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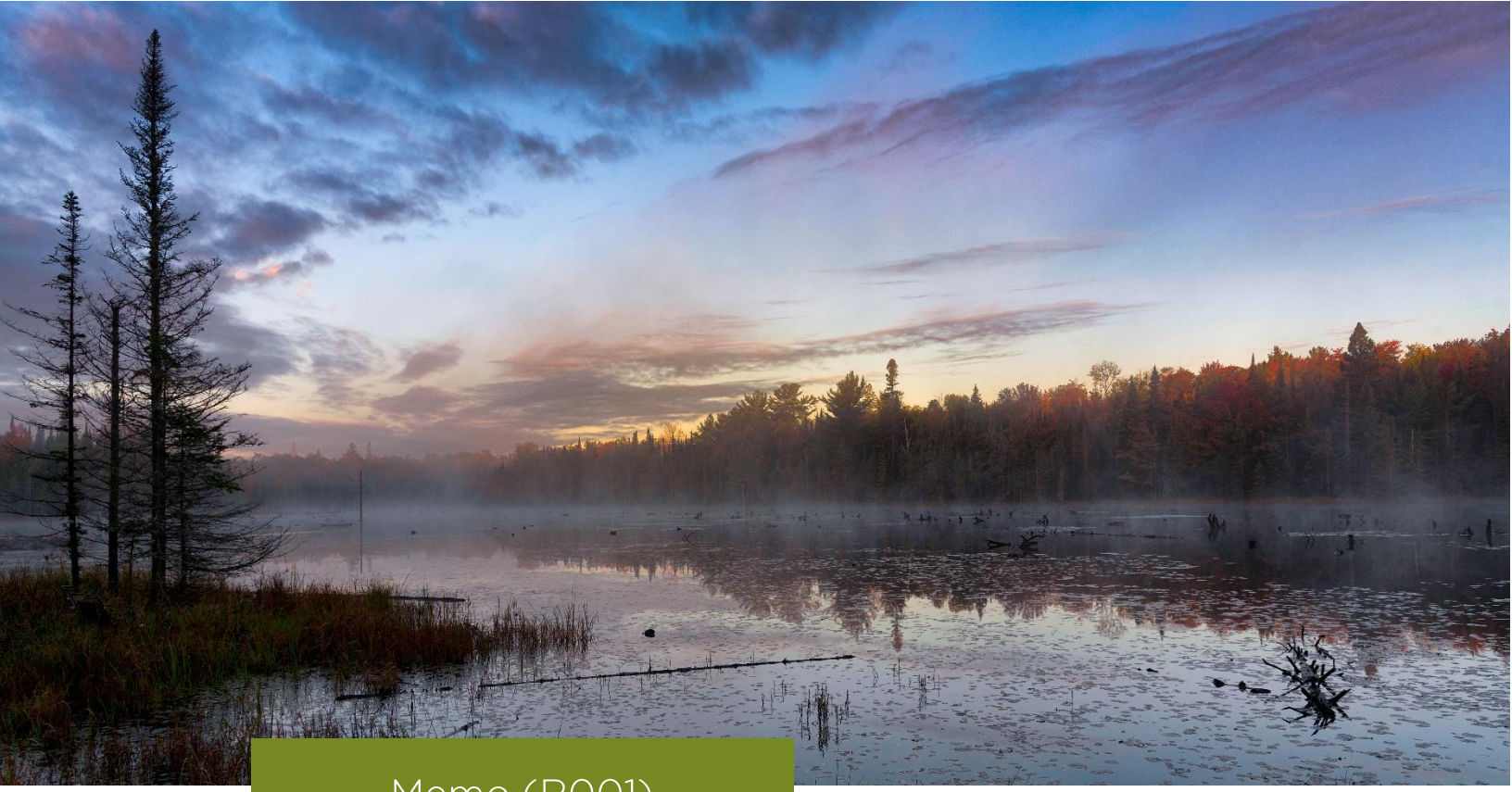

Memo (R001)

File Name: NWMO_BIS_2022_Change Assessment Memo_IG (R001)

BIODIVERSITY IMPACT STUDIES – NORTHWESTERN ONTARIO REGION: 2022 CHANGE ASSESSMENT MEMORANDUM

September 8, 2023

SUBMITTED TO

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R001	8-Sept-2023	Addressed ERG comments with edits in the following sections: Executive Summary, 1.0, 5.1, 5.2, 5.4, 6.0 (Section 6.0 renamed from Avoidance Zones to Setback Area). Added Section 8.0 Next Steps. Also updated text in Table 5-1, Table 5-2, Table 5-3, Table 5-4, Table 5-5, Table 5-6, Table 5-7 and updated Figure 1-1. Added Figures 3-2.	C. Warbington, A. Buckman, C. Chui, A. Hamilton, D. MacKinnon	H. Bears	H. Bears

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EXECUTIVE SUMMARY

The Nuclear Waste Management Organization (NWMO) is responsible for implementing the Adaptive Phased Management (APM) Deep Geological Repository (DGR) (hereafter 'APM Project'), which is Canada's plan for the safe, long-term management of used nuclear fuel, in a manner that protects both people and the environment. The NWMO has retained Zoetica™ to undertake Biodiversity Impact Studies (BIS) for the APM Project at the two remaining potential locations being considered for a DGR and associated infrastructure for the long-term disposal of Canada's used nuclear waste. This document focuses on the WLON-Ignace siting area located within the northwestern Ontario region approximately 40 km west of Ignace and near the First Nation community of the Wabigoon Lake Ojibway Nation (WLON).

The 2022 BIS Change Assessment Memorandum, along with its future iterations, examines potential interactions between the APM Project and biodiversity values (BVs) that could result in changes to those BVs, based on information available at the time of writing (December 2022). The Change Assessment document outlines any known biodiversity sensitivities within and surrounding the AOI based on existing data and data collected as part of Tier 1 studies. The change assessment should not be interpreted as an initial impact assessment (IA). As such, impacts and benefits due to the APM Project and cumulative effects in the surrounding area are not assessed in this document; rather potential project interactions are outlined. Impacts and benefits to biodiversity resulting from the APM Project and cumulative effects will be assessed for extent of significance during the formal IA process. The early information based on successive findings presented in Change Assessment memos will facilitate the timely application of the mitigation hierarchy[1] and flag important potential effects for consideration by communities. The change assessment herein is not meant to replace a formal IA that draws from multiple years of multidisciplinary field data and a formalized project description. The 2022 BIS Change Assessment draws from Tier 1 desk- and field-based studies conducted to date (focused on foundational habitat and species presence information) within relevant BIS study areas: an Area of Interest (AOI) where project infrastructure will be placed, terrestrial and aquatic local study areas (LSAs), and BV-specific regional study areas (RSAs). Biodiversity information was considered alongside the updated Conceptual Site Model (CSM) (CanNorth 2022) to identify potential interactions. This change assessment document outlines all areas within the AOI that need to be considered when designing the APM Project as location of infrastructure within the AOI are not yet finalized. Potential effects outlined within this report are hypothetical as it is assumed that infrastructure could be located anywhere within the AOI. Commonly utilized mitigation measures and best practices to manage potential negative changes to biodiversity are also presented.

A formal IA will be conducted if-and-when community willingness has been achieved and a site has been selected for ongoing investigation, and after the completion of more focused Tier 2 and 3 studies on relevant BVs at that site. The formal IA, conducted following the federal *Impact Assessment Act*, will assess the magnitude and extent of significance of potential changes to BVs that are selected as valued components (VCs), along with relevant cumulative effects based on other activities in the WLON-Ignace siting area.

[1] The Mitigation Hierarchy is a set of guidelines that are nationally and internationally accepted as a best practice and provide a framework to follow a series of mitigation options in the order of avoidance, minimization, restoration, and offset to reduce development impacts and aim to achieve no net loss of biodiversity (BBOP 2012, IFC 2012, CSBI 2015).

Regulatory Considerations and Community Feedback

Zoetica's BIS is designed to comply with regulatory requirements, and with consideration of community concerns and feedback received through engagement conducted to date. Based on these regulatory and community considerations, the following sections summarize baseline information, potential APM Project x biodiversity interactions for BVs that are likely to become VCs for the APM Project IA; namely, species of interest, important wildlife and fish habitats, wetland and riparian areas, and ecosystem functions and services.

Species of Interest

Several types of species of interest were considered during baseline work and the preparation of the 2022 BIS Change Assessment: i) species of conservation concern, ii) species of interest to stakeholders and rights-holders, and iii) invasive species.

Species of conservation concern include federally and provincially listed species at risk (SAR) and provincially rare species and are protected through various federal and provincial regulations. A total of 15 species of conservation concern, including 10 SAR and five provincially rare species, have been detected (or potentially detected) within relevant BIS study areas. Of the species detected, two at-risk bats (little brown myotis, northern myotis), four at-risk birds (eastern whip-poor-will, eastern wood-pewee, common nighthawk, olive-sided flycatcher), two rare plants (Vasey's rush, green arrow arum), and three rare invertebrates (Macoun's arctic, Old World swallowtail, permanent marsh mosquito) have been detected within the AOI. American eel was one of the at-risk species detected through eDNA metabarcoding studies within the BIS study areas (outside of the AOI), but additional studies are needed to confirm its presence.

Species of interest to stakeholders and rights-holders include those that have been mentioned during engagement as important to include in the BIS (see Appendix B in Zoetica's BPPA Report (Zoetica 2021)). Multiple species and groups of interest to stakeholders and rights-holders, including six mammals (moose, black bear, gray wolf, snowshoe hare, northern flying squirrel, and beaver), tree frogs, ducks and geese, grouse, five species of fish (walleye, lake trout, northern pike, white sucker, shiner species), wild rice, and other edible and medicinal plants, were detected within the relevant BIS study areas. All species of interest mentioned by stakeholders and rights-holders during engagement, with the exception of lake trout, were detected within the AOI.

Invasive species are those that are not native to Ontario, or to a part of Ontario, where its introduction or spread threatens the natural environment, human health, or socio-economic values. A total of five invasive species (Spongy Moth, Octagonal tail worm, red earthworm, feral hog, Canada thistle) and five other weedy and introduced vegetation species (meadowtail foxtail, pondwater starwort, purple iris, variable leaf pondweed, mountain ash) were detected within the relevant BIS study areas; however, detections made using eDNA metabarcoding analyses require further validation. Two invasive species were reported in the AOI based on eDNA results.

Potential Project Interactions with Species of Interest

Potential project interactions for species of interest differ among the three groups discussed above. For species of conservation concern and species of interest to stakeholders and rights-holders, APM Project interactions are similar and include:

1. Direct loss of habitat due to clearing of land or infilling of water during construction
2. Indirect habitat loss due to dust, noise, vibrations, and changes in habitat conditions resulting in the loss of functional habitat
3. Direct and indirect mortality related to traffic, collisions with infrastructure, mechanical clearing activities, trampling and injury, spread of disease, reproductive failure, and creation of zones of attraction to areas with higher risk of mortality
4. Impacts to movement due to the creation of barriers, zones of avoidance, or large expanses of cleared habitat
5. Changes to ecosystem function

For invasive species, as well as weedy and introduced plants not considered invasive, APM Project interactions relate to the potential to spread these species through the WLON-Ignace siting area during the APM Project construction and operations phases if no mitigation measures exist to control for their spread. Invasive species have the potential to negatively impact species of conservation concern and those of interest to stakeholders and rights-holders through effect pathways 1-5 as they can modify habitats essential for sustaining naturally occurring biodiversity, cause additional competition for resources, increase predation risk, and can act as a vector in spreading disease to natural populations.

Important Habitat

Several types of important habitats were considered during baseline work and the preparation of the 2022 BIS Change Assessment: candidate Significant Wildlife Habitat (SWH), critical habitat for SAR, and important fish habitat. These habitats are components of the natural heritage features and areas that are protected by Ontario Provincial Policy Statement (PPS) under the *Planning Act* (MMAH 2020). SWH includes seasonal concentration areas, rare vegetation communities, specialized habitat for wildlife, habitat for species of conservation concern, and animal movement corridors. Critical habitat is habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in a federal recovery strategy or action plan for the species. Important fish habitat includes habitat required to fulfill important life history phases of fish species. It includes habitat used for spawning, rearing, overwintering and migration between seasonally important habitats.

Based on desk-based analyses of ecosites and other habitat criteria, Zoetica has identified one confirmed SWH type (Moose Aquatic Feeding Area) and six candidate SWH types within the BV-specific study areas. At this time, there is no known critical habitat occurring in the WLON-Ignace siting area.

Desk-based information collated to date and important fish habitats identified during field-based Tier 1 studies revealed important fish habitats within BIS study areas, including: walleye spawning and nursery areas, lake trout spawning areas, northern pike and muskellunge spawning areas, white sucker spawning areas, and potential overwintering and refuge areas for various species (e.g., deep pools within watercourses). The majority of these important fish habitats were recorded in the RSA, which is thought to be outside the zone of potential influence rom the APM Project. However, potential spawning areas were documented within the aquatic LSA. No potentially important fish habitat has been documented within the AOI.

The primary potential APM Project-related interactions with important habitat include:

1. Direct habitat loss due to land/vegetation clearing and infilling of aquatic habitats during construction

2. Indirect habitat loss due to changes in habitat conditions (e.g., light, noise, vibration)
3. Alterations to habitat resulting in barriers to movement
4. Changes to ecosystem function resulting in degraded quality of habitat (e.g., loss of riparian vegetation/shading leading to increased stream temperatures)

Wetlands and Riparian Areas

Wetlands and riparian areas fulfill a wide range of ecological, hydrological, and biochemical functions and provide unique and specialized habitats for wildlife that depend on these features for various life-history phases and movement and migrations through connected, undisturbed habitat networks. In Ontario, wetlands are considered natural heritage features that require protection and sustainable management. Tier 1 studies within relevant BIS study areas included determining the distribution and prevalence of wetlands and riparian areas through desk-based analyses of ecosites, existing data for Provincially Significant Wetlands (PSWs), and through mapping of various riparian buffer widths around watercourses and waterbodies that should be retained or enhanced to preserve wetland function into the future. The APM Project could potentially interact with wetlands and riparian areas through clearing activities and infilling during construction, or indirectly through the degradation of these habitats from project activities, which could affect the ecological functions that sustain aquatic health and biodiversity.

Ecosystem Function and Services

Ecosystem functions include the physical, chemical, and biological processes within the ecosystem to maintain biodiversity. Ecosystem services are the variety of benefits that nature provides to people, including regulating services (e.g., shading, pollutant removal, regulation of water), provisioning services (e.g., material benefits such as food, water, raw materials, and medicinal resources), and cultural services (e.g., non-material benefits including recreation and metal and physical health). A review of existing desk-based information collected to date as well as feedback received during engagement specific to the BIS revealed several components within the BIS study areas related to providing ecosystem functions and services to biodiversity and humans. These components include Provincial Parks, Conservation Reserves, or Wilderness Areas providing important habitats for sustaining biodiversity, as well as trail networks and important fishing lakes that provide recreational services to people. Except for one trail located within the AOI, these components were located primarily within the local and regional BIS study areas developed for ecosystem services. Potential project interactions with these ecosystem function and services components include i) restriction of trail access within the AOI due to fencing around project infrastructure, and ii) impacts to the quality of trails and parks and conservation areas due to direct and indirect impacts on habitat and vegetation (e.g., wetlands and riparian habitats protect aquatic habitats by filtering contaminants and sediments; thus, loss of wetlands and riparian vegetation can decrease water quality).

Mitigation for Potential APM Project x Biodiversity Value Interactions

Mitigation for the APM Project will be planned and implemented following the steps of the mitigation hierarchy: avoid, minimize, restore, and offset. The NWMO will follow best management practices developed for protecting species of interest, important habitats, wetlands and riparian areas, and ecosystem function and services, where available. These best practices will be applied throughout the design, construction, and operation of the APM Project. The project will implement proven mitigation measures in both aquatic and terrestrial environments to protect these BVs. Key mitigation measures include designing infrastructure and activities to avoid important habitats and habitat features where

feasible; minimizing areas to be cleared or infilled; minimizing habitat fragmentation by restricting activities within a project footprint; implementing prescribed setbacks to protect important habitats and adjacent lands; minimizing disturbance to species of interest and their habitats through measures to reduce light, noise, vibration, and human-BV interactions; implementing measures to preserve proper ecosystem functioning (including preventing the introduction and spread of invasive species, engineering wetlands to maintain surface hydrology and other wetland functions); and avoiding activities that could impact species of conservation concern and their habitats during sensitive periods, wherever possible. A more extensive list of mitigation methods that can be used to ensure impacts to BVs are not significant are outlined within the current document.

Setback Area Considerations

Zoetica has created setback maps to show areas of the AOI that will likely require high, moderate, low, and less mitigation based on the presence of natural heritage features, as per the Ontario PPS, including aquatic habitats (waterbodies, watercourses, wetlands) and candidate SWH and their recommended or mandated buffers. These maps will be continually updated as more information is collected through the BIS baseline program and will assist the NWMO with APM Project site alignment and mitigation planning. Once a Project Description is developed by the NWMO and likely project interactions with biodiversity are analyzed, more specific recommendations of the mitigation to be used, and where, will be provided to the NWMO.

Potential Significant Effects

Based on data collected and analyzed to date, along with consideration of the CSM during all stages of development and operation of the APM Project and the relatively small size of the surface infrastructure and available mitigation measures, no biodiversity issues have currently been identified, from a technical/biological perspective that would preclude the WLON-Ignace siting area as a feasible site for ongoing consideration of the APM Project. However, as more biodiversity baseline studies are conducted, and more is learned about the APM Project design and infrastructure, including the siting and the footprint of the excavated rock and surface infrastructure, additional APM Project x biodiversity interactions may be identified that need to be considered.

Next Steps

Information collected as part of the BIS Tier 1 studies along with information collected as part of other environmental programs (e.g., the Environmental Media Baseline Program [EMBP]), and through the human, social, and economic pillars, will aid in the site selection process for the APM Project. Once a site has been selected with a willing host community, the BIS will proceed with the collection of Tier 2 biodiversity data at the selected site. The focus of Tier 2 studies is to collect data to understand community and population metrics for biodiversity (e.g., relative abundance, species diversity) within relevant BIS study areas. These data will be important for determining the overall effects (impacts and positive effects) of the APM Project on biodiversity. Tier 2 studies will also prioritize data collection for species of interest including listed species, species of importance to stakeholders and rights-holders determined through engagement with the relevant communities, and species that can act as indicators.

Additional Tier 1 studies may continue at the selected site to gather data required for the IA. For example, terrestrial ecosystem mapping may be extended to the RSA to collect relevant data for determining important species habitat associations for select species, and for determining the relative proportion of

available high-quality habitat in the various BIS study areas. Environmental DNA metabarcoding studies may be continued to include repeated seasonal sampling to enable occupancy modelling, identify biological hotspots within the BIS study areas, and provide for detections of cryptic species that may not be as easily detected through traditional methods.

Data collected as part of Tier 2 BIS studies will build on data collected in Tier 1 studies to update setback considerations and to inform the NWMO of priority locations that require early consideration through the mitigation hierarchy. Along with a formal APM Project Description and project-specific Tailored Impact Statement Guidelines, this stage of data collection will start to inform the IA (e.g., which biodiversity values may be selected as valued components, and allow for preliminary predictions of both impacts and benefits to biodiversity. The iterative process of baseline reporting and identifying potential impacts and benefits allows for the application of early learnings to assist in making good decisions, identifying needed cross-disciplinary collaborations, and applying the mitigation hierarchy (e.g., identifying design adaptation needs early in the process) and will result in the submission of a sound and focused IA following best practices outlined in the Best Practices and Preferred Approaches Report (Zoetica 2021).

Table of Contents

List of Appendices

List of Figures

List of Tables

List of Appendix Tables

GLOSSARY AND ABBREVIATIONS

Adaptive management	Adaptive management is defined consistent with the CNSC's definition of adaptive management (REGDOC-3.6): A planned and systematic process for continuously improving management practices [primarily environmental] by learning from their outcomes. [For an environmental assessment (EA),] it involves, among other things, the implementation of new or modified mitigation measures over the life of the project to address unanticipated environmental effects. Note: The need to implement adaptive management measures may be determined through an effective follow-up program.
AHM	Aquatic Habitat Mapping
AOI	Area of Interest
APM Project	The Adaptive Phased Management (APM) Project is the Deep Geological Repository (DGR) and other required infrastructure for the safe, long-term management of Canada's used nuclear fuel
BIS	Biodiversity Impact Studies
BMP	Best Management Practice
BPD	Biodiversity Impact Studies – Northwestern Ontario Region: Baseline Program Design
BPPA	Biodiversity Impact Studies – Northwestern Ontario Region: Best Practices and Preferred Approaches
BV	Biodiversity Value; The biotic environmental components that will be considered for study within The APM Project's Biodiversity Impact Studies. A subset of biodiversity values will ultimately be scoped into the Biodiversity Impact Assessment as Valued Components.
CNSC	Canadian Nuclear Safety Commission
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
Critical habitat	Habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species (*Species at Risk Act*, S.C. 2002, c. 29). Identification of critical habitat is not a required component of a recovery strategy under the Ontario *Endangered Species Act*. However, the approach used to identify critical habitat, in conjunction with the best scientific information available, is recommended when developing a habitat regulation. A habitat regulation is a legal instrument under the *ESA* that prescribes an area that will be protected as the habitat of the species.
CSM	Conceptual Site Model
DD	Data Deficient
DGR	Deep Geological Repository
ECCC	Environment and Climate Change Canada
Ecoregion	Second highest level of the ELC hierarchy (Crins *et al.* 2009). Large geographic areas primarily identified by sub-continental climatic regimes and bedrock geology.

