

# WEBEQUIE SUPPLY ROAD FINAL ENVIRONMENTAL ASSESSMENT REPORT / IMPACT STATEMENT

---

January 30, 2026

AtkinsRéalis Ref: 661910

## SECTION 10: Assessment of Effects on Fish and Fish Habitat



WEBEQUIE FIRST NATION

AtkinsRéalis



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# 10. Assessment of Effects on Fish and Fish Habitat

Fish and fish habitat was identified as one of the valued components (VC) during the VC scoping and selection as part of the Environmental Assessment / Impact Assessment (EA/IA) process. This section describes and assesses the potential effects that the Project may have on the Fish and Fish Habitat VC.

Existing conditions for fish and fish habitat have been established through the field work programs, desktop studies and engagement and consultation activities completed by the Project Team. This includes, but not limited to, background information review, internet research, fish habitat surveys, fish sampling, engagement with Indigenous communities and stakeholders, and expert opinion. The existing conditions are being used as baseline conditions to assess and determine the potential effects of the Project. The results of the baseline studies are provided in Appendix F – Natural Environment Existing Conditions (NEEC) Report.

The assessment of potential effects on the Fish and Fish Habitat VC is presented in the following manner:

- Scope of the Assessment;
- Existing Conditions Summary;
- Potential Effects, Pathways and Indicators;
- Mitigation and Enhancement Measures;
- Characterization of Net Effects;
- Determination of Significance;
- Cumulative Effects;
- Prediction of Confidence in the Assessment;
- Predicted future Condition of the Environment if the Project Does Not Proceed;
- Follow-up and Monitoring Programs; and
- References.

## 10.1 Scope of the Assessment

### 10.1.1 Regulatory and Policy Setting

The Fish and Fish Habitat VC is assessed in accordance with the requirements of the *Impact Assessment Act* (IAA), the Ontario *Environmental Assessment Act*, the *Fisheries Act*, the Tailored Impact Statement Guidelines (TISG) for the Project (Appendix A-1), the provincial approved EA Terms of Reference (ToR) (Appendix A-2), and EA/IA guidance documents.

**Table 10-1** outlines the key regulations, legislation and policies relevant to the assessment of the Fish and Fish Habitat VC for the construction and operation of the Project.



**Table 10-1: Key Regulation, Legislation, Policy Relevant to Fish and Fish Habitat**

Regulatory Agency	Regulation, Legislation, or Policy	Project Relevance
<b>Federal</b>		
Impact Assessment Agency of Canada (IAAC)	<i>Impact Assessment Act</i>	The Project is subject to the federal IAA (refer to Section 2). The Tailored Impact Statement Guidelines (TISG) issued by IAAC (2020) for the Project were used to identify requirements for the assessment of Fish and Fish Habitat VC.
Department of Fisheries and Oceans (DFO)	<i>Fisheries Act</i>	The <i>Fisheries Act</i> provides for the management and control of fisheries in Canada. It has provisions for fish and fish habitat protection, including prohibitions against causing the death of fish by means other than fishing; and causing the harmful alteration, disruption, or destruction of fish habitat.
Environment and Climate Change Canada	<i>Species at Risk Act</i>	<p>The purpose of the <i>Species at Risk Act</i> (SARA) is to prevent Canadian indigenous species from becoming extinct; to provide for recovery of species that are extirpated, endangered and threatened as a result of human activity; and to encourage management of special concern and other species to prevent them from becoming at risk.</p> <p>Aquatic species are protected throughout Canada, regardless of whether they are found on federal, provincial, public, or private land. If an aquatic species is listed under SARA, there is prohibition against harming it, or its residence. SARA makes it an offence to kill, harm, harass, capture or take a listed species that is extirpated, endangered, or threatened or damage such a species' residence.</p>
<b>Provincial</b>		
Ministry of the Environment, Conservation and Parks (MECP)	<i>Endangered Species Act</i>	<p>The <i>Endangered Species Act</i> protects extirpated, endangered or threatened species in the province of Ontario. The Act prohibits the killing, harm and harassment of protected species and damage or destruction to their habitat. The purpose of this Act is to identify species at risk, create measures for their protection, and promote recovery and stewardship for endangered species. Protected species are identified and designated by the Committee on the Status of Species at Risk in Ontario. Once a species is designated under the Act, it may not be harmed, captured, killed, sold or possessed. Damaging the habitat of a protected species is prohibited. Regulations under the Act provide for the Species at Risk in Ontario List, as well as exemptions applicable to specific species, activities and industries. Some exemptions require the filing of a Notice of Activity on the registry. Authorizations under the <i>Endangered Species Act</i> are not required if the activity can be carried out without having adverse effects on protected species and their habitats.</p> <p>Key amendments to the <i>Endangered Species Act</i> were introduced by Bill 5: Protect Ontario by Unleashing Our Economy Act, 2025, before its full repeal and replacement by the <i>Species Conservation Act</i> (SCA). Key amendments include purpose revised to include social and economic considerations, emphasizing sustainable economic growth alongside species protection; new habitat definition that is more narrow and limited; removal of "Harass as a prohibition under the Act; elimination of requirements for government to develop recover plans; and Cabinet discretion to add or remove listed species.</p>



