podiceps auritus*)	Permanent potholes with vegetation	Likely N/A – Mid-May to Mid-June
Olive-sided flycatcher (*Contopus cooperi*)	Open coniferous forests near edge of bogs/wetlands	June-mid-July; Sunrise-10:00
Rusty blackbird (*Euphagus carolinus*)	Wet areas (e.g., treed muskeg)	Mid-May to mid-July; Sunrise-10:00
Short-eared owl (*Asio flammeus*)	Open areas such as marshes and fens with tall dense vegetation with cover, bog, muskeg, and open boreal forest	Mid-April to late June; nocturnal

Species (Scientific Name)	Habitat Preference	Mating Call Period (Dates/Times)
BIRDS		
Yellow rail (*Coturnicops noveboracensis*)	Wetlands – shallow, grassy marsh or sedge fen; wet sedge meadows where sedge species are selected for and water depth around the nest is 10 cm	Mid-May to August; primarily nocturnal (will call during day)
AMPHIBIANS		
Spring peeper (*Pseudacris crucifer*)	Forested habitat near ponds and other wetlands	Late April and early May, following snow melt and warming temperatures
Northern leopard frog (*Lithobates pipiens*)	Grasslands or forests near lakes, ponds, or other wetlands	Late April and early May, following snow melt and warming temperatures

*See Appendices B and C for definitions on conservation status listing. Sources: Altman and Sallabanks, 2000, Avery 1995, Bookhout and Stenzel 1987, Bookhout 1995, Clark 1975, Conway 1999, Godfrey 1986, Holland and Taylor 2003a,b, Koonz and Taylor 2003, Nature North 2017, Nero and Taylor 2003, Poulin *et al.,* 1996, Taylor 2003.

Site Selection and Temporal Settings

Knowledge respecting species present in the RAA enhances the assessment of potential Project activities to impact specific birds and/or amphibians. Throughout the Project 6 assessment history, ARUs have been deployed within appropriate habitats to ensure the best opportunity for detection of the targeted birds and amphibians; aerial reconnaissance surveys were undertaken to assist in the selection of the most appropriate forest covertypes prior to placement of the ARUs. Key criteria governing the placement of ARUs included:

- All ARUs deployed along/adjacent to proposed road infrastructure
- Habitats were selected using existing habitat information (LCCES)
- Potential sites selected were mapped using LCCES data at a 1:10,000 scale; and
- ARUs were typically set up within or near clearings close to suitable habitat that facilitates deployment and monitoring.

ARUs were securely attached to trees on the edge of a clearing; barbed wire was wrapped around the tree underneath the ARU as a deterrent to black bear destructive curiosity. The seasonal deployment of ARU's was based on known species-specific habitat requirements during the breeding season (Table I-1 and I-2). The periodicity for operation of the recording units was based on an evaluation of the most efficient use of time resources. ARUs were programmed to record for certain peak activity periods when species were most active, e.g., dusk or night for common nighthawks. Recording units were left in place for 2-4 weeks before being moved to another location, this assured increased probability of recording a rare species and correcting for recording times when weather interfered with recordings and animal detection.

The proposed periods for which the ARUs deployed in 2016 recorded various species of birds are outlined in Table J-2. The ARUs were set to record half an hour before sunrise and sunset, recording for 10 minutes each hour for four hours (for a total of four 10-minute recordings). For habitats potentially supporting rare species during the sampling period, a minimum of three ARUs, with a minimum of 4 km of separation between units, were placed in each habitat types interspersed along/near the Project infrastructure sites. Sampling dates in the P6 RAA assured adequate recording coverage of the beginning, middle, and end phases of breeding cycles.

Table J-2: Temporal settings for ARUs deployed in the P6 RAA

Sampling* Period	Temporal Setting	Frequency	Habitat	Focal Species
March 21 - May 27	1900h-0100h	10 min/hr	Moist mixedwood and riparian forests with dense understory; mature hardwood-dominated stands, esp. in low- lying areas near marsh and rivers	Barred owl
April 11 - June 3	1900h-0100h	10 min/hr	Open areas such as marshes and fens with tall dense vegetation with cover. Likely non-breeder (*reduce/avoid sample size*).	Short-eared owl
June 6-20	Incidental with other ARU recordings	10 min/hr	Permanent potholes with vegetation, small ponds, sloughs, and shallow, protected inlets on lakes	Horned grebe
June 6-20	0430h-1000h	10 min/hr	Wet areas (e.g., treed muskeg); bogs, fens, riparian areas	Rusty blackbird
June 6-20	2130h-0500h	10 min/hr	Wetlands – shallow, grassy marsh or sedge fen; wet sedge meadows where sedge species are selected for and water depth around the nest is 10 cm	Yellow rail
June 6-20	0430h-1000h	10 min/hr	Deciduous or mixed-wood with dense and diverse understory, often on sloping terrain near lake	Canada warbler
June 6-20	0430h-1000h	10 min/hr	Deciduous woods, large aspen bluffs, beach ridges, riparian sites and open tall jack pine stands	Eastern Wood-pewee
June 6-20	0430h-1000h	10 min/hr	Open coniferous forests near edge of bogs/wetlands and recently burned stands (standing dead trees)	Olive-sided flycatcher
June 6-20	1800h-2300h	10 min/hr	Forests with extensive rock outcrops, clearings or burns–openings such as gravel pits	Common nighthawk

*Timeframes consider the early spring in 2016 and can be adjusted as spring progresses

To augment the information collected by ARUs, observations of birds and unique or sensitive habitat (e.g., heron rookery or eagle nest) were collected during the ARU deployment phase. This assisted in collecting information on species not readily heard on ARUs but more likely to be seen visually, e.g., waterfowl and waterbirds such as horned grebes.

ARUs were initially deployed within the P6 RAA in different months (i.e. March to June) to assure that other species (listed in Table J-1 and Table J-2) would be potentially recorded if present. Once units were retrieved, the ARU data was collected and new data storage cards were inserted. Recording units were then relocated to new locations along the P6 routes to survey a greater area for the same species. For example, the ARUs used to sample owls and frogs were redeployed in May to assure there was adequate sampling for rare species of migratory neotropical songbirds that potentially breed in the area. ARUs that were used to sample for owls were retained in habitats that would be sampled for other species (e.g., the barred owl breeding sites were in habitats similar to the location of many other neotropical migrants. Redeployment of the owl ARUs to habitats well suited to passerines occupation was done in late May/early June coinciding with breeding season activity.

Sampling Protocol

The intent of the analysis was to determine presence/absence of species. ARUs were set to record during the early, peak, and late phases of the breeding periods for birds and amphibians. The following are some of the key factors considered in the analyses of data generated by the ARUs:

- Prior to listening to recordings, reviewers would listen to the calls of the species in question; and
- Reviewers listened to a minimum of 3-5, 10-minute pre-selected sample units/period (morning, evening, night) to assure that analyses occurred during the:
  - onset of owl breeding (late March/early April), during the middle (late April/early May), and near the end of the recording cycle (late May);
  - onset of amphibian courtship (late April) and throughout the breeding period; and
  - onset of songbird breeding (May) and throughout the breeding cycle (until mid-August).

Table J-3: P6 ARU sampling locations and periods in 2016

Project	Site	Latitude	Longitude	Date Start	Date End	Time Start	Time End	Data	Habitat Type*
P6-1	SM06	54.86742	-94.04983	2016-03-21	2016-04-20	0500, 1730	0700, 2030	Yes	Standing water in marsh, short spruce trees
P6-2	SM06	54.89451	-94.102482	2016-04-20	2016-05-18	0500, 1730	0700, 2030	Yes	Marsh grass, ~1 km from open lake. Surrounded by willow, TM with spruce farther away
P6-3	SM06	54.89451	-94.102482	2016-05-18	2016-06-16	1950	0815	No	
P6-4	SM06	54.85342	-94.390482	2016-06-16	2016-07-07	2030	0800	No	15km west along a large pond/lake, 15m of grass from treeline to creek, edge of treeline is mixed with willow
P6-5	SM06	54.85859	-94.41464	2016-07-07	2016-07-19	2030	0800	No	50% mature spruce-40% TM-10% MW in 0.5 hectare on TM
P6-6	SM06	54.85859	-94.41464	2016-07-19	2016-08-15	1900	1100	Yes	
P6-1	SM07	54.7075	-94.97585	2016-03-21	2016-04-20	0500, 1730	0700, 2030	Yes	Small lake with marshy area, standing dead trees, MW nearby
P6-2	SM07	54.79071	-95.142422	2016-04-20	2016-05-17	0500, 1730	0700, 2030	Yes	On road alignment: Dry upland MW, large poplar trees 30 m tall
P6-1	SM09	54.61548	-94.70279	2016-03-22	2016-04-20	0500, 1730	0700, 2030	Yes	Grassy swamp with standing dead trees, willows, TM, boggy with standing water near small lake
P6-2	SM09	54.59844	-94.677759	2016-04-20	2016-05-16	0500, 1730	0700, 2030	Yes	Road alignment, small marshy area with willows
P6-3	SM09	54.59844	-94.677759	2016-05-16	2016-06-16	1950	0515	No	
P6-4	SM09	54.60544	-94.690866	2016-06-16	2016-07-07	2030	0800	No	Along winter road: no grass on the road peaty hummock, TM on either side; spruce trees are spaced out.
P6-5	SM09	54.61176	-94.697552	2016-07-07	2016-07-19	2030	0800	No	1 hectare (ha) 80% mature spruce, 20% tamarack north of alignment
P6-6	SM09	54.61176	-94.697552	2016-07-19	2016-09-28	350, 1820	1200, 2230	Yes	
P6-1	SM10	54.88281	-95.22083	2016-03-21	2016-04-20	0415, 1800	0715, 2100	Yes	Marshy area near small creek. Surrounded by tall MW
P6-2	SM10	54.87019	-95.233527	2016-04-20	2016-05-16	0300, 1800	0600, 2100	Yes	Clearcut road alignment, tall spruce and poplar
P6-3	SM10	54.87019	-95.233527	2016-05-16	2016-06-16	1950	0815	No	
P6-4	SM10	54.86431	-95.22567	2016-06-16	2016-07-07	2030	0500	Yes	Opening along the proposed road, TM edge, 0.1ha opening with willows and small spruce
P6-5	SM10	54.87757	-95.258227	2016-07-07	2016-07-19	1900	0600	Yes	3 ha opening: 70% tamarack-30% mature spruce south of hydro line

Project	Site	Latitude	Longitude	Date Start	Date End	Time Start	Time End	Data	Habitat Type*
P6-6	SM10	54.87757	-95.258227	2016-07-19	2016-08-11	2000	1030	Yes	
P6-3	SM11	54.89374	-94.227372	2016-05-18	2016-06-16	1950	0815	No	3 ha opening: 70% TM-30% mature spruce south of hydro line
P6-4	SM11	54.89275	-94.202343	2016-06-19	2016-07-02	2030	0800	Yes	Spruce-TM mix along the winter road
P6-5	SM11	54.8732	-94.125998	2016-07-08	2016-07-10	2030	0800	No	Winter road north side of road on black spruce
P6-6	SM11	54.8732	-94.125998	2016-07-19	2016-10-05	1715	1230	Yes	
P6-1	SM13	54.84902	-94.48282	2016-03-21	2016-04-20	0500, 1730	0700, 2030	Yes	Small bog, grassy surrounded by spruce
P6-2	SM13	54.81203	-94.52219	2016-04-20	2016-05-16	0500, 1730	0700, 2030	Yes	Two deciduous stands nearby: small bog, short spruce trees
P6-3	SM13	54.81203	-94.52219	2016-05-16	2016-06-16	1950	0815	No	
P6-4	SM13	54.82782	-94.508197	2016-06-16	2016-07-07	2030	0800	No	Winter road, small spruce intermixed with small clumps of willows
P6-5	SM13	54.83643	-94.484291	2016-07-19	2016-07-20	2030	0800	Yes	70% mature spruce-30% MW
P6-6	SM13	54.83643	-94.484291	2016-07-20	2016-08-11	1930	1100	Yes	
P6-3	SM14	54.88816	-94.164111	2016-05-18	2016-06-16	1950	0815	No	No record
P6-4	SM14	54.88306	-94.151188	2016-06-16	2016-07-07	2030	0800	No	Along winter road: taller spruce to the north with small spruce and TM to the south and willows mixed throughout
P6-5	SM14	54.88577	-94.171495	2016-07-08	2016-07-08	0200	0800	No	1 ha opening: 50% mature spruce-50% TM east side of opening
P6-6	SM14	54.88577	-94.171495	2016-08-07	2016-10-04	1730	1230	Yes	
P6-1	SM15	54.78535	-94.58913	2016-03-21	2016-04-20	0500, 1730	0700, 2030	Yes	Short grass, dead standing spruce, next to large marsh
P6-2	SM15	54.68213	-94.850282	2016-04-20	2016-05-16	0500, 1730	0700, 2030	Yes	Marshy area with dead trees. Grassy next to spruce/TM forest
P6-3	SM15	54.68213	-94.850282	2016-05-16	2016-06-16	1950	0815	No	
P6-4	SM15	54.68483	-94.882681	2016-06-16	2016-07-07	2030	0800	No	On winter road: 20m opening, short grass, spruce to the west and willow on the other side of the road
P6-5	SM15	54.69168	-94.902335	2016-07-08	2016-07-19	2030	0800	No	0.25 ha on TM, cell phone tower to the south: 10% mature spruce-60% tamarack-30% MW
P6-6	SM15	54.69168	-94.902335	2016-07-19	2016-10-05	1730	1230	Yes	
P6-1	SM16	54.56897	-94.57143	2016-03-22	2016-04-20	0500, 1730	0700, 2030	Yes	Grassy marsh with willows near small lake. Beaver lodge and dam 50m away