Ecosite	Second lowest level of the ELC hierarchy (Crins *et al.* 2009). The land within an ecosite will generally contain similar substrate and vegetation.
Ecosystem function	In the context of biodiversity, ecosystem functions include the physiochemical and biological processes that occur within the ecosystem to maintain biodiversity.
Ecosystem services	Ecosystem services are the direct and indirect benefits to human well-being that the natural environment provides through healthy ecosystems. Ecosystem services include provisioning services such as the production of food and water, regulating services, such as the control of climate and disease, supporting services, such as nutrient cycles and oxygen production, and cultural services, such as spiritual and recreational benefits.
ECS	Ecoregional Criterion Schedule
eDNA	Environmental DNA
ELC	Ecological Land Classification
EMBP	Environmental Media Baseline Program
END	Endangered
EO	Element Occurrence
ESA	Ontario *Endangered Species Act*
GBIF	Global Biodiversity Information Facility
GHD	General Habitat Description
GIS	Geographic Information System
Habitat suitability / suitable habitat	The ability of the habitat, in its current condition, to provide the life requisites of a species.
HPS	High potential sensitivity
HSM	Habitat Suitability Modelling
IA	Impact Assessment
LSA	Local Study Area
MAFA	Moose Aquatic Feeding Area
MAI	Moose Aerial Inventory
Mitigation hierarchy	A tool designed to help limit the negative impacts of development on biodiversity and ecosystem services. Involves a sequence of four key actions – avoid, minimize, restore, and offset – and provides a best practice approach to aid in the sustainable management of environmental resources by establishing a mechanism to balance conservation needs with development priorities.
MPS	Moderate potential sensitivity
NA	Not Applicable
NAR	Not at Risk
NDMNRF	Ontario Ministry of Northern Development, Mines, and Natural Resources and Forestry

NHIC	Ontario Natural Heritage Information Centre
NWMO	Nuclear Waste Management Organization
PSW	Provincially Significant Wetland
Rights-holders	First Nation and Métis communities who have asserted and or hold recognized treaty and/or Indigenous rights and whose traditional territories include the project location.
Riparian Environments	The riparian environment or riparian area is the interface between land and an aquatic habitat. Riparian vegetation is characterized by hydrophilic plants that occurs along the river margins and banks.
RSA	Regional Study Area
SAR	Species at Risk; for the purposes of the BIS, SAR include species listed under Schedule 1 of the federal *Species at Risk Act* (*SARA*), species designated as Species at Risk in Ontario (SARO) and listed under the provincial *Endangered Species Act, 2007* (*ESA*), and species assessed as Extirpated, Endangered, Threatened, or Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
SARA	Federal *Species at Risk Act*
SARO	Species at Risk in Ontario
SC	Special Concern
SCC	Species of Conservation Concern; includes provincially and/or federally listed SAR (Extirpated, Endangered, Threatened, Special Concern) and provincially rare (SRANK S1, S2, S3, SH) species. Regionally rare species may also be scoped in if identified by stakeholders and/or rights-holders as VCs.
SOI	Species of Interest; includes species of conservation concern, culturally important species, indicator species, and invasive species (where applicable).
SON	Saugeen Ojibway Nation
SRANK	Subnational Conservation Rank; the conservation status of a species or plant community within a particular province, territory, or state. In Ontario, the NHIC assigns SRANKs using the best available information and considering factors such as abundance, distribution, population trends, and trends (NDMNRF 2021). Species assigned S1 (Critically Imperiled), S2 (Imperiled), S3 (Vulnerable), and SH (Possibly Extirpated) are considered provincially rare by the NHIC. See the NatureServe website for more information: https://www.natureserve.org/nsexplorer/about-the-data/statuses/conservation-status-categories
SWH	Significant Wildlife Habitat; Defined in the Ontario Provincial Policy Statement, 2020 as: *Wildlife habitat* – areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter, and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual life cycle; and areas which are important to migratory and non-migratory species. *Significant* – in regards to wildlife habitat, ecologically important in terms of features, functions, representation, or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system. Candidate SWH are areas that meet the ELC ecosite code(s) and/or habitat criteria outlined in the SWH ecoregional criterion schedule (ECS). Confirmed SWH are areas that

	meet the defining criteria outlined in the SWH ECS. Detailed field investigations are usually needed to confirm SWH.
TEM	Terrestrial Ecosystem Mapping
THR	Threatened
VC	Valued Component. For impact assessments of designated projects under the *Impact Assessment Act*, the Agency's Glossary of Terms defines VCs as "environmental, health, social, economic or additional elements or conditions of the natural and human environment that may be impacted by a proposed project and are of concern or value to the public, Indigenous peoples, federal authorities and interested parties. Valued components may be identified as having scientific, biological, social, health, cultural, traditional, economic, historical, archaeological and/or aesthetic importance."
WLON	Wabigoon Lake Ojibway Nation
WLON-Ignace siting area	Used to describe the broader area surrounding the defined area within which the APM Project may be located. The WLON-Ignace siting area is the general area near the Township of Ignace and the community of Wabigoon Lake Ojibway Nation in northwestern Ontario. It is located in Treaty #3 in the traditional territory of Wabigoon Lake Ojibway Nation, among other Indigenous communities.

1.0 OVERVIEW

The Nuclear Waste Management Organization (NWMO) is responsible for implementing the Adaptive Phased Management (APM) Deep Geological Repository (DGR) (hereafter 'APM Project'), which is Canada's plan for the safe, long-term management of used nuclear fuel, in a manner that protects both people and the environment. Zoetica™ was retained by the NWMO, to undertake Biodiversity Impact Studies (BIS) for the APM Project within two potential locations that are both being considered for a Deep Geological Repository (DGR) for the long-term storage of Canada's used nuclear waste. Initial Tier 1 studies conducted as part of the BIS, along with other environmental studies conducted as part of the Environmental Media Baseline Program (EMBP) designed by CanNorth (CanNorth 2020a), and information collected through the human, social, and economic pillars, will aid in the site selection process for the DGR and associated project infrastructure that make up the APM Project.

The two sites for which studies are being undertaken include the WLON-Ignace siting area near the Township of Ignace and the traditional territory of the Wabigoon Lake Ojibway Nation (WLON) in northwestern Ontario and the SON-South Bruce siting area near the Municipality of South Bruce and the traditional territory of the Saugeen Ojibway Nation (SON) in southwestern Ontario. The focus of the BIS is the study of biodiversity values (BVs) of known or predicted relevance to the potential APM Project at each potential site, to ultimately enable impact predictions and optimal application of the mitigation hierarchy.

The BIS is designed to include a series of iterative documents that will ultimately feed into a formal Impact Assessment (IA). These documents include BIS design documents outlining best practices and preferred approaches to be used during study implementation (*Biodiversity Impact Studies – Northwestern Ontario Region: Best Practices and Preferred Approach* (BPPA) Report (Zoetica 2021)) and baseline study design documents that include detailed Standard Operating Procedures (*Biodiversity Impact Studies – Northwestern Ontario Region: Baseline Program Design* (BPD) Report (Zoetica 2022a)) and draw from the BPPA. Design documents are ultimately used to direct BIS baseline studies. In addition to design documents, reporting documents are also prepared following baseline work. Reporting documents include baseline reports (*Biodiversity Impact Studies – Northwestern Ontario Region: Biodiversity Baseline Report* (Zoetica 2022b)) that outline findings of baseline work and change assessment memos (this document) that flag potential APM Project x Biodiversity interactions and biodiversity changes. The design and reporting documents include iterative input from other baseline programs, communities, and field experts. Learnings from earlier versions of these reports are integrated back into the design for further BIS studies until sufficient biodiversity information is gathered to fulfill the APM Project-specific requirements of a formal IA (see **Figure 1-1**).

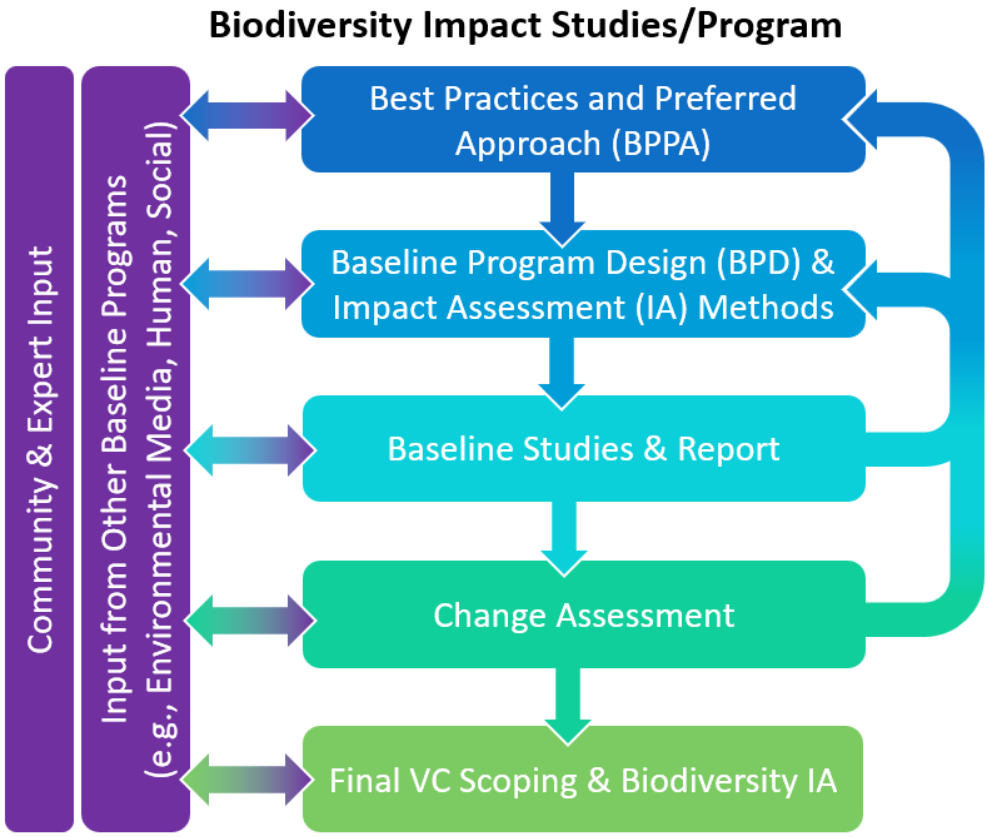


Figure 1-1. Biodiversity Impact Studies design flow and deliverables.

The 2022 BIS Change Assessment Memorandum along with its future iterations, examines potential interactions between the APM Project and BVs that could result in changes to those BVs, based on information available at the time of writing (December 2022). The early information based on successive findings presented in annual change assessment memos will facilitate the timely application of the mitigation hierarchy[2] and flag important potential effects for consideration by communities. The change assessment herein is not meant to replace a formal IA that draws from multiple years of multidisciplinary field data and a formalized project description. The 2022 BIS Change Assessment draws from Tier 1 desk- and field-based studies conducted to date within relevant BIS study areas: an Area of Interest (AOI) where project infrastructure will be placed, terrestrial and aquatic local study areas (LSAs), and BV-specific regional study areas (RSAs). Biodiversity information was considered alongside the updated Conceptual Site Model (CSM) (CanNorth 2022) to identify potential interactions. While an initial project description is in progress, it has not yet been shared with Zoetica. Future iterations of this change assessment document will consider the project description when available. Commonly utilized mitigation measures and best practices to manage potential negative changes to biodiversity are also presented.

[2] The Mitigation Hierarchy is a set of guidelines that are nationally and internationally accepted as a best practice and provide a framework to follow a series of mitigation options in the order of avoidance, minimization, restoration, and offset to reduce development impacts and aim to achieve no net loss of biodiversity (BBOP 2012, IFC 2012, CSBI 2015).

The APM Project is in early phases of baseline data collection. Zoetica's approach to the BIS follows a tiered approach (see Section 4.2 of Zoetica's BPPA Report (Zoetica 2021) for more information on tiers) and is currently in the Tier 1 of study focused on the collation of existing data on species presence, known important habitats, and the collection of foundational habitat information through Terrestrial Ecosystem Mapping (TEM), Aquatic Habitat Mapping (AHM), and identification of candidate Significant Wildlife Habitat (SWH) (Zoetica 2022a). Initial studies documenting species presence, through searches of existing databases and environmental DNA (eDNA) metabarcoding studies in aquatic habitats, were also initiated in 2021 to aid in directing more specific (i.e., Tier 2) biodiversity studies and the results will be reported in the next iteration of the Baseline Report. Initial scoping of BVs for the BIS, along with rationale for inclusion, is found in Section 3.1 of the BPPA Report (Zoetica 2021). The following BVs have been included in the scope of the BIS for baseline study to date:

1. Vegetation
2. Wetlands and Riparian Environments
3. Mammals
    a. Ungulates
    b. Carnivores
    c. Small Terrestrial Mammals
    d. Semi-Aquatic Mammals
    e. Bats
4. Herpetofauna
    a. Amphibians
    b. Reptiles
5. Terrestrial Invertebrates
6. Birds (including migratory birds)
    a. Upland Breeding Birds (including Game Birds)
    b. Shorebirds
    c. Waterbirds
    d. Raptors
7. Fish and Fish Habitat
    a. Fish
    b. Primary and Secondary Producers (including aquatic invertebrates)
8. Ecosystem Function and Services

For the change assessment document these BVs were further grouped into the following BV categories to summarize the potential APM Project related effects:

1. Species of Interest
    a. Species of conservation concern (SCC)
    b. Species of interest to stakeholders and rights-holders (SOI)
    c. Invasive Species
2. Important Habitat
    a. Candidate Significant Wildlife Habitat (SWH)
    b. Critical Habitat
    c. Important Fish Habitat
3. Wetland and Riparian Areas

4. Ecosystem Function and Services

A formal IA will be conducted if-and-when community willingness has been achieved and a site has been selected for ongoing investigation, and after the completion of more focused Tier 2 and 3 studies on relevant BVs at that site. The formal IA, conducted following the federal *Impact Assessment Act*, will assess the magnitude and extent of significance of potential APM Project-related changes to BVs that are selected as valued components (VCs), along with relevant cumulative effects based on other activities in the WLON-Ignace siting area.

2.0 PROJECT LOCATION AND STUDY AREAS

2.1 Project Location

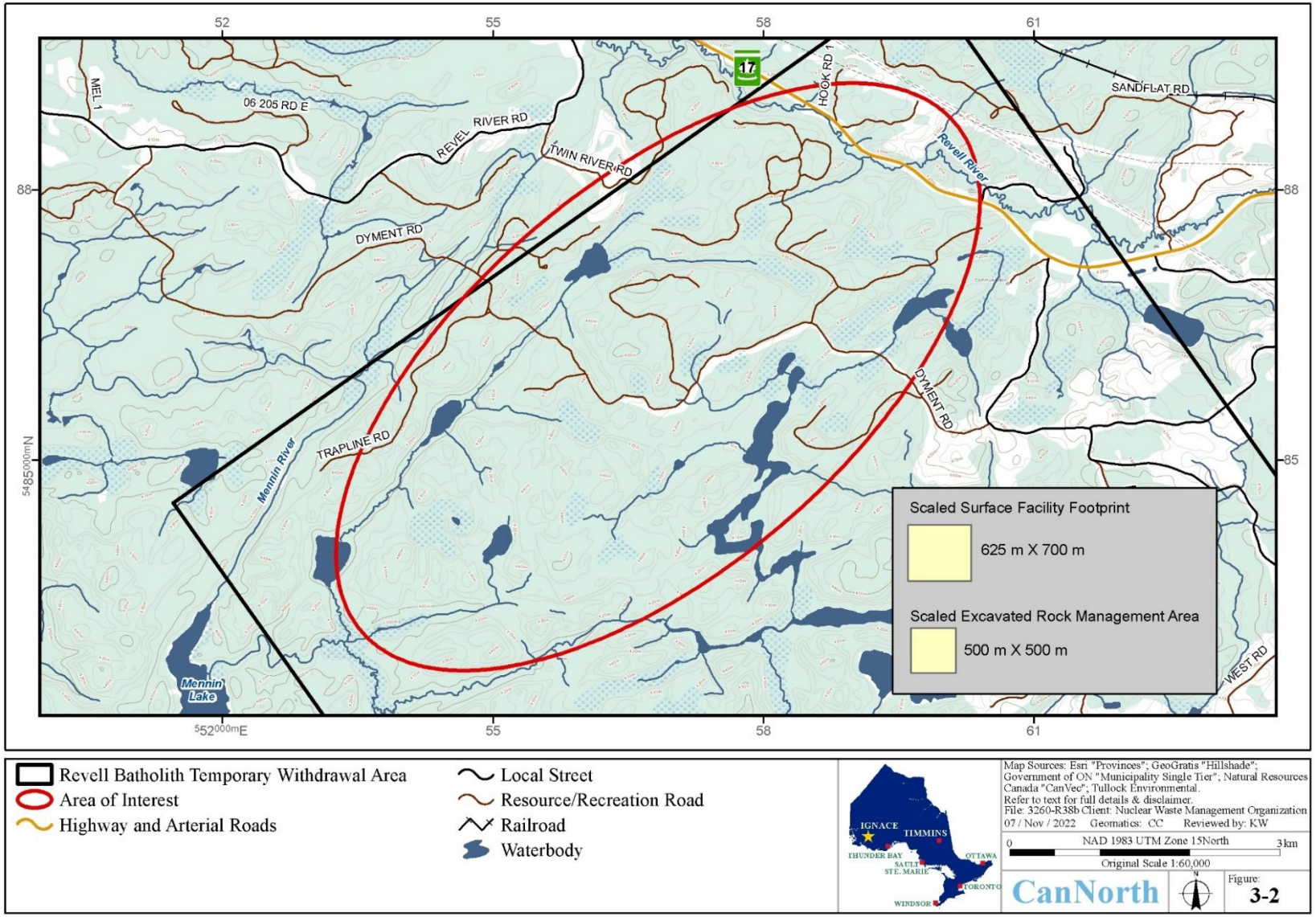
The WLON-Ignace siting area for the BIS is located within the Kenora District of Ontario. For this report the term 'WLON-Ignace siting area' is used to describe the general area surrounding the Revell Batholith Withdrawal Area within which the APM Project may be located. The WLON-Ignace siting area is near the Township of Ignace and the community of Wabigoon Lake Ojibway Nation in northwestern Ontario. It is located in Treaty #3 in the traditional territory of Wabigoon Lake Ojibway Nation (WLON), and the Métis peoples of Treaty #3, among other Indigenous communities.