Regulatory Agency	Regulation, Legislation, or Policy	Project Relevance
		An interim <i>Endangered Species Act</i> framework is currently in place until SCA is proclaimed with supporting regulations. The amendments to the <i>Endangered Species Act</i> and SCA are relevant to the Project, including requirement for an authorization for impacts to species at risk.
	Ontario <i>Water Resources Act</i>	The <i>Water Resources Act</i> regulates sewage disposal and “sewage works” and prohibits the discharge of polluting materials that may impair water quality.
	Ontario <i>Environmental Assessment Act</i>	Ontario <i>Environmental Assessment Act</i> generally requires an environmental assessment of any major public or designated private undertaking in order to determine the ecological, cultural, economic and social impact of the project. The Project is subject to the Act and the ToR for the EA (Webequie First Nation, 2020) was approved by the MECP on October 8, 2021, and is being used to identify the requirements for the assessment of Fish and Fish Habitat VC.
	Ontario <i>Environmental Protection Act</i>	The <i>Environmental Protection Act</i> is the primary pollution control legislation in Ontario and can be used interchangeably with the <i>Water Resources Act</i> . The legislation prohibits discharge of any contaminants into the environment that cause or are likely to cause adverse effects, including to fish and fish habitat. Amounts of approved contaminants must not exceed limits prescribed by the regulations. The Act also requires that spills of pollutants are reported and cleaned up promptly. The <i>Environmental Protection Act</i> also has the authority to establish liability on the party at fault.
Ontario Ministry of Natural Resources (MNR)	<i>Fish and Wildlife Conservation Act</i>	The <i>Fish and Wildlife Conservation Act</i> , governs the lawful hunting and trapping of wildlife (mammals, birds, reptiles, and amphibians) and fish in the province of Ontario and aids the conservation and protection of wildlife and the environment that they inhabit. The Act further prohibits keeping live game wildlife or live specially protected wildlife in captivity unless under the authority of a license and in accordance with the regulations. Licences/permits are available for scientific collection purposes for fish and wildlife and are required for the taking and transferring of fish or wildlife during construction and/or operations of the Project.
	Guidelines on Ontario Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat	Restricted activity timing windows are applied to protect fish and fish habitat from impacts of works during spawning and critical life stages. In Ontario, the MNR sets timing window guidelines in consultation with DFO based on different regions in Ontario and if fish are spring or fall spawners.
<b>Other</b>		
Webequie First Nation	Webequie First Nation On-Reserve Land Use Plan	Environmental protection guidelines outline Environmentally Sensitive Areas that are protected from development impacts and include waterways and waterbodies (Webequie First Nation, 2019a).
	Webequie First Nation draft Community Based Land Use Plan	Webequie First Nation and Ontario have committed to gather baseline environmental data in the Ring of Fire area and track changes in environmental and ecological conditions in the area over time. Ecological systems of focus include water systems (Webequie First Nation, 2019b).
Ontario Benthos Biomonitoring Network	Ontario Benthos Biomonitoring Network: Protocol Manual	This manual was used to guide collection of benthic invertebrates within the project area.



## 10.1.2 Consideration of Input from Engagement and Consultation Activities

**Table 10-2** summarizes the input related to Fish and Fish Habitat received during the engagement and consultation for the EA/IA and how inputs are addressed in the EAR/IS. This input includes key concerns raised by Indigenous communities and groups, the public, government agencies, and stakeholders prior to the formal commencement of the federal IA and provincial EA, during the Planning Phase of the IA and ToR phase of the EA. The Project Team considered the comments received on the Draft EAR/IS in finalizing the EAR/IS. Details of responses and how the comments have been addressed are provided in the Record of Engagement and Consultation.

**Table 10-2: Fish and Fish Habitat VC – Summary of Inputs Received During Engagement and Consultation**

Comment Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community, Organization, or Stakeholder
<p>O mushkegowuk Inninuuk (O mushkego Cree communities along the James Bay coast) are downstream of the Project and still utilize and enjoy their Inherent and Treaty Rights on the waters, including fishing rights. The O mushkegowuk Women’s Water Council is not in acceptance with the Webequie Supply Road Draft Terms of Reference.</p>	<p>Section 19 (Assessment of Effects on Indigenous Peoples and Impacts to the Exercise of Aboriginal and Treaty Rights) of this EAR/IS assesses potential effects of the Project on Aboriginal and Treaty Rights, such as the traditional uses of streams and rivers downstream of the Project, including fishing rights.</p>	<p>O mushkegowuk Women’s Water Council</p>
<p>Mushkegowuk Council had aquatic environment concerns and suggested that the Proponent includes the monthly methylmercury monitoring for one year, as well as ongoing throughout operation, construction and commissioning.</p>	<p>Methylmercury and other water quality concerns (parameters) have been included in the surface water baseline investigation program and is relevant to understanding existing conditions for fish and fish habitat. Surface water quality was monitored for seasonal and annual changes during the EA/IA process. During construction and operation phases of the Project, surface water parameters are proposed to be tested again at up and downstream locations from the road. The results will be compared with the baseline conditions to evaluate potential changes in surface water quality. Section 7 (Assessment of Effects on Surface Water Resources VC) of this EAR/IS outlines the following as part of the monitoring program for surface water quality and sediment quality:</p> <ul style="list-style-type: none"> <li>▪ Surface water quality and sediment quality should be monitored, documented, and reported according to terms and conditions of the approved water taking permit (e.g., Permits to Take Water or Environmental Activity and Sector Registration) and others permits, if applicable.</li> <li>▪ Continue surface water sampling on a seasonal basis (e.g., spring, summer and fall) and sediment sampling on an annual basis at representative water body crossings. The monitoring and sampling programs will span pre-, during and post-construction periods (e.g., three years after construction is complete).</li> </ul>	<p>Mushkegowuk Council</p>