Project	Site	Latitude	Longitude	Date Start	Date End	Time Start	Time End	Data	Habitat Type*
P6-2	SM16	54.55623	-94.584884	2016-04-20	2016-05-16	0500, 1730	0700, 2030	Yes	In swamp 70m from beaver lodge. Large upland ridges, dry with poplar
P6-3	SM16	54.55623	-94.584884	2016-05-16	2016-06-16	1950	0815	No	
P6-4	SM16	54.55184	-94.571153	2016-06-16	2016-07-07	2030	0800	No	Along winter road: short grass on road with willows all around
P6-5	SM16	54.55942	-94.567564	2016-07-07	2016-07-19	2030	0800	No	0.5 ha water hole surrounded by mature spruce
P6-1	SM18	54.84853	-95.17338	2016-03-21	2016-04-20	0500, 1730	0700, 2030	Yes	Marshy grassy area surrounded by small dry ridges with large spruce trees, MW
P6-2	SM18	54.84067	-95.188263	2016-04-20	2016-05-16	0500, 1730	0700, 2030	Yes	Road crossroad: Large MW forest stand
P6-3	SM18	54.84067	-95.188263	2016-05-16	2016-06-16	1950	0815	No	
P6-4	SM18	54.83161	-95.177001	2016-06-16	2016-07-07	2030	0800	No	Further down road: mixed with TM and spruce, road is grassy
P6-5	SM18	54.81994	-95.137241	2016-07-07	2016-07-19	2030	0800	No	Mature spruce grassy opening 1.5 hectare
P6-6	SM18	54.81994	-95.137241	2016-07-19	2016-08-18	1900	1100	Yes	
P6-1	SM19	54.76307	-94.72947	2016-03-21	2016-04-20	0500, 1730	0700, 2030	Yes	Small grassy bog near large MW upland habitat
P6-2	SM19	54.73235	-94.802118	2016-04-20	2016-05-16	0500, 1730	0700, 2030	Yes	On road alignment: large MW stand
P6-3	SM19	54.73235	-94.802118	2016-05-16	2016-06-16	1950	0815	No	
P6-4	SM19	54.74198	-94.801174	2016-06-16	2016-07-07	2030	0800	No	Spruce on either side: small willows along the edge with short grass on the road, with a pond/swamp to the north
P6-5	SM19	54.75288	-94.782273	2016-07-08	2016-07-19	2030	0800	No	0.5 hectare: 70% mature spruce-30% MW, grassy open area on black spruce tree north side of opening
P6-6	SM19	54.75288	-94.782273	2016-07-19	2016-08-26	1900	1100	Yes	
P6-1	SM21	54.76981	-95.07153	2016-03-21	2016-04-20	0500, 1730	0700, 2030	Yes	In stream bed with lots of grass by very large MW upland area
P6-2	SM21	54.76237	-95.088228	2016-04-20	2016-05-16	0500, 1730	0700, 2030	Yes	On road alignment: upland dry site near a small marsh by large upland MW
P6-3	SM21	54.76237	-95.088228	2016-05-16	2016-06-16	1950	0815	No	
P6-4	SM21	54.75157	-95.065879	2016-06-16	2016-07-07	2030	0800	No	Further down road at a Junction: .1ha opening, short grass, spruce with willow
P6-5	SM21	54.7424	-95.047382	2016-07-07	2016-10-12	2030	0800	No	North side of winter road at 215 km marker
P6-6	SM21	54.7424	-95.047382	2016-07-19	2016-10-05	1730	1230	Yes	

Project	Site	Latitude	Longitude	Date Start	Date End	Time Start	Time End	Data	Habitat Type*
P6-1	SM23	54.89395	-94.25981	2016-03-21	2016-04-20	0420, 1810	0720, 2150	Yes	Small marsh, grassy with willows
P6-2	SM23	54.88602	-94.277192	2016-04-20	2016-05-16	0300, 1900	0600, 2220	Yes	Very grassy, wet, standing dead trees in marsh, small creek
P6-3	SM23	54.88602	-94.277192	2016-05-16	2016-06-16	1950	0815	No	
P6-4	SM23	54.88178	-94.249176	2016-06-16	2016-07-07	2030	0800	No	Along edge of a 2.5 ha pond: there is 10m of grass from the edge of pond to tree line, willows along the edge with spruce and TM
P6-5	SM23	54.88869	-94.270919	2016-07-08	2016-07-19	2030	0800	No	North side of pond on TM
P6-6	SM23	54.88869	-94.270919	2016-07-19	2016-09-02	2000	1130	Yes	
P6-1	SM24	54.6574	-94.86872	2016-03-21	2016-04-20	0500, 1730	0700, 2030	Yes	Marsh surrounded by MW, willows, grass, TM

*TM= Tamarack, MW -= Mixedwood

See Map 56 for ARU deployment locations

Table J-4: ARU bird species heard March 21 - October 12, 2016

Species	SM06			SM07		SM09			SM10					SM11	SM13					SM14	SM15				SM16			SM18				SM19						SM21			SM23				SM24
	1	2	6	1	2	1	2	6	1	3	4	5	6	6	1	2	3	5	6	6	1	2	3	6	1	2	3	1	2	3	6	1	2	3	4	5	6	1	2	6	1	2	3	6	1
Alder flycatcher			√					√		√		√	√					√						√											√										
American Crow		√			√			√			√	√				√	√								√	√			√						√			√	√						
American robin		√					√											√											√	√			√						√						
American Three-toed Woodpecker						√																							√									√							
American tree sparrow		√																																											
Unknown blackbird		√			√																																								
Black-capped Chickadee						√																√						√										√			√				
Blue jay					√											√	√					√	√											√											
Blue-headed vireo																			√																										
Boreal chickadee							√						√	√					√				√																						
Brown creeper																																	√												
Canada goose		√		√	√		√		√	√		√				√	√					√				√			√	√			√					√				√			
Cedar waxwing																													√				√												
Chipping sparrow										√	√	√	√				√	√				√	√	√		√	√						√		√				√	√		√		√	
Common loon		√			√		√	√		√	√			√		√		√	√	√						√	√			√	√		√		√		√		√	√		√		√	
Common nighthawk														√										√											√					√					
Common raven	√	√		√					√	√		√		√	√		√				√	√	√		√	√	√					√	√		√				√		√				√
Common redpoll							√			√			√						√			√				√			√				√	√			√								
Common grackle		√																																											
Connecticut warbler		√			√		√						√									√		√		√			√				√						√						
Dark-eyed junco							√							√																									√	√					
Downy woodpecker																													√																
Unknown duck		√						√																																					
Evening grosbeak													√								√								√																
Gray catbird							√			√																							√												

Species	SM06			SM07		SM09			SM10					SM11	SM13					SM14	SM15				SM16			SM18				SM19						SM21			SM23				SM24
	1	2	6	1	2	1	2	6	1	3	4	5	6	6	1	2	3	5	6	6	1	2	3	6	1	2	3	1	2	3	6	1	2	3	4	5	6	1	2	6	1	2	3	6	1
Gray jay																√			√	√															√					√					
Great gray owl																	√								√																				
Hairy woodpecker							√										√																						√						
Harris's sparrow								√				√						√																											
Hermit thrush			√		√			√		√	√	√		√			√	√	√			√		√		√			√		√		√		√		√		√	√					
Hoary redpoll																												√																	
Le Conte's sparrow		√											√																				√		√										
Lesser yellowlegs		√			√		√						√									√	√			√			√				√												
Lincoln’s sparrow		√			√																																								
Mallard		√						√		√																									√										
Nashville warbler																							√																						
Northern flicker																													√										√			√			
Olive-sided flycatcher								√			√									√				√																				√	
Orange-crowned warbler																																												√	
Ovenbird					√					√		√					√					√				√				√			√		√				√	√					
Pied-billed grebe												√																					√												
Pileated woodpecker					√						√					√					√					√																			
Pine grosbeak						√																										√													
Red crossbill																																						√							
Red-breasted nuthatch		√																																											
Red-winged blackbird		√																																											
Ring-billed gull		√	√									√														√							√												
Ring-necked duck																																										√			
Rose-breasted grosbeak														√				√														√													
Ruby-crowned kinglet		√			√		√			√	√					√	√					√	√			√	√		√	√			√	√					√						
Ruffed grouse										√																		√	√																
Sandhill crane		√			√		√				√	√		√		√			√		√	√				√	√		√	√	√		√		√		√		√			√		√	

Species	SM06			SM07		SM09			SM10					SM11	SM13					SM14	SM15				SM16			SM18				SM19						SM21			SM23				SM24
	1	2	6	1	2	1	2	6	1	3	4	5	6	6	1	2	3	5	6	6	1	2	3	6	1	2	3	1	2	3	6	1	2	3	4	5	6	1	2	6	1	2	3	6	1
Short-eared owl											√											√																							
Sora																											√																		
Spruce grouse																√								√														√				√			
Swainson's thrush																√						√																							
Swamp sparrow		√					√	√		√																							√		√										
Tennessee warbler												√						√																											
Unknown bird		√	√		√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√		√		√	√	√	√	√	√	√		√
White-crowned sparrow										√																√			√				√						√						
White-throated sparrow		√								√	√		√	√					√					√											√		√			√				√	
White-winged crossbill						√																										√													
Wilson's snipe		√	√		√		√	√	√	√	√	√		√		√	√	√			√	√	√	√		√	√	√	√		√		√		√			√	√		√	√			√
Winter wren										√	√												√																						
Unknown woodpecker					√			√			√		√		√	√	√				√	√		√		√		√	√	√		√	√					√	√						
Yellow warbler																														√				√											
Yellow-bellied sapsucker																													√										√						
Yellow-rumped warbler																																												√	

Table J-5: ARU amphibian species heard March 21 - October 12, 2016

Species	ARU: Site Where Species Heard At Least Once																								
	SM6:			SM9:		SM10:				SM11:	SM13:		SM14:	SM15:		SM16:		SM18:		SM19:			SM21:		SM23:
	P6-1	P6-2	P6-6	P6-2	P6-6	P6-3	P6-4	P6-5	P6-6	P6-6	P6-2	P6-3	P6-6	P6-2	P6-6	P6-2	P6-3	P6-2	P6-6	P6-3	P6-4	P6-6	P6-2	P6-2	P6-3
Boreal chorus frog				√	√	√	√			√				√	√				√			√	√	√	
Eastern American toad						√																			
Spring peeper				√		√	√			√		√		√			√			√			√	√	√
Wood frog	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√			√		√	√	√

Table J-6: Data collected during the Manitoba Breeding Bird Atlas surveys, 2014

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
Alder Flycatcher	**20**	**22**	**42**
15UA57	3		3
15UA58	2		2
15UA76	1		1
15UA85	3		3
15UA86	1		1
15UA97	4		4
15VA07	6	14	20
15VA08		1	1
15VA18		7	7
American Crow	**1**	**1**	**2**
15UA59		1	1
15UA85	1		1
American Goldfinch	**1**	**0**	**1**
15UA76	1		1
American Robin	**11**	**26**	**37**
15UA57	1	2	3
15UA58	3	2	5
15UA59		1	1
15UA76	1	9	10
15UA85	3	1	4
15UA86		6	6
15UA95		2	2
15UA97	3		3
15VA07		3	3
Bald Eagle	**1**	**2**	**3**
15UA57		1	1
15UA76		1	1
15VA07	1		1
Bay-breasted Warbler		**1**	**1**
15UA58		1	1
Belted Kingfisher	**1**		**1**
15UA58	1		1
Black-and-white Warbler		**1**	**1**
15UA58		1	1
Black-backed Woodpecker	**2**		**2**
15UA97	2		2
Blackburnian Warbler	**1**		**1**
15UA58	1		1
Black-capped Chickadee	**1**		**1**
15UA58	1		1
Blackpoll Warbler	**1**		**1**
15UA97	1		1
Blue-headed Vireo	**11**		**11**
15UA58	5		5
15UA85	1		1
15UA86	1		1

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
15UA97	3		3
15VA07	1		1
Bonaparte's Gull	**8**	**4**	**12**
15UA59		1	1
15UA85	5		5
15UA95		1	1
15VA07	3		3
15VA18		2	2
Boreal Chickadee	**2**	**10**	**12**
15UA57		2	2
15UA58	1		1
15UA76		1	1
15UA85	1	1	2
15UA86		1	1
15UA95		4	4
15UA97		1	1
Brown Creeper	**1**		**1**
15UA86	1		1
Canada Goose	**5**	**20**	**25**
15UA58	5		5
15VA07		20	20
Cedar Waxwing	**5**	**16**	**21**
15UA57		3	3
15UA58		9	9
15UA76		2	2
15UA85	2		2
15UA95		2	2
15UA97	3		3
Chipping Sparrow	**1338**	**89**	**1427**
15UA57	80	12	92
15UA58	12	7	19
15UA59		1	1
15UA67	193	7	200
15UA76	129	8	137
15UA85	86	8	94
15UA86	209	7	216
15UA95	221	7	228
15UA97	8	7	15
15VA07	145	16	161
15VA08		2	2
15VA18	255	7	262
Common Grackle		**3**	**3**
15UA58		3	3
Common Loon	**14**	**7**	**21**
15UA57	2	3	5
15UA58	2		2
15UA76		1	1
15UA97	4		4
15VA07	6	3	9

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
Common Nighthawk	**1**	**2**	**3**
15UA57		1	1
15UA58	1		1
15VA07		1	1
Common Raven	**9**	**8**	**17**
15UA57		2	2
15UA58		1	1
15UA59		1	1
15UA76		1	1
15UA85	1		1
15UA95		1	1
15UA97	6		6
15VA07	2		2
15VA18		2	2
Common Tern		**6**	**6**
15UA57		3	3
15UA59		3	3
Common Yellowthroat	**1**		**1**
15UA76	1		1
Connecticut Warbler	**2**	**3**	**5**
15UA58	1		1
15UA67		1	1
15UA76	1		1
15VA07		1	1
15VA08		1	1
Dark-eyed Junco	**39**	**65**	**104**
15UA57	2	4	6
15UA58	6	7	13
15UA67		7	7
15UA76	4	6	10
15UA85	4		4
15UA86		7	7
15UA95		4	4
15UA97	16	7	23
15VA07	7	15	22
15VA08		1	1
15VA18		7	7
Eastern Kingbird	**1**		**1**
15UA58	1		1
Forster's Tern	**3**		**3**
15UA97	3		3
Fox Sparrow	**16**	**25**	**41**
15UA57		1	1
15UA76	1		1
15UA85	4		4
15UA86		7	7
15UA97	10	7	17
15VA07	1	3	4
15VA18		7	7