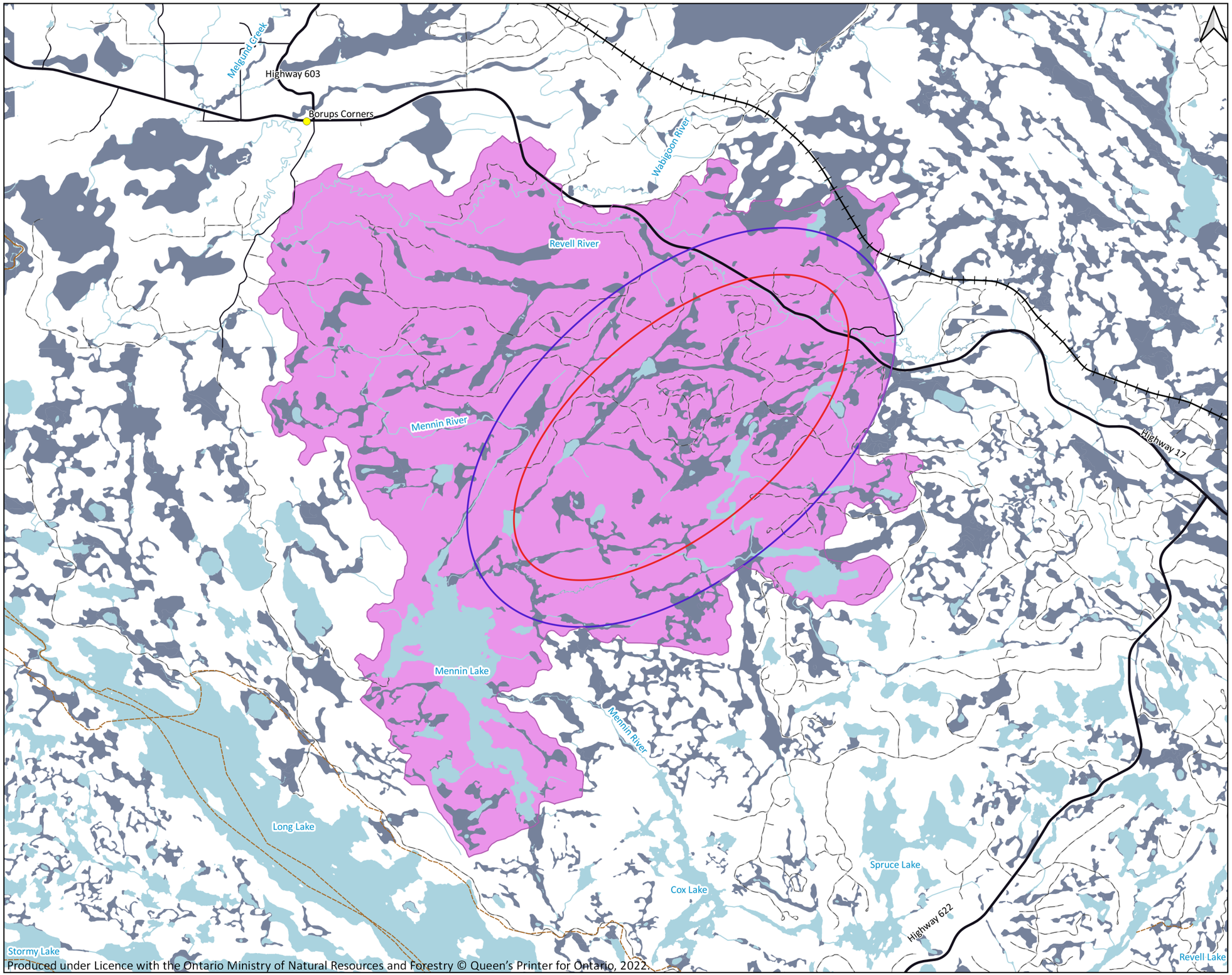
The exact location of the APM Project infrastructure is under development. The APM Project's initial conceptual, preliminary design was prepared by the NWMO and can be found in *Deep Geological Repository Conceptual Design Report Crystalline/Sedimentary Rock Environment* (Naserifard et al. 2021). A preliminary CSM was then developed by CanNorth along with their Environmental Media Baseline Program (EMBP) and includes a description of the project components (CanNorth 2020a). Most recently, CanNorth produced an updated CSM in their *Biophysical Conceptual Site Model Update and Screening Level Change Assessment* Report (CanNorth 2022). Zoetica used this draft CSM to make assumptions about the APM Project needed for designing the BIS Program; these assumptions included project components and their overall sizes. **Figure 2-1** presents a mock-up of the CSM within the AOI; however, the location of infrastructure could be placed anywhere within the AOI.

2.2 Study Areas

For the BIS, several study areas were established to ensure that adequate but not extraneous information is collected to support the biodiversity IA. Study areas were designed to encompass the extent of anticipated APM Project activities and impacts while considering the distribution of BVs across the landscape (**Figure 2-2**). The design of study areas also considered potential cumulative impacts that may occur in the region within the ranges of the potential valued components (VCs; deemed BVs at this stage of investigation until VCs can be established) (**Figure 2-3**, **Figure 2-4**). For the BIS, the terrestrial and aquatic study areas were designed separately due to the unique considerations of each. Descriptions and rationale for developing these study areas can be found in Section 5.2 of the BPPA Report (Zoetica 2021).

Figure 2-1. Mock-up of the Conceptual Site Model within the Area of Interest. Figure reproduced from CanNorth's *Biophysical Conceptual Site Model Update and Screening Level Change Assessment* Report (CanNorth 2022).





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NWMO Biodiversity Impact Studies

Area of Interest and Local Study Areas

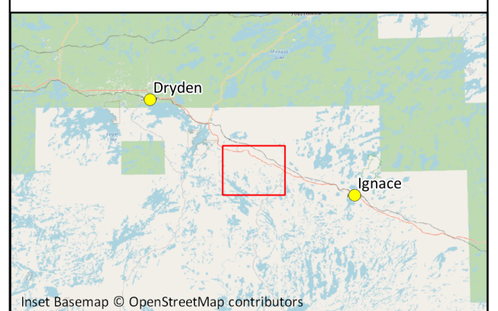
Figure 2-2

- Area of Interest (AOI)
- Local Study Area (LSA_{TER})
- Local Study Area (LSA_{AQU})
- Lake
- Wetland
- Watercourse
- Highway or Arterial Road
- Local Road
- Resource/Recreation Road
- Railroad
- Trail
- Community

1:80,000

0 2 4 km

ZOETICA



Inset Basemap © OpenStreetMap contributors

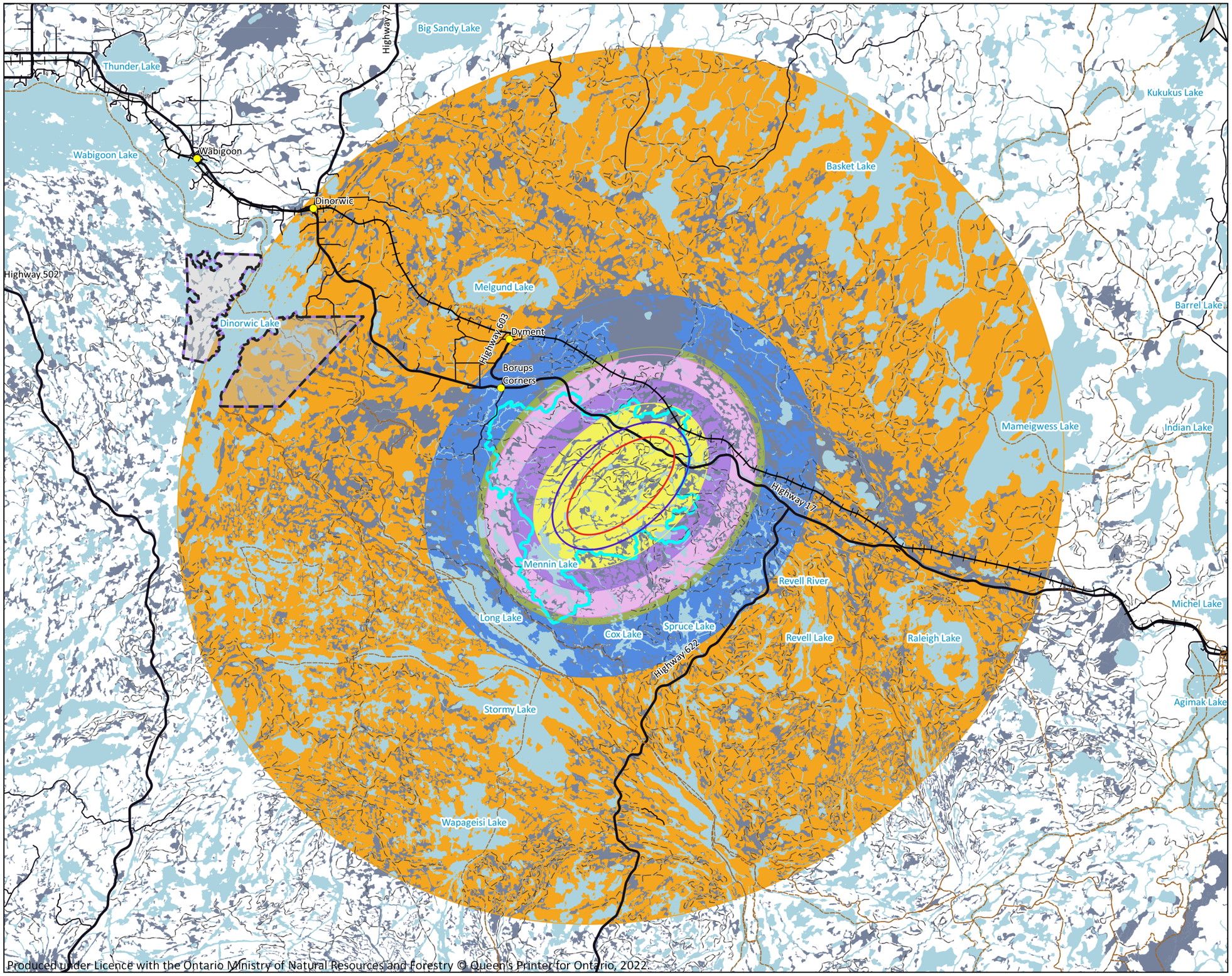
Data received from:
Ontario GeoHub — OHN Waterbody (NDMNRF); OHN Watercourse (NDMNRF); ORWN Railway (NDMNRF); MNRF Road Segments (NDMNRF); Wetlands (NDMNRF)
NWMO — AOI; Trail Segments (NDMNRF)

Project CRS: NAD83 / UTM zone 15N		
Author: AH	Reviewed by: CC	Approved by: HB
November 07, 2022	Map ID: NWMO_BIS_A007_IG	

NWMO Biodiversity Impact Studies

Terrestrial Regional Study Areas

Figure 2-3



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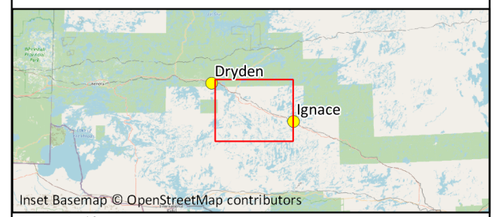
- Area of Interest (AOI)
- Local Study Area (LSA_{TER})
- Local Study Area (LSA_{AQU})
- Regional Study Area (RSA_{STM})
- Regional Study Area (RSA_{AVI})
- Regional Study Area (RSA_{BAT})
- Regional Study Area (RSA_{HRP})
- Regional Study Area (RSA_{SAM})
- Regional Study Area (RSA_{UNG}, RSA_{CAR}, and RSA_{VEG})
- Lake
- Wetland
- Watercourse
- Highway or Arterial Road
- Local Road
- Resource/Recreation Road
- Railroad
- Trail
- Community
- Wabigoon Lake No. 27

Not shown here are the $RSA_{HRP\text{-}AQU}$ and $RSA_{AVI\text{-}AQU}$, which will include the area covered by the $RSA_{AVI/HRP}$ plus the area emcompassed by the LSA_{AQU} used for aquatic biodiversity values.

1:250,000

0 4 8 km

ZOETICA



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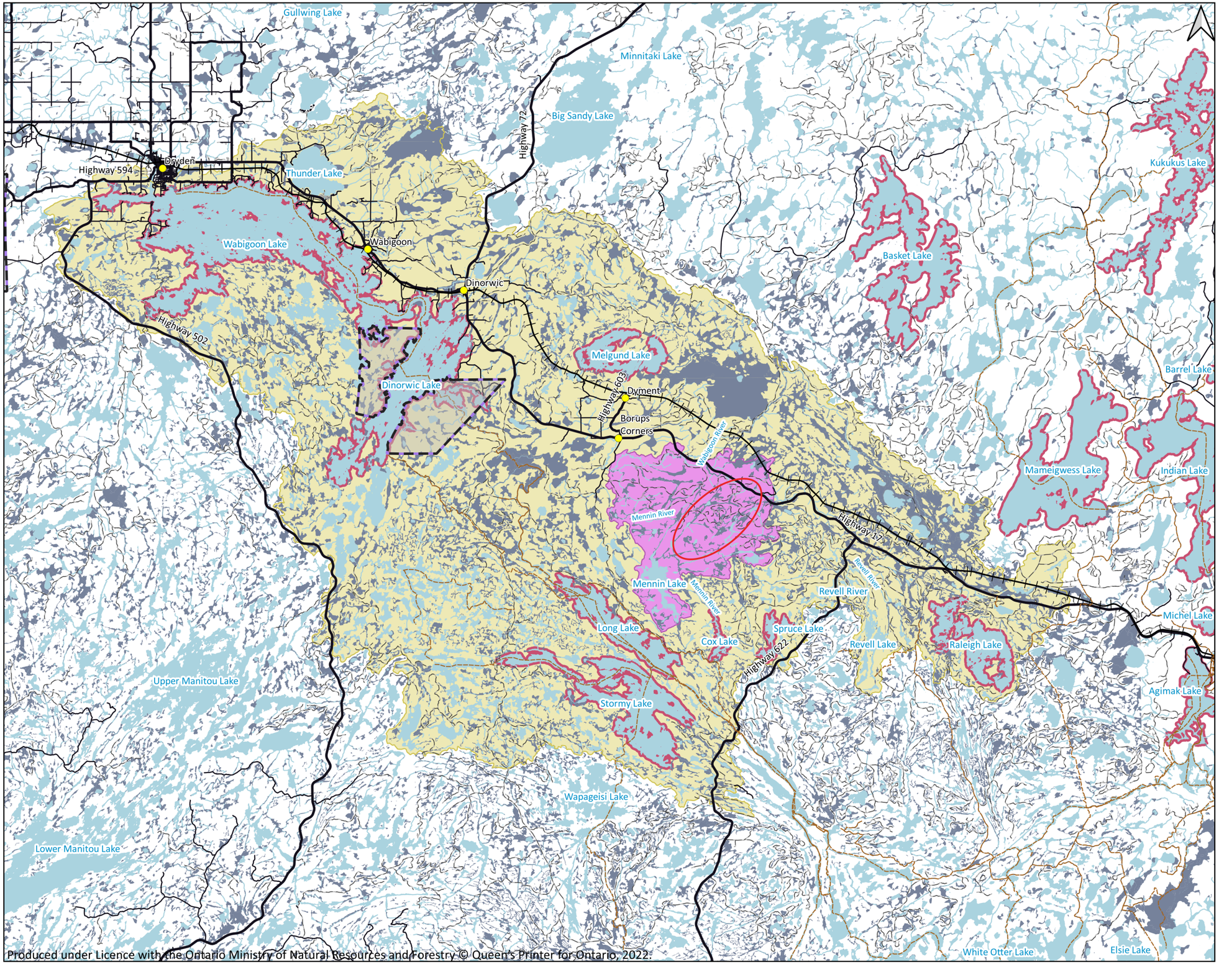
NWMO — AOI; Trail Segments (NDMNRF)

Project CRS: NAD83 / UTM zone 15N		
Author: AH	Reviewed by: CC	Approved by: HB
November 07, 2022	Map ID: NWMO_BIS_A008_IG	

NWMO Biodiversity Impact Studies

Aquatic and Ecosystem Services (RSA_{AQU})

Figure 2-4a

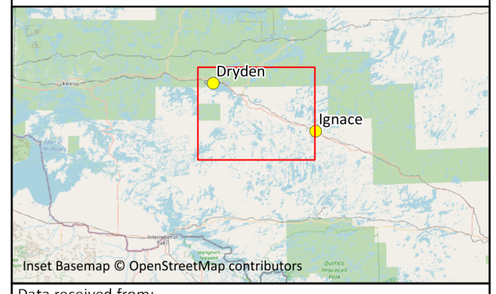


Area of Interest (AOI)
Local Study Area (LSA_{AQU})
Regional Study Area (RSA_{AQU})
Lake
Lake Mentioned as Important for Fishing and/or Recreation
Wetland
Watercourse
Highway or Arterial Road
Local Road
Resource/Recreation Road
Trail
Railroad
Community
Wabigoon Lake No. 27

1:300,000

0 6 12 km

ZOETICA



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NWMO — AOI; Trail Segments (NDMNRF)

Project CRS: NAD83 / UTM zone 15N		
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December 06, 2022	Map ID: NWMO_BIS_A009a_IG	

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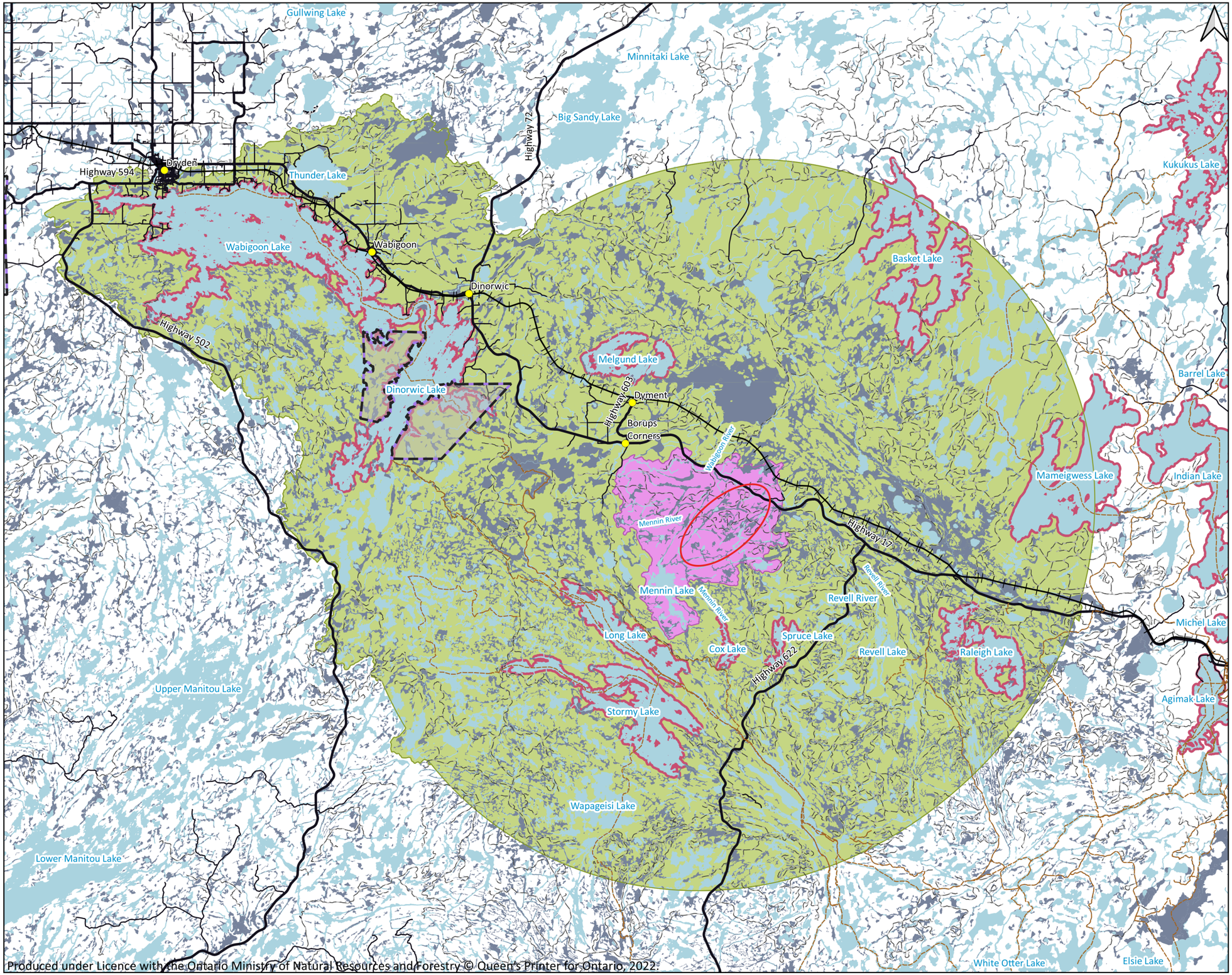
NWMO Biodiversity Impact Studies

Aquatic and Ecosystem Services (RSA_{ECO})

Figure 2-4b



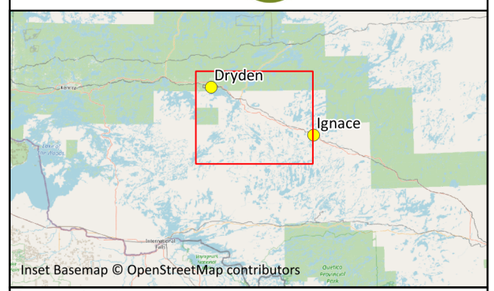
- Area of Interest (AOI)
- Local Study Area (LSA_{AQU})
- Regional Study Area (RSA_{ECO})
- Lake
- Lake Mentioned as Important for Fishing and/or Recreation
- Wetland
- Watercourse
- Highway or Arterial Road
- Local Road
- Resource/Recreation Road
- Trail
- Railroad
- Community
- Wabigoon Lake No. 27

The RSA_{ECO} includes the area covered by the RSA_{AQU} plus the area emcompassed by the $RSA_{CAR/UNG/VEG}$

0 6 12 km

1:300,000

ZOETICA



Data received from:
Ontario GeoHub — Indian Reserve (NDMNRF); OHN Waterbody (NDMNRF); OHN Watercourse (NDMNRF); ORWN Railway (NDMNRF); MNRF Road Segments (NDMNRF); Wetlands (NDMNRF)
NWMO — AOI; Trail Segments (NDMNRF)

Project CRS: NAD83 / UTM zone 15N		
Author: AH	Reviewed by: CC	Approved by: HB
December 06, 2022	Map ID: NWMO_BIS_A009b_IG	

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3.0 POTENTIAL APM PROJECT X BIODIVERSITY INTERACTIONS (GENERAL)

Zoetica used the CSM developed for the APM Project (see Section 2.0) to predict project components that could interact and potentially affect BVs. Major components of the APM Project outlined in the CSM include: the DGR, Excavated Rock Management Area, Access Road, and other buildings and small ancillary infrastructure. A preliminary APM Project component and biodiversity interaction matrix based on proposed BVs to include in the APM Project BIS and available information from the preliminary CSM is presented in Table 3-3 of Zoetica's BPPA Report (Zoetica 2021). When considering the construction and operation phases of the APM Project, the following general effects to biodiversity were considered possible (**Table 3-1**).