Comment Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community, Organization, or Stakeholder
	Section 5.22 (Water Quality Monitoring) in Appendix E (Mitigation Measures) includes more details on proposed water quality monitoring programs.	
Concerns regarding the possible impacts (associated with road or mine construction and operation) arising from variability of groundwater table levels leading to increased levels of methylmercury in fish. Commentor recommends adding Health Canada to the review team for this issue of concern.	<p>Potential effects of the Project resulting in changes to groundwater level are assessed in Section 8.3. With the implementation of mitigation measures for dewatering as outlined in Section 8.4 and Appendix E of this EAR/IS, there are no expected permanent changes to either the regional ground water conditions or the regional surface water conditions/hydrology in the area.</p> <p>Methylmercury and other water quality concerns (parameters) have been included in the groundwater baseline investigation program. Groundwater quality will be monitored for seasonal and annual changes during the EA/IA process and monitoring will be included in the groundwater and surface water management plans during detail design for implementation in the construction and operation phases.</p> <p>Representatives of Health Canada have been part of the Federal Authority team providing guidance and direction to the Project Team in the development of the study plans that are used to conduct the EA/IA. In particular, Health Canada experts have provided input to the Human Health component and are expected to be principal reviewers of the Human Health Risk Assessment (HHRA), which will include potential effects on country foods such as fish, and the overall Health Impact Assessment, which will incorporate the results of the HHRA.</p>	Mushkegowuk Council
Concerns with fish habitat sensitivities and habitat values should be determined in consultation with land users. Commentor also suggested benthic invertebrate sampling should be conducted alongside the aquatic habitat survey.	<p>As part of the ongoing EA/IA, the Project Team continues to seek input from land users, and Indigenous Knowledge from communities with respect to wildlife, including fish and fish habitat. Benthic invertebrate sampling was completed during field surveys in 2020. Overall, the benthic invertebrate communities suggest that the aquatic environments are unimpaired, characterized by low to moderate currents and mixed substrates ranging from boulders to fine-textured organic sediments.</p> <p>Detailed description of methods and results of the benthic invertebrate sampling is provided in Section 8 (Fish and Fish Habitat) in the NEEC Report (Appendix F) of this EAR/IS.</p>	Attawapiskat First Nation
Concerns about potential impacts from blasting to fish and aquatic resources, including incubating eggs and resident and migrating fish, noting required buffer zones and timing windows will not mitigate all impacts to aquatic resources, including several species of resident fish.	To mitigate potential adverse effects to fish and fish habitat all blasting activities be undertaken in accordance with applicable guidelines and permit requirements to protect aquatic species and their habitats, including restricting such activities during the critical life functions of fish (migration, spawning, etc.). Blasting work is currently not expected within waterbodies but will be required during construction for extraction of rock at aggregate source areas. Should blasting be carried out in, or near, a waterbody these operations will be conducted in accordance with DFO guidelines and Ontario Provincial Standard Specification 120 General Specification for the Use of Explosives. In accordance with the DFO guidelines	Neskantaga First Nation



Comment Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community, Organization, or Stakeholder
	no explosives will be detonated in or near fish habitat that produces, or is likely to produce an instantaneous pressure change (i.e., overpressure) greater than 100 kPa in the swimbladder of a fish. Further details on mitigation measures related the protection of fish and fish habitat from blasting are described in Section 5.12 (Blasting Near a Watercourse) in Appendix E (Mitigation Measures) and in this Section (refer to <b>Section 10.4</b> ).	
The community has concerns about freshness of the surface water flow, with Sturgeon in the waters. Constance Lake First Nation noted that every spring there is a harvest with the community, which also includes maintaining burial sites in the area. During this time, there is also data collection for water in the river. Constance Lake First Nation members also check fish for parasites and send the fish to labs to see what food is being eaten by the fish.	The Project Team appreciates that Constance Lake First Nation shared information on the community's data collection related to water and fish. The Project Team will continue its follow-up efforts with the community on the noted data collection and if information is shared by Constance Lake First Nation it will be considered in the final EAR/IS.	Constance Lake First Nation
Concerns regarding the potential impacts to fish and aquatics from dust impacts from the road traffic.	This potential impact will be addressed using standard best management practices to suppress dust such as application of water via tanker truck and use of erosion and sediment control measures (e.g., erosion control blankets on newly graded soil embankments; check dams in drainage ditches/channels). Appendix E (Mitigation Measures) of this EAR/IS outlines measures to control fugitive dust impacts.	Neskantaga First Nation
Concerns that the proposed study areas are inadequate for considering ecological (e.g., caribou, wolverine, lake sturgeon, migratory birds, freshwater fish biodiversity, eskers, peatlands) and social (e.g., eskers, transportation, cultural and sacred sites, traditional land use) impacts.	<p>The Local Study Area (LSA) for fish and fish habitat extends one km from the centreline of the preliminary recommended preferred route for the Webequie Supply Road (WSR) and 500 m from temporary or permanent support infrastructure and is where potential largely direct and indirect effects of the Project are likely to occur and can be predicted or measured for assessment. The Regional Study Area (RSA) for fish and fish habitat is the area where potential largely indirect and cumulative effects of the Project in the broader context may occur and includes the tertiary watersheds crossed by the road. Both the LSA and RSA are considered by the regulators to be adequate to characterize and assess direct and indirect impacts to fish and fish habitat. As such, it is expected that these study areas will sufficiently capture the effects on fish habitat.</p> <p>SAR are identified and addressed in Section 13. Potential effects to Lake Sturgeon are identified in Section 13.3.12 with fish mitigation and enhancement measures recommended for the Project in Section 13.4.8.</p> <p>The Project study areas for fish and fish habitat are further described in <b>Section 10.1.5</b>. The 1 km LSA for fish and fish habitat are similar for most wildlife and their habitats</p>	Neskantaga First Nation