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
Gray Jay	**38**	**6**	**44**
15UA57	4	3	7
15UA58	15		15
15UA76	5	2	7
15UA85	4		4
15UA86	3		3
15UA97	3		3
15VA07	4		4
15VA08		1	1
Great Gray Owl	**2**	**2**	**4**
15UA97	2		2
15VA08		2	2
Greater Yellowlegs	**25**	**6**	**31**
15UA57		1	1
15UA58	1	1	2
15UA76		2	2
15UA86	3		3
15UA97	10		10
15VA07	11	1	12
15VA08		1	1
Hairy Woodpecker		**2**	**2**
15UA76		1	1
15UA97		1	1
Hermit Thrush	**62**	**90**	**152**
15UA57	7	18	25
15UA58	14	7	21
15UA67		7	7
15UA76	6	8	14
15UA85	2		2
15UA86	3	7	10
15UA95		14	14
15UA97	18	7	25
15VA07	12	15	27
15VA18		7	7
Herring Gull	**3**	**3**	**6**
15UA57		1	1
15UA58		1	1
15UA59		1	1
15UA97	2		2
15VA07	1		1
Least Flycatcher	**2**		**2**
15UA57	1		1
15VA07	1		1
Lincoln's Sparrow	**45**	**58**	**103**
15UA57	1		1
15UA58	7	7	14
15UA76	8	8	16
15UA85	4		4
15UA95		14	14

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
15UA97	13	7	20
15VA07	12	14	26
15VA08		1	1
15VA18		7	7
Magnolia Warbler	**10**	**1**	**11**
15UA57	1		1
15UA58	1		1
15UA76	1	1	2
15UA85	2		2
15UA86	2		2
15UA97	3		3
Nashville Warbler	**7**	**1**	**8**
15UA58	2		2
15UA76	2		2
15UA85	2		2
15UA95		1	1
15VA07	1		1
Northern Flicker	**2**	**6**	**8**
15UA58	1		1
15UA59		1	1
15UA76		1	1
15UA97	1	1	2
15VA07		2	2
15VA08		1	1
Northern Harrier	**1**		**1**
15UA85	1		1
Northern Waterthrush	**3**	**2**	**5**
15UA57	2		2
15UA97		1	1
15VA07	1		1
15VA08		1	1
Olive-sided Flycatcher	**4**	**8**	**12**
15UA76	1	1	2
15UA85	1		1
15UA97	2		2
15VA18		7	7
Orange-crowned Warbler	**15**	**21**	**36**
15UA57	2		2
15UA58	1		1
15UA76	3		3
15UA85	2		2
15UA86		7	7
15UA97	6	7	13
15VA07	1	7	8
Osprey		**1**	**1**
15UA57		1	1
Ovenbird	**5**	**13**	**18**
15UA57	1	5	6
15UA58	1		1

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
15UA67		7	7
15UA85		1	1
15UA86	3		3
Palm Warbler	**28**	**51**	**79**
15UA58	3		3
15UA76	1		1
15UA85	5	7	12
15UA86		7	7
15UA95		7	7
15UA97	14	7	21
15VA07	5	16	21
15VA18		7	7
Pied-billed Grebe	**1**		**1**
15UA97	1		1
Pine Siskin	**1**	**1**	**2**
15UA57	1		1
15UA95		1	1
Purple Finch	**1**		**1**
15VA07	1		1
Red-eyed Vireo	**2**	**4**	**6**
15UA58	1		1
15UA59		4	4
15UA97	1		1
Red-tailed Hawk	**2**	**5**	**7**
15UA58	1		1
15UA76		1	1
15UA85		1	1
15UA95		1	1
15UA97	1		1
15VA07		2	2
Ring-billed Gull		**8**	**8**
15UA57		3	3
15UA59		1	1
15UA76		2	2
15VA07		1	1
15VA08		1	1
Ruby-crowned Kinglet	**73**	**86**	**159**
15UA57	7	12	19
15UA58	21	7	28
15UA67		7	7
15UA76	10	8	18
15UA85	8	7	15
15UA86	4	7	11
15UA95		7	7
15UA97	18	7	25
15VA07	5	16	21
15VA08		1	1
15VA18		7	7

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
Rusty Blackbird	**3**	**6**	**9**
15UA58	1		1
15UA76		1	1
15UA85	2	3	5
15UA86		1	1
15VA08		1	1
Sandhill Crane	**5**	**8**	**13**
15UA57		8	8
15UA58	3		3
15UA85	2		2
Solitary Sandpiper	**8**	**9**	**17**
15UA57	1		1
15UA58	2		2
15UA67		1	1
15UA76		6	6
15UA85	3		3
15UA86	1		1
15VA07	1	1	2
15VA08		1	1
Song Sparrow		**3**	**3**
15UA59		2	2
15UA97		1	1
Spruce Grouse	**6**	**30**	**36**
15UA58	6		6
15UA76		8	8
15UA85		9	9
15UA86		1	1
15UA95		1	1
15UA97		10	10
15VA08		1	1
Swainson's Thrush	**9**	**7**	**16**
15UA57	5	7	12
15UA58	2		2
15UA76	1		1
15UA85	1		1
Swamp Sparrow	**13**		**13**
15UA57	1		1
15UA58	4		4
15UA76	2		2
15UA85	3		3
15UA86	1		1
15UA97	1		1
15VA07	1		1
Tennessee Warbler	**55**	**85**	**140**
15UA57	13	15	28
15UA58	23	7	30
15UA59		2	2
15UA67		7	7
15UA76	9	16	25

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
15UA85	1	1	2
15UA86	2	7	9
15UA95		14	14
15UA97	3		3
15VA07	4	7	11
15VA08		2	2
15VA18		7	7
Tree Swallow		**1**	**1**
15UA59		1	1
White-throated Sparrow	**95**	**115**	**210**
15UA57	15	16	31
15UA58	14	7	21
15UA59		1	1
15UA67		7	7
15UA76	14	15	29
15UA85	10	8	18
15UA86	7	14	21
15UA95		14	14
15UA97	23	7	30
15VA07	12	17	29
15VA08		2	2
15VA18		7	7
White-winged Crossbill	**21**	**75**	**96**
15UA57	3		3
15UA58	5		5
15UA67		58	58
15UA76	1	8	9
15UA85		3	3
15UA86		2	2
15UA97	12		12
15VA07		4	4
Wilson's Snipe	**19**	**18**	**37**
15UA57		5	5
15UA58	6		6
15UA76		2	2
15UA85	5	2	7
15UA86	1	1	2
15UA95		1	1
15UA97	7		7
15VA07		4	4
15VA18		3	3
Wilson's Warbler	**5**	**8**	**13**
15UA57	1		1
15UA58	4		4
15UA86		1	1
15VA18		7	7
Winter Wren	**7**	**9**	**16**
15UA57	5	7	12
15UA58	1		1

Species/Grid Block Observed	Point Count Observations	Incidental Observations	Total Observed
15UA85		1	1
15VA07	1	1	2
Yellow Warbler	**1**	**16**	**17**
15UA59		15	15
15UA97	1		1
15VA18		1	1
Yellow-bellied Flycatcher	**23**	**31**	**54**
15UA57	5	2	7
15UA58	1		1
15UA76	2	8	10
15UA85	2		2
15UA86	4	7	11
15UA95		7	7
15UA97	8	7	15
15VA07	1		1
Yellow-bellied Sapsucker	**4**	**2**	**6**
15UA57	1	2	3
15UA58	1		1
15UA76	1		1
15UA86	1		1
Yellow-rumped Warbler	**36**	**41**	**77**
15UA57	11	10	21
15UA58	5		5
15UA67		7	7
15UA76		1	1
15UA85	7	8	15
15UA86	3	7	10
15UA97	8	7	15
15VA07	2	1	3

See Map 57 for MBBA survey locations

Table J-7: Data collected during the aerial waterfowl survey of Project 6, June 15-17

Waypoint	Species	Number	Activity	Habitat	Comments
090	Sandhill crane	2	LO	pond	
091	Mallard	3	LO	lake/shore	Brood (1P 1S)
092	Common merganser	1	FL	pond	
093	Canada Goose	2	LO	pond	Brood
094	Swainson’s hawk	1	LO	pond	
095	Mallard	1	FL	pond	
096	Ring necked duck	3	SW	bog/marsh	1P 1S
097	Mallard	1	SW	bog/marsh	
098	Unknown diver	1	SW	bog/marsh	
098	Common merganser	1	SW	bog/marsh	
099	Green winged teal	2	FL	bog/marsh	
099	Ring necked duck	1	FL	bog/marsh	
101	Common merganser	1	FL	lake/shore	
101	Ring necked duck	4	FL	lake/shore	
101	Common merganser	1	FL	lake/shore	
102	Wilsons snipe	1	FL	bog/marsh	
103	Mallard	1	FL	bog/marsh	
104	Sandhill crane	1	FL	pond	
105	Mallard	2	FL	lake/shore	1P
106	Mallard	1	FL	lake/shore	
107	Sandhill crane	1	LO	lake/shore	
108	Swan	6	SW	lake/shore	Unknown white; Brood (4 off spring)
109	Common merganser	2	SW	lake/shore	
110	Common merganser	2	SW	lake/shore	
111	Loon	1	NE	lake/shore	
112	Mallard	1	FL	lake/shore	
113	Bald eagle	3	FL	lake/shore	
114	Sandhill crane	2	Lo	pond	1P
115	Scaup	2	SW	pond	1P
115	Sandhill crane	2	LO	pond	1P
116	Sandhill crane	1	LO	pond	
117	Scaup	2	FL	pond	
118	Ring necked duck	1	SW	pond	
119	Bufflehead	5	SW	pond	
120	Mallard	2	FL	lake/shore	
121	Bald eagle	2	FL	lake/shore	
122	Common merganser	1	SW	lake/shore	
123	Loon	1	SW	lake/shore	
124	Sandhill crane	2	LO	pond	
125	Golden eagle	1	FL	lake/shore	
126	Mallard	1	FL	lake/shore	
127	Ring necked duck	3	SW	lake/shore	
128	Common merganser	1	SW	lake/shore	
129	Mallard	1	FL	pond	
129	Ring necked duck	1	SW	pond	
130	Mallard	6	FL	pond	
130	Ring necked duck	1	SW	pond	
131	Mallard	1	SW	pond	
132	Sandhill crane	1	FL	bog/marsh	
133	Mallard	2	FL	bog/marsh	1P
134	Ring necked duck	1	SW	bog/marsh	
135	Mallard	1	SW	pond	
136	Scaup	3	SW	pond	
137	Common merganser	3	SW	lake/shore	

Waypoint	Species	Number	Activity	Habitat	Comments
138	Mallard	5	SW	lake/shore	
138	Blue winged Teal	2	SW	lake/shore	
138	Ring necked duck	5	SW	lake/shore	
138	Canada Goose	1	FL	lake/shore	
138	Common merganser	3	SW	lake/shore	
139	Mallard	4	SW	lake/shore	
140	Ring necked duck	2	FL	lake/shore	
141	Common merganser	11	FL	pond	
141	Mallard	1	FL	pond	
141	Mallard	3	FL	pond	
142	Mallard	1	FL	lake/shore	
143	Common merganser	5	SW	lake/shore	
144	Common merganser	5	SW	lake/shore	
145	Bald eagle	1	FL	lake/shore	
146	Common merganser	2	FL	pond	
147	Mallard	1	FL	pond	
147	Blue winged Teal	3	FL	pond	
148	Mallard	1	FL	pond	
149	Ring necked duck	3	FL	pond	
149	Common merganser	3	FL	pond	
150	Common merganser	5	FL	pond	
151	Ring necked duck	4	FL	bog/marsh	
151	Mallard	1	FL	bog/marsh	
152	Blue winged Teal	2	FL	bog/marsh	1P
153	Ring necked duck	2	FL	bog/marsh	1P
154	Mallard	1	FL	bog/marsh	
154	Mallard	2	FL	bog/marsh	
155	Ring necked duck	4	FL	bog/marsh	
156	Ring necked duck	1P	FL	bog/marsh	1P
157	Mallard	4	FL	pond	
158	Ring necked duck	8	FL	bog/marsh	
158	Ring necked duck	2	FL	pond	
158	Mallard	1	FL	pond	
158	Blue winged Teal	3	FL	pond	
159	Ring necked duck	2	FL	bog/marsh	
160	Ring necked duck	1	FL	bog/marsh	
161	Ring necked duck	4	FL	bog/marsh	
162	Swan	2	SW	lake/shore	Unknown white
162	Mallard	1	SW	lake/shore	
163	Scaup	1	SW	lake/shore	
164	Ring necked duck	8	SW	lake/shore	
165	Mallard	1	SW	pond	
165	Scaup	1	SW	pond	
166	Ring necked duck	2	SW	pond	1P
167	Sandhill crane	2	LO	pond	
168	Ring necked duck	7	SW	pond	
169	Blue winged Teal	4	SW	bog/marsh	
169	Scaup	2	SW	bog/marsh	
169	Mallard	2	SW	bog/marsh	
169	Mallard	2	FL	lake/shore	
169	Ring necked duck	3	FL	lake/shore	
169	Canada Goose	8	FL	lake/shore	Brood (3 off spring)
170	Sandhill crane	1	FL	pond	
171	Greater yellow legs	2	FL	bog/marsh	1P
172	Mallard	1	FL	lake/shore	
173	Greater yellow legs	1	SW	lake/shore	

Waypoint	Species	Number	Activity	Habitat	Comments
174	Sandhill crane	2	FL	lake/shore	
174	Unknown	1	SW	lake/shore	Brood
175	Mallard	3	FL	lake/shore	1P 1S
176	Common merganser	2	FL	pond	1P
177	Common merganser	3	FL	lake/shore	
178	Wigeon	1	SW	pond	
179	Bufflehead	1	FL	lake/shore	
180	Mallard	1	FL	pond	
180	Ring necked duck	3	FL	pond	
180	Mallard	4	FL	pond	
180	Greater yellow legs	1	FL	pond	
181	Blue winged Teal	2	FL	pond	
182	End of survey				Day 1
183	Ring necked duck	5	FL	bog/marsh	
184	Canada Goose	1	FL	pond	
184	Sandhill crane	2	FL	pond	
185	Loon	2	SW	pond	
186	Mallard	2	FL	lake/shore	
187	Ring necked duck	1	SW	bog/marsh	
188	Sandhill crane	1	FL	bog/marsh	
189	Loon	1	NE	bog/marsh	
190	Sandhill crane	1	LO	pond	
191	Loon	2	SW	lake/shore	
192	Mallard	2	SW	bog/marsh	
192	Scaup	2	SW	bog/marsh	
193	Ring necked duck	8	SW	lake/shore	
194	Loon	3	SW	bog/marsh	
195	Canada Goose	6	SW	bog/marsh	Brood (4 off spring)
196	Mallard	1	SW	pond	
196	Greater yellow legs	1	LO	pond	
197	Mallard	1	SW	pond	
198	Loon	2	SW	lake/shore	
199	Mallard	2	SW	bog/marsh	1P
199	shore bird (unknown)	1	SW	lake/shore	
199	Greater yellow legs	1	LO	lake/shore	
200	Mallard	1	FL	bog/marsh	
200	Ring necked duck	1	FL	bog/marsh	
201	Ring necked duck	2	SW	bog/marsh	1P
202	Sandhill crane	1	LO	bog/marsh	
203	Ring necked duck	15	SW	bog/marsh	
204	Mallard	2	SW	bog/marsh	1P
204	Ring necked duck	3	SW	bog/marsh	
205	Ring necked duck	5	SW	bog/marsh	
206	Ring necked duck	9	SW	bog/marsh	
206	Mallard	2	SW	bog/marsh	1P
207	Common merganser	2	SW	bog/marsh	
208	Ring necked duck	1	SW	lake/shore	
209	Ring necked duck	5	SW	bog/marsh	
209	Mallard	2	SW	bog/marsh	
210	Green winged teal	1	SW	bog/marsh	
211	Northern pintail	6	SW	pond	
212	Common merganser	2	SW	bog/marsh	
212	Ring necked duck	19	SW	bog/marsh	
213	Northern pintail	5	SW	bog/marsh	
213	Ring necked duck	7	SW	bog/marsh	
213	Green winged teal	2	SW	bog/marsh	