Table 3-1. Potential project interactions on Biodiversity Values for which baseline data are available (Zoetica 2022b). Suggested mitigation that can be applied along the mitigation hierarchy is provided in Figure 4-1. In most cases, sufficient information is not available to fully characterize the effects; therefore, the focus of this table is to identify ways in which the potential effects can be avoided or minimized prior to their being assessed.

Effect or Potential Effect	Project Phase(s)	Cause	Potentially Affected Biodiversity Value[3]
Direct Habitat Loss[1]	Construction & Operations Phases	• Clearing of land • Infilling of water during construction	• SCC (including SAR and rare species) • SOI to stakeholders & rights-holders • SWH • Functional Riparian Habitat • Wetlands
Indirect Habitat Loss[2]	Construction & Operations Phases	• Dust settling on vegetation adjacent to infrastructure • Noise causing species to avoid adjacent habitats • Underwater and surface level vibrations • Change in habitat conditions (e.g., water temperature, water quality, shading, water flow, depth, sedimentation) • Spread of invasive species into an area due to temporary disturbance • Use of pesticides/herbicides resulting in reduced availability of insect prey and/or direct or indirect mortality	• SCC (including SAR and rare species) • SOI to stakeholders & rights-holders • SWH • Functional Riparian Habitat • Wetlands • Fish/Fish Habitat
Direct and Indirect Mortality	Construction & Operations Phases	• Traffic-caused mortality related to use of roads • Collisions of flying BVs with infrastructure • Clearing of vegetation or disruption of ground materials containing BVs, or their occupied dens, roosts, nests, or hibernacula • Spread of disease-causing agents • Injury or mortality due to trampling and equipment • Creation of zones of attraction into areas with higher risk of mortality (e.g., certain insectivorous species foraging on light-seeking insects) • Reproductive failure (e.g., nest abandonment) due to noise or other sensory disturbance	• SCC (including SAR and rare species) • SOI to stakeholders & rights-holders • Fish/Fish Habitat

Effect or Potential Effect	Project Phase(s)	Cause	Potentially Affected Biodiversity Value[3]
Impacts to Movement	Construction & Operations Phases	• Creation of new barriers across water bodies • Creation of barriers or semi-permeable barriers through road construction and/or road traffic • Creation of zones of avoidance (due to noise, light, mechanical and human disturbance) within typical movement pathways • Large expanses of cleared habitat preventing the movement of species that require connected habitat or habitat islands in close proximity to move through an area	• SCC (including SAR and rare species) • SOI to stakeholders & rights-holders • Fish/Fish Habitat
Changes to Ecosystem Function	Construction & Operations Phases	• Changes to water buffering capacity to naturally mitigate floods, droughts, and flows within natural ranges of variation • Changes in ecological communities that can be supported, and can support other species and humans • Changes to processes that protect soil health and turnover	• SCC (including SAR and rare species) • SOI to stakeholders & rights-holders • Functional Riparian Habitat • Wetlands • Fish/Fish Habitat

Notes:
Abbreviations: SCC = Species of Conservation Concern, SAR = Species at Risk; SOI = Species of Interest; SWH = Significant Wildlife Habitat

1. The loss of land for the creation of a permanent infrastructure component that will not enable restoration.
2. "Functional" habitat loss that causes the area to not be used by species or plants that were formerly found there, despite the absence of permanent infrastructure.
3. The BVs outlined in Section 1.0 were further grouped into the following BV categories to summarize potential APM Project-related effects: species of interest (species of conservation concern (SCC), species of interest (SOI) to stakeholders and rights-holders, invasive species); important habitats (candidate SWH, critical habitat, important fish habitat); wetland and riparian areas; and ecosystem function and services.

4.0 MITIGATION

4.1 Mitigation Hierarchy

In general, mitigation will be approached in the order of the mitigation hierarchy: Avoid, Minimize, Restore, and Offset. **Figure 4-1** provides an example of mitigation measures that can be applied at each level along the hierarchy, with the measures within the top box needing to be attempted and exhausted prior to moving down the hierarchy to reduce, and ideally eliminate any potential net negative impacts of the APM Project. Mitigation options shown in **Figure 4-1** are not meant to be exhaustive, as additional or more precise measures can be applied based on particular circumstances (noted in Sections 4.2 and 4.3, **Table 5-1** through **Table 5-7** as relevant). With the current level of information (i.e., no formal Project Description, and limited biodiversity data), it is not possible to identify which stages of the mitigation hierarchy may be applicable to all species or habitats.

Figure 4-1. Steps of the mitigation hierarchy including avoidance, minimization, restoration, and offset options to eliminate or reduce the magnitude of impacts at each step. While the last stage in the mitigation hierarchy is acknowledged to be "offset", offset will only be considered after other steps along the mitigation hierarchy are applied to their maximum feasible extent, and a residual effect still remains.

4.2 Aquatic Mitigation (General)

The following mitigation measures are those that are generally recognized as effective at reducing or eliminating project effects to aquatic habitats and species. Measures A.1, A.2, A.3, and A.4 are generally applicable to all aquatic and semi-aquatic BVs.

- A.1 Follow the conceptual framework of the Mitigation Hierarchy (Section 4.1, **Figure 4-1**)
- A.2 Design infrastructure to avoid aquatic habitat, wherever possible
- A.3 Limit areas to be cleared to strictly as necessary to minimize habitat loss and disturbance
- A.4 Apply required and recommended setbacks (**Table 4-1**) to protect sensitive features
- A.5 Time activities based on Ontario Restricted Activity Timing Windows for relevant species present to avoid disturbance during sensitive periods
- A.6 Identify presence of species to appropriately design culverts to allow for fish and wildlife passage
- A.7 Build culverts large enough to allow for uninhibited movement of water
- A.8 Build culverts with designs that hinder nest construction
- A.9 Retain existing culverts that are in satisfactory condition and are considered to have adequate hydraulic capacity
- A.10 Use alternatives to salt/sand where feasible for controlling ice on roads to avoid inputs of chemicals to aquatic habitats (watercourses, waterbodies, and wetlands)
- A.11 Use alternatives to herbicides and pesticides on rights-of-way to avoid runoff of chemicals to aquatic habitats
- A.12 Develop runoff catchment systems to divert runoff to areas where it can be filtered before entering aquatic habitat
- A.13 Apply dust suppression measures during drilling and blasting activities to reduce the amount of dust entering aquatic habitats
- A.14 Avoid or minimize blasting near aquatic habitat to reduce impacts from noise, vibration, and dust to these environments
- A.15 Avoid or minimize blasting on windy days and very cold days to reduce distance over which noise, and its incumbent impacts to biota, travels and reduce the spread of dust to aquatic habitats
- A.16 Monitor blasting and drilling vibrations to ensure thresholds identified in the eventual IA are not exceeded, and to enable further reduction of noise and vibration through additional mitigation if thresholds are exceeded
- A.17 Minimize equipment in aquatic habitat and ensure all equipment needed for temporary construction measures or permanent works is clean before entering water to minimize disturbance to aquatic habitats (e.g., erosion of banks), reduce potential for crushing of aquatic flora and fauna, and reduce potential introduction of foreign materials (e.g., contaminants, disease vectors)
- A.18 Follow proper waste disposal measures to minimize the potential for waste materials (including contaminants) to enter aquatic habitats
- A.19 Minimize lighting on aquatic habitat to minimize avoidance by fish and wildlife and to reduce the potential for mortality by predators due to increased visibility
- A.20 Ensure proper screening on hoses for drawing water from watercourses and waterbodies to prevent potential entrainment of fish

A.21 Ensure spills are cleaned up immediately to avoid contaminants entering and spreading in aquatic habitats and to limit potential uptake by and impacts to flora and fauna

A.22 Retain surrounding wetlands to maintain surface hydrology or create engineered wetlands, bioswales and other features that can provide lost or altered ecosystem function[3]

A.23 Minimize in-stream work to only necessary to minimize physical disturbance of aquatic habitat

A.24 Conduct salvage of fish, amphibians, and turtles at isolated work zones for in-water works

A.25 Adhere to applicable regulatory requirements (e.g., Ontario's *Endangered Species Act, 2007*; *Migratory Birds Convention Act, 1994*; the provincial *Pesticides Act, 1990*; federal *Pest Control Products Act*; see also Appendix E of the BPPA Report for Acts, regulations, and other biodiversity considerations (Zoetica 2021))

A.26 Apply established Best Management Practices where appropriate and economically feasible (BMPs, see Section 4.4 and Appendix A)

A.27 Develop and implement a Construction Environmental Management Plan to minimize the impacts of construction activities on biodiversity

A.28 Develop and implement an Erosion and Sediment Control Plan to minimize runoff of sediments, avoid interaction of sediments with aquatic habitats, and help maintain bank stability

A.29 Develop a Compliance and Effectiveness Monitoring Program to ensure mitigation measures are properly implemented and are effective and to determine the need for adaptive mitigation

A.30 Develop and implement a Revegetation Plan to reduce habitat loss and restore ecosystem function

A.31 Develop and implement a Restoration Plan to help increase the speed and area in which habitat is restored after disturbance to restore ecosystem function

A.32 Develop and implement an Environmental Incident Management Plan to document unexpected impacts of the APM Project to biodiversity and assess the need for adaptive management

4.3 Terrestrial Mitigation (General)

The following mitigation measures are those that are generally recognized as effective at reducing or eliminating project effects to terrestrial habitats and species. Measures T.1, T.2, T.3, , T.4, T.5and T.6 are generally applicable to all terrestrial and semi-aquatic BVs.

T.1 Follow the conceptual framework of the Mitigation Hierarchy (Section 4.1, **Figure 4-1**)

T.2 Avoid overlap with habitat of high biodiversity value, habitat hosting aggregates of provincially or federally listed plant or animal species, or species of interest to rights-holders and stakeholders

T.3 Design infrastructure to avoid important habitat wherever feasible to minimize habitat loss and disturbance

T.4 Site infrastructure in previously disturbed areas that do not provide important habitat values for biodiversity

[3] Case studies demonstrating the effectiveness of engineered drainage features (e.g., bioswales, artificial wetlands) are presented in the City of Surrey's *Biodiversity Design Guidelines*: https://www.surrey.ca/sites/default/files/media/documents/BiodiversityDesignGuidelines_Drainage.pdf

T.5 Limit areas to be cleared to minimize habitat loss and disturbance
T.6 Apply required and recommended setbacks (**Table 4-1**) to protect sensitive features
T.7 Retain important and mature trees whenever possible to avoid removal of potentially important habitats
T.8 Implement deterrent features to keep wildlife from interacting with unsafe areas
T.9 Time activities based on activity windows for relevant species, such as nesting/breeding season or migration to avoid disturbance and mortality
T.10 Conduct pre-clearing surveys for plant and invertebrate species of interest (e.g., at-risk, rare, culturally important species) and active nests, dens, and other important habitat features before commencing construction activities to avoid disturbance to sensitive biota
T.11 Establish setbacks to protect plants from encroachment by construction activities
T.12 Implement an appropriate, scientifically informed buffer zone around active nests on a case-by-case and species-by-species basis (ECCC 2022) to protect biota from disturbance
T.13 Monitor active nests until they are deemed inactive by a qualified environmental professional with sufficient and relevant experience (e.g., successful fledging or depredation) to avoid disturbance to birds during sensitive periods
T.14 If needed, build artificial nesting stations/structures to account for lost habitat due to direct or indirect habitat loss
T.15 Retain coarse woody debris as habitat for small mammals to reduce habitat loss
T.16 Utilize existing roads where feasible to avoid construction of additional linear features and minimize habitat fragmentation
T.17 Utilize wildlife presence and wildlife crossing signs to minimize mortality due to collisions with traffic
T.18 Build wildlife corridors to facilitate animal movement
T.19 Pair new linear requirements (e.g., transmission lines) with existing linear features (e.g., roads) to avoid habitat loss, disturbance, and fragmentation
T.20 Use a vertical alignment design for roads that improves visibility and stopping sight distance for motorists and keep vegetation clear to improve sightlines for motorists (these measures should reduce animal collisions)
T.21 Use alternatives to salt/sand for controlling ice on roads to reduce the potential attraction of salt-seeking wildlife (e.g., moose) to locations that will increase their risk of mortality
T.22 Use alternatives to herbicides and pesticides on rights-of-way to reduce ingestion of harmful chemicals by wildlife
T.23 Use materials on the road base that are free of contaminated materials (e.g., use of recycled blast material that is not acid rock generating)
T.24 Apply dust suppression measures during drilling and blasting activities to minimize dusting of adjacent soil and vegetation
T.25 Avoid or minimize drilling and blasting on windy days, very cold days, and near waterbodies to reduce distance over which noise, and its incumbent impacts to biota, travels
T.26 Monitor blasting and drilling vibrations to ensure thresholds identified in the eventual IA are not exceeded, and to enable further reduction of noise and vibration through additional mitigation if thresholds are exceeded
T.27 Follow proper waste disposal measures to minimize wildlife waste interactions

T.28 Ensure spills are cleaned up immediately to minimize contaminants entering important habitats

T.29 Adhere to applicable regulatory requirements (e.g., Ontario's *Endangered Species Act, 2007*; *Migratory Birds Convention Act, 1994*; the provincial *Pesticides Act, 1990*; federal *Pest Control Products Act*; see also Appendix E of the BPPA Report for Acts, regulations, and other biodiversity conditions (Zoetica 2021))

T.30 Apply established BMPs where appropriate and economically feasible (see Section 4.4 and Appendix A)

T.31 Create a Road Management Plan to minimize potential impacts to wildlife (e.g., amphibian fencing, wildlife underpasses, speed limits)

T.32 Develop plans to protect soil health to reduce impacts to vegetation and biota that require the retention of nutrients

T.33 Develop and implement a rare plant and/or seed salvage plan, if needed

T.34 Develop an Erosion and Sediment Control Plan to reduce the potential for sediment to interact with sensitive habitats and reduce the potential for erosion in sensitive areas (e.g., riparian areas)

T.35 Develop and implement a Construction Environmental Management Plan to minimize the impacts of construction activities on biodiversity

T.36 Develop a Compliance and Effectiveness Monitoring Program to ensure mitigation measures are properly implemented and are effective and to determine the need for adaptive mitigation

T.37 Develop and implement a Revegetation Plan to reduce habitat loss and restore ecosystem function

T.38 Develop and implement a Restoration Plan to help increase the speed and area in which habitat is restored after disturbance to restore ecosystem function

T.39 Develop and implement an Environmental Incident Management Plan to document unexpected impacts of the APM Project to biodiversity and assess the need for adaptive management

Table 4-1. Required or recommended setback distances for natural heritage features from sources identified to date. General habitat descriptions (GHDs) are only included for habitat of relevance to SAR that have been observed within the BIS study areas to date (Zoetica 2022b).

Feature	Minimum Buffer (m)	Reference Details
Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 2nd Ed. (OMNR 2010a)		
Significant habitat of endangered or threatened species	120	Section 5.4 – Adjacent Lands
Significant wetlands	120	Section 6.4 – Adjacent Lands
Significant wildlife habitat	120	Section 9.4 – Adjacent Lands
Significant areas of natural and scientific interest – life science	120	Section 10.4 – Adjacent Lands
Significant areas of natural and scientific interest – earth science	50	

Feature	Minimum Buffer (m)	Reference Details
All fish habitat	120	Section 51.4 – Adjacent Lands
Significant Wildlife Habitat Criteria Schedules For Ecoregion 3W (OMNRF 2017)[1]		
Waterfowl Stopover and Staging Area (Aquatic)	100-300[2]	Section 1.1 – Seasonal Concentration Areas
Waterfowl Stopover and Staging Area (Terrestrial)	100	
Shorebird Migratory Stopover Area	100	
Colonially-Nesting Bird Breeding Habitat (Bank and Cliff)	50	
Colonially-Nesting Bird Breeding Habitat (Ground)	• Double-crested Cormorant – 100 • Other Species – 150	
Colonially-Nesting Bird Breeding Habitat (Tree/Shrubs)	• Great Blue Heron – 300 • Bonaparte's Gull – 150 • Double-crested Cormorant – 100	
Sharp-tailed Grouse Lek	200	
Bat Hibernaculum	200	
Snake Hibernaculum	30	
Cliff and Cliff Rim	120	Section 1.2.1 Rare Vegetation Communities
Rock Barren	120	
Diverse and Sensitive Orchid Communities	120	
Waterfowl Nesting Area	120	Section 1.2.2 Specialized Habitat for Wildlife
Milkweed Patch	30	
Bald Eagle and Osprey Nesting Habitat	• Bald Eagle – 400-800[3] • Osprey – 300	
Woodland Raptor Nesting Habitat	• Great Gray Owl, Northern Goshawk – 400 • Barred Owl (stick nest) – 200 • Broad-winged Hawk, Cooper's Hawk, Great Horned Owl (stick nest), Barred Owl (cavity nest), Red-tailed Hawk, Long-eared Owl – 100 • Great Horned Owl (cavity nest), Northern Hawk Owl, Common Raven, Merlin, Sharp-shinned Hawk – 50 • American Kestrel, Boreal Owl, Northern Saw-whet Owl – 25	
Turtle Nesting Area	30	
Aquatic Feeding Habitat	120	
Mineral Lick	120	
Mammal Denning Site	• Wolf – 200 • Other Species – 100	

Feature	Minimum Buffer (m)	Reference Details
Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNR 2010b)[4]		
Large, medium, small lakes; ponds – high (HPS) or moderate potential sensitivity (MPS)	30-90[5]	
Rivers; stream segments – HPS or MPS	30-90[5]	
Provincially Significant Wetlands (PSWs)	120	
Nests/communal roosts in cavities	• Chimney Swift – 50 • Eastern Screech-owl – 25	
Ground nests	• Turkey Vulture – 150 • Short-eared Owl – 100 • Northern Harrier – 50	
Occupied cougar dens	200	
Wolverine dens	4000	
Wabigoon Forest 2019-2029 Forest Management Plan (MNRF 2019)[6]		
Bat Roosting Site	60	
Conservation Reserves, Lola Lake Provincial Park, and Butler Lake Provincial Park[7]	60	
Dryden Forest 2021-2031 Forest Management Plan (Dryden Forest Management Company 2021)[6]		
Bat Roosting Site	60	
Provincial Park and Other Protected Areas	30	
Ecologically Significant Areas[8]	60	
Eastern Whip-poor-will General Habitat Description (MECP 2013)		
Eastern Whip-poor-will GHD Category 1	20	N/A
Eastern Whip-poor-will GHD Category 2	170 (from Category 1)	
Eastern Whip-poor-will GHD Category 3	500 (from Category 2)	

Notes:

1. SWH types for which ELC ecosites or other defined habitat units constitute the SWH (rather than a distance-based buffer) are not included in this table.
2. The flooded field ecosite habitat plus a 100-300 m radius area, dependent on local site conditions and adjacent land use, is the SWH (OMNR 2000).
3. The area of the habitat from 400-800 m is dependent on sight lines from the nest to the development and inclusion of perching and foraging habitat (James 1984).
4. Habitat features that are also considered SWH, with an equal or larger buffer specified in OMNRF (2017), are not repeated in this table.
5. Area of concern is based on slope: 0-15% (30 m), >15-30% (50 m), >30-45% (70 m), >45% (90 m).
6. Operational prescriptions for areas of concern are only included for values identified by the forest planning team(s). Habitat features included in (OMNR 2010b) are not repeated in this table.
7. Only prevents use of herbicide, no other restriction on operations.
8. Modified operations within buffer, not complete avoidance.

Feature	Minimum Buffer (m)	Reference Details
Inactive nests/dens have not been included in this table. Inactive nests/dens and habitat features for additional species may be added to the table in future iterations of this report if identified through fieldwork. At this time, the list of setback distances do not indicate which are required or may permit development with a demonstration of mitigation to enable no net negative effects. At this time, the list of setback distances does not indicate which are required or may still permit development with a demonstration of mitigation to enable no net negative effects.		