Comment Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community, Organization, or Stakeholder
	<p>(Section 12.1.5.1, Table 12.6) with the exception being Moose and Grey Wolf which have a 11 km LSA and a large regional study (Missisa and OXHISKI Caribou ranges) similar in size to the tertiary watershed approach for the RSA for fish. The 5 km RSA extension beyond the LSA was considered sufficient for furbearers, bats, migratory birds, reptiles, amphibians and net vegetation effects (Section 11.1.5.1, Figure 11.1).</p> <p>Spatial boundaries for social environment VCs are community-based and presented in Section 14.1.5.1. The VCs are focused on human and social interactions of the project (e.g., change to population and demographics - Section 14.3) and extend to many First Nations and communities in the broader RSA context.</p> <p>Spatial boundaries on the for the assessment of effects on Indigenous Peoples are 1 km LSA and a quaternary watershed RSA (using a community-based approach extending boundaries as necessary to be inclusive) as presented in Section 19.1.5.1. The potential effects to Indigenous Peoples are presented in Section 19.3.</p> <p>Overall, the fish and fish habitat LSA and RSA are appropriately sized in relation to the other study areas.</p>	
<p>Concerns with how upstream and downstream impacts to waterways and fish habitat be addressed, e.g., ensuring no blockage of access for fish.</p>	<p>This section (<b>Section 10</b>) and Section 7 of the EAR/IS assess potential effects to fish habitat and surface water flow and quality in waterways and outline mitigation measures to minimize and/or avoid adverse potential effects. For crossing structures, mitigation include design measures such as appropriate sizing of structures (culverts or bridges) to convey flow, and embedment of culverts or use of open bottom type culverts to ensure fish passage. As described in Section 4 (Project Description), routine maintenance activities may include removal of obstructions to waterflow at bridge and culvert waterbody crossings where logs, trees, ice or other debris may obstruct flow.</p> <p>As outlined in Section 7.4, <b>Section 10.4</b>, and Appendix E of this EAR/IS, to protect surface water quality and fish and fish habitat, proposed mitigation measures include procedures and practices for implementation to prevent the release of contaminants (petroleum or chemical products) resulting from improper management and maintenance of equipment (e.g., leaks), or accidental spills from vehicles and equipment used during the construction and operations of the WSR.</p>	<p>Kasabonika Lake First Nation</p>
<p>Concerns regarding the consequences to fish from alterations in groundwater pathways. Concerns with how impacts to fish populations will be studied and will studies account for population variability.</p>	<p>Section 7 and Section 8 of this EAR/IS assess changes to surface water and groundwater interactions from the Project, including potential linkage to harm fish and/or fish habitat.</p> <p>Fish and fish habitat studies were conducted in 2019, 2020, 2021, and 2023 to characterize existing conditions and to address seasonal and annual variability of data on fisheries. In general, the objectives of aquatic assessment are to: identify potential fish habitat and species, including species at risk, at waterbody crossings potentially affected</p>	<p>Neskantaga First Nation</p>

Comment Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community, Organization, or Stakeholder
	<p>by the Project through fish community and spawning surveys; characterize benthic invertebrate species composition, richness and abundance at waterbody crossings; and provide a general characterization of fish and other aquatic species as defined in the <i>Fisheries Act</i> on the basis of resident and migratory species, food webs and trophic levels, structural and functional linkages, life history and population dynamics. Results of the effects assessment for fish and fish habitat are further described throughout <b>Section 10</b> of this EAR/IS. This also includes recommended mitigation measures, management plans and monitoring programs.</p>	
<p>Concerns regarding water quality and construction in smaller ponds and watercourses and there could be impacts to aquatic life, fish and shoreline birds. Concerns also in regard to the surface water and groundwater interactions, as well as spills of chemicals onto the roadway and into watercourses.</p>	<p>The road design and supportive infrastructure (e.g., camps, aggregate source areas) have been located to minimize impacts to waterbodies, and thereby avoid infilling of watercourses, ponds and lakes that may adversely affect fish and fish habitat. The assessment of potential impacts to fish/fish habitat and birds from the construction and operations of the Project, including mitigation measures to avoid and/or minimize adverse effects, are provided in the following sections of this EAR/IS:</p> <ul style="list-style-type: none"> <li>▪ <b>Section 10</b> (Assessment of Effects on Fish and Fish Habitat);</li> <li>▪ Section 12 (Assessment of Effects on Wildlife and Wildlife Habitat); and</li> <li>▪ Section 13 (Assessment of Effects on Species at Risk).</li> </ul> <p>The following sections of the EAR/IS assess changes to groundwater and surface water interactions from the Project, including water quality and quantity and potential linkage to harm fish and/or fish habitat:</p> <ul style="list-style-type: none"> <li>▪ Section 7 (Assessment of Effects on Surface Water Resources);</li> <li>▪ Section 8 (Assessment of Effects on Groundwater Resources); and</li> <li>▪ <b>Section 10</b> (Assessment of Effects on Fish and Fish Habitat).</li> </ul> <p>Best management practices will be used during construction and operations to address potential handling and storage of hazardous chemicals and/or fuels. This will include a commitment to prepare and implement a Spill Prevention and Emergency Response Management Plan that describes specific measures to eliminate and reduce the potential for a spill or release of petroleum or other hazardous materials and procedures to be followed in the event of unanticipated emergency situations that may occur during construction and operations of the Project.</p>	<p>Weenusk (Peawanuck) First Nation</p>