Waypoint	Species	Number	Activity	Habitat	Comments
214	Common merganser	2	SW	bog/marsh	
215	Mallard	1	FL	pond	
216	Sandhill crane	2	LO	bog/marsh	
217	Ring necked duck	2	SW	bog/marsh	1P
218	Ring necked duck	6	SW	pond	
219	Swan	1	SW	pond	Unknown white
220	Scaup	2	SW	pond	1P
221	Bald eagle	1	FL	bog/marsh	
222	Ring necked duck	1	FL	bog/marsh	
223	Bald eagle	1	FL	pond	
224	Ring necked duck	2	SW	pond	
225	Canada Goose	7	SW	pond	Brood (6 off spring)
226	Green winged teal	1	SW	pond	
227	Ring necked duck	5	SW	pond	
228	Bald eagle	2	FL	pond	
228	Greater yellow legs	1	FL	pond	
229	Golden eagle	2	FL	pond	
230	Loon	2	SW	bog/marsh	
231	Mallard	3	FL	bog/marsh	
232	Canada Goose	5	SW	bog/marsh	Brood (3 off spring)
233	Sandhill crane	2	LO	pond	
234	Mallard	3	FL	bog/marsh	
235	Ring necked duck	3	SW	pond	
236	Ring necked duck	1	SW	pond	
236	Mallard	2	SW	pond	1P
237	Ring necked duck	1	SW	pond	
238	Mallard	1	SW	pond	
239	Ring necked duck	1	SW	lake/shore	
240	Loon	2	SW	lake/shore	
241	Canada Goose	1	SW	bog/marsh	
242	Canada Goose	2	SW		
243	Ring necked duck	1	SW	bog/marsh	
244	Ring necked duck	5	SW	bog/marsh	
244	Sandhill crane	1	LO	bog/marsh	
245	Ring necked duck	6	FL	bog/marsh	
246	Greater yellow legs	3	LO	bog/marsh	
247	Canada Goose	9	SW	lake/shore	Brood (4 off spring)
248	Ring necked duck	2	SW	pond	
249	Canada Goose	8	SW	pond	Brood (6 off spring)
250	Canada Goose	6	SW	lake/shore	Brood (4 off spring)
251	Mallard	3	FL	lake/shore	
252	Mallard	2	FL	lake/shore	
253	Common merganser	1	SW	pond	
254	Ring necked duck	6	SW	pond	
255	Ring necked duck	5	SW	pond	
256	Ring necked duck	27	SW	pond	
257	Mallard	1	FL	pond	
258	Sandhill crane	2	LO	pond	
258	Moose	1	Walk	pond	Bull
258	Common merganser	36	SW	pond	
259	Bald eagle	1	FL	lake/shore	
260	Loon	1	SW	pond	
261	Ring necked duck	4	SW	lake/shore	
262	Common merganser	1	SW	lake/shore	
263	Mallard	1	FL	bog/marsh	
264	Mallard	1	FL	bog/marsh	

Waypoint	Species	Number	Activity	Habitat	Comments
265	Ring necked duck	3	SW	bog/marsh	
266	Ring necked duck	5	SW	bog/marsh	
267	Ring necked duck	2	SW	lake/shore	
268	Greater yellow legs	4	LO	bog/marsh	
269	Greater yellow legs	1	LO	bog/marsh	
270	Scaup	2	SW	pond	
271	Bald eagle	1	FL	pond	
272	Canada Goose	2	SW	pond	1P
273	Ring necked duck	6	SW	pond	
274	Loon	1	SW	pond	
274	Canada Goose	2	SW	pond	
275	Loon	1	SW	lake/shore	
276	Ring necked duck	6	SW	bog/marsh	
277	Mallard	1	SW	bog/marsh	
278	Ring necked duck	5	SW	bog/marsh	
279	Mallard	1	SW	bog/marsh	
279	Ring necked duck	2	SW	bog/marsh	1P
280	Common merganser	5	SW	lake/shore	
281	Mallard	2	SW	lake/shore	
281	Ring necked duck	5	SW	lake/shore	
282	Mallard	11	SW	lake/shore	Brood (10 off spring)
283	Ring necked duck	4	SW	bog/marsh	2P
284	Mallard	2	SW	bog/marsh	
285	Greater yellow legs	1	SW	bog/marsh	
285	Common merganser	1	SW	bog/marsh	
285	Ring necked duck	4	SW	bog/marsh	2P
285	Mallard	1	SW	bog/marsh	
285	Scaup	2	SW	bog/marsh	
286	Scaup	2	SW	bog/marsh	
287	Mallard	1	SW	lake/shore	
288	Greater yellow legs	2	LO	bog/marsh	
289	Blue winged Teal	3	SW	bog/marsh	
290	Sandhill crane	2	LO	lake/shore	
291	Mallard	4	FL	lake/shore	
292	Sandhill crane	2	LO	bog/marsh	
292	Greater yellow legs	1	LO	lake/shore	
293	Ring-necked duck	4	FL	bog/marsh	2P
293	Sandhill crane	2	FL	bog/marsh	1P
294	Canada Goose	2	FL	pond	1P
295	Mallard	2	FL	pond	
295	Common merganser	6	FL	lake/shore	
296	Common merganser	26	FL	lake/shore	
297	Bald eagle	6	FL	lake/shore	
298	Sandhill crane	2	FL	pond	
299	Ring necked duck	10	FL	bog/marsh	
300	Mallard	2	FL	lake/shore	1P
301	Bald eagle	1	FL	lake/shore	
302	Bald eagle	2	FL	lake/shore	
303	Common merganser	3	FL	lake/shore	
304	Ring necked duck	2	FL	lake/shore	
305	Loon	1	SW	lake/shore	
306	Bald eagle	1	FL	lake/shore	
307	Loon	1	SW	lake/shore	
308	Loon	5	SW	lake/shore	
309	Ring necked duck	2	SW	lake/shore	1P
310	Common merganser	2	SW	lake/shore	

Waypoint	Species	Number	Activity	Habitat	Comments
311	Ring necked duck	6	SW	lake/shore	
312	Greater yellow legs	1	LO	lake/shore	
312	Bald eagle	1	FL	lake/shore	
313	Greater yellow legs	1	LO	lake/shore	
314	Canada Goose	2	SW	pond	1P
315	Ring necked duck	3	SW	pond	
315	Canada Goose	2	SW	pond	1P

Note: Habitat designators - 2=marsh/bog; 4= pond; 7=lake / lakeshore; FL=Flying, LO=Loafing, ST=Stand (Loafing), SW=Swimming; WA=Walk; P=Pair

Table J-8: Data collected during the aerial waterfowl survey of Project 6, July 16, 2016

Waypoint	Species	Number	Activity	Habitat	Comments
54	Unknown duck	5	SW		1A 4J old brood
55	Sandhill cranes	2	FL		
56	Canada geese	5	SW		1pair 3J
57	Canada geese	12	SW		1Pair 10J
58	Diving ducks	4	SW		1A 3J
59	Canada geese	10	SW		1pair 8j
60	Diving ducks	3	SW		1A 2J
61	Ring-necked duck	7	SW		1A 6J
62	Ring-necked duck	4	SW		
63	Diving Ducks	4	SW		1A 3J
64	Mallard	1	FL		
65	WATER COMMENT				LOW
66	Terns	10			
67	Tundra swans	2	SW		
68	Ring-necked duck	6	SW		1A 5J OLD BROOD
69	Scratch				
70	Common merganser	1	SW		
71	Diving Ducks	6	SW		1A 5J
72	Diving Ducks	4	SW		1A 3J
73	Bald eagle	1			
74	Ring-necked duck	3	SW		
75	Bald eagle	1			
75	Ring-necked duck	7	SW		1A 6J
76	Common merganser	4	SW		
77	Greater yellowlegs	3	FL		
78	Ring-necked duck	30	SW		
79	Caribou	1			bull swimming across the lake
80	Scratch				
81	Common Merganser	1	SW		
82	Mallard	3	SW		
83	Bald eagle	1	FL	river	
84	Duck Brood	5	SW	river	Brood
85	Sandhill cranes	1	FL		
86	Bald eagle	1	FL		
87	Tundra swans	2	SW	lake	
88	Bald eagle	1	FL		FL river
89	brood	5	SW	creek	Brood
90	Ring-necked duck	2	SW	creek	
91	brood	5	SW	creek	duck brood
92	Unknown Duck	1	SW	creek	
93	brood	4	SW	creek	duck brood
94	Canada Geese	10	SW	creek	1pair 8j
95	Bald eagle	1	FL		
96	Loon	1	SW	river	

Waypoint	Species	Number	Activity	Habitat	Comments
97	Mallard	4	SW	lake	
97	Ring-necked duck	30	SW	lake	
98	Sandhill cranes	1	ST	creek	
99	Moose	2			calf cow
100	Mallard	3	SW	lake	
101	Tundra swans	2	SW	lake	
102	Bald eagle	1	FL	lake	
103	Common merganser	1	SW	lake	
104	Scratch				
1	Scratch				
2	Scratch				
3	Scratch				
4	Scratch				
5	Loon	1	SW		
6	Mallard	4			1A 3J
7	Unknown diver	1	SW		
8	Mallard	2			
8	Unknown diver	1	SW		
9	Mallard	3			
9	Unknown diver	4			1A 3J
10	Ring-necked duck	3			
11	Unknown diver	1	FL		
12	Bald eagle	1			
13	Canada geese	8	SW		1pair 6J
14	Ring-necked duck	3	FL		
14	Sandhill crane	2	FL		
14	Loon	2	SW		
15	Loon	2	SW		
16	Ring-necked duck	1	SW		
16	Green-winged teal	4	FL		
17	Ring-necked duck	8	FL		
18	Loon	2	SW		
19	Moose	1	ST		cow
20	Unknown diver	8	SW		
20	Unknown duck	5	SW		brood
21	Unknown duck	3	SW		brood
22	Unknown dabblers	6	FL		
23	Loon	1	SW		
24	Scratch				
25	Loon	1	SW		
26	Loon	1	SW		
27	Loon	3	SW		
28	Bald eagle	1	FL		
29	Mallard	6	SW		1A 5J
30	Bald eagle	1	FL		
31	Ring-necked duck	6	SW		1A 5J

Waypoint	Species	Number	Activity	Habitat	Comments
32	Loon	1	SW		
33	Tundra swan	2	SW		
34	Scratch				
35	Unknown duck	5	SW		brood
36	Unknown duck	4	SW		

Note: Habitat designators - 2=marsh/bog; 4= pond; 7=lake / lakeshore; Water comment=Low water noticed during survey; Scratch = point marked in error; FL=Flying, LO=Loafing, ST=Stand (Loafing), SW=Swimming; WA=Walk; A=Adult; J=Juvenile

Table J-9: Data collected during the aerial reconnaissance survey of Project 6, October 12-14, 2016

Waypoint	Species	Number	Habitat
16	bufflehead/goldeneye	30	marsh/pond
17	bufflehead/goldeneye	350	lake
25	bufflehead/goldeneye	30-40	marsh/pond
26	bufflehead/goldeneye	10	marsh/pond
27	bufflehead/goldeneye	10	lake
28	bufflehead/goldeneye	30	lake
29	bufflehead/goldeneye	10	lake
31	bufflehead/goldeneye	30-40	lake
32	bufflehead/goldeneye	30	lake
34	bufflehead/goldeneye	70-100	lake
36	bufflehead/goldeneye	40-50	lake
42	bufflehead/goldeneye/scoters	20	lake
43	bufflehead/goldeneye	40	lake
44	bufflehead/goldeneye	400-500	lake
45	scoters	130	lake
46	bufflehead/goldeneye	130	lake
49	scoters	120	lake
51	scoters	40	lake
53	bufflehead/goldeneye/ scoters	230-250	lake
54	bufflehead/goldeneye	160-170	lake
55	bufflehead/goldeneye	130	lake
59	bufflehead/goldeneye	20	lake
62	bufflehead/goldeneye	15	lake
66	bufflehead/goldeneye	30	lake

Table J-10: Combined results of ARU, MBBA point count, MBBA incidental, and waterfowl bird observations by species.