4.4 Best Management Practices

Agencies within the Ontario and Federal governments have created a plethora of BMPs from which to draw from when detailed mitigation and management plans are being created. Not all BMPs published in provincial or federal guidance documents will be applicable to the APM Project. The APM Project will only draw from relevant and implementable BMPs. A list of relevant BMPs that will be considered in the development, construction, and operation of the APM Project is included in Appendix A; however, this list is not likely to be exhaustive.

5.0 POTENTIAL APM PROJECT X BIODIVERSITY INTERACTIONS AND MITIGATION

Zoetica's BIS is designed to comply with regulatory requirements, and will take community concerns and feedback received through engagement into consideration (see Zoetica's BPPA Report for a detailed summary of engagement and concerns and interests relevant to biodiversity expressed by attendees (Zoetica 2021)). Studies were also designed with consideration of requirements relevant to biodiversity outlined in the *Tailored Impact Statement Guidelines (TISG) Template for Designated Projects Subject to the Impact Assessment Act and the Nuclear Safety and Control Act* (hereafter 'TISG Template') (IAAC 2020). While a formal APM Project-specific TISG document has not yet been issued, requirements outlined in the TISG Template are those that are likely to be included in the APM Project-specific TISG document. Based on these regulatory and community considerations, the following sections summarize baseline information, potential APM Project x biodiversity interactions, and specific mitigation measures for BVs that are likely to become VCs for the APM Project IA; namely, species of interest, important wildlife and fish habitats (including candidate SWH and critical habitat for federally listed SAR), wetland and riparian areas, and ecosystem functions and services.

For the purposes of the 2022 BIS Baseline Report and Change Assessment Memo, "species of interest" includes species of conservation concern, species of interest to stakeholders and rights-holders, and invasive species. The cultural importance of species cannot be ascertained by Zoetica at this time, as this task requires coordination with the APM Project's human health and social impact team. The scope of species of interest for BIS reporting will be expanded in future years of the BIS baseline program to include culturally important and indicator species (to be carried forward as VCs for the IA) when more information is gathered through Tier 2 studies and engagement.

In addition, species of interest and important habitats reported within the 2022 BIS Change Assessment Memo include those that occur within any relevant BIS study area and not just within the AOI. This conservative approach was taken to account for the movement of certain species into and out of the Project area and because the project may have indirect effects that fall beyond the boundaries of the AOI (e.g., dust, noise). Over time, as more is known about the siting and activities of the APM Project, it is possible that some BVs may be added or eliminated from the APM Project x biodiversity interactions assessment. For example, if a species of conservation concern is located within the RSA, but not the LSA or AOI, the species may be deemed as not interacting with the APM Project and may be eliminated from further change assessment reporting.

5.1 Species of Interest

Species of interest include species of conservation concern, species of interest to stakeholders and rights-holders, and invasive species. Scientific names for species of interest discussed within this section are provided in **Appendix B**.

5.1.1 Species of Conservation Concern

Species of conservation concern include provincially and/or federally listed SAR (Extirpated, Endangered, Threatened, Special Concern) protected under the federal *Species at Risk Act* (*SARA*) and Ontario *Endangered Species Act* (*ESA*), and provincially rare (subnational rank S1, S2, S3, SH) species whose habitat is protected as SWH (see Section 5.2.1). Regionally rare species may also be scoped into the BIS in future years if they are identified by stakeholders and/or rights-holders as VCs. The species of conservation concern summarized in Further studies are required to determine whether the APM Project will interact with any of these species.

Table 5-1 include those that were positively identified within the BIS study areas of relevance during Tier 1 studies. A total of 15 species of conservation concern, including 10 SAR and five provincially rare species, have been observed to date. Further studies are required to determine whether the APM Project will interact with any of these species.

Table 5-1. SAR and provincially rare species identified to date within relevant BIS study areas, the ways in which the APM Project could interact with them, data gaps, and potential mitigation.

Species	Federal Status	Provincial Status	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
			AOI	LSA	RSA				
Species at Risk									
American Eel[3]	THR (COSEWIC)	THR (SARO)	-	✓ *LSA_{AQU}*	*NA*	• Figure 4-13 in Appendix F to Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b) • eDNA detection near water intake & discharge at outlet of Mennin Lake[4]	• Clearing of land leading to enhanced erosion and transport of sediment and pollutants into streams. • Underwater noise and vibrations • Infilling of water during construction • Change in habitat conditions (e.g., water quality, temperature, shading, water flow, depth, sedimentation)	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, especially A.2, A.3, A.5	Tier 1 • Confirm eDNA spp. presence[4] using appropriate methods for trapping eels Tier 2 • If presence confirmed, expand spatial density of sampling • Expand surveys to other seasons and years to enable occupancy analysis
Little Brown Myotis & Northern Myotis[5]	END (COSEWIC, *SARA*)	END (SARO)	✓[6]			• Candidate SWH occurs throughout the AOI, LSA_{TER}, and RSA_{BAT} (Figure 6-1 in Chapter 4, 2022 BIS Baseline Report (Zoetica 2022b))	• Clearing of land • Noise and vibrations • Spread of disease-causing agents (e.g., spread of fungus causing white-nosed syndrome due to increased human presence in the area)	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.3 for terrestrial mitigation, namely T.7, T.8	Tier 2 • Evaluate candidate SWH in the AOI, LSA_{TER}, and RSA_{BAT} • Expand acoustic surveys for information about bat space use

Species	Federal Status	Provincial Status	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
			AOI	LSA	RSA				
						• Closest known critical habitat is outside of the RSA_{BAT} (Section 6.3.1.1 of Chapter 4, 2022 BIS Baseline Report (Zoetica 2022b))	• Creation of areas that biodiversity values avoid or are attracted to (e.g., feeding on light-seeking insects)		• If detected, capture and radio-track bats for fine-scale habitat use (e.g., roost and foraging areas) • Conduct other Tier 2 field studies for bats if needed
Cougar	DD (COSEWIC)	END (SARO)	*NA*	*NA*	✓ *RSA_{CAR}*	• One NHIC record from 2019 (Figure 3-2 of Chapter 4, 2022 BIS Baseline Report (Zoetica 2022b))	• Clearing of land • Increased road traffic • Creation of barriers to movement • Creation of areas that biodiversity values avoid or are attracted to	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.3 for terrestrial mitigation, namely T.16	Tier 2 • Expand surveys (e.g., camera traps, snow tracking) to verify species presence • Conduct Tier 2 field studies for carnivores
Black Ash	THR (COSEWIC)	END (SARO)	-	✓ *LSA_{AQU}*	*NA*	• Figure 1-1 in Chapter 2 of the 2022 BIS Baseline Report (Zoetica 2022b) • Black ash stands known in polygons west and southwest of Mennin Lake	• Dust settling on vegetation adjacent to infrastructure • Change in habitat conditions (e.g., water flow, depth) • Spread of invasive species (e.g., non-native plants, emerald ash borer) • Injury or mortality of seedlings due to trampling or equipment	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.10, T.11, T.33 • See Section 4.2 for aquatic mitigation • Avoid area recommended for the species' habitat regulation: entire wetland ecosite and min. 28 m radius around tree (Catling *et al.* 2022)	Tier 2 • Field-verify black ash-associated ecosites identified in Figure 1-1 • Conduct Tier 2 field studies for at-risk plants
Eastern Whip-poor-will	THR (COSEWIC, SARA)	THR (SARO)	✓	✓ *LSA_{TER}*	✓ *RSA_{AVI}*	• Figure 2-2 in Chapter 7 of 2022 BIS Baseline Report: western portion of LSA_{TER} into RSA_{AVI} (Zoetica 2022b) • Table 5 in Memo of 2018 Phase 2 Studies (Tulloch Engineering 2019)	• Clearing of land • Noise and vibrations causing species to avoid adjacent habitats and/or nest failure • Change in habitat conditions • Traffic-caused mortality • Collisions with infrastructure • Clearing of vegetation or disruption of ground materials containing occupied nests	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.9, T.10, T.11, T.13 • Avoid area specified in the species' GHD: 500 m of suitable habitat from the nest site or centre of	Tier 1 • Complete habitat suitability modelling and mapping for eastern whip-poor-will Tier 2 • Conduct Tier 2 field studies for eastern whip-poor-will (OMNRF 2014)

Species	Federal Status	Provincial Status	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
			AOI	LSA	RSA				
							• Creation of areas that biodiversity values avoid or are attracted to (e.g., feeding on light-seeking insects) • Use of pesticides/herbicides reducing availability of insect prey	approximated defended territory (MECP 2013)	
Eastern Wood-pewee	SC (COSEWIC, SARA)	SC (SARO)	✓	✓ *LSA_{TER}*	✓ *RSA_{AVI}*	• Figure 2-2 in Chapter 7 of 2022 BIS Baseline Report: northern portion of LSA_{TER} near Hwy 17 (Zoetica 2022b) • Table 5 in Memo of 2018 Phase 2 Studies (Tulloch Engineering 2019)	• Clearing of land • Noise and vibrations causing species to avoid adjacent habitats and/or nest failure • Change in habitat conditions • Traffic-caused mortality • Collisions with infrastructure • Clearing of vegetation containing occupied nests • Creation of areas that biodiversity values avoid or are attracted to values • Use of pesticides/herbicides reducing availability of insect prey	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.9, T.10, T.11, T.13	• Conduct Tier 2 field studies for upland breeding birds to assess community composition and relative abundance
Common Nighthawk **Olive-sided Flycatcher**	SC (COSEWIC) THR (SARA)	SC (SARO)	✓	- *LSA_{TER}*	- *RSA_{AVI}*	• Table 5 in Memo of 2018 Phase 2 Studies (Tulloch Engineering 2019)	• Clearing of land • Noise and vibrations causing species to avoid adjacent habitats and/or nest failure • Change in habitat conditions • Traffic-caused mortality • Collisions with infrastructure • Clearing of vegetation or disruption of ground materials containing occupied nests • Creation of areas that biodiversity values avoid or are attracted to (e.g., feeding on light-seeking insects) • Use of pesticides/herbicides reducing availability of insect prey	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.9, T.10, T.11, T.13	• Conduct Tier 2 field studies for upland breeding birds to assess community composition and relative abundance
Bald Eagle	NAR (COSEWIC)	SC (SARO)	-	✓ *LSA_{TER}*	✓ *$RSA_{AVI\text{-}AQU}$*	• Figure 5-2 in Chapter 7 of the 2022 BIS Baseline Report: nest record near north shore of Mennin Lake (discussed in Section 5.2.1)	• Noise and vibrations causing species to avoid adjacent habitats and/or nest failure • Change in habitat conditions • Traffic-caused mortality • Collisions with infrastructure • Clearing of vegetation containing occupied nests • Creation of areas that biodiversity values avoid or are attracted to Exposure to	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation, namely T.7, T.9, T.10, T.11, T.13 • See Section 5.2.1 for mitigation of bald	• Conduct Tier 2 field studies for raptors

Species	Federal Status	Provincial Status	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
			AOI	LSA	RSA				
							chemical contaminants (to be studied through the EMBP)	eagle nesting habitat (SWH)	
Provincially Rare Species									
Vasey's Rush	-	Vulnerable (S3) (SRANK)	✓	✓ LSA_{AQU}	✓ RSA_{VEG}	• Figure 1-2 in Chapter 2 of the 2022 BIS Baseline Report: eastern portion of AOI and LSA_{AQU} into RSA_{VEG} (Zoetica 2022b)	• Clearing of land • Infilling of water during construction • Dust settling on vegetation adjacent to infrastructure • Change in habitat conditions (e.g., water flow, depth) • Spread of invasive species into an area due to temporary disturbance • Injury or mortality due to trampling or equipment	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.10, T.11, T.33 • See Section 4.2 for aquatic mitigation	Tier 2 • Field-verify NHIC Element Occurrences (EOs) for species presence, distribution, and habitat suitability to confirm SWH • Conduct Tier 2 field studies for rare plants
Green Arrow Arum	-	Vulnerable (S3) (SRANK)	✓	✓ LSA_{AQU}	*NA*	• Figure 3-1 in Appendix E, Chapter 1 of the 2022 BIS Baseline Report: watercourse reaches S013, S018 (Zoetica 2022b) • Figure 3-2 in Appendix E, Chapter 1 of the 2022 BIS Baseline Report: waterbody site W006 (Zoetica 2022b)	• Clearing of land • Infilling of water during construction • Dust settling on vegetation adjacent to infrastructure • Change in habitat conditions (e.g., water flow, depth) • Spread of invasive species into an area due to temporary disturbance • Injury or mortality due to trampling or equipment	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation, namely T.10, T.11, T.33	Tier 2 • Conduct Tier 2 field studies for rare plants • Identify candidate and confirmed SWH for rare species
Macoun's Arctic	-	Vulnerable (S3) (SRANK)	✓	- LSA_{TER}	*NA*	• Figure 1-2 in Chapter 6 of the 2022 BIS Baseline Report (Zoetica 2022b)	• Clearing of land • Dust settling on vegetation adjacent to infrastructure • Change in habitat conditions • Mortality due to road traffic, trampling, and equipment	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.10	Tier 2 • Conduct Tier 2 field studies for at-risk and rare terrestrial invertebrate species • Identify candidate and confirmed SWH for rare species
Old World Swallowtail	-	Imperiled-Vulnerable (S2S3) (SRANK)							

Species	Federal Status	Provincial Status	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
			AOI	LSA	RSA				
Permanent Marsh Mosquito	-	Vulnerable (S3) (SRANK)	✓	✓ *LSA_{AQU}*	*NA*	• Figure 4-13 in Appendix F to Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b)	• Clearing of land leading to enhanced erosion and transport of sediment and pollutants into streams. • Infilling of water during construction • Change in habitat conditions (e.g., water quality, temperature, shading, water flow, depth, sedimentation)	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, especially A.2, A.3, A.11	Tier 2 • Conduct Tier 2 field studies for at-risk and rare terrestrial invertebrate species • Identify candidate and confirmed SWH for rare species

Notes:
SAR Conservation statuses: END = Endangered, THR = Threatened, SC = Special Concern, NAR = Not at Risk, DD = Data Deficient.
Provincially Rare SRANKS: S1 = Critically Imperiled, S2 = Imperiled, S3 = Vulnerable. B (Breeding), M (Migration), and N (Non-breeding) are breeding status qualifiers; only the relevant SRANK(s) for the WLON-Ignace siting area is presented in this table.

1. For the purposes of this table, the indicated study area excludes overlap with other study area(s) that may be encompassed by its boundaries. A "✓" was used when a species is detected within a study area. An "X" denotes the species was not detected within a study area that was investigated for the species. "NA" was used where study area was not investigated for the species. Spatial data from NHIC are represented by a 1 km grid rather than a point, as per the NHIC's Sensitive Data Location Standards. As such, check marks for species with NHIC records do not necessarily indicate confirmed presence in the study area(s).
2. Potential mitigation included in this table reflects the typical mitigation measures that can be applied to reduce potential Project impacts. Additional mitigation measures may be included where needed to minimize any negative effects of the Project on biodiversity. The NWMO will follow the mitigation hierarchy (see Section 4.1) in all stages of the Project using the best available data at each stage.
3. Based on information found in the Recovery Strategy for the American Eel (*Anguilla rostrata*) in Ontario (MacGregor *et al.* 2013), the American eel eDNA detections made in 2021 were outside of their known geographic range in Ontario. Additional Tier 2 studies are required to confirm presence of American eel within the BIS study areas.
4. Based on information from the CSM (CanNorth 2020b).
5. One acoustic signal for northern myotis was detected in the AOI. It was determined that it was not possible to rule in or rule out the presence of northern myotis as the signal was detected within the possible geographic range, but could also be of another myotis species.
6. Location of detection is not specified (Sparrow-Scinocca *et al.* 2022). However, precise locations of little brown myotis (a restricted species as designated by the NHIC) would remain undisclosed due to data sensitivity.

5.1.2 Species of Interest to Stakeholders and Rights-holders

The NWMO has been actively engaging with interested parties in the WLON-Ignace siting area since 2010. Engagement focused on environmental studies (EMBP and BIS) began in 2018 and is ongoing. Species identified as of interest and potentially important by local stakeholders and rights-holders, and that were identified within the BIS study areas of relevance during Tier 1 studies to date, are presented in **Table 5-2**. This list is not comprehensive, and species may be added or removed as studies progress. Along with eastern whip-poor-will, a species of conservation concern described in Section 5.1.1, four species included in **Table 5-2** (moose, black bear, snowshoe hare, northern flying squirrel) were also selected as focal species for Tier 1 Habitat Suitability Modelling (HSM) studies due to their potential importance to local and Indigenous communities. Complete results and mapping from HSM will be incorporated into baseline and change assessment reporting in future years.

Table 5-2. Species of interest identified to date within relevant BIS study areas, the ways in which the APM Project could interact with them, data gaps, and potential mitigation.

Species	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
Moose	✓	✓ LSA_{UNG}	✓ RSA_{UNG}	• Detected in RSA_{UNG} in GBIF dataset and during 2016 and 2016 fieldwork (Section 2.3.2 of Chapter 4, 2022 BIS Baseline Report (Zoetica 2022b)) • eDNA detections in AOI and LSA_{AQU} at 33 sites, in all types of aquatic habitats (Section 2.3.2 of Chapter 4, 2022 BIS Baseline Report (Zoetica 2022b)) • During Moose Aerial Inventory (MAI), higher moose densities appeared to be associated with abundant winter forage close to cover patches (Foster *et al.* 2022) • See Section 5.2.1 for discussion of Moose Aquatic Feeding Areas (MAFAs)	• Increased exposure to roads and traffic • Stress / winter exhaustion • Clearing of land • Infilling of water during construction • Creation of barriers to movement • Creation of areas that biodiversity values avoid or are attracted to	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation, namely A.2 • See Section 4.3 for terrestrial mitigation, namely T.21, T.16 • Manage snowbank height • Create escape gaps in snowbanks	Tier 1 • Habitat suitability modelling (HSM) to predict areas of high quality habitat Tier 2 • Expand surveys to establish areas with higher moose density (MAI) or use (camera trapping, snow tracking) • Conduct Tier 2 field studies for ungulates
Black Bear	✓	✓[2]		• Bear sign (tracks and scats) noted as prevalent throughout the Phase 2 Study Areas used by Tulloch[3] (Tulloch Engineering 2018a) • Black bear detected on trail cameras inside the AOI (Tulloch Engineering 2019)	• Increased exposure to roads and traffic • Clearing of land • Creation of barriers to movement • Creation of areas that biodiversity values avoid or are attracted to	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.16	Tier 1 • Habitat suitability modelling (HSM) to predict areas of high quality habitat Tier 2 • Expand surveys (e.g., camera traps, hair snag stations) to establish distribution • Conduct Tier 2 field studies for carnivores
Gray Wolf[4]	✓	✓ LSA_{TER}	*NA*	• eDNA detections at 11 sites, in all types of aquatic habitat (Appendix G of Appendix F, Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b)) • Wolf detections reported by Tulloch during fieldwork (Tulloch Engineering 2018a) • Wolf detected on a trail camera inside the AOI (Tulloch Engineering 2019)	• Increased exposure to roads and traffic • Clearing of land • Creation of barriers to movement • Creation of areas that biodiversity values avoid or are attracted to	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.16	Tier 2 • Expand surveys (e.g., camera traps) to establish distribution • Conduct Tier 2 field studies for carnivores
Snowshoe Hare	✓	✓ LSA_{TER}	*NA*	• Snowshoe hare detected on trail cameras inside the AOI (Tulloch Engineering 2019)	• Increased exposure to roads and traffic • Clearing of land • Creation of barriers to movement	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.16	Tier 1 • Habitat suitability modelling (HSM) to predict areas of high quality habitat

Species	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
					• Creation of areas that biodiversity values avoid or are attracted to		Tier 2 • Expand surveys (e.g., snow track surveys, pellet counts) to investigate habitat use • Conduct Tier 2 field studies for small terrestrial mammals
Northern Flying Squirrel	✓	✓ LSA_{TER}	*NA*	• eDNA detections to genus only (*Glaucomys*) (Section 4.2.1 in Appendix F to Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b))	• Increased exposure to roads and traffic • Clearing of land • Creation of barriers to movement • Creation of areas that biodiversity values avoid or are attracted to	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.16, T.7	Tier 1 • Habitat suitability modelling (HSM) to predict areas of high quality habitat Tier 2 • Expand surveys to verify species presence • Conduct Tier 2 field studies for small terrestrial mammals
Beaver	✓	✓ LSA_{AQU}	*NA*	• eDNA detections in all types of aquatic habitat (Appendix B to Appendix F, Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b))	• Increased exposure to roads and traffic • Clearing of land • Infilling of water during construction • Creation of barriers to movement • Creation of areas that biodiversity values avoid or are attracted to	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation, namely A.22 • See Section 4.3 for terrestrial mitigation, namely T.16	Tier 1 • AHM with investigation of beaver dams to establish areas of presence and activity Tier 2 • Conduct Tier 2 field studies for semi-aquatic mammals
Grouse	✓	✓ LSA_{TER}	*(✓)*[5] RSA_{AVI}	• Table 2-3 in Chapter 7 of the 2022 BIS Baseline Report (Zoetica 2022b) • App D. in Appendix F, Chapter 1 of the 2022 BIS Baseline Report: eDNA detections of ruffed grouse (Zoetica 2022b)	• Clearing of land • Dust settling on vegetation adjacent to infrastructure • Noise and vibrations causing species to avoid adjacent habitats and/or nest failure • Change in habitat conditions • Traffic-caused mortality • Collisions with infrastructure • Clearing of vegetation or disruption of ground materials containing occupied nests	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.9, T.10, T.11, T.13, T.17, T.31	• Conduct Tier 2 field studies for upland breeding birds to assess community composition and relative abundance