Comment Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community, Organization, or Stakeholder
<p>Concerns about over-harvesting and encroachment of non-traditional harvesters because more non-resident people in the territory would have a detrimental effect on food security. Weenusk relies on the land and waters for sustenance and food sources include fish, sturgeon, beaver, caribou and moose among others.</p>	<p>An assessment of country foods is provided in the Country Foods Assessment report (Appendix O of this EAR/IS). Section 19 (Assessment of Effects on Indigenous Peoples and the Exercise of Aboriginal and/or Treaty Rights) of this EAR/IS assesses potential effects of the Project on Aboriginal and Treaty Rights and includes proposed mitigation measures to address potential adverse effects, including potential over-harvesting due to increase in access. Mitigation measures to address concerns around potential over-harvesting by non-indigenous resource users (e.g., hunters, trappers, fishers) may include, but not limited to, access restrictions for road users.</p> <p>The Project Team continues engagement and consultation with Indigenous communities to gather Indigenous Knowledge and Land and Resource Use (IKLRU) information to help inform the EA/IA, the future Detail Design Phase, the development of the Construction Environmental Management Plan (CEMP) and the Operation Environmental Management Plan (OEMP) for the Project; and to identify and address concerns regarding traditional use areas that are potentially affected by the Project.</p>	<p>Weenusk (Peawanuck) First Nation</p>
<p>Discussed the need for an agreement with Webequie First Nation surrounding mitigation measures, operational requirements and other information.</p> <p>They do not believe there are benefits to building a road and that it would create more social issues, and the road is related to potential Ring of Fire extraction activities. Commentor is running several monitoring programs on fish, moose and caribou and would also like to implement a water quality monitoring program.</p>	<p>The comments raised by the Chief of Weenusk First Nation, including need for agreement with Webequie, are currently being reviewed by Webequie First Nation and it is proposed that a Nation-to-Nation meeting be held to discuss the Project. The Project Team continue to engage Weenusk First Nation on the noted monitoring programs being implemented and to inquire if they would be prepared to share the monitoring results for fish, moose, caribou, fish and surface water. Details of the activities and outcomes from engagement and consultation to date with Weenusk First Nation are presented in Section 2 (Engagement and Consultation Summary).</p>	<p>Weenusk (Peawanuck) First Nation</p>
<p>Concerns about mercury levels in fish, and suggestions were made for future monitoring of fish health.</p>	<p>Through the ongoing engagement and consultation activities for the Project, the Project Team are engaging with potentially affected Indigenous communities and groups on the proposed planning and implementation of the Project's future monitoring programs, including monitoring of fish health related to mercury and methylmercury. The proposed follow-up monitoring programs to address concerns regarding mercury levels are described in Section 7 (Surface Water) and in this <b>Section 10</b> of this EAR/IS.</p> <p>As noted in <b>Table 10-1</b>, Webequie First Nation and Ontario have committed to gather further baseline environmental data in the Ring of Fire area and track changes in environmental and ecological conditions in the area over time (Webequie First Nation, 2019b).</p>	<p>Webequie First Nation – Meeting on August 20-22, 2024</p>

Comment Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community, Organization, or Stakeholder
<p>Provide further detail to demonstrate how information regarding the description of habitat information on littoral, sublittoral, limnetic, profundal, and benthic zones as well as stratification information including epilimnion, metalimnion, and hypolimnion depths will be captured in the habitat assessment studies, as per the requirements in Section 8.8 of the TISG.</p>	<p>Detailed description of methods and results of background information review and field surveys for fish and fish habitat is provided in Section 8 (Fish and Fish Habitat) in the NEEC Report (Appendix F) of this EAR/IS.</p>	<p>IAAC (Fish and Fish Habitat Study Plan)</p>
<p>Provide supporting information for deploying artificial substrate egg mats in suitable habitat. If this method adds value to the project, the collection of eggs will need to be included on the Licence to Collect Fish for Scientific Purposes application, with an indication of the number of eggs required for collection to confirm a spawning site.</p>	<p><b>Section 10.2.2.1.2</b> summarizes methods and results of spring spawning surveys conducted in June 2020 to determine the presence of Walleye and Lake Sturgeon and the extent of spawning habitat within the LSA for the WSR. Spawning surveys using egg mats were conducted at several locations, including near the mouth of the Winisk River where Lake Sturgeon had been historically found. The spawning surveys utilized deployment of artificial substrate egg mats in suitable habitat.</p> <p>The required license for this investigation was obtained prior to completing the study.</p> <p>Detailed description of methods and results of spring spawning surveys is provided in Section 8 (Fish and Fish Habitat) in the NEEC Report (Appendix F) of this EAR/IS.</p>	<p>MNR (Fish and Fish Habitat Study Plan)</p>
<p>Concerns about “Degradation of/alteration to surface water quality and flow, and/or fish habitat” as well as the mitigation measures related to water taking and dewatering in the ToR (Project Effects on Natural Environment).</p>	<p>Potential effects of the Project on surface water and fish and fish habitat are assessed in the following sections of this EAR/IS.</p> <ul style="list-style-type: none"> <li>▪ Section 7 (Assessment of Effects on Surface Water Resources); and</li> <li>▪ <b>Section 10</b> (Assessment of Effects on Fish and Fish Habitat).</li> </ul> <p>Mitigation measures related to water taking and dewatering are outlined in Section 7.4, Section 8.4, <b>Section 10.4</b>, and Appendix E of this EAR/IS.</p>	<p>MECP (ToR)</p>
<p>Request that alternatives assessment during EA/IA would include advantages and disadvantages using criteria and indicators for comparison.</p>	<p>Section 3 (Evaluation of Project Alternatives) of this EAR/IS includes an analysis of the advantages and disadvantages of the WSR alternatives. The alternatives assessment included consideration of fish and fish habitat as a factor/screening criterion for the evaluation of alternatives to determine the recommended preferred route for the WSR.</p>	<p>MECP (Fish and Fish Habitat Study Plan)</p>

### 10.1.3 Incorporation of Indigenous Knowledge and Land and Resource Use Information

To-date, the following First Nations have provided Indigenous Knowledge and Land and Resource Use information to the Project Team:

- Webequie First Nation;
- Marten Falls First Nation;
- Weenusk First Nation;
- Kashechewan First Nation; and
- Fort Albany First Nation.

Indigenous Knowledge and Land and Resource Use (IKLRU) reports provided information on fish and fish habitat that generally overlapped with information on groundwater and surface water resources. Surface water quality and fish and fish habitat, and their interaction and interconnectedness, have been identified as an essential element for foods and for the health and well-being of Indigenous communities and groups.

**Table 10-3** summarizes IKLRU information relating to Fish and Fish Habitat and indicates where the information is incorporated in the EAR/IS.