Bird Types/Families	ARU	MBBA Incidental Observations	MBBA Point Count Survey	Waterfowl Surveys	Total
Migratory Waterfowl	**442**	**61**	**203**	**959**	**1665**
Anseriformes	**125**	**20**	**22**	**899**	**1066**
Canada Goose	112	20	20	103	255
Common Merganser				144	144
Mallard	9		1	132	142
Northern Pintail				11	11
Red-breasted Merganser			1		1
Ring-necked Duck	1			386	387
Unknown Duck	3			57	60
Wigeon				1	1
Blue-winged Teal				17	17
Bufflehead				6	6
Green-winged Teal				10	10
Scaup spp.				17	17
Swan spp.				9	9
Tundra Swans				6	6
Charadriiformes	**126**	**33**	**165**	**23**	**347**
Greater Yellowlegs		6	63	22	91
Least Sandpiper			1		1
Lesser Yellowlegs	30				30
Solitary Sandpiper		9	41		50
Spotted Sandpiper			1		1
Wilson's Snipe	96	18	59	1	174
Gruiformes	**191**	**8**	**16**	**37**	**252**
Sandhill Crane	190	8	15	37	250
Sora	1				1
Yellow Rail			1		1
Migratory Forest Birds	**767**	**1021**	**2737**		**4525**
Caprimulgiformes	**11**	**2**	**1**		**14**
Common Nighthawk	11	2	1		14
Passeriformes	**578**	**994**	**2549**		**4121**

Bird Types/Families	ARU	MBBA Incidental Observations	MBBA Point Count Survey	Waterfowl Surveys	Total
Alder Flycatcher	30	22	56		108
American Crow	42	1	1		44
American Goldfinch			1		1
American Robin	22	26	54		102
American Tree Sparrow	2				2
Bay-breasted Warbler		1			1
Black-and-white Warbler		1	10		11
Blackburnian Warbler			3		3
Black-capped Chickadee	9		5		14
Blackpoll Warbler			2		2
Blue-headed Vireo	1		54		55
Boreal Chickadee	9	10	14		33
Brown Creeper	3		6		9
Cape May Warbler			1		1
Cedar Waxwing	4	16	14		34
Chipping Sparrow	75	89	184		348
Clay-colored Sparrow			2		2
Common Grackle	2	3	5		10
Common Redpoll	30				30
Common Yellowthroat			8		8
Connecticut Warbler	34	3	12		49
Dark-eyed Junco	3	65	185		253
Eastern Kingbird			1		1
Fox Sparrow		25	51		76
Gray Catbird	4				4
Harris's Sparrow	9				9
Hermit Thrush	65	90	216		371
Hoary Redpoll	1				1
Le Conte's Sparrow	12		2		14
Least Flycatcher			16		16
Lincoln's Sparrow	5	58	133		196
Magnolia Warbler		1	61		62
Nashville Warbler	2	1	27		30

Bird Types/Families	ARU	MBBA Incidental Observations	MBBA Point Count Survey	Waterfowl Surveys	Total
Northern Waterthrush		2	14		16
Olive-sided Flycatcher	13	8	36		57
Orange-crowned Warbler		21	61		82
Ovenbird	18	13	31		62
Palm Warbler		51	135		186
Purple Finch			1		1
Red Crossbill	2				2
Red-breasted Nuthatch	3		1		4
Red-eyed Vireo		4	20		24
Red-winged Blackbird	6		5		11
Rose-breasted Grosbeak	3				3
Ruby-crowned Kinglet	93	86	209		388
Rusty Blackbird		6	13		19
Savannah Sparrow			2		2
Song Sparrow		3	1		4
Swainson's Thrush	3	7	66		76
Swamp Sparrow	15		39		54
Tennessee Warbler	5	85	244		334
Tree Swallow		1			1
White-throated Sparrow	24	115	270		409
White-winged Crossbill	4	75	54		133
Wilson's Warbler		8	19		27
Winter Wren	12	9	30		51
Yellow Warbler	4	16	2		22
Yellow-bellied Flycatcher		31	74		105
Yellow-rumped Warbler		41	98		139
White-crowned Sparrow	7				7
blackbird spp.	2				2
Piciformes	**13**	**8**	**32**		**53**
Northern Flicker	11	6	14		31
Yellow-bellied Sapsucker	2	2	18		22
Migratory Waterbirds and Waterfowl	**70**	**28**	**90**	**51**	**239**

Bird Types/Families	ARU	MBBA Incidental Observations	MBBA Point Count Survey	Waterfowl Surveys	Total
Charadriiformes	**16**	**21**	**38**	**10**	**85**
Bonaparte's Gull		4	32		36
Common Tern		6			6
Forster's Tern			3		3
Herring Gull		3	3		6
Ring-billed Gull	16	8			24
Tern spp.				10	10
Gaviiformes	**48**	**7**	**51**	**41**	**147**
Common Loon	48	7	51	41	147
Passeriformes	**104**	**15**	**143**		**262**
Blue Jay	7				7
Common Raven	79	8	14		101
Evening Grosbeak	8				8
Gray Jay	6	6	123		135
Pine Grosbeak	4				4
Pine Siskin		1	6		7
Piciformes	**61**	**2**	**12**		**75**
American Three-toed Woodpecker	4				4
Black-backed Woodpecker			3		3
Downy Woodpecker	3		2		5
Hairy Woodpecker	6	2	6		14
Pileated Woodpecker	7		1		8
Woodpecker spp.	41				41
Podicipediformes	**6**		**1**		**7**
Pied-billed Grebe	6		1		7
Non-migratory Birds	**12**	**40**	**17**	**37**	**106**
Accipitriformes			**1**		**1**
Northern Harrier			1		1
Coraciiformes			**1**		**1**
Belted Kingfisher			1		1
Falconiformes		**8**	**5**	**37**	**50**
Bald Eagle		2	1	33	36

Bird Types/Families	ARU	MBBA Incidental Observations	MBBA Point Count Survey	Waterfowl Surveys	Total
Golden Eagle				3	3
Merlin			1		1
Osprey		1			1
Red-tailed Hawk		5	3		8
Swainsons Hawk				1	1
Galliformes	**9**	**30**	**8**		**47**
Ruffed Grouse	5		1		6
Spruce Grouse	4	30	7		41
Strigiformes	**3**	**2**	**2**		**7**
Great Gray Owl	1	2	2		5
Short-eared Owl	2				2
Grand Total	**1291**	**1150**	**3047**	**1047**	**6535**

Joro Consultants

APPENDIX K: WILDLIFE ASSESSMENT CRITERIA AND EFFECTS ASSESSMENT TABLES

Table K-1: Description of Standard Wildlife Assessment Criteria and Levels of Potential Environmental Effects

Assessment Criteria	Range of Criteria	Level of Effect and Definition[5]
Direction of Change **(type of effect)**	Neutral or Negligible	No measurable change on the VC.
	Negative	Net loss (adverse or undesirable change) on the VC.
	Positive	Net benefit (or desirable change) on the VC.
Duration **(period of time the effect occurs)**	Short-Term	**Level I** - The potential effect results from short-term events or activities such as the time required to complete a discrete component of construction, maintenance, or rehabilitation activities (i.e., a timeframe of several months up to one year).
	Medium-Term	**Level II** - The potential effect is likely to persist until the completion of construction and rehabilitation activities (i.e., 1 year to 10 years).
	Long-Term	**Level III** -The potential effect is likely to persist beyond the completion of construction and rehabilitation activities into the operations and maintenance phase of the Project (i.e., a timeframe of greater than 10 years).
Magnitude[6] **(degree or intensity of the change)**	Negligible or Low	**Level I** - A change that is not likely to have a definable, detectable or measurable potential effect above baseline (i.e., potential effect is within a normal range of variation) or is below established thresholds of acceptable change (e.g., water quality guideline).
	Moderate	**Level II** – A change that will have a potential measurable effect that can be detected with a well-designed monitoring program; but is only marginally beyond standards/guidelines or established thresholds of acceptable change.
	High	**Level III** – A change that will have potential effects that are easily observed, measured, and described (i.e., readily detectable without a monitoring program) and are well beyond guidelines or established thresholds of acceptable change.
Extent **(Spatial Boundary)**[7]	Project Footprint	**Level I** - The physical space or directly affected area on which Project components or activities are located and/or immediately adjacent area which is within the defined limits of the P6-ASR ROW (i.e., 100 m) and permanent and temporary facilities (e.g., temporary access routes and quarries) within which potential effects are likely to be measurable.
	LAA	**Level II** - Area within which potential Project effects are measurable and extending beyond the Project Footprint to, but not beyond, the LAA.
	RAA	**Level III** - Area beyond the LAA within which most potential indirect effects would occur.
Frequency **(how often the effect occurs)**	Infrequent	**Level I** - The potential effect occurs once or seldom during the life of the Project (e.g., initial clearing of the ROW).
	Sporadic/Intermittent	**Level II** - The potential effect occurs only occasionally and without any predictable pattern during the life of the Project (e.g., blasting at quarries; site-specific construction equipment noise; potential wildlife-vehicle collisions).

5 **Section 7** outlines VC specific definitions for the three-level ranking system.
6 Magnitude is considered species-specific. Refer to Table K-2 to for individual VC criteria definitions for magnitude.
7 Spatial boundaries of the LAA and RAA vary between VC species and are discussed in greater detail in **Section 2.0**.

Assessment Criteria	Range of Criteria	Level of Effect and Definition[5]
	Regular/Continuous	**Level III** – The potential effect occurs at regular and frequent intervals during the Project phase in which they occur or over the life of the Project (e.g., construction traffic; operations traffic).
Reversibility **(the degree of permanence)**	Fully Reversible	**Level I** – Project-specific potential effects are fully reversible.
	Partially Reversible	**Level II** – Project-specific potential effects are partially reversible but over a long period of time (i.e., over eight years).
	Not Reversible	**Level III** - Project-specific potential effects are permanent.
Ecological and Social Context **(resilience of a VC to adapt to changes as a result of the project)**	Low	**Level I** – The VC is not rare or unique and is resilient to imposed change.
	Moderate	**Level II** – The VC is moderately/seasonally fragile and has some capacity to adapt to imposed change.
	High	**Level III** – The VC is a protected/designated species or fragile with low resistance to imposed change or part of a very fragile ecosystem.

Table K-2: Description of VC Magnitude Assessment Criteria and Levels of Potential Environmental Effects

VC	Magnitude (degree or intensity of the change)		
	Negligible or Low	**Moderate**	**High**
Moose	Level I - A change that is not likely to have a definable, detectable or measurable potential effect and considered to occurs at the individual level, not affecting population or habitat availability.	Level II – A change that will have a potential measurable effect on population (i.e., readily detectible with a well-designed monitoring program), and considered to be moderate relative to habitat availability.	Level III – A change that will have potential population effects that are easily observed, measured, and described (i.e., readily detectible with a well-designed monitoring program), and considered to have a major impact on habitat availability.
Caribou	Level I - A change that is not likely to have a definable, detectable or measurable potential effect and considered to occurs at the individual level, not affecting population or habitat availability.	Level II – A change that will have a potential measurable effect on population (i.e., readily detectible with a well-designed monitoring program), and considered to be moderate relative to habitat availability.	Level III – A change that will have potential population effects that are easily observed, measured, and described (i.e., readily detectible with a well-designed monitoring program), and considered to have a major impact on habitat availability.
Birds • Migratory Forest Birds (Palm warbler, Magnolia warbler, Ovenbird, Yellow-bellied flycatcher) • Migratory Raptor (Bald eagle) • Migratory waterfowl (Canada goose, mallard, ring-necked duck) • Non-migratory game Bird (Ruffed grouse)	Level I - A change that is not likely to have a definable, detectable or measurable potential effect and considered to occurs at the individual level, not affecting population or nesting habitat availability.	Level II – A change that will have a potential measurable effect on population (i.e., readily detectible with a well-designed monitoring program), and considered to be moderate relative to nesting habitat availability.	Level III – A change that will have potential population effects that are easily observed, measured, and described (i.e., readily detectible with a well-designed monitoring program), and considered to have a major impact on nesting habitat availability.

VC	Magnitude (degree or intensity of the change) Negligible or Low	Moderate	High
Beaver	Level I - A change that is not likely to have a definable, detectable or measurable potential effect and considered to occurs at the individual level, not affecting population or water flow patterns.	Level II – A change that will have a potential measurable effect on population (i.e., readily detectible with a well-designed monitoring program), and considered to be moderate relative to water flow patterns.	Level III – A change that will have potential population effects that are easily observed, measured, and described (i.e., readily detectible with a well-designed monitoring program), and considered to have a major impact on water flow patterns.
Marten	Level I - A change that is not likely to have a definable, detectable or measurable potential effect and considered to occurs at the individual level, not affecting population or denning habitat availability.	Level II – A change that will have a potential measurable effect on population (i.e., readily detectible with a well-designed monitoring program), and considered to be moderate relative to denning habitat availability.	Level III – A change that will have potential population effects that are easily observed, measured, and described (i.e., readily detectible with a well-designed monitoring program), and considered to have a major impact on denning habitat availability.
Spring peeper	Level I - A change that is not likely to have a definable, detectable or measurable potential effect and considered to occurs at the individual level, not affecting population or breeding habitat availability.	Level II – A change that will have a potential measurable effect on population (i.e., readily detectible with a well-designed monitoring program), and considered to be moderate relative to breeding habitat availability.	Level III – A change that will have potential population effects that are easily observed, measured, and described (i.e., readily detectible with a well-designed monitoring program), and considered to have a major impact on breeding habitat availability.