Species	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
					• Creation of areas that biodiversity values avoid or are attracted to • Creation of barriers to movement		
Ducks and Geese	✓	✓ LSA_{TER}	✓ $RSA_{AVI-AQU}$	• Table 4-3 in Chapter 7 of the 2022 BIS Baseline Report (Zoetica 2022b) • Appendix D in Appendix F, Chapter 1 of the 2022 BIS Baseline Report: eDNA detections of Canada goose, wood duck, hooded merganser (Zoetica 2022b)	• Clearing of land • Infilling of water during construction • Dust settling on vegetation adjacent to infrastructure • Noise causing species to avoid adjacent habitats • Surface level vibrations • Change in habitat conditions • Traffic-caused mortality • Collisions with infrastructure • Clearing of vegetation or disruption of ground materials containing occupied nests • Creation of areas that biodiversity values avoid or are attracted to (due to noise, light, mechanical and human disturbance) within typical movement pathways	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation, namely A.14 • See Section 4.3 for terrestrial mitigation, namely T.7, T.9, T.10, T.11, T.13	• Conduct Tier 2 field studies for upland breeding birds to assess community composition and relative abundance
Walleye	✓	✓ LSA_{AQU}	✓ RSA_{AQU}	• Reported in ARA dataset (Figure 2-2, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b) • eDNA detections in all types of aquatic habitat (Appendix F, Chapter 1 and Figure 2-3, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b)	• Clearing of land • Underwater noise and vibrations leading to avoidance of habitat • Infilling of water during construction • Change in habitat conditions (e.g., water temperature, shading, water flow, depth, sedimentation) • Creation of barriers to movement with water crossing structures (e.g., culverts) • Injury or mortality due to construction and use of in-water structures (e.g., water intake pipes)	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.5, A.6, A.24	Tier 1 • Conduct seasonal eDNA surveys to help elucidate spawning and rearing areas and migratory corridors Tier 2 • Confirm presence using Tier 2 seasonal fish community survey techniques • If presence confirmed, conduct more detailed habitat assessments in the AOI to determine
Northern Pike	✓	✓ LSA_{AQU}	✓ RSA_{AQU}	• Reported in ARA dataset (Figure 2-5, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b)) • eDNA detections in all types of aquatic habitat (Appendix F, Chapter 1 and Figure 2-6, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b))			
White Sucker	✓	✓ LSA_{AQU}	✓ RSA_{AQU}	• Reported in ARA dataset (Figure 2-7, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b))			

Species	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
				• eDNA detections in a watercourse in AOI and a waterbody in LSA_{AQU} (Appendix F, Chapter 1, and Figure 2-8, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b))			potentially important habitats
Shiner spp.	✓	✓ *LSA_{AQU}*	✓ *RSA_{AQU}*	• Reported in ARA dataset (Figure 2-9, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b)) • eDNA detections in all types of aquatic habitat (Appendix F, Chapter 1 and Figure 2-10, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b))			
Lake Trout	-	-	✓ *RSA_{AQU}*	• Reported in ARA dataset (Figure 2-4, Chapter 8, 2022 BIS Baseline Report (Zoetica 2022b)	• No potential APM Project interactions have been identified yet	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation namely A.5, A.6, A.24	Tier 2 • Conduct Tier 2 seasonal fish community surveys to determine if present in the AOI and LSA_{AQU} • If present, conduct more detailed habitat assessments to determine potentially important habitats.
Wild Rice	✓	✓ *LSA_{AQU}*	*NA*	• Figure 1-1 in Chapter 2 of the 2022 BIS Baseline Report: north shore of Mennin Lake (Zoetica 2022b) • Figure 3-1 in Appendix E, Chapter 1 of the 2022 BIS Baseline Report: watercourse reaches S007, S156 (Zoetica 2022b) • Figure 3-2 in Appendix E, Chapter1 of the 2022 BIS Baseline Report: waterbody sites W006, W007, W010, W014, W077, W079 (Zoetica 2022b)	• Clearing of land leading to loss of wetlands that support wild rice • Infilling of wetland that support wild rice during construction • Dust settling on vegetation adjacent to infrastructure • Change in habitat conditions (e.g., water flow, depth) • Spread of invasive species into wetland areas due to temporary disturbance • Injury or mortality due to trampling or equipment	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation, namely T.10, T.37 • Allow for harvest of culturally important plants prior to clearing and grubbing • Incorporate culturally important native plants into revegetation/restoration plan	• Conduct Tier 2 field studies for culturally important plants
Other Edible and Medicinal Plants	✓	✓ *LSA_{TER}* *LSA_{AQU}*	*NA*	• Table 1-3 and Table A-2 in Chapter 2 of the 2022 BIS Baseline Report (Zoetica 2022b) • Appendix D of Appendix E, Chapter 1 of the 2022 BIS Baseline Report (Zoetica 2022b)	• Clearing of land • Infilling of water during construction • Dust settling on vegetation adjacent to infrastructure	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation, namely T.10, T.37	• Continue engagement with Indigenous communities to identify/clarify species of cultural importance

Species	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
					• Change in habitat conditions (e.g., water flow, depth) • Spread of invasive species into an area due to temporary disturbance • Injury or mortality due to trampling or equipment	• Allow for harvest of culturally important plants prior to clearing and grubbing • Incorporate culturally significant native plants into revegetation/restoration plan	• Conduct Tier 2 field studies for culturally important plants
Tree Frogs	✓	- *LSA_{TER}*	✓	• Table 2-2 in Chapter 5 of the 2022 BIS Baseline Report (Zoetica 2022b) • Table 5 in Memo of 2018 Phase 2 Studies (Tulloch Engineering 2019)	• Clearing of land • Infilling of water during construction • Noise and vibrations (surface, underwater) causing species to avoid adjacent habitats • Change in habitat conditions (e.g., water temperature, shading, water flow, depth, sedimentation) • Spread of invasive species • Traffic-caused mortality • Spread of disease-causing agents • Creation of barriers to movement (terrestrial and aquatic) • Creation of areas that biodiversity values avoid or are attracted to	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation, namely A.17, A.24 • See Section 4.3 for terrestrial mitigation, namely T.8, T.10 • For in-stream works, clean and disinfect equipment and gear between disconnected aquatic habitats to prevent transmission of amphibian diseases (e.g., chytrid fungus, ranavirus)	Tier 1 • Repeat analyses of amphibian detections from seasonal eDNA sampling Tier 2 • Conduct Tier 2 field studies for amphibians

Notes:

1. For the purposes of this table, the indicated study area excludes overlap with other study area(s) that may be encompassed by its boundaries. . A "✓" was used when a species is detected within a study area. An "X" denotes the species was not detected within a study area that was investigated for the species. "NA" used where study area was not investigated for the species.
2. Potential mitigation included in this table reflects the typical mitigation measures that can be applied to reduce potential Project impacts. Additional mitigation measures may be included where needed to minimize any negative effects of the Project on biodiversity. The NWMO will follow the mitigation hierarchy (see Section 4.1) in all stages of the Project using the best available data at each stage.
3. BIS study area(s) could not be distinguished for observations of bear sign as Tulloch Engineering used different study areas during their Phase 2 studies.
4. Although COSEWIC and COSSARO officially recognize the northern gray wolf as a subspecies of the gray wolf in the province, it is thought that gray wolves in Northwestern Ontario are a distinct genetic cluster of canids with differentiated ancestry (Wheeldon and White 2009) known as the Great Lakes wolf, Great Lakes-Boreal wolf, or Ontario-type gray wolf (*C. lupus occidentalis x C. lupus lycaon*) (Beacon Environmental Limited and Wildlife 2000 Consulting 2018).
5. Tier 1 eDNA studies were focused on the AOI and LSA_{AQU}. Data could be analyzed for LSA_{TER} (which is fully encompassed within the LSA_{AQU}) but not for RSA_{AVI} (which partially overlaps the LSA_{AQU}).

5.1.3 Invasive Species

An invasive species is one that is not native to Ontario (or a part of Ontario) and that threatens ecosystems, habitats, or native species. Invasive species can also threaten human health and socio-economic values such as infrastructure and recreation. Regulated invasive species (e.g., listed under the Ontario *Invasive Species Act* and *Weed Control Act*), non-regulated invasive species (e.g., those identified as species of concern by provincial or regional invasive species organizations),

and other weedy and introduced plants could be spread through the WLON-Ignace siting area due to unmitigated APM Project development. A list of invasive species that have the potential to occur within the BIS study areas is listed in Appendix D of Zoetica's BPPA Report (Zoetica 2021)). Invasive species identified within the BIS study areas of relevance during Tier 1 studies to date are presented in **Table 5-3**, with four of these species identified through Tier 1 eDNA studies. However, as the eDNA metabarcoding analyses are currently undergoing refinement and optimization, invasive (and other) species identification may change and be improved in future years of the BIS baseline program.

Table 5-3. Invasive species identified to date within relevant BIS study areas, the ways in which the APM Project could interact with them, data gaps, and potential mitigation.

Species	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
Spongy Moth (also known as LDD Moth)[3,4]	-	✓ *LSA_{AQU}*	*NA*	• Detected with eDNA on the western side of LSA_{AQU}, north of Mennin Lake (Section 4.1.3 of Appendix F to Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b))	• Spread of invasive species into an area due to temporary disturbance • Ongoing surface land management during operations	• Ensure construction equipment and materials brought on site are clean and free of visible plant parts and soil • Conduct pre-construction surveys for invasive insects • Inspect plants for egg masses, caterpillars, leaf damage, or other sign of species presence • Manage and dispose of species parts (e.g., egg masses, caterpillars) according to BMPs	• Conduct Tier 2 field studies to verify species presence
Octagonal Tail-worm[4]	✓	✓ *LSA_{AQU}*	*NA*	• Detected with eDNA in all aquatic habitat types sampled (Section 4.1.3 of Appendix F to Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b))	• Spread of invasive species into an area due to temporary disturbance • Ongoing surface land management during operations	• Ensure construction equipment and materials brought on site are clean and free of visible plant parts and soil	• Conduct Tier 2 field studies to verify species presence
Red Earthworm[4]	-	✓ *LSA_{AQU}*	*NA*	• Detected with eDNA in watercourses in the LSA_{AQU} (Section 4.1.3 of Appendix F to Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b))	• Spread of invasive species into an area due to temporary disturbance • Ongoing surface land management during operations	• Ensure construction equipment and materials brought on site are clean and free of visible plant parts and soil	• Conduct Tier 2 field studies to verify species presence
Feral Hog[5] **(AKA Wild Pig)**	✓	✓ *LSA_{AQU}*	*NA*	• Detected with eDNA in all aquatic habitat types sampled (Section 4.1.3 of Appendix F to Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b))	• Clearing of land • Ongoing surface land management during operations	• Report any sightings or evidence of wild pigs (e.g., rooted areas, wallows) to NDMNRF • Dispose of waste promptly and properly	• Conduct Tier 2 field studies to verify species presence (e.g., camera trapping)
Canada Thistle (noxious weed)	-	- *LSA_{TER}*	✓	• Figure 3-2 in Appendix E, Chapter 1 of the 2022 BIS Baseline Report: waterbody site W081 (Zoetica 2022b)	• Spread of invasive species into an area due to temporary disturbance	• Ensure construction equipment and materials brought on site are clean and free of visible plant parts and soil	• Conduct Tier 2 field studies for invasive plants

Species	Observed in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
					• Ongoing surface land management during operations	• Conduct pre-construction surveys for invasive plants • Manage and dispose of invasive plants according to BMPs • Re-seed disturbed areas as soon as possible with native plant mix to prevent establishment and spread of invasive species • Monitor for invasive plants during construction and operations	
Other weedy and introduced plants (5 spp.)	✓	✓ LSA_{TER} LSA_{AQU}	*NA*	• Table 1-3 in Chapter 2 of the 2022 BIS Baseline Report (Zoetica 2022b) • Appendix D of Appendix E, Chapter 1 of the 2022 BIS Baseline Report (Zoetica 2022b)	• Spread of weedy and introduced species into an area due to temporary disturbance • Ongoing surface land management during operations	• Ensure construction equipment and materials brought on site are clean and free of visible plant parts and soil • Re-seed disturbed areas as soon as possible with native plant mix to prevent establishment and spread of weedy and introduced species	• Conduct Tier 2 field studies for weedy and introduced plants

Notes:

1. For the purposes of this table, the indicated study area excludes overlap with other study area(s) that may be encompassed by its boundaries. A "✓" was used when a species is detected within a study area. An "X" denotes the species was not detected within a study area that was investigated for the species. "NA" used where study area was not investigated for the species.
2. Potential mitigation included in this table reflects the typical mitigation measures that can be applied to reduce potential Project impacts. Additional mitigation measures may be included where needed to minimize any negative effects of the Project on biodiversity. The NWMO will follow the mitigation hierarchy (see Section 4.1) in all stages of the Project using the best available data at each stage.
3. Detection is outside of the species' known range.
4. This species does not have a barcode gap for the primer(s) used in the eDNA study (Section 5.0 of Appendix F to Chapter 1, 2022 BIS Baseline Report (Zoetica 2022b)).
5. eDNA detections suggest pig presence, but cannot distinguish between feral and domestic pigs.

5.2 Important Habitat

Habitats within this section were those identified as potentially important within the BIS study areas of relevance during Tier 1 studies to date.

5.2.1 Candidate Significant Wildlife Habitat

SWH is a component of the natural heritage features and areas that are protected by Ontario Provincial Policy Statement (PPS) under the *Planning Act* (MMAH 2020). SWH includes seasonal concentration areas, rare vegetation communities, specialized habitat for wildlife, habitat for species of conservation concern, and animal movement corridors. For the WLON-Ignace siting area, identification of candidate and confirmed SWH is currently informed by the draft *Significant Wildlife Habitat Criteria Schedules for Ecoregion 3W* (OMNRF 2017) as the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF) has not yet developed criteria schedules for Ecoregion 4S, where the APM Project would be located. **Table 5-4** lists candidate and confirmed SWH identified within the BIS study areas of relevance during Tier 1 studies. Only candidate SWH that meet additional habitat criteria outlined in the 3W ecoregional criteria schedule

are included in **Table 5-4** (i.e., candidate SWH that are based solely on ecosite matches and cannot be further refined at this point in BIS studies are not yet considered). To date, the only confirmed SWH present within the AOI are the Moose Aquatic Feeding Areas (MAFAs) previously mapped by the NDMNRF.

Table 5-4. Candidate and confirmed SWH identified to date within relevant BIS study areas, the ways in which the APM Project could interact with them, data gaps, and potential mitigation.

Type	Identified in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
Rare Treed Type: Red and White Pine	-	✓ LSA_{TER}	*NA*	• Figure 4-9 in Appendix C, Chapter 1 of the 2022 BIS Baseline Report (Zoetica 2022b) • Strong candidate SWH ecosite east of AOI, north of Hwy 17	• Dust settling on vegetation adjacent to infrastructure • Change in habitat conditions	• See Figure 4-1 for mitigation hierarchy • See Section 4.3 for terrestrial mitigation, namely T.6, T.10 • Avoid area of the red and white pine ecosite (if confirmed as SWH)	Tier 2 • Field-verify red pine ecosites identified in Figure 4-9 to confirm SWH • Continue engagement with local stakeholders and rights-holders to identify regionally rare plants • Conduct Tier 2 field studies for rare plants
Amphibian Breeding Habitat	✓	✓ LSA_{TER}	*NA*	• Figure 4-6 in Appendix C, Chapter 1 of the 2022 BIS Baseline Report (Zoetica 2022b) • Data from 2017 Phase 2 Studies (Tulloch Engineering 2018b)	• Clearing of land • Infilling of water during construction • Change in habitat conditions (e.g., water temperature, shading, water flow, depth, sedimentation) • Spread of invasive species into an area due to temporary disturbance	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation, namely T.6, T.10 • Avoid area of the ecosite(s) and shorelines (if confirmed as SWH).	Tier 2 • Field-verify candidate SWH ecosites identified in Figure 4-6, with a focus on areas that may be impacted by construction activities (see CSM map/diagram) • Conduct Tier 2 field studies for amphibians
Waterfowl Nesting Area	✓	✓ LSA_{TER}	*NA*	• Figure 4-13 in Appendix C, Chapter 1 of the 2022 BIS Baseline Report (Zoetica 2022b) • Figure 5 in Memo of 2018 Phase 2 Studies (Tulloch Engineering 2019)	• Clearing of land • Infilling of water during construction • Change in habitat conditions • Clearing of vegetation or disruption of ground materials containing occupied nests	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation, namely T.6, T.7, T.10 • Avoid area of the wetland plus 120 m of adjacent upland habitats (if confirmed as SWH)	Tier 2 • Field-verify candidate SWH ecosites identified in Figure 4-13, with a focus on areas that may be impacted by construction activities (see CSM map/diagram) • Conduct Tier 2 field studies for waterbirds/waterfowl
Bald Eagle and Osprey Nesting Habitat	✓	✓ LSA_{TER}	✓ $RSA_{AVI-AQU}$	• Figure 4-4 in Appendix C, Chapter 1 of the 2022 BIS Baseline Report (Zoetica 2022b) • Bald eagle nest record near north shore of Mennin Lake	• Clearing of land • Infilling of water during construction • Change in habitat conditions • Clearing of vegetation containing occupied nests	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation, namely T.6, T.7, T.10	Tier 2 • Field-verify bald eagle nest record to determine if nest is still active or was recently used. Identify any alternate nests and perching and foraging habitat.

Type	Identified in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				
						• Avoid active nest plus setback: 300 m for osprey, 400-800 m for bald eagle (if confirmed as SWH)	• Field-verify candidate SWH ecosites identified in Figure 4-4, with a focus on areas that may be impacted by construction activities (see CSM map/diagram) • Conduct Tier 2 field studies for stick-nesting raptors
Wild Rice Stand	✓	✓ LSA_{TER}	✓ $RSA_{AVI-AQU}$	• Figure 4-1 in Chapter 7 of the 2022 BIS Baseline Report (Zoetica 2022b) • Figure 4-14 in Appendix C, Chapter 1 of the 2022 BIS Baseline Report (Zoetica 2022b)	• Clearing of land • Infilling of water during construction • Dust settling on vegetation adjacent to infrastructure • Change in habitat conditions (e.g., water flow, depth) • Spread of invasive species into an area due to temporary disturbance • Injury or mortality due to trampling or equipment	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation, namely T.6, T.10	Tier 2 • Field-verify Wild Rice Stand polygon to determine if size of stand meets criteria for SWH (>1 ha). • Field-verify candidate SWH ecosites identified in Figure 4-14, with a focus on areas that may be impacted by construction activities (see CSM map/diagram)
Moose Aquatic Feeding Area (MAFA) ***Confirmed SWH***	✓	✓ LSA_{AQU}	✓ RSA_{UNG}	• Figures 2-1 and 2-2 in Chapter 4 of the 2022 BIS Baseline Report (Zoetica 2022b) • 8 wetland polygons are confirmed SWH in LSA_{AQU}, including 2 in eastern portion of AOI	• Clearing of land • Infilling of water during construction • Dust settling on vegetation adjacent to infrastructure • Change in habitat conditions (e.g., water flow, depth) • Spread of invasive species into an area due to temporary disturbance	• See Figure 4-1 for mitigation hierarchy • See Section 4.1 for aquatic mitigation, namely • See Section 4.2 for terrestrial mitigation, namely T.6 • Avoid NDMNRF-mapped MAFAs plus 120 m of adjacent upland habitats	Tier 1 • Complete habitat suitability modelling and mapping for moose Tier 2 • Field-verify NDMNRF-mapped MAFAs for further evaluation of significance (e.g., evidence of use by moose)
Mammal Denning Site	✓	✓ LSA_{TER}	✓ RSA_{CAR}	• Data from 2017 Phase 2 Studies (Tulloch Engineering 2018b) • Figures 4-21 and 4-22 in Appendix C, Chapter 1 of 2022 BIS Baseline Report (Zoetica 2022b)	• Clearing of land • Infilling of water during construction • Change in habitat conditions • Clearing of vegetation or disruption of ground materials containing occupied dens	• See Figure 4-1 for mitigation hierarchy • See Section 4.2 for terrestrial mitigation, namely T.6, T.7, T.10 • See Section 4.1 for aquatic mitigation • Avoid active den plus setback: 200 m for wolf, 100 m for other species indicated in the SWH Criteria Schedule for Ecoregion 3W (if confirmed as SWH)	Tier 1 • Complete habitat suitability modelling and mapping for black bear Tier 2 • Conduct Tier 2 field studies (community surveys) for carnivores

Type	Identified in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA	RSA				

Notes:

1. For the purposes of this table, the indicated study area excludes overlap with other study area(s) that may be encompassed by its boundaries. "NA" used where study area was not investigated for the species.
2. Potential mitigation included in this table reflects the typical mitigation measures that can be applied to reduce potential Project impacts. Additional mitigation measures may be included where needed to minimize any negative effects of the Project on biodiversity. The NWMO will follow the mitigation hierarchy (see Section 4.1) in all stages of the Project using the best available data at each stage.