Table K-3: Caribou Effects Analysis

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Caribou – Boreal Woodland and Eastern Migratory	**Habitat loss/ alteration/ fragmentation**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level II Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Clearing and grubbing of the road and ROW will be avoided during normal parturition times (i.e. May 18 to 28) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife and EP1 – Clearing and Grubbing. • Conduct wildlife habitat features pre-construction surveys and utilize telemetry collar data to identify if calving areas are present. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible. • Limit clearing and construction to designated areas within the Project Footprint and Local Assessment Area (e.g. quarries and borrow pits) as per ES 130.17 – Clearing and Grubbing and EP1 –Clearing and Grubbing. • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level II Magnitude – Level II Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	Effects of the project on habitat loss are minor in nature with proposed mitigation measures providing some protection to mineral licks if discovered as well as minimizing the footprint during construction.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Caribou – Boreal Woodland and Eastern MigratoryMigratory	**Habitat loss/ alteration/ fragmentation**	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level II Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level II	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid parturition times (i.e. May 10 to June 15). • Use existing access routes, trails, or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible. • Decommission temporary access routes, trails and existing winter road not required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	Effects of the project on habitat loss are minor in nature with proposed mitigation measures providing some protection to mineral licks if discovered as well as minimizing the footprint during operation and maintenance.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Caribou – Boreal Woodland and Eastern Migratory	**Sensory Disturbance**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level II Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Stage construction activities (sections) such as clearing, grubbing and construction to limit noise disturbance to defined areas. • Use scheduling to avoid construction ROW clearing and quarry blasting during normal parturition times in habitats known to be high quality caribou calving habitats (i.e. May 18 to 28) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails, or cut lines where feasible and keep new access routes, trails, or cut lines as short and narrow as feasible. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES130.8 – Designated Areas and Access. • Apply feasible noise and dust suppression techniques as per ES130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Nosie Control, EP18 – Dust Suppression Procedures.	Direction – Negative Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level II	Given the overall low density of roads in the project area and absence of other disturbances in the LAA, effects of increased access on sensory disturbance is not expected. The mitigation measures outline also contribute to minimizing this effect during construction.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Caribou – Boreal Woodland and Eastern Migratory	**Sensory Disturbance**	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level II Extent – Level II Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level II	• Undertake ROW (i.e. brushing, clearing or herbicide application), bridge and culvert maintenance activities and operations quarry blasting during fall and winter to the extent feasible to avoid parturition times (i.e. May 18 to 28) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 Clearing and Grubbing and EP14 - Wildlife. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Nosie Control, EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level II	Given the overall low density of roads in the project area and absence of other disturbances in the LAA, effects of increased access on sensory disturbance is not expected. The mitigation measures outline also contribute to minimizing this effect during operation and maintenance.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Caribou – Boreal Woodland and Eastern Migratory	**Increased mortality due to vehicle collisions**	Construction			
		Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas. • Limit vegetation clearing within the right-of-way to the removal of trees and tall shrubs (to maintain line of sight safety requirements). • Restrict access to the ASR corridor to construction personnel as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Design road to optimize line of sight. • Provide information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions. • Install crossing and/or speed reduction signs where necessary (i.e. detected problem areas) to reduce the potential of wildlife-vehicle collisions.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	The residual effect of increased vehicle collisions is considered to be minor and not measurable at the population level.
		Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level II	• Install crossing and/or speed reduction signs where necessary to reduce the potential of wildlife-vehicle collisions. • Avoid using wildlife-attracting road salts.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level II	The residual effect of increased vehicle collisions is considered to be minor and not measurable at the population level.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Caribou – Boreal Woodland and Eastern Migratory	**Increased mortality due to changes in hunting access**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level II Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas • Prohibit hunting by employees and agents of MI and employees, agents and contractors while working on the construction of the road as per ES 130.19 – Wildlife and EP14 – Wildlife. • Prohibit possession of firearms by workers in camps and at work sites to reduce caribou mortality due to hunting during road construction. • Limit road access during construction to reduce hunting opportunities as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Design road designed with no pullouts or parking areas. • Promote stewardship and caribou conservation with construction staff. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negative Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level II	The likelihood of major increased harvest of caribou as a result of the new ASR is not expected as rights based and licensed hunting access during winter currently exists. The overall predicted effects of the project on caribou mortality through increased hunting are minor given the time periods the herd spend in the RAA (winter) and the size of potential harvest relative to the population of the Pen Islands caribou which is estimated at greater than 16,000 (COSEWIC, 2017).

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Operations & Maintenance			
Caribou – Boreal Woodland and Eastern Migratory	**Increased mortality due to changes in hunting access**	Direction – Negative Duration – Level III Magnitude – Level II Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level II	• Prohibit hunting by employees and agents of MI and employees and agents of Contractors while working on the maintenance of the road as per ES 130.19 – Wildlife and EP14 – Wildlife. • Implement access controls at quarry sites during the operation and maintenance phase to limit access and reduce hunting opportunities as per ES 130.6 – General and EP130.8 – Designated Areas and Access. • Liaise with Manitoba Sustainable Development, participate on committees and working groups (e.g., caribou committees), and share wildlife information obtained through monitoring efforts. • Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	The likelihood of major increased harvest of caribou as a result of the new ASR is not expected as rights based and licensed hunting access during winter currently exists. The overall predicted effects of the project on caribou mortality through increased hunting are minor given the time periods the herd spend in the RAA (winter) and the size of potential harvest relative to the population of the Pen Islands caribou which is estimated at greater than 16,000 (COSEWIC, 2017).

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Caribou – Boreal Woodland and Eastern Migratory	**Increased mortality due to changes in predation**	Construction			
		Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning. (This practice will also reduce wolf mobility and subsequent predation risk.)	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level II	Increased predation on caribou in the RAA is not expected to be measurable due to the very low density of linear features, combined with their short duration of occupancy and movement through the RAA.
		Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	Increased predation on caribou in the RAA is not expected to be measurable due to the very low density of linear features, combined with their short duration of occupancy and movement through the RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Caribou – Boreal Woodland and Eastern Migratory	**Introduction of disease from white-tailed deer (i.e., brainworm [P. tenuis], liverfluke)**	Construction			
		Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level III Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level II	• Use existing access routes, trails, or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible. Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level III Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	Potential for increased transmission of parasites including brainworm and liver fluke are not expected and extremely unlikely because project area is well past the northern limit of the white-tailed deer range. Even with climate change, the range of white-tailed deer will be south of project boundaries.
		Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level III Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level II	• Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible. Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level III Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	Potential for increased transmission of parasites including brainworm and liver fluke are not expected and extremely unlikely because project area is well past the northern limit of the white-tailed deer range. Even with climate change, the range of white-tailed deer will be south of project boundaries.

Table K-4: Moose Effects Analysis

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Moose	**Habitat loss/ alteration/ fragmentation**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level II Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Schedule to avoid construction ROW clearing during normal parturition times (i.e. May 10 to June 15) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 Wildlife. • Conduct wildlife habitat features pre-construction surveys to identify if mineral licks are present. Leave a vegetated buffer between sensitive wildlife habitat features as per ES130.17 – Clearing and Grubbing. • Align all-season road to avoid/minimize the loss of habitat (riparian areas, potential aquatic feeding areas, wetlands) where feasible. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 – Disturbance to Stream beds and Stream Banks. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 Clearing and Grubbing. • Retain a vegetated buffer zone in riparian areas between construction activities and lakes, rivers, streams and ponds throughout. construction as per as per ES 130.15 – Working Within or Near Water and EP6 Working Within or Near Fish Bearing Waters. • Design and install equalization culverts. • Maintain existing water flow patterns, levels and wetland hydrologic regimes. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	Habitat modeling illustrates that the amount of habitat being removed is minimal and will not affect habitat availability in the LAA or RAA. Due to the remote nature of this area and the inherently low densities of linear features in the RAA (below identified thresholds), effects of fragmentation are very low within the RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Moose	**Habitat loss/ alteration/ fragmentation**	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level II Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level II	• Maintain a vegetated buffer zone between construction activities and lakes, rivers, streams and ponds throughout operation of the road as per as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters. • Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid parturition times (i.e. May 10 to June 15) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	Habitat modeling illustrates that the amount of habitat being removed is minimal and will not affect habitat availability in the LAA or RAA. Due to the remote nature of this area and the inherently low densities of linear features in the RAA (below identified thresholds), effects of fragmentation are very low within the RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Moose	**Sensory Disturbance**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level II Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas as per ES 130.19 – Wildlife and EP14 – Wildlife. • Schedule to avoid construction ROW clearing and quarry blasting during normal parturition times in habitats known to be high quality moose calving habitats (i.e. May 10 to June15) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails, or cut lines where feasible and keep new access routes, trails, or cut lines as short and narrow as feasible ES 130.15.3.4 Disturbance to Stream Beds and Stream Banks • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Apply feasible noise and dust suppression techniques as per ES 130.11- Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations EP4 – Noise Control and EP18 – Dust suppression Techniques.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level II	Low moose densities combined with low road densities after construction is not expected to result in any measurable effect on the moose population within the RAA. Effects on individual animals would be expected, however at an infrequent rate that would not be measurable.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Moose	**Sensory Disturbance**	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level II Extent – Level II Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level II	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities and operations quarry blasting during fall and winter to the extent feasible to avoid parturition times (i.e. May 10 to June 15) as per ES 130.17 – Clearing and Grubbing and ES 130.19 – Wildlife EP1 – Clearing and Grubbing and EP14 - Wildlife. • Apply feasible noise and dust suppression techniques as per ES 130.11- Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations EP4 – Noise Control and EP18 – Dust suppression Techniques.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level II	Low moose densities combined with low road densities after construction is not expected to result in any measurable effect on the moose population within the RAA. Effects on individual animals would be expected, however at an infrequent rate that would not be measurable.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Moose	Increased mortality due to vehicle collisions	Construction			
		Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas as per ES 130.17 – Clearing and Grubbing and ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Limit vegetation clearing within the right-of-way to the removal of trees and tall shrubs (to maintain line of sight safety requirements). • Restrict access to the ASR corridor to construction personnel as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Design road to optimize line of sight. • Provide information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions. • Install crossing and/or speed reduction signs where necessary (i.e. detected problem areas) to reduce the potential of wildlife-vehicle collisions. • Avoid using wildlife-attracting road salts.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	The potential effects of vehicle collisions on moose are expected to be very low and not measurable due to signage, speed reductions where necessary and no use of road salts.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Operations & Maintenance			
Moose	**Increased mortality due to vehicle collisions**	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level II	• Install crossing and/or speed reduction signs where necessary to reduce the potential of wildlife-vehicle collisions. • Avoid using wildlife-attracting road salts.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level II	The potential effects of vehicle collisions on moose are expected to be very low and not measurable due to signage, speed reductions where necessary and no use of road salts.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Construction			
Moose	**Increased mortality due to changes in hunting access**	Direction – Negative Duration – Level II Magnitude – Level II Extent – Level III Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level II	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas as per ES 130.17 – Clearing and Grubbing and ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Prohibit hunting by employees and agents of MI and employees, agents and contractors while working on the construction of the road as per ES 130.19 – Wildlife and EP14 – Wildlife. • Prohibit possession of firearms by workers in camps and at work sites to reduce moose mortality due to hunting during road construction. • Control road access control during construction to limit access and reduce hunting opportunities as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Design road with no pullouts or parking areas. • Promote stewardship and moose conservation with construction staff. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negative Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	The likelihood of major increased harvest of moose resulting in declining populations in GHA 3 as a result of the new ASR would not result due to the large geographic area. Staging in sections rather than clearing and having access through many sections will significantly reduce access and travel by hunters and allow for better control of hunting across long stretches of the ASR. Moose populations in the RAA are likely to not be impacted, however the degree to which moose numbers in the LAA respond to long-term harvest near the ASR are unknown.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Operations & Maintenance			
Moose	**Increased mortality due to changes in hunting access**	Direction – Negative Duration – Level III Magnitude – Level III Extent – Level III Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level II	• Prohibit hunting by employees and agents of MI and employees and agents of Contractors while working on the maintenance of the road as per ES 130.19 – Wildlife and EP14 - Wildlife. • Implement access controls at quarry sites during the operation and maintenance phase to limit access and reduce hunting opportunities as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Liaise with Manitoba Sustainable Development and participate on committees and working groups (e.g., moose committees) • Share wildlife information obtained through monitoring efforts. • Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access.	Direction – Negative Duration – Level III Magnitude – Level II Extent – Level II Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level II	The likelihood of major increased harvest of moose resulting in declining populations in GHA 3 as a result of the new ASR would not result due to the large geographic area. Moose populations in the RAA are likely to not be impacted, however the degree to which moose numbers in the LAA respond to long-term harvest near the ASR are unknown.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Moose	Increased mortality due to changes in predation	Construction			
		Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, ES21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level II	Increased predation on moose in the RAA is not expected to be measurable due to the very low density of linear features. Mortality due to increased predator mobility are not expected to result in higher than normal rates of predation and are not expected to affect local moose numbers in the LAA or in the RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Moose	Increased mortality due to changes in predation	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	• Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level II	Increased predation on moose in the RAA is not expected to be measurable due to the very low density of linear features. Mortality due to increased predator mobility are not expected to result in higher than normal rates of predation and are not expected to affect local moose numbers in the LAA or in the RAA.
	Introduction of disease from white-tailed deer (i.e., brainworm [P. tenuis], liverfluke)	Construction			
		Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level III Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level II	• Use existing access routes, trails, or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible to minimize edge habitat. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level III Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	Potential for increased transmission of parasites including brainworm and liver fluke are not expected and extremely unlikely because project area is well past the northern limit of the white-tailed deer range. Even with climate change, the range of white-tailed deer will be south of project boundaries.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Moose	**Introduction of disease from white-tailed deer (i.e., brainworm [P. tenuis], liverfluke)**	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level III Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level II	• Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible • Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level III Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	Potential for increased transmission of parasites including brainworm and liver fluke are not expected and extremely unlikely because project area is well past the northern limit of the white-tailed deer range. Even with climate change, the range of white-tailed deer will be south of project boundaries.

Table K-5: Beaver Effects Analysis

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Beaver	**Habitat loss/ alteration / fragmentation from changes in local drainage**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Schedule to avoid construction ROW clearing during normal parturition times (i.e. April to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Conduct wildlife habitat feature pre-construction surveys prior to any clearing to identify if lodges are present. • Lodges and dams found during pre-construction surveys that require removal shall be removed gradually and with authorization with MSD as per ES 130.15.10 – Beaver Dam Removal. • Following standards for MSD protocols for problem beaver. • Align all-season road to avoid wetland habitat including lakes, rivers, streams and ponds or locate a minimum of 100 m from waterbodies except when crossing a watercourse, where feasible as per ES 130.15 – Working Within or Near Water and EP6 – Working Within or Near Fish Bearing Waters. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Maintain a vegetated buffer zone between construction activities and lakes, rivers, streams and ponds throughout operation of the road as per ES 130.15 – Working Within or Near Water and EP6 – Working Within or Near Fish Bearing Waters.	Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Effects of construction on beaver habitat are considered very low due to the small area that will be disturbed and mitigation measures to protect beaver lodges.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Beaver	**Habitat loss/ alteration / fragmentation from changes in local drainage**	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level I	• Maintain a vegetated buffer zone in riparian areas between the cleared ASR ROW and lakes, rivers, streams and ponds throughout operations and maintenance as per ES 130.15 – Working Within or Near Water and EP6 – Working Within or Near Fish Bearing Waters.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Effects of construction on beaver habitat are considered very low due to the small area that will be disturbed and mitigation measures to protect beaver lodges.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Beaver	**Mortality due to project effects**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas. • Limit riparian vegetation clearing within the right-of-way to the removal of trees and tall shrubs (to maintain line of sight safety requirements) beyond road and ditching. • Maintain existing water flow patterns, levels and wetland hydrologic regimes as per ES 130.15.3 – Disturbance to Stream Beds and Stream Banks and design and install equalization culverts. • Retain a vegetated buffer zone in riparian areas between the cleared ASR ROW and lakes, rivers, streams and ponds throughout construction as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters. • Restrict access to the ASR corridor to construction personnel as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Provide information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions. • Dams found during pre-construction surveys that require removal shall be removed gradually, but not in winter and with authorization with MSD as per ES 130.15.10 – Beaver Dam Removal. • Where feasible, problem beaver will be trapped.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level I	With the application of the mitigation measures described, the effect of sensory disturbance and associated potential mortality (such as dam removal) is minimal and will not affect populations in the LAA or near the project footprint.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Beaver	Mortality due to project effects	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level I	• Maintain a vegetated buffer zone in riparian areas between the cleared ASR ROW and lakes, rivers, streams and ponds throughout operations and maintenance as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level I	With the application of the mitigation measures described, the effect of sensory disturbance and associated potential mortality (such as dam removal) is minimal and will not affect populations in the LAA or near the project footprint.