5.2.2 Critical Habitat

Critical habitat is habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the federal recovery strategy or in an action plan for the species (*Species at Risk Act*, S.C. 2002, c. 29). Identification of critical habitat is not a required component of a provincial recovery strategy under the Ontario *ESA*. However, the approach used to identify critical habitat, in conjunction with the best scientific information available, is recommended when developing a habitat regulation. A habitat regulation is a legal instrument under the *ESA* that prescribes an area that will be protected as the habitat of the species, where habitat is defined in part as "*an area on which the species depends, directly or indirectly, to carry on its life processes, including life processes such as reproduction, rearing, hibernation, migration or feeding*… [and includes] *dens, nests, hibernacula and other residences*".

Currently, to our knowledge, relevant authorities have not designated any critical habitat within the WLON-Ignace siting area.

5.2.3 Important Fish Habitat

Important fish habitat includes habitat that is required to fulfill important life history phases of fish including spawning, rearing, and overwintering phases and includes migratory habitat that is required by fish to access these habitats. A review of desk-based existing information collected to date as well as field identification of important fish habitats during Tier 1 baseline studies conducted for the BIS revealed various important fish habitats located within the BIS study areas (**Table 5-5**). These include walleye spawning and nursery areas, lake trout spawning areas, northern pike and muskellunge spawning areas, white sucker spawning areas, and potential overwintering and refuge areas for various species (e.g., deep pools within watercourses). The majority of these important fish habitats were recorded in the RSA; however, potential spawning areas detected during Tier 1 field surveys were documented within the aquatic LSA (LSA_{AQU}). No potentially important fish habitat has been documented within the AOI. In addition, no migratory habitat has been reported to date in any of the BIS aquatic study areas.

Table 5-5. Important fish habitat identified to date within relevant BIS study areas, the ways in which the APM Project could interact with them, data gaps, and potential mitigation.

Type	Observed/Reported in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA_{AQU}	RSA_{AQU}				
Walleye Spawning Area	-	✓	✓	• Figure 2-1, Chapter 8, BIS Baseline Report (Zoetica 2022b)	• Change in habitat conditions (e.g., water temperature, water quality, shading, water flow, depth, sedimentation)	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.5, A.6, A.14, A.16, A.19	Tier 2 • Confirm presence of walleye spawning areas using Tier 2 fish community survey techniques during the spawning season

Type	Observed/Reported in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA_{AQU}	RSA_{AQU}				
					• Creation of barriers to movement with water crossing structures (e.g., culverts)		• If present, conduct more detailed habitat assessments in the AOI to determine potentially important habitats • If present, conduct seasonal eDNA surveys to help elucidate spawning and rearing areas and migratory corridors
Lake Trout Spawning Area	-	-	✓	• Figure 2-1, Chapter 8, BIS Baseline Report (Zoetica 2022b)	• No potential APM Project interaction identified to date.	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.5, A.6, A.14, A.16	Tier 2 • Conduct Tier 2 fish community surveys to determine lake trout presence in the LSA_{AQU}. • If present, conduct further detailed lake trout spawning surveys to detect presence of habitat within the AOI and LSA_{AQU}, especially in aeras that could be impacted by the APM Project.
Northern Pike and Muskellunge Spawning Area	-	-	✓	• Figure 2-1, Chapter 8, BIS Baseline Report (Zoetica 2022b)	• No potential APM Project interaction identified to date.	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.5, A.6, A.14, A.16, A.19	Tier 2 • Conduct a reconnaissance survey in spring to determine seasonally flooded areas where northern pike may spawn. • Conduct seasonal eDNA surveys to help elucidate spawning and rearing areas and migratory corridors • Conduct seasonal Tier 2 fish characterization studies to understand seasonal distribution of northern pike • If present, conduct more detailed habitat assessments in the AOI to determine potentially important habitats for spawning northern pike
White Sucker Spawning Area	-	-	✓	• Figure 2-1, Chapter 8, BIS Baseline Report (Zoetica 2022b)	• No potential APM Project interaction identified to date.	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.5, A.6, A.14, A.16	Tier 1 • Conduct additional AHM shoreline surveys for lakes to determine potential spawning habitat • Conduct seasonal eDNA surveys to help elucidate spawning and rearing areas and migratory corridors Tier 2 • Conduct seasonal Tier 2 fish characterization studies using methods appropriate for benthic species to understand seasonal distribution of white sucker
Potential Spawning Area (species unknown)	-	✓	✓	• Figure 2-1, Chapter 8, BIS Baseline Report (Zoetica 2022b)	• Change in habitat conditions (e.g., water temperature, water quality, shading, water flow, depth, sedimentation)	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.5, A.6, A.14, A.16, A.19	Tier 1 • Conduct additional AHM shoreline surveys for lakes • Conduct additional AHM surveys in wetlands that were dry in 2021 to determine additional potential spawning and rearing areas

Type	Observed/Reported in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA_{AQU}	RSA_{AQU}				
					• Creation of barriers to movement with water crossing structures within the AOI (e.g., culverts)		
Walleye Nursery Area	-	-	✓	• Figure 2-1, Chapter 8, BIS Baseline Report (Zoetica 2022b)	• No potential APM Project interaction identified to date.	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.5, A.6, A.14, A.16, A.19	Tier 1 • Conduct additional AHM shoreline surveys for lakes and Tier 1 AHM surveys of wetlands that were dry in 2021 to determine additional potential nursery areas
Potential Overwintering and Refuge Area (deep pools)	-	-	✓	• Figure 2-1, Chapter 8, BIS Baseline Report (Zoetica 2022b)	• No potential APM Project interaction identified to date.	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.5, A.6, A.14, A.16, A.19	Tier 1 • Conduct additional AHM shoreline surveys for lakes

Notes:
1. For the purposes of this table, the indicated study area excludes overlap with other study area(s) that may be encompassed by its boundaries.
2. Potential mitigation included in this table reflects the typical mitigation measures that can be applied to reduce potential Project impacts. Additional mitigation measures may be included where needed to minimize any negative effects of the Project on biodiversity. The NWMO will follow the mitigation hierarchy (see Section 4.1) in all stages of the Project using the best available data at each stage.

5.3 Wetland and Riparian Areas

Wetlands and riparian environments play a vital role in sustaining healthy aquatic ecosystems. These environments provide unique and specialized habitats for a variety of wildlife that depend on these features to carry out various life history phases. Tier 1 studies conducted to date have revealed that wetland and riparian habitats can contribute to many of the candidate SWHs in BIS study areas relevant to the BVs they support (see Section 5.2.1). In addition to supporting biodiversity, wetlands and riparian environments can provide hydrological and social functions as they contribute to and are affected by groundwater recharge and discharge, regulating functions for flooding and water quality in aquatic habitats, and economic value as they tend to support valuable products such as wild rice, commercial fish and furbearers, and recreational opportunities. **Table 5-6** contains a list of the wetland types and Provincially Significant Wetlands (PSWs) found within the AOI, and aquatic LSA and relevant RSAs. In addition, **Table 5-6** summarizes the proportion of each study area consisting of the area surrounding aquatic habitats, represented as riparian habitat widths of 15 m, 30 m, and 100 m that are relevant to healthy ecosystem function. The relative proportions in each study area of increasing size tells the reader about the relative distribution of certain wetland features across space. For example, the amount of marsh habitat is very low in the AOI and LSA_{AQU} relative to the larger regional (RSA_{ECO}) area. Inversely, fen habitat is represented more proportional to area within the AOI relative to the RSA_{ECO}. The relative rarity of wetland types across space, and the need for retaining functional riparian area for protecting wetland health and biodiversity are considered in this section alongside potential interactions with the APM Project and potential mitigation to minimize impacts. Major wetland categories and riparian areas may be adjusted following the integration of TEM and/or AHM data and in future tiers of study.

Table 5-6. Wetlands and riparian areas identified to date within relevant BIS study areas, the ways in which the APM Project could interact with them, data gaps, and potential mitigation.

Type	Percentage of Study Area Mapped[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA_{AQU}	RSA_{ECO}				
Swamp	*10.1*	*10.6*	10.8	• Figure 1-1 and 1-2, Chapter 3 in 2022 BIS Baseline Report (Zoetica 2022b)	• Clearing of land • Infilling of water during construction • Decreased habitat quality for supporting biodiversity due to dusting	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation, namely A.17, A.22, A.23 • See Section 4.3 for terrestrial mitigation	Tier 1 • Update desk-based mapping with field collected data. Tier 2 • Conduct Tier 2 wetland studies in AOI and LSA with a focus on areas that may be impacted by the APM Project.
Marsh	*0.4*	*0.4*	14.9				
Fen	*7.4*	*6.5*	4.0				
Bog	*<0.1*	*0.2*	0.1				
Provincially Significant Wetlands (Nabish Creek Wetland Complex)	-	-	<0.1	• Figure 1-2, Chapter 3 in 2022 BIS Baseline Report (Zoetica 2022b)	• No likely interaction	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation namely A.17, A.22, A.23 • See Section 4.3 for terrestrial mitigation	• NA
Riparian Area (15 m)	*31.5*	*33.2*	NA	• Figure 1-3 and 1-4, Chapter 3 in 2022 BIS Baseline Report (Zoetica 2022b)	• Clearing of land • Degradation of riparian habitat for supporting biodiversity due to dusting • Decreased riparian function for sustaining aquatic health	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation namely A.17, A.22, A.23 • See Section 4.3 for terrestrial mitigation	Tier 2 • Determine actual condition of riparian habitat within 15 m buffer zone. • Conduct Tier 2 biodiversity studies to understand biodiversity in riparian environments
Riparian Area (30 m)	*40.4*	*40.8*	NA		• Clearing of land • Degradation of riparian habitat for supporting biodiversity due to dusting • Decreased riparian function for sustaining aquatic health		Tier 2 • Determine actual condition of riparian habitat within 30 m buffer zone. • Conduct Tier 2 biodiversity studies to understand biodiversity in riparian environments
Riparian Area (100 m)	*71.1*	*69.1*	NA		• Clearing of land • Decreased riparian function for sustaining aquatic health		Tier 2 • Determine actual condition of riparian habitat within 100 m buffer zone. • Conduct Tier 2 biodiversity studies to understand biodiversity in riparian environments

Notes:

1. For the purposes of this table, the indicated study area includes overlap with other study area(s) that may be encompassed by its boundaries. "NA" used where study area was not investigated.

Type	Percentage of Study Area Mapped[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA_{AQU}	RSA_{ECO}				

2. Potential mitigation included in this table reflects the typical mitigation measures that can be applied to reduce potential Project impacts. Additional mitigation measures may be included where needed to minimize any negative effects of the Project on biodiversity. The NWMO will follow the mitigation hierarchy (see Section 4.1) in all stages of the Project using the best available data at each stage.

5.4 Ecosystem Function and Services

Ecosystem functions include the physical, chemical, and biological processes within the ecosystem to maintain biodiversity. Ecosystem services are the variety of benefits that nature provides to people including regulating services that help regulate ecosystem processes (e.g., shading, pollutant removal, regulation of water), provisioning services (e.g., material benefits such as food, water, raw materials, and medicinal resources), and cultural services (e.g., nonmaterial benefits including recreation, conducting ceremonies, and mental and physical health). **Table 5-7** contains important or potentially important areas identified to date for providing ecosystem services within the BIS study areas of relevance during Tier 1 studies. While wetlands can provide water regulating services, further information gathered during Tier 2 BIS studies and other studies (e.g., conducted as part of the EMBP) will be important for determining the relevance of a particular wetland in providing a regulating service. Similarly, other ecosystem components (e.g., lakes, rivers, and wetlands) can provide provisioning services (e.g., fish, wild rice), but require additional information to determine the relevance of these ecosystem components in the area. Thus, currently, **Table 5-7** contains only those ecosystem components that are of known significance and do not require further studies to glean their importance as ecosystem services within the BIS study areas.

Table 5-7. Ecosystem services and functions identified to date within relevant BIS study areas, the ways in which the APM Project could interact with them, data gaps, and potential mitigation.

Type	Reported in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA_{AQU}	RSA_{ECO}				
Ecosystems and ecosystem components critical to sustaining biodiversity							
Provincial Parks, Conservation Reserve, or Wilderness Area	-	✓	✓	• Figure 1-1, Chapter 9, BIS Baseline Report (Zoetica 2022b)	• Change in quality of vegetation and aquatic areas due to dusting, change to water quality or quantity	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.2 for aquatic mitigation • See Section 4.3 for terrestrial mitigation	• Conduct Tier 2 studies in areas potentially impacted by the APM Project and in reference areas to understand the importance of these areas in sustaining biodiversity
Ecosystems and ecosystem components providing provisioning services and cultural services							
Trails	✓	✓	✓	• Figure 1-1, Chapter 9, BIS Baseline Report (Zoetica 2022b)	• Restricted access of trails running through the AOI due to fencing around infrastructure • Impact on quality of trail for recreation due to impacts on vegetation and habitat	• See Figure 4-1 for mitigation hierarchy steps that could apply • See Section 4.3 for terrestrial mitigation	• Work with teams from other IA pillars to plan relevant BIS Tier 2 studies if required.

Type	Reported in[1]			Key Locations	Potential Interactions with APM	Potential Mitigation[2]	Gaps/Next Steps
	AOI	LSA_{AQU}	RSA_{ECO}				

Notes:

1. For the purposes of this table, the indicated study area excludes overlap with other study area(s) that may be encompassed by its boundaries.
2. Potential mitigation included in this table reflects the typical mitigation measures that can be applied to reduce potential Project impacts. Additional mitigation measures may be included where needed to minimize any negative effects of the Project on biodiversity. The NWMO will follow the mitigation hierarchy (see Section 4.1) in all stages of the Project using the best available data at each stage.

6.0 SETBACK AREAS

Zoetica has taken data collected to date and created maps showing areas where setback distances will help to minimize potential APM Project x biodiversity interactions and will help to direct engineering in this endeavour (**Figure 6-1**). Zoetica emphasizes that maps are based on data collected to date, only, and maps are unable to capture features that may change in location over time (e.g., new stick nests constructed in the future). In general, areas to be avoided as much as possible during project design (else, high mitigation efforts if not avoided) include aquatic habitats (waterbodies, watercourses, wetlands) and their 15-30 m riparian buffers, wildlife features, and around areas known to contain significant wildlife habitat or SAR. As shown in **Figure 6-1** and described in Chapter 2 and Appendix B of the 2022 BIS Baseline Report (Zoetica 2022b), aquatic habitats are widely distributed and comprise approximately 36% of the AOI.

The setback maps integrate required or recommended buffer distances outlined in **Table 4-1**, using the most conservative values where applicable until more information is available through detailed field investigations planned as part of Tier 2 studies for the BIS baseline program. For example, field studies are needed to confirm the bald eagle nesting habitat and habitat for Vasey's rush (a provincially rare plant), shown on **Figure 6-1**, as SWH. When the area of the SWH has been identified, the additional 120 m buffer to accommodate adjacent lands for SWH, according to the *Natural Heritage Reference Manual* (OMNR 2010a), can also be applied. These setback maps will be continually built upon and refined as more baseline data are collected for the BIS and other disciplines (e.g., groundwater connections identified through the EMBP). Ultimately, these maps are intended to show where development and site alteration should be avoided, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions, in alignment with the Ontario PPS.

NWMO Biodiversity Impact Studies

Setback Area Considerations Map

Figure 6-1a

Area of Interest

Local Study Area (LSA_{TER})

Potential Development Constraints

Red Zone: High Mitigation
- Water Features (Lakes, Watercourses, and Wetlands)
- Riparian Buffers (15 and 30 m)
- Moose Aquatic Feeding Area Rank 3 or 4 (120 m buffer)

Orange Zone: Moderate Mitigation
- Moose Aquatic Feeding Area Rank 1 or 2 (120 m buffer)

Yellow Zone: Low Mitigation
- Riparian Buffer (100 m)

Green Zone: Less Mitigation
- No biodiversity x APM Project interactions identified to date.

Potential Red Zone*

Vasey's Rush NHIC Occurrence

Eagle Nest (800 m buffer)

*Exact location of data cannot be shown on map due to data sensitivity, and therefore are masked with a 1 km grid.

Subject to change based on integration of additional information.

1:37,500

0 0.5 1 km

ZOETICA

Inset Basemap © OpenStreetMap contributors

Data received from:
Ontario GeoHub — OHN Waterbody (MNRF); OHN Watercourse (MNRF); Wetlands (MNRF)
NWMO — AOI; NHIC Species Occurrences (MNRF); Non-Sensitive Wildlife Activity Area (MNRF); Wildlife Activity Site (MNRF)

Project CRS: NAD83 / UTM zone 15N		
Author: AH	Reviewed by: CC	Approved by: HB
August 29, 2023	Map ID: NWMO_BIS_A089a_IG	

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Layer 1: Eagle Nest (800 m buffer)

Layer 2: Vasey's Rush NHIC Occurrence

Layer 3: Moose Aquatic Feeding Areas (120 m buffer)

Layer 4: Riparian Buffers and Water Features

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NWMO Biodiversity Impact Studies

Setback Area Considerations Map

Figure 6-1b

Area of Interest

Local Study Area (LSA_{TER})

Potential Development Constraints

Red Zone: High Mitigation
- Water Features (Lakes, Watercourses, and Wetlands)
- Riparian Buffers (15 and 30 m)
- Moose Aquatic Feeding Area Rank 3 or 4 (120 m buffer)

Orange Zone: Moderate Mitigation
- Moose Aquatic Feeding Area Rank 1 or 2 (120 m buffer)

Yellow Zone: Low Mitigation
- Riparian Buffer (100 m)

Green Zone: Less Mitigation
- No biodiversity x APM Project interactions identified to date.

Potential Red Zone*

Vasey's Rush NHIC Occurrence

Eagle Nest (800 m buffer)

*Exact location of data cannot be shown on map due to data sensitivity, and therefore are masked with a 1 km grid.

Subject to change based on integration of additional information.

1:75,000

0 1 2 km

ZOETICA

Inset Basemap © OpenStreetMap contributors

Data received from:
Ontario GeoHub — OHN Waterbody (MNRF); OHN Watercourse (MNRF); Wetlands (MNRF)
NWMO — AOI; NHIC Species Occurrences (MNRF); Non-Sensitive Wildlife Activity Area (MNRF); Wildlife Activity Site (MNRF)

Project CRS: NAD83 / UTM zone 15N		
Author: AH	Reviewed by: CC	Approved by: HB
August 29, 2023	Map ID: NWMO_BIS_A089b_IG	

7.0 POTENTIAL SIGNIFICANT EFFECTS

Based on data collected and analyzed to date, along with considerations of the CSM during all stages of development and operation of the APM Project, and the relatively small size of the surface infrastructure and available mitigation measures, no biodiversity issues have been identified at this time that would preclude the WLON-Ignace siting area as a feasible site for ongoing consideration of the APM Project. Zoetica has included both spatial and Best Practice considerations within this report for consideration by the NWMO, and which can be used to build and manage a project that can eliminate or minimize potential impacts of the APM Project to biodiversity at this site, based on potential interactions that have been identified to date.

However, Zoetica provides the following important cautions:

1. Field studies have only recently been initiated, with only some data from Tier 1 studies received to date.
2. Additional studies and analyses of Tier 1 data, and data collection during future Tiers of studies, may uncover data that require further consideration about the site's suitability and potential for impacts.
3. The NWMO has not yet produced a formal Project Description, nor has Zoetica had the opportunity to examine data and predictions collected and made by other disciplines. While a project description is in progress, it has not yet been shared with Zoetica. Future iterations of this change assessment document will consider the project description when available. Biodiversity is also affected by the chemical, physical, and social environment, which may be altered by the APM Project. Chemical and physical environmental impacts of the project are being investigated and predicted by the EMBP, and human and social impacts are being considered in the human and social impact studies program.

8.0 NEXT STEPS

The NWMO is currently nearing the site selection stage, anticipated to occur in the fourth quarter of 2024. Information collected as part of the BIS Tier 1 studies along with information collected as part of other environmental programs such as the EMBP, and through the human, social, and economic pillars, will aid in the site selection process for the APM Project. The project will only proceed with a willing host community, thus information collected as part of these programs will help inform local communities of the potential project interactions and possible mitigations to allow communities to make an informed decision on their willingness to house the APM Project in their community. Currently at the WLON-Ignace site, Tier 1 data are being collected in 2023 to fill data gaps identified during the review of previously collected Tier 1 baseline data reported in the 2022 BIS Baseline Report.

Once a site has been selected, the BIS will proceed with data collection as part of Tier 2 BIS studies. The design of these studies is informed by BIS Tier 1 data along with relevant and available data collected as part of the EMBP and the human and social pillars. The focus of Tier 2 studies is to collect data to understand community and population metrics for biodiversity (e.g., relative abundance, species diversity) within the relevant BIS study areas, which will be important for determining the overall effects of the APM Project on biodiversity. Tier 2 studies will also prioritize data collection for species of interest including listed species, species of importance to stakeholders and rights-holders, and species that can act as indicators. It is anticipated that further engagement will be conducted with the relevant communities

and feedback received during these engagement activities will provide valuable information that will be incorporated in the Tier 2 baseline study design at the selected site. For example, species of importance to stakeholders and rights holders revealed through engagement activities will assist Zoetica in focussing data collection for Tier 2 studies.

Some Tier 1 studies are also anticipated to continue at the selected site. For example, Terrestrial Ecosystem Mapping has thus far been restricted to the LSAs and may be conducted in the larger RSA, where required, to understand habitat associations for larger-ranging species (e.g., for developing habitat suitability maps for select species of interest) and the relative proportions of high-quality habitat withing the various study areas. eDNA studies may also continue and include repeated seasonal sampling to enable occupancy modelling, identify biological hotspots within the BIS study areas, and provide for detections of cryptic species that may not be as easily detected through traditional methods. eDNA metabarcoding may also be used as a tool to detect changes in occupancy over time and can be used to track changes in species ranges, track the progression of introduced or invasive species, and track species extirpations over time. Traditional Tier 2 survey methods would be implemented along with eDNA metabarcoding studies to validate eDNA detections.

Once sufficient biodiversity data are collected, these data will be used to identify important habitats within the relevant BIS study areas and help to prioritize ecosystem components that provide important ecosystem services for people. These data will build on data collected as part of Tier 1 studies to update disturbance avoidance maps and to inform the NWMO of priority locations that require consideration through the mitigation hierarchy. Along with a formal APM Project Description, and a project-specific TISG, this stage of data collection will start to inform the IA (e.g., which biodiversity values may be selected as valued components), and preliminary predictions (both impacts and benefits) on biodiversity can be assessed. The iterative process of baseline reporting and identifying potential impacts and benefits to biodiversity as data are being collected allows for: (1) the application of early learnings to assist in making good decisions, (2) identifying needed cross-disciplinary collaborations, and (3) early application of the mitigation hierarchy (e.g. identifying design adaptation needs early in the process) to ultimately result in a sound and focused IA with carefully documented change processes, following best practices outlined in the BPPA (Zoetica 2021).

9.0 LIMITATIONS AND CAUTIONS

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REFERENCES

Beacon Environmental Limited and Wildlife 2000 Consulting. 2018. DRAFT Recovery Strategy for the Algonquin Wolf (Canis sp.) in Ontario. Page Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario.

CanNorth. 2020a. Environmental Media Baseline Program Design - Final Report. Page Nuclear Waste Management Organization, Adaptive Phased Management Project – Northwestern Ontario Region. Prepared by Canada North Environmental Services for the Nuclear Waste Management Organization.

CanNorth. 2020b. Technical Memorandum: Conceptual Site Model for the Deep Geological Repository for the South Bruce Site - Revised Draft.

CanNorth. 2022. Biophysical Conceptual Site Model Update and Screening Level Change Assessment - Draft Report. Page Nuclear Waste Management Organization Adaptive Phased Management Project - Northwestern Ontario Region. Prepared by Canada North Environmental Services, Geosyntec Consultants International, Inc., Independent Environmental Consultants, and Zajdlik & Associates Inc. for the Nuclear Waste Management Organization, Saskatoon, Saskatchewan.

Catling, P. K., W. D. Van Hemessen, D. A. Bettencourt, T. D. North, and L. M. Wallis. 2022. Recovery Strategy for the Black Ash (Fraxinus nigra) in Ontario. Page Ontario Recovery Strategy Series. Prepared for the Ministry of the Environment, Conservation and Parks, Peterborough, Ontario.

Crins, W. J., P. A. Gray, P. W. C. Uhlig, and M. C. Wester. 2009. The Ecosystems of Ontario, Part 1: Ecozones and Ecoregions. Page Technical Report SIB TER IM. Ontario Ministry of Natural Resources, Inventory, Monitoring and Assessment, Peterborough, Ontario.

Dryden Forest Management Company. 2021. 2021-2031 Forest Management Plan for the Dryden Forest - Final Plan.

ECCC. 2022. Guidelines to avoid harm to migratory birds. Environment and Climate Change Canada. https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html.

Foster, R. F., G. Racey, T. Armstrong, and R. Schott. 2022. 2021-2022 Winter Moose Aerial Inventory NWMO Project Report.

IAAC. 2020. Tailored Impact Statement Guidelines Template for Designated Projects Subject to the Impact Assessment Act and the Nuclear Safety and Control Act. Impact Assessment Agency of Canada. https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/tailored-impact-statement-guidelines-projects-impact-assessment-nuclear-safety-act.html#_Toc16256536.

James, R. 1984. Habitat Management Guidelines for Ontario's Forests: Nesting Accipiters, Buteos, and Eagles 7:23.

MacGregor, R., L. Greig, J. Dettmers, W. A. Allen, L. McDermott, and T. Haxton. 2013. Recovery Strategy for the American Eel (Anguilla rostrata) in Ontario. Page Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario.

MECP. 2013. Eastern Whip-poor-will General Habitat Description. Ministry of the Environment,

Conservation and Parks.

MMAH. 2020. Provincial Policy Statement, 2020.

MNRF. 2019. Forest Management Plan Summary: 2019 - 2029 Wabigoon Forest Management Plan.

Naserifard, N., A. Lee, K. Birch, A. Chiu, and X. Zhang. 2021. Deep Geological Repository Conceptual Design Report Crystalline / Sedimentary Rock.

NDMNRF. 2021. Natural heritage methodology. https://www.ontario.ca/page/natural-heritage-methodology.

OMNR. 2010a. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second. Ontario Ministry of Natural Resources. Queen's Printer for Ontario., Toronto, Ontario.

OMNR. 2010b. Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales. Queen's Printer for Ontario, Toronto, Ontario.

OMNRF. 2014. Survey Protocol for Eastern Whip-poor-will (Caprimulgus vociferus) in Ontario (DRAFT). Ontario Ministry of Natural Resources and Forestry, Species at Risk Branch, Peterborough, Ontario.

OMNRF. 2017. Significant Wildlife Habitat Criteria Schedules for Ecoregion 3W - DRAFT. Ontario Ministry of Natural Resources and Forestry, Northwest Region Resources Section, Thunder Bay, Ontario.

Sparrow-Scinocca, B., M. Donnelly, and T. J. Thorne. 2022. 2021 Bat Activities Report, Toronto Zoo & NWMO Partnership. Prepared by the Toronto Zoo, Toronto.

Tulloch Engineering. 2018a. Summary Report. Page Phase 2: Preliminary Environmental Studies, Township of Ignace and Area, Ontario. Prepared for the Nuclear Waste Management Organization.

Tulloch Engineering. 2018b. Technical Memorandum 3, Ignace, ON. Page Adaptive Phased Management - Phase 2 Environmental Work. Submitted to the Nuclear Waste Management Organization.

Tulloch Engineering. 2019. Memorandum of 2018 Environmental Field Investigation Methods and Results. Page Phase 2: Preliminary Environmental Studies, Township of Ignace and Area, Ontario. Prepared for the Nuclear Waste Management Organization.

Wheeldon, T., and B. N. White. 2009. Genetic analysis of historic western Great Lakes region wolf samples reveals early Canis lupus/lycaon hybridization. Biology Letters 5:101–104.

Zoetica. 2021. Biodiversity Impact Studies - Northwestern Ontario Region: Best Practices and Preferred Approach Report. Prepared by Zoetica Environmental Consulting Services for the Nuclear Waste Management Organization.

Zoetica. 2022a. Biodiversity Impact Studies - Northwestern Ontario Region: 2022 Baseline Program Design. Prepared by Zoetica Environmental Consulting Services for the Nuclear Waste Management Organization, Maple Ridge, BC.

Zoetica. 2022b. Biodiversity Impact Studies - Northwestern Ontario Region: 2022 Baseline Report.

APPENDIX A — BEST MANAGEMENT PRACTICES

Table A-1. Partial list of Best Management Practices (BMPs) and other guidance documents

Topic	Relevant BMPs
General	Township of Ignace Final Official Plan. 2020 (Link) Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Ministry of Natural Resources, 2010, Publication No. 52630 (Link)
Soil Health	AF203 – Best Management Practice: Cold and Wet Soils. Ministry of Agriculture, Food and Rural Affairs, 2021, Publication No. 300534 (Link) AF151 – Best Management Practices Soil Health in Ontario. Ministry of Agriculture, Food and Rural Affairs, 2016, Publication No. 025616 (Link) (Lien) AF183 – Best Management Practices Soil Remediation. Ministry of Agriculture, Food and Rural Affairs, 2018, Publication No. 026873_U (Link) AF165 – Best Management Practices: Erosion Control Structures. Ministry of Agriculture, Food and Rural Affairs, 2017, Publication No. 025866 (Link) AF193 – Best Management Practices: Wind Erosion. Ministry of Agriculture, Food and Rural Affairs, 2018, Publication No. 026472 (Link) AF187 – Best Management Practices: Wind Strips. Ministry of Agriculture, Food and Rural Affairs, 2017, Publication No. 02590 (Link) AF191 – Soil Erosion by Water. Ministry of Agriculture, Food and Rural Affairs, n.d. (Link) (Lien) AF185 – Best Management Practices: Subsurface Drainage. Ministry of Agriculture, Food and Rural Affairs, 2017, Publication No. 025898 (Link) AF195 – Best Management Practices: Subsurface Compaction. Ministry of Agriculture, Food and Rural Affairs, 2018, Publication No. 026865 (Link) AF197 – Best Management Practices: Surface Crusting. Ministry of Agriculture, Food and Rural Affairs, 2018,Publication No. 026867_U (Link) AF207 – Best Management Practices: pH Extremes. Ministry of Agriculture, Food and Rural Affairs, 2021, Publication No. 300755 (Link) AF205 – Best Management Practices: Droughtiness. Ministry of Agriculture, Food and Rural Affairs, 2021, Publication No. 300538 (Link) ***Additional documents from the Ministry of Agriculture, Food and Rural Affairs are available here.***

Roads	Best Management Practices for Mitigating the Effects of Roads on Amphibian and Reptile Species at Risk in Ontario. OMNRF, 2016 (Link) Resource Roads and Wetlands: A guide for Planning, Construction, and Maintenance. Ducks Unlimited Canada, 2016, Special Publication SP-530E (Link) Fish and Wildlife Crossing Guidelines. Credit Valley Conservation, 2017 (Link) Protocol for the Review and Approval of Forestry Water Crossings, MNRF and Fisheries and Oceans Canada, 2020 (Link) Technical Guide for Enhancing, Managing and Restoring Pollinator Habitat Along Ontario's Roadsides. Pollinator Partnership Canada, n.d. (Link) (Lien) Environmental guidelines for access roads and water crossings. Ministry of Natural Resources, 1990 (Link) Codes of Practice. Fisheries and Oceans Canada, 2022 (Link)
Fish and Wildlife Management	Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada. Canadian Wildlife Service, Environment Canada, 2004 (Link) (Lien) BMP10 – Best Management Practices: Fish and Wildlife Habitat Management. Service Ontario Publications, 2012 (Link) Reptile and Amphibian Exclusion Fencing: Best Practices. MNRF, 2020 (Link) Best Management Practices for Excluding Barn Swallows and Chimney Swifts from Buildings and Structures. MNRF, 2017 (Link) Best management Practices for the Protection, Creation and Maintenance of Bank Swallow Habitat in Ontario. MNRF, 2017 (Link) Best Management practices for Identifying, Managing, and Creating Habitat for Ontario's Species at Risk Snakes. MNRF, 2018 (Link) Creating Nesting Habitat for Barn Swallows, Best Practices Technical Note. OMNRF, 2016 (Link) MTO Best Management Practices for Species at Risk Protection During Maintenance Activities. Ontario Ministry of Transportation, 2017 (Link) Forestry and Waterfowl: Assessing and Mitigating Risk Practitioner Guide. Forest Management and Wetland Stewardship Initiative, 2018 (Link) Codes of Practice. Fisheries and Oceans Canada, 2022 (Link) General Nesting Periods of Migratory Birds. Environment and Climate Change Canada, 2018 (Link)

	The below documents may have been rewritten and/or replaced by newer guides, but may still be in use by some forest management plans during their operational period, and for independent forest audit purposes. Additional archived documents that may be useful are available here. Habitat Management Guidelines for Birds of Ontario Wetlands, Including Marshes, Swamps, and Fens or Bogs of Various Types. OMNR, 1985 [Archived] (Link) Habitat Management Guidelines for Cavity-Nesting Birds in Ontario. OMNR, 1984 [Archived] (Link) Habitat Management for Ontario's Forests Nesting Accipiters, Buteos and Eagles. OMNR, 1984 [Archived] (Link) Management Guidelines and recommendations for Osprey in Ontario. OMNR, 1983 [Archived] (Link)
Invasive Species and Pest Control	A Landowner's Guide to Managing and Controlling Invasive Plants in Ontario. OMNR, 2016 (Link) Best Management Practices - Integrated Pest Management. Ministry of Agriculture, Food and Rural Affairs, 2016 (Link) Preventing Aquatic Invasive Species. Fisheries and Oceans Canada, 2022 (Link) Clean Equipment Protocol for Industry. Peterborough Stewardship Council and Ontario Invasive Plant Council, 2013 (Link) ***The following documents are a selection of resources from the Ontario Invasive Plant Council. More guidance documents are available here.*** Invasive *Phragmites* (*Phragmites australis*) Best Management Practices in Ontario. Ontario Invasive Plant Council, 2020 (Link) (Lien) Invasive Reed Canary Grass (*Phalaris arundinacea* subsp. *arundinacea*) Best Management Practices in Ontario. Ontario Invasive Plant Council, 2012 (Link) Purple Loosestrife (*Lythrum salicaria* L.), Best Management Practice Technical Document for Land Managers. Ontario Invasive Plant Council, 2017 (Link)
Wetlands and Water	Wetland Best Management Practices for Forest Management Planning & Operations. Forest Management and Wetland Stewardship Initiative, 2018 (Link for download) Best Management Practices – Water Management. Ministry of Agriculture, Food and Rural Affairs, 2016 (Link)
Fish and Fish Habitat	A Protocol Detailing the Fish Habitat referral Process in Ontario. Fisheries and Oceans Canada, 2000 (Link) Measures to Protect Fish and Fish Habitat. Fisheries and Oceans Canada, 2019 (Link) Codes of Practice. Fisheries and Oceans Canada, 2022 (Link) Extension Notes Ontario – Protecting Fish Habitat. LandOwner Resource Centre, 2000 (Link)

	Extension Notes Ontario – Protecting Fish Habitat from Sediment. LandOwner Resource Centre, 2000 (Link) Ontario's Provincial Fish Strategy – Fish for the Future. OMNRF, 2015 (Link) Ontario Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat. Fisheries and Oceans Canada, 2013 (Link)
Forest Management	AF193 – Best Management Practices: Buffer Strips. Ministry of Agriculture, Food and Rural Affairs, 2017, Publication No. 025990 (Link) BMP18E – Best Management Practices Agroforestry Series Volume 1: Woodlot Management. Ministry of Agriculture, Food and Rural Affairs, 2012 (Link) Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales. MNRF, 2010 (Link) Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales: Background and Rationale for Direction. Ministry of Natural Resources, 2010 (Link) Forest Management Guide for Boreal Landscapes. Ministry of Natural Resources, 2014 (Link) Forest Management Guide for Great Lakes-St. Lawrence Landscapes. Ministry of Natural Resources, 2019 (Link) Forest Management Guide to Silviculture in the Great Lakes-St. Lawrence and Boreal Forests of Ontario. Ministry of Natural Resources, 2019 (Link) Boreal Mixedwood Notes. Ministry of Natural Resources, 2000 (Link)

APPENDIX B — SCIENTIFIC NAMES

Table B-1. Scientific names for species mentioned in this report

Common Name	Scientific Name
VEGETATION	
Meadowtail foxtail	*Alopecurus pratensis*
Pondwater starwort	*Callitriche stagnalis*
Canada Thistle	*Cirsium arvense*
Black Ash	*Fraxinus nigra*
Purple iris	*Iris germanica*
Vasey's Rush	*Juncus vaseyi*
Green Arrow Arum	*Peltandra virginica*
Variable leaf pondweed	*Potamogeton gramineus*
Mountain ash	*Sorbus aucuparia*
Wild Rice	*Zizania palustris*
MAMMALS	
Moose	*Alces alces*
Gray Wolf[1]	*Canis lupus*
Beaver	*Castor canadensis*
Northern Flying Squirrel	*Glaucomys sabrinus*
Snowshoe Hare	*Lepus americanus*
Little Brown Myotis	*Myotis lucifugus*
Northern Myotis	*Myotis septentrionalis*
Cougar	*Puma concolor*
Pig	*Sus scrofa*
Black Bear	*Ursus americanus*
BIRDS	
Cooper's Hawk	*Accipiter cooperii*
Northern Goshawk	*Accipiter gentilis*
Sharp-shinned Hawk	*Accipiter striatus*
Northern Saw-whet Owl	*Aegolius acadicus*

Common Name	Scientific Name
Boreal Owl	*Aegolius funereus*
Eastern Whip-poor-will	*Antrostomus vociferus*
Great Blue Heron	*Ardea herodias*
Short-eared Owl	*Asio flammeus*
Long-eared Owl	*Asio otus*
Great Horned Owl	*Bubo virginianus*
Red-tailed Hawk	*Buteo jamaicensis*
Broad-winged Hawk	*Buteo platypterus*
Turkey Vulture	*Cathartes aura*
Chimney Swift	*Chaetura pelagica*
Common Nighthawk	*Chordeiles minor*
Bonaparte's Gull	*Chroicocephalus philadelphia*
Northern Harrier	*Circus hudsonius*
Olive-sided Flycatcher	*Contopus cooperi*
Eastern Wood-pewee	*Contopus virens*
Common Raven	*Corvus corax*
Merlin	*Falco columbarius*
American Kestrel	*Falco sparverius*
Bald Eagle	*Haliaeetus leucocephalus*
Eastern Screech-owl	*Megascops asio*
Double-crested Cormorant	*Nannopterum auritum*
Osprey	*Pandion haliaetus*
Great Gray Owl	*Strix nebulosa*
Barred Owl	*Strix varia*
Northern Hawk Owl	*Surnia ulula*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Grouse	Ruffed Grouse (*Bonasa umbellus*), Spruce Grouse (*Falcipennis canadensis*), Sharp-tailed Grouse

Common Name	Scientific Name
FISHES	
American Eel	*Anguilla rostrata*
White Sucker	*Catostomus commersonii*
Northern Pike	*Esox lucius*
Shiner species	*Notropis* spp.*, Notemigonus* spp.*, and Luxilus* spp.
Lake Trout	*Salvelinus namaycush*
Walleye	*Sander vitreus*
INVERTEBRATES	
Permanent Marsh Mosquito	*Anopheles walkeri*
Octagonal Tail-worm	*Dendrobaena octaedra*
Red Earthworm	*Lumbricus rubellus*
Spongy Moth	*Lymantria dispar*
Macoun's Arctic	*Oeneis macounii*
Old World Swallowtail	*Papilio machaon*

Notes:

1. Although COSEWIC and COSSARO officially recognize the northern gray wolf as a subspecies of the gray wolf in the province, it is thought that gray wolves in Northwestern Ontario are a distinct genetic cluster of canids with differentiated ancestry (Wheeldon and White 2009) known as the Great Lakes wolf, Great Lakes-Boreal wolf, or Ontario-type gray wolf (*C. lupus occidentalis x C. lupus lycaon*) (Beacon Environmental Limited and Wildlife 2000 Consulting 2018).