Table K-6: Marten Effects Analysis

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Marten	**Habitat loss/ alteration/ fragmentation**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Avoid clearing and construction of road and ROW during normal denning and parturition times (i.e. late March to April months) as per ES 130.17 – Clearing and Grubbing and ES 130.19 – Wildlife where feasible. • Conduct pre-construction surveys prior to any clearing necessary during denning and parturition periods as described above to identify if denning areas are present. • Denning areas found during pre-construction surveys will be marked and isolated and setbacks from construction activities will be implemented to the extent possible as per ES 130.17 – Clearing and Grubbing. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	The P6 Project will result in a small effect on overall marten habitat (removal/alteration or fragmentation) as the RAA has very low road and linear feature density as described in the moose section. Mitigation described further minimizes habitat loss at the local level and reduces overall potential effects of fragmentation.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Marten	**Habitat loss/ alteration/ fragmentation**	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level I	• Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible. • Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	The P6 Project will result in a small effect on overall marten habitat (removal/alteration or fragmentation) as the RAA has very low road and linear feature density as described in the moose section. Mitigation described further minimizes habitat loss at the local level and reduces overall potential effects of fragmentation.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Marten	**Sensory Disturbance**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas. • Schedule to avoid construction ROW clearing during parturition and rearing period (April - September) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails, or cut lines where feasible and keep new access routes, trails, or cut lines as short and narrow as feasible. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level I	Sensory disturbance effects may be neutral during winter given the pre-existing activity of clearing of rights-of-way associated with the winter roads that have been in use for decades. Also given that a winter road currently exists, additional effects of an all-season road are considered incremental and primarily associated with increased annual use of the road, particularly during the non-winter months.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
	Sensory Disturbance	Operations & Maintenance			
Marten		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level I	• Apply feasible noise and dust suppression techniques as per EP130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level I	Sensory disturbance effects may be neutral during winter given the pre-existing activity of clearing of rights-of-way associated with the winter roads that have been in use for decades. Also given that a winter road currently exists, additional effects of an all-season road are considered incremental and primarily associated with increased annual use of the road, particularly during the non-winter months.

Table K-7: Migratory Raptors Effects Analysis

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Raptor	**Habitat loss/ alteration/ fragmentation**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Schedule to avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. April to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Maintain existing water flow patterns, levels and wetland hydrologic regimes as per ES 130.15.3 – Disturbance to Stream Beds and Stream Banks. • Design and install equalization culverts • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning. • Mitigation and guidelines for eagles will also benefit other species of raptors, if stick nests are discovered during monitoring or other project activities.	Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Timing of clearing and construction, the application of set back and timing restrictions are expected to minimize or eliminate any potential project effects.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Raptors	Habitat loss/ alteration/ fragmentation	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. April to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as ES 130.15.3.4 Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Timing of clearing and construction, the application of set back and timing restrictions are expected to minimize or eliminate any potential project effects.
	Loss of nests, mortality to young	Construction			
		Direction – Negative Duration – Level II Magnitude – Level II Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas. • Schedule to avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. April to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Mitigation and guidelines for eagles will also benefit other species of raptors, if stick nests are discovered during monitoring or other project activities. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as ES 130.15.3.4 Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Timing of clearing and construction, the application of set back and timing restrictions are expected to minimize or eliminate any potential project effects.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Raptors	Loss of nests, mortality to young	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing application), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. April to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters.	Direction –Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Timing of clearing and construction, the application of set back and timing restrictions are expected to minimize or eliminate any potential project effects.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Raptors	**Sensory Disturbance**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas. • Schedule to avoid and/or suspend ROW clearing during the normal breeding and nesting times (i.e. spring months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level I	Timing of clearing and construction, the application of set back and timing restrictions are expected to minimize or eliminate any potential project effects.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Raptors	**Sensory Disturbance**	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities and operations quarry blasting during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. spring months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14– Wildlife. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level I	Timing of clearing and construction, the application of set back and timing restrictions are expected to minimize or eliminate any potential project effects.

Table K-8: Migratory Waterfowl Effects Analysis (including Canada goose, Mallard, Ring-necked duck)

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Waterfowl	**Habitat loss/ alteration/ fragmentation**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 - Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Align all-season road to avoid wetland habitat where feasible. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Maintain existing water flow patterns, levels and wetland hydrologic regimes as per ES 130.15.3 – Disturbance to Stream Beds and Stream Banks. • Design and install equalization culverts • Retain a vegetated buffer zone in riparian areas between construction activities and lakes, rivers, streams and ponds throughout construction as per ES 130.15 – Working Within or Near Water and EP6 – Working Within Or Near Fish Bearing Waters.	Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	The results of habitat modelling for Canada goose, mallard and ringed-neck duck all demonstrate the P6 Project will have a minimal impact on habitat availability within the LAA or RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Waterfowl	**Habitat loss/ alteration/ fragmentation**	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Maintain a vegetated buffer zone in riparian areas between the cleared ASR ROW and lakes, rivers, streams and ponds throughout construction as per as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	The results of habitat modelling for Canada goose, mallard and ringed-neck duck all demonstrate the P6 Project will have a minimal impact on habitat availability within the LAA or RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Waterfowl	**Loss of nests, mortality to young**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Maintain existing water flow patterns, levels and wetland hydrologic regimes as per ES 130.15.3 – Disturbance to Stream Beds and Stream Banks. • Design and install equalization culverts • Retain a vegetated buffer zone in riparian areas between construction activities and lakes, rivers, streams and ponds throughout construction as per as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Based on the timing of clearing and construction restrictions and setbacks from wetlands will result in little to no mortality on nesting waterfowl, eggs or young birds. Project effects are likely not measurable and expected to be negligible.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Operations & Maintenance			
Migratory Waterfowl	**Loss of nests, mortality to young**	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Maintain a vegetated buffer zone in riparian areas between the cleared ASR ROW and lakes, rivers, streams and ponds throughout construction as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters.	Direction –Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Based on the timing of maintenance activites, restrictions and setbacks from wetlands will result in little to no mortality on nesting waterfowl, eggs or young birds. Project effects are likely not measurable and expected to be negligible.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Waterfowl	Sensory Disturbance	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing during the normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level I	Results of habitat modeling illustrate habitat is not limited to areas near the PF and LAA. If displaced due to disturbance, waterfowl are adaptable and will find refuge throughout the LAA and RAA. The mitigation measures described will minimize local effects. Overall there is potential for occasional sensory disturbance near areas being utilized by waterfowl, with potential short term periodic effects of waterfowl movement away from project activities.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Waterfowl	Sensory Disturbance	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities and operations quarry blasting during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, EP130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level I	Results of habitat modeling illustrate habitat is not limited to areas near the PF and LAA. If displaced due to disturbance, waterfowl are adaptable and will find refuge throughout the LAA and RAA. The mitigation measures described will minimize local effects. Overall there is potential for occasional sensory disturbance near areas being utilized by waterfowl, with potential short term periodic effects of waterfowl movement away from project activities.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Waterfowl	Increased mortality due to project infrastructure and vehicle collisions	Construction			
		Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Limit vegetation clearing within the right-of-way to the removal of trees and tall shrubs (to maintain line of sight safety requirements). • Restrict access to the ASR corridor to construction personnel as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Design road to optimize line of sight. • Provide information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Given the low traffic volumes and other mitigations including aquatic and riparian buffers, this effect is not expected to be a measurable impact on local or regional waterfowl populations.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Operations & Maintenance			
Migratory Waterfowl	**Increased mortality due to project infrastructure and vehicle collisions**	Direction –Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Given the low traffic volumes and other mitigations including aquatic and riparian buffers, this effect is not expected to be a measurable impact on local or regional waterfowl populations.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Construction			
Migratory Waterfowl	**Increased mortality due to changes in hunting access**	Direction – Negative Duration – Level II Magnitude – Level II Extent – Level II Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level II	• Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Restrict access to the ASR corridor to construction personnel as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Prohibit hunting by employees and agents of MI and employees, agents and contractors while working on the construction of the road as per ES 130.19 – Wildlife and EP14 – Wildlife. • Prohibit Possession of firearms by workers in camps and at work sites to reduce waterfowl mortality due to hunting during road construction. • Control road access during construction to limit access and reduce hunting opportunities as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Road designed with no pullouts or parking areas. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negative Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	With increased access during the spring and summer staging periods, increased local resource use of waterfowl could potentially occur. However, current access to waterfowl lakes and rivers is restricted and with the presence of the ASR, opportunities for increased harvest and benefit to local resource users are possible. With the availability of habitat throughout the RAA and LAA, any effects on waterfowl related to overharvest are not anticipated and expected to be minor.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Operations & Maintenance			
Migratory Waterfowl	**Increased mortality due to changes in hunting access**	Direction – Negative Duration – Level III Magnitude – Level III Extent – Level II Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level II	• Decommissioning of access trails and roads required for temporary operation and maintenance activities that are near wetlands, rivers and lakes as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negative Duration – Level III Magnitude – Level II Extent – Level II Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level II	With increased access during the spring and summer staging periods, increased local resource use of waterfowl could potentially occur. However, current access to waterfowl lakes and rivers is restricted and with the presence of the ASR, opportunities for increased harvest and benefit to local resource users are possible. With the availability of habitat throughout the RAA and LAA, any effects on waterfowl related to overharvest are not anticipated and expected to be minor.

Table K-9: Non-migratory Upland Game Birds Analysis (including Ruffed Grouse)

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Non-migratory Upland Game Bird	**Habitat loss/ alteration/ fragmentation**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May and June months in particular) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing.	Direction – Positive Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Effects on ruffed grouse habitat are minimal and potentially positive with the creation of roadside habitat and regeneration of deciduous shrubs and trees.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Non-migratory Upland Game Birds	Habitat loss/ alteration/ fragmentation	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Effects on ruffed grouse habitat are minimal and potentially positive with the creation of roadside habitat and regeneration of deciduous shrubs and trees.
	Loss of nests, mortality to young	Construction			
		Direction – Negligible Duration – Level II Magnitude – Level II Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Loss of nests and mortality to upland birds requires the application of the mitigation measures described. If applied, mortality to young and or destruction to nests is likely not measurable and is expected to be negligible.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Non-migratory Upland Game Birds	**Loss of nests, mortality to young**	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to June months) as per ES 130.17 – Clearing and Grubbing and ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Loss of nests and mortality to upland birds requires the application of the mitigation measures described. If applied, mortality to young and or destruction to nests is likely not measurable and is expected to be negligible.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Non-migratory Upland Game Birds	**Sensory Disturbance**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing during the normal breeding and nesting times (i.e. May to June months) as per ES 130.17 – Clearing and Grubbing and ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level I	Given the low density of roads within the LAA and RAA, sensory disturbance is not expected to have any effect on local populations of upland game birds.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Non-migratory Upland Game Birds	Sensory Disturbance	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities and operations quarry blasting during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to June months) as per ES 130.17 – Clearing and Grubbing and ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level I	Given the low density of roads within the LAA and RAA, sensory disturbance is not expected to have any effect on local populations of upland game birds.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Non-migratory Upland Game Birds	**Increased mortality due to project infrastructure and vehicle collisions**	Construction			
		Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Restrict access to the ASR corridor to construction personnel as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Design road to optimize line of sight. • Install road signage regarding speed and identification of wildlife crossing areas. • Provide information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Given the low density of roads within the LAA and RAA, road mortality is not expected to have any effect on local populations of upland game birds.
		Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to June months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Install road signage regarding speed and identification of wildlife crossing areas.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Given the low density of roads within the LAA and RAA, road mortality is not expected to have any effect on local populations of upland game birds.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Construction			
Non-migratory Upland Game Birds	**Increased mortality due to changes in hunting access**	Direction – Negative Duration – Level II Magnitude – Level II Extent – Level II Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level II	• Stage construction activities during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Restrict access to the ASR corridor to construction personnel as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Prohibit hunting by employees and agents of MI and employees, agents and contractors while working on the construction of the road as per ES 130.19 – Wildlife and EP14 - Wildlife. • Prohibit possession of firearms by workers in camps and at work sites to reduce game bird mortality due to hunting during road construction. • Control road access control during construction to limit access and reduce hunting opportunities as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Road designed with no pullouts or parking areas. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negative Duration – Level I Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level II	Habitat conditions near the PF are likely to improve and attract ruffed grouse and would likely benefit local resource users. The remote nature of the RAA in combination with the low density of linear features and access, impacts to populations in the LAA or RAA would not be measurable. The cyclic nature of ruffed grouse populations is likely to result in fluctuating hunting opportunities as populations increase and decline through time, which was verified through local knowledge and resource users participating in the wildlife workshop.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Non-migratory Upland Game Birds	**Increased mortality due to changes in hunting access**	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level III Extent – Level II Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level II	• Decommissioning of access trails and roads required for temporary operation and maintenance activities as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negative Duration – Level III Magnitude – Level II Extent – Level II Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level II	Habitat conditions near the PF are likely to improve and attract ruffed grouse and would likely benefit local resource users. The remote nature of the RAA in combination with the low density of linear features and access, impacts to populations in the LAA or RAA would not be measurable. The cyclic nature of ruffed grouse populations is likely to result in fluctuating hunting opportunities as populations increase and decline through time, which was verified through local knowledge and resource users participating in the wildlife workshop.

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Table K-10: Migratory Forest Birds Effects Analysis (including Palm warbler, Magnolia warbler, Yellow-bellied flycatcher, Ovenbird)

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Forest Birds	**Habitat loss/ alteration/ fragmentation**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level II Extent – Level II Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Maintain existing water flow patterns, levels and wetland hydrologic regimes as per ES 130.15.3 – Disturbance to Stream Beds and Stream Banks. • Design and install equalization culverts. • Decommission temporary access routes, trails and existing winter road required for road construction to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning.	Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Localized low level habitat impacts are anticipated and within the physical ROW, however, habitat availability with the LAA and RAA are abundant. Also, the overall density of linear features and other landscape disturbances is very low. With the mitigation measures implemented, overall effects on habitat and fragmentation would be considered a local effect, but not affecting habitat at the LAA scale.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
		Operations & Maintenance			
Migratory Forest Birds	Habitat loss/ alteration/ fragmentation	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Decommission temporary access routes, trails and existing winter road required for road operations and maintenance to allow for the regeneration of vegetation and to restrict/limit off-road access by vehicles as per ES 130.8 – Designated Areas and Access.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Localized low level habitat impacts are anticipated and within the physical ROW, however, habitat availability with the LAA and RAA are abundant. Also, the overall density of linear features and other landscape disturbances is very low. With the mitigation measures implemented, overall effects on habitat and fragmentation would be considered a local effect, but not affecting habitat at the LAA scale.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Forest Birds	Loss of nests, mortality to young	Construction			
		Direction – Negative Duration – Level II Magnitude – Level II Extent – Level I Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing during normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Based on the timing of clearing and construction restrictions and setbacks from wetlands will result in little to no mortality on nesting birds, eggs or young.
		Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters.	Direction –Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Based on the timing of maintenance activities, restrictions and setbacks from wetlands will result in little to no mortality on nesting birds, eggs or young.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Forest Birds	**Sensory Disturbance**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas. • Avoid and/or suspend ROW clearing and quarry blasting during the normal breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Apply feasible noise and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level I	Majority of sensory disturbance will occur during the non-breeding period (winter) and will be localized to the PF. Mitigation measures proposed to minimize potential effects of sensory disturbance and will result in no measurable effect.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Forest Birds	**Sensory Disturbance**	Operations & Maintenance			
		Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level III Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to July months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Apply noise reduction and dust suppression techniques as per ES 130.11 – Dust and Particulate Control, ES 130.12 – Noise and Noise Limitations, EP4 – Noise Control and EP18 – Dust Suppression Procedures.	Direction –Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level III Reversibility – Level II Eco. & Soci. Con.– Level I	Majority of sensory disturbance will occur during the non-breeding period (winter) and will be localized to the PF. Mitigation measures proposed to minimize potential effects of sensory disturbance and will result in no measurable effect.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Migratory Forest Birds	**Increased mortality due to project infrastructure and vehicle collisions**	Construction			
		Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Stage construction activities (sections) during clearing, grubbing and construction to limit disturbance to defined areas. • No ROW clearing or construction will ocurr during during normal breeding and nesting times (April 1 – September 1), minimize disorientation to breeding birds and territories as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Limit vegetation clearing within the right-of-way to the removal of trees and tall shrubs (to maintain line of sight safety requirements). • Restrict access to the ASR corridor to construction personnel as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Design the road and ROW to optimize line of sight. • Provide information about wildlife awareness to road construction workers to reduce vehicle speeds and the risk of wildlife-vehicle collisions.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Effects related to vehicle mortality are not expected to be measurable due to low traffic volumes and construction restrictions during the breeding and nesting season that may result in disorientation of breeding male territories.
		Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing, clearing or herbicide application), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. May to July months) to minimize disorientation of breeding birds as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Road signage identifying speed reduction and wildlife concentration/crossing areas.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Effects related to vehicle mortality are not expected to be measurable due to low traffic volumes and construction restrictions during the breeding and nesting season that may result in disorientation of breeding male territories.

Table K-11: Spring Peeper Effects Analysis

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Spring Peeper	**Habitat loss/ alteration/ fragmentation**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	• Avoid and/or suspend ROW clearing during normal breeding times (i.e. late April to early May months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 – Wildlife. • Align all-season road to avoid wetland habitat (shallow ponds and forest edges) where feasible. • Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 – Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Maintain existing water flow patterns, levels and wetland hydrologic regimes as per ES 130.15.3 – Disturbance to Stream Beds and Stream Banks • Design and install equalization culverts • Retain a vegetated buffer zone in riparian areas between construction activities and lakes, rivers, streams and ponds throughout construction as per as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters	Direction – Negligible Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level II Eco. & Soci. Con.– Level I	Habitat modeling illustrates the subsequent loss of habitat as a result of the project is minor due to the amount of habitat available within the LAA and RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Spring Peeper	**Habitat loss/ alteration/ fragmentation**	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level I	• Undertake ROW (i.e. brushing and clearing), bridge and culvert maintenance activities during fall and winter to the extent feasible to avoid breeding and nesting times (i.e. late April to early May months) as per ES 130.17 – Clearing and Grubbing, ES 130.19 – Wildlife, EP1 – Clearing and Grubbing and EP14 - Wildlife. • Maintain a vegetated buffer zone in riparian areas between the cleared ASR ROW and lakes, rivers, streams and ponds throughout operations and maintenance as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level I	Habitat modeling illustrates the subsequent loss of habitat as a result of the project is minor due to the amount of habitat available within the LAA and RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Spring Peeper	**Winter mortality from compaction**	Construction			
		Direction – Negative Duration – Level II Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level I	• Use existing access routes, trails or cut lines where feasible and keep new access routes, trails or cut lines as short and narrow as feasible as per ES 130.15.3.4 Disturbance to Stream Beds and Stream Banks and EP6 – Working Within or Near Fish Bearing Waters. • Limit clearing and construction to designated areas within the Project Footprint as per ES 130.17 – Clearing and Grubbing and EP1 – Clearing and Grubbing. • Prohibit equipment and limit access outside the designated cleared area throughout construction as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Retain a vegetated buffer zone in riparian areas between construction activities and lakes, rivers, streams and ponds throughout construction as per as per ES 130.15 – Working Within or Near Water and EP6 Working Within Or Near Fish Bearing Waters.	Direction – Negligible Duration – Level I Magnitude – Level I Extent – Level I Frequency – Level II Reversibility – Level I Eco. & Soci. Con.– Level I	Some local effects may be expected. With mitigation measures employed, mortality will be reduced and considered minor. However, the extent to which mortality would occur is uncertain. Habitat loss as a result of the project is also minimal and will not affect populations within the RAA.

	Nature of Potential Effects	Evaluation (Before Mitigation)	Specific Mitigation Procedures	Evaluation (After Mitigation)	Residual Effect
Spring Peeper	**Winter mortality from compaction**	Operations & Maintenance			
		Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	• Prohibit equipment and limit access outside the designated cleared area throughout operations and maintenance as per ES 130.6 – General and ES 130.8 – Designated Areas and Access. • Maintain a vegetated buffer zone between the cleared ASR ROW and lakes, rivers, streams and ponds throughout operations and maintenance as per ES 130.15 – Working Within or Near Water and EP6 – Working Within Or Near Fish Bearing Waters.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level I Eco. & Soci. Con.– Level I	Some local effects may be expected. With mitigation measures employed, mortality will be reduced and considered minor. However, the extent to which mortality would occur is uncertain. Habitat loss as a result of the project is also minimal and will not affect populations within the RAA.

Table K-12: SOCC Effects Analysis

Biophysical Environmental Component	Nature of Potential Effects	Evaluation (Before Mitigation)	Species Specific Mitigation General mitigation applicable to all SOCC are identified in footnotes	Evaluation (After Mitigation)	Residual Effect
Mammals					
Boreal woodland caribou ** Effects assessment would apply to Eastern Migratory Caribou should they be listed in the future*	Potential effects on population and or habitat on boreal woodland caribou resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• Mitigation measures described for VC caribou apply.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects
Wolverine	Potential effects on population and or habitat on wolverine resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures will apply to wolverine. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SOCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects

Biophysical Environmental Component	Nature of Potential Effects	Evaluation (Before Mitigation)	Species Specific Mitigation General mitigation applicable to all SOCC are identified in footnotes	Evaluation (After Mitigation)	Residual Effect
Little Brown Bat	Potential effects on population and or habitat on little brown bat resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	• Provide construction staff with information on potential bat hibernacula, such as abandon mine shafts if observed during construction. • General guidelines regarding restrictions to clearing in summer provide protection to potential roosting sites. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SOCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects
Forest Birds					
Bank Swallow	Potential effects on population and or habitat on bank swallow resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures will apply to bank swallow. • Identify and avoid vertical and near vertical faces for road routing where possible. • Consider high quality habitat as part of quarry site selection criteria. • Prior to reinstating a quarry or borrow site for maintenance, surveys of the rock or face will be conducted. If bank swallow nests are identified they will not be disturbed during the breeding season. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SOCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects

Biophysical Environmental Component	Nature of Potential Effects	Evaluation (Before Mitigation)	**Species Specific Mitigation** General mitigation applicable to all SOCC are identified in footnotes	Evaluation (After Mitigation)	Residual Effect
Barn Swallow	Potential effects on population and or habitat on barn swallow resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures will apply to barn swallow. • Identify and avoid vertical and near vertical faces, ledges or overhangs for road routing where possible. • Inspect temporary structures prior to removal for presence of nests during the breeding and rearing. If barn swallow nests are identified they will not be disturbed during the breeding season (May-September). • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects
Canada Warbler	Potential effects on population and/or habitat on Canada warbler resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures will apply to Canada warbler. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SOCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects

Biophysical Environmental Component	Nature of Potential Effects	Evaluation (Before Mitigation)	Species Specific Mitigation General mitigation applicable to all SOCC are identified in footnotes	Evaluation (After Mitigation)	Residual Effect
Common Nighthawk	Potential effects on population and or habitat on common nighthawk resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures regarding clearing and construction will apply to common nighthawk. • Prior to reinstating a quarry or borrow site for maintenance, surveys will be conducted. If common nighthawk nests are identified they will not be disturbed during the breeding season (May to September). • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. All SOCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects As common nighthawk selects for open spaces, quarry areas and cleared roadsides may provide additional habitat.
Eastern Wood-pewee	Potential effects on population and or habitat on eastern wood-pewee resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	• The P6 RAA is well outside the published range. • General and specific mitigation measures regarding timing of clearing and construction will apply to eastern wood -peewee. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SOCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects

Biophysical Environmental Component	Nature of Potential Effects	Evaluation (Before Mitigation)	Species Specific Mitigation General mitigation applicable to all SOCC are identified in footnotes	Evaluation (After Mitigation)	Residual Effect
Olive-Sided Flycatcher	Potential effects on population and or habitat on olive-sided flycatcher resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures will apply to olive-sided flycatcher. • General and specific mitigation measures pertaining to wetland, water-crossings (which include adjacent mature forests) clearing specifications will apply to olive-sided flycatcher. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SOCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects As olive-sided flycatcher like mature forest in proximity to forest openings, the clearings/quarries may create habitat.
Peregrine Falcon	Potential effects on population and or habitat on peregrine falcon resulting from construction and operation activities.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	• The P6 RAA is well outside the known breeding range, but may migrate through the region. • Provide construction staff with SOCC handbooks to facilitate identification if present. All SCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects

Biophysical Environmental Component	Nature of Potential Effects	Evaluation (Before Mitigation)	Species Specific Mitigation General mitigation applicable to all SOCC are identified in footnotes	Evaluation (After Mitigation)	Residual Effect
Rusty Blackbird	Potential effects on population and or habitat on rusty blackbird resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures pertaining to wetland and water-crossings and clearing will apply to rusty blackbird. • Provide construction staff with SOCC handbooks to facilitate identification if present. All SCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects
Short-Eared Owl	Potential effects on population and or habitat on short-eared owl resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures pertaining to wetland and water-crossings and clearing will apply to the short-eared owl. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects Open areas may create additional foraging areas for short-eared owls.

Biophysical Environmental Component	Nature of Potential Effects	Evaluation (Before Mitigation)	Species Specific Mitigation General mitigation applicable to all SOCC are identified in footnotes	Evaluation (After Mitigation)	Residual Effect
Waterbirds					
Horned Grebe	Potential effects on population and or habitat on horned grebe resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures pertaining to wetland and water-crossings and maintenance of surface water flows will apply to horned grebe. • Reclaim disturbed areas and encourage natural re-vegetation and slope excavations to promote retention of water for creation of ponds as per ES 130.8 – Designated Areas and Access, EP21 – Winter Road Closure and Reclamation Plan and EP22 – Temporary Site Decommissioning. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. All SOCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects
Yellow Rail	Potential effects on population and or habitat on yellow rail resulting from construction and operation activities.	Direction – Negative Duration – Level III Magnitude – Level I Extent – Level II Frequency – Level II Reversibility – Level III Eco. & Soci. Con.– Level III	• General and specific mitigation measures pertaining to wetland and water-crossings and maintenance of surface water flows will apply to horned grebe. • Reclaim disturbed areas and encourage natural re-vegetation and slope excavations to promote retention of water for creation of ponds. • Provide construction staff with Species of Conservation Concern handbooks to facilitate identification if present. • All SCC observations to be documented and reported.	Direction – Negligible Duration – Level III Magnitude – Level I Extent – Level I Frequency – Level I Reversibility – Level III Eco. & Soci. Con.– Level III	Negligible effects

Notes:

General mitigation applicable to all SOCC:

- Pre-construction survey to identify stick nests and nesting colonies.
- Right-of-way selected to avoid sensitive sites such as raptor nests, multi-generational stick nests and nesting colonies.
- Road routing avoids waterbodies except at crossing locations.
- Clearing activities will occur between September 1 and March 31 (outside breeding season) where feasible; clearing activities restricted near active bird nests or nest cavities.
- Reclaim disturbed areas or encourage natural re-vegetation augmented by native plants and seeds if required; block abandoned access roads and encourage natural re-vegetation; rehabilitation of trails and winter roads to offset habitat loss.
- Use existing disturbed or cleared areas for road right-of-way where practical.
- Existing water flow patterns, water levels and wetland hydrologic regimes will be maintained via ES 130 requirements and design.
- Leave vegetated buffers between road and disturbed areas such as quarries and borrow pits.
- Inspectors and Contract Administrators will receive training and handbooks to identify all potential SOCC that could be encountered - the Environmental Inspector will be advised when encounters occur, and management strategies applied if required.
- Prohibit herbicide application near identified environmentally sensitive sites or beyond road ROW and apply by hand within 30 m of any waterbody.

Additional mitigation measures outlined in:

ES 130.6 General

ES 130.8 Designated Areas and Access

ES 130.9 Materials Handling, Storage and Disposal

ES 130.10 Spills and Remediation and Emergency Response

ES 130.11 Dust and Particulate Control

ES 130.12 Noise and Noise Limitations

ES 130.14 Staff Training and Awareness

ES 130.15 Working Within or Near Water

ES 130.17 Clearing and Grubbing

ES 130.19 Wildlife

ES 130.21 Cement Batch Plan and Concrete Wash-Out Area