**Table 10-3: Fish and Fish Habitat VC – Summary of Indigenous Knowledge and Land and Resource Use Information**

Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
Water quality and quantity (surface and/or groundwater)	<p><b><u>Information Shared</u></b></p> <ul style="list-style-type: none"> <li>▪ Many sites in the region already have abandoned materials such as fuel drums, which can cause leaking into the water and onto the lands.</li> <li>▪ “No safe distance would exist from contamination related to future development”. Spring run-off will carry the contaminants through the water system and impacts to water quality and quantity could move between the watersheds.</li> </ul> <p><b><u>Concerns</u></b></p> <ul style="list-style-type: none"> <li>▪ Concerns regarding the risk of spills affecting pristine lakes and land.</li> <li>▪ Concerns about potential river system damage and rerouting due to spills during development.</li> <li>▪ Future contamination of the water in and outside of traditional areas of Indigenous communities.</li> <li>▪ Concerns of mercury accumulation in fish. Community members expressed concern over rising mercury levels in certain harvested fish in their traditional areas and how this can impact their overall health. The mercury levels are increasing with pike and Walleye and pickerel.</li> </ul>	<ul style="list-style-type: none"> <li>▪ The potential effects of accidental spills are assessed in Section 23 – Accidents and Malfunctions. Consequences of these potential accidents and malfunctions incidents associated with surface water are evaluated using a risk-based assessment by examining the likelihood of an incident and the potential consequences of the incident to relevant VCs and Indigenous interests (Section 23.3). Table 23-3 in Section 23 identifies potential hazards and outlines associated mitigation measures.</li> <li>▪ Potential project effects on water quality and quantity are assessed in EAR/IS Section 7 (Assessment of Effects on Surface Water Resources VC), Section 8 (Assessment of Effects on Groundwater Resources VC), and Section 21 (Cumulative Effects Assessment).</li> <li>▪ Appendix E of the EAR/IS outlines proposed mitigation measures to eliminate or reduce potential adverse effects of the Project. These mitigation measures reflect</li> </ul>



Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
	<ul style="list-style-type: none"> <li>▪ Concerns were shared surrounding the short and long-term effects of contamination to water, humans and land, changes to flow patterns, and the impacts of their traditional livelihoods, like trapping and hunting, for future generations.</li> <li>▪ Concerns about development of the roads and the Ring of Fire area causing water contamination. All animals drink from the river and fish lives in the river.</li> <li>▪ Concerns about the rise of pollution as projects develop, causing water contamination, noise pollution, industrial dust, contaminants in nearby waterways and groundwater and littering.</li> <li>▪ Concern about the impact of dust from increased traffic on water, wildlife, and the environment and about the inability to contain the dust and its negative effects of ecosystems and wildlife, including fish.</li> <li>▪ Community members have witnessed decreasing water levels in rivers and lakes.</li> </ul>	<p>environmental protection guidelines to protect “Environmentally Sensitive Areas” as described in the Webequie First Nation On-Reserve Land Use Plan (Webequie First Nation, 2019). Further measures will be provided in the Construction Environmental Management Plan (CEMP) and the Operation Environmental Management Plan (OEMP) that will be developed for the Project. Section 4.6 (Project Description) of the EAR/IS describes the proposed framework for the development of the CEMP and the OEMP.</p> <ul style="list-style-type: none"> <li>▪ The proposed follow-up water quality monitoring program is outlined in Section 8.9, Section 22, and in Section 5.22 (Water Quality Monitoring) of Appendix E – Mitigation Measures.</li> </ul>
Fish habitat	<p><b>Information Shared</b></p> <ul style="list-style-type: none"> <li>▪ October coincides with whitefish spawning.</li> <li>▪ Community members recommend adjusting road routes to avoid identified sensitive habitat areas, especially near river crossings.</li> <li>▪ Kistachowan Sipi (Albany River) system flows through First Nation’s traditional territory, providing vital support to terrestrial and aquatic habitats that maintain resources like fish, wildlife, and plant life.</li> <li>▪ First Nation territory contains critical habitats for caribou, moose, and Canada geese, as well as calving and breeding areas, migration routes, and fish spawning sites for species such as sturgeon and trout. Community members have identified presence of Pike, walleye, sturgeon, whitefish, trout, pickerel, bass, salmon, muskie, carp, herring, white sucker, burbot, catfish, fish eggs, and brown trout.</li> <li>▪ Harvesting locations include the Albany River and its tributaries, from Marten Falls to Fort Albany and the Chemahagan River.</li> </ul> <p>The rapids along the Albany River near Ogoki, as well as the mouth of the Henley River, are known for yielding abundant fish. Other notable features include the Fork area and Pledger Lake.</p>	<ul style="list-style-type: none"> <li>▪ Potential effects on fish habitat are assessed in <b>Section 10.3</b>. Mitigation measures and predicted net effects are provided in <b>Section 10.4</b> and <b>Section 10.5</b>, respectively. Potential cumulative effects on fish habitat are assessed in Section 21 (Cumulative Effects Assessment).</li> <li>▪ During the design phase, mitigation through design was prioritized by minimizing the number of stream crossings, shortening the length of stream crossings and avoiding more sensitive fish habitat that was identified.</li> </ul>



Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
	<p><b>Concerns</b></p> <ul style="list-style-type: none"> <li>▪ Building roads could harm fish habitats by changing their environments and affecting their natural cycles and spawning grounds. They stress the need to protect water crossings to preserve fish populations and noted past disruptions caused by dams blocking fish from their spawning areas. These changes could permanently affect local wildlife, including sturgeon and other fish important to their traditional food sources and cultural practices.</li> <li>▪ Concerns about river crossings impacting fish spawning areas.</li> <li>▪ Sturgeon require deep water and channels beneath the main flow as part of their natural habitat. Lower water levels have created poor habitat for sturgeon populations and sturgeon are dying.</li> </ul>	
<p>Fish is a key source of food and fishing is an important traditional activity</p>	<p><b>Information Shared</b></p> <ul style="list-style-type: none"> <li>▪ Fish, caribou, geese, and moose are key species harvested by community members for food.</li> <li>▪ Ice fishing is common during the winter season and net fishing is most common during the summer. Nets are set in certain areas because community members know where fish may be present.</li> <li>▪ Different seasons bring different fishing strategies; during the spring fishing is done in shallow waters, in the summer fishing is done in deep water and in the fall, rocky areas. The use of gill nets is a common year-round practice for harvesters. Depending on the fish being harvested and the season, the size of gill nets can vary. Community members described fishing sturgeon on the Winisk River, using nets up to 50 yards long.</li> <li>▪ Traditional fish traps were used in the past; these were described as ladders where the water went through them, but the fish did not.</li> <li>▪ Angling became popular in the 1960's and is practiced throughout the ice-free seasons.</li> <li>▪ Changes in weather patterns affect winter fishing activities; changes in ice formation, ice buildup and the lack of blue ice make it difficult to set up winter nets for fishing.</li> <li>▪ The harvest has fluctuated throughout the years. During the late 1980's it was reported that fish were more often caught during the winter months. Currently, fish are often caught in October, which</li> </ul>	<ul style="list-style-type: none"> <li>▪ Existing conditions of fish and fish habitat are described in the NEEC Report (Appendix F of the EAR/IS) and summarized in this EAR/IS section (<b>Section 10.2</b>).</li> <li>▪ An assessment of country foods including fish is provided in the Country Foods Assessment report (Appendix O of the EAR/IS).</li> <li>▪ Potential project effects on fish and fish habitat are assessed in this EAR/IS section (<b>Section 10</b>) and Section 21 (Cumulative Effects Assessment).</li> <li>▪ Potential effects on traditional activities including fishing are assessed in Section 19 (Assessment of Effects on Aboriginal and Treaty Rights and Interests).</li> <li>▪ The following fish species were included as indicators in the impact assessment to address the concerns presented here: <ul style="list-style-type: none"> <li>▫ Brook Trout;</li> <li>▫ Lake Whitefish;</li> <li>▫ Chain Pickerel;</li> <li>▫ Yellow Perch;</li> <li>▫ Cisco;</li> <li>▫ Burbot;</li> <li>▫ Longnose Sucker;</li> <li>▫ White sucker;</li> <li>▫ Lake Chub;</li> <li>▫ Northern Pike;</li> </ul> </li> </ul>



Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
	<p>coincides with whitefish spawning and the beginning of trapping season.</p> <ul style="list-style-type: none"> <li>▪ Fishing efforts intensify in October because this is the last chance to do so before the ice -on water bodies is thick enough for ice fishing.</li> <li>▪ During the fall season, fish are an important source of food in preparation for the winter.</li> <li>▪ Northern pike will not rot if hung upside down, and so this was a large part of winter preparation as it was a staple food in the wintertime.</li> <li>▪ Community members noted that fish considered in the Project baseline data collection include fish species of importance, including Brook Trout, Northern Pike, Walleye, Lake Sturgeon, White Sucker, Longnose Sucker, Lake Whitefish, Chain Pickerel, Yellow Perch, Cisco, Burbot, forage species such as Lake Chub, and lower trophic organisms.</li> <li>▪ Fishing preferences: based on 2013 survey data, Walleye, Whitefish, and Northern Pike were among the top five country foods most frequently eaten by community members while smoked Whitefish is considered a favourite by locals. Lake sturgeon and Brook Trout, although rare to catch, are considered the best to eat. Both Whitefish and Walleye are preferred over Northern Pike, Longnose Suckers, and White Suckers.</li> <li>▪ Throughout the years, fish would be commonly shared among the community, with preference given to family members, Elders, and those unable to fish. Fish would also be traded or sold outside of the community when it was in abundance.</li> <li>▪ Between the 1960's and 1970's, Webequie First Nation had a commercial fishing industry. Since the closure of it, members have observed an increase in the number of fish.</li> <li>▪ The Webequie First Nation's Draft Community Based Land Use Plan prescribed land use zones, many of which overlap with the RSA, for traditional and recreational activities. Many prescribed zoning areas support fish habitat and spawning sites.</li> <li>▪ Webequie First Nation members fish in the larger lakes and rivers within their territory (e.g., Winisk, Kanuchuan, Chipai, Wapikopa, and Prime Lakes).</li> </ul>	<ul style="list-style-type: none"> <li>▫ Walleye; and</li> <li>▫ Lake Sturgeon (Detailed in EAR/IS Section 13 – Species at Risk).</li> </ul> <p>Chain Pickerel were identified in the TISG as being a species that should be considered in the EA/IA; however, this species is unlikely to be found (and were not found) within the project area so further assessments regarding this species were not completed.</p>



Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
	<ul style="list-style-type: none"> <li>▪ In the spring, areas were scouted for the new shelters away from the winter homes in preparation for the spring hunt. During spring break-up, travel was limited until the rivers started to flow again. Canoes were crafted in preparation for travel. After the break-up, fishing and muskrat trapping would commence.</li> <li>▪ March would bring spring spawning, resulting in Sucker, Walleye, and Northern Pike being more active within the shallows of lakes and rivers, near where nets would be cast. In April, the harvest would decrease as attention would be shifted to the spring goose hunt.</li> <li>▪ It was emphasized that fisheries have a crucial role in Anishininiwuk life and culture. Indigenous community members uphold traditional practices for sustainable fish harvesting and do not endorse catch and release fishing in their planning area due to cultural beliefs.</li> <li>▪ Fishing has long been integral to sustaining Indigenous communities, with fishing activities conducted year-round. All family members, regardless of age or gender, participated in fishing alongside trapping. Common catches included Pickerel, Pike, Salmon, Walleye, Whitefish, and culturally significant Sturgeon.</li> <li>▪ Although fish were previously considered difficult to find, current harvests remain abundant and healthy.</li> <li>▪ Impacts to fish health and perceived quality due to water contamination.</li> </ul>	
<p>Each species of fish has a particular cultural use</p>	<p><b>Information Shared</b></p> <ul style="list-style-type: none"> <li>▪ Fish play a vital cultural role, used for food and spiritual practices.</li> <li>▪ In addition to consumption, members use fish for a variety of purposes, including rattles made from burbot, and storage bags for fat or oil made from the skin of northern pike. Fish could also be used for medicinal purposes. Pike skin was used as a part of a cure to relieve infant constipation.</li> <li>▪ Fish grease is commonly made from Whitefish and can be used as a bug repellent for children.</li> <li>▪ Fish can be boiled to make soap used to help with children’s energy.</li> <li>▪ Fish was used as dog food and bait for traps; suckers and Northern Pike less than 60 centimeters long were placed on the shore to entice furbearers to the area.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential project effects on fish and fish habitat are assessed in this EAR/IS section (<b>Section 10</b>) and Section 21 (Cumulative Effects Assessment). Potential project effects on other valued components (VCs), including Non-Traditional Land and Resource Use VC and Aboriginal and Treaty Rights and Interests VC are assessed in Sections 6, 7, 8, 9 and 11 to 21.</li> <li>▪ Appendix E of the EAR/IS outlined mitigation measures to eliminate or reduce potential adverse effects of the Project. These mitigation measures reflect environmental protection guidelines to protect “Environmentally Sensitive Areas” as described in the Webequie First Nation On-Reserve Land Use Plan (Webequie First Nation, 2019a).</li> </ul>



Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
<p>Current state of environment and connectedness of water to cultural and spiritual necessity, livelihood, Indigenous way of life, land, wildlife, fish, plants and herbs</p>	<p><b>Information Shared</b></p> <ul style="list-style-type: none"> <li>▪ The land right now is unique, untouched and natural, with no current contaminations or major impacts. It is preserved and safe, allowing for natural activities like drinking directly from the water and living off the land.</li> <li>▪ The connection between water, wildlife, vegetation, and water quality and quantity are crucial for members' health. While members' traditional territories are generally seen as "pristine" and "safe", some members of the area, including Elders, have noticed changes over their lifetime. The water, once clear and fast, has become murky and shallow, making navigation difficult and unpredictable.</li> <li>▪ Water is the most sacred, spiritual and precious element to Indigenous People and they have protected the water since time immemorial.</li> <li>▪ Water holds profound importances to Anishinawbek Culture, revered as a sacred gift from Keyshay-Maniido (Creator). Healthy rivers and lakes are vital to the spiritual practices of those who have stewarded these traditional territories and sustain abundant fish species such as Lake Sturgeon, Lake Trout, Brook Trout, Northern Pike, Walleye, Whitefish, suckers, Yellow Perch and Ling/Burbot. These interconnected waterways serve as essential travel routes and provide access to medicinal plants, supporting the community well-being.</li> <li>▪ Concerns about water quality and potential contamination could limited community members ability to use water for drinking and ceremonial purposes, as well as to engage in subsistence fishing and safely consume their catch.</li> </ul>	<p>Further measures will be provided in the CEMP and the OEMP that will be developed for the Project. Section 4.6 (Project Description) of the EAR/IS describes the proposed framework for the development of the CEMP and the OEMP.</p> <ul style="list-style-type: none"> <li>▪ The recommended follow-up monitoring program related to Fish and Fish Habitat VC is outlined in this <b>Section 10.9</b>. Additional details on monitoring programs for the Project are described in Section 22 (Follow-up and Compliance Monitoring Programs) of this EAR/IS.</li> </ul>
<p>Monitoring</p>	<p><b>Information Shared</b></p> <ul style="list-style-type: none"> <li>▪ Community members suggested water monitoring and fish monitoring programs to test contaminant levels in the water and wildlife and requested to be involved in the planning and execution of these monitoring programs.</li> <li>▪ Rather than a one-time assessment on animals and environment, community members want the next 100 years to be monitored.</li> </ul>	<ul style="list-style-type: none"> <li>▪ The recommended monitoring programs related to Surface Water Resources VC and Fish and Fish Habitat VC are outlined in Section 7.9 and <b>Section 10.9</b>, respectively. Additional details on monitoring programs for the Project are described in Section 22 (Follow-up and Compliance Monitoring Programs) of this EAR/IS.</li> <li>▪ Potential cumulative effects on fish habitat are assessed in Section 21 (Cumulative Effects Assessment).</li> </ul>



Common Theme	Key Information and Concerns	Response and/or Relevant EAR/IS Section
	<ul style="list-style-type: none"> <li>▪ Community members have noted changes in fish populations, including declines in species like the Southern Hudson/James Bay lake sturgeon (classified as Special Concern in Ontario), have been observed over time by community members. Webequie actively engages in researching and monitoring sturgeon and other fish species to maintain healthy ecosystems and sustainable fisheries.</li> <li>▪ The Webequie community collaborates with Laurentian University to study climate change impacts, including shifts in fish and wildlife, permafrost thawing, and shorter winter road seasons.</li> </ul> <p><b>Concerns</b></p> <ul style="list-style-type: none"> <li>▪ Concerns regarding keeping water clean for next generations.</li> <li>▪ Community members felt that fish quantities in general have changed as a result of changes to water levels in the nearby river systems. The river system has become shallower every year and it is hard for fish to be present in the waters where it is shallow.</li> <li>▪ Changes within climate and environment have also impacted the quality of fish. Harvesters have reported abnormalities such as bumps and lesions in the fish.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential environmental effects resulting from climate change are assessed in Section 15.5 (Climate Change).</li> </ul>

**Notes:** Names of First Nations and associated location-specific description for some instances are not presented in this table due to potential sensitivity and confidentiality of IKLRU information.

## 10.1.4 Valued Component and Indicators

For the assessment, ‘fish’ is defined per the *Fisheries Act (1985)*, which specifies fish to include:

- (a) *parts of fish,*
- (b) *shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and*
- (c) *the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.*

Similarly, ‘fish habitat’ is defined per the *Fisheries Act* to mean *water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas.*

Therefore, fish habitat, per this assessment, considers:

- Reproduction (spawning), nursery, and rearing areas;
- Access to food;
- Shelter and cover; and
- Access to other habitats (i.e., transit and migratory corridors).



Valued components, including fish and fish habitat, have been identified in the TISG and by the Project Team and are based, in part, on what Indigenous communities and groups, the public, and stakeholders have identified as valuable to them in the EA/IA process to-date. Subcomponents (or criteria) of the Fish and Fish Habitat VC are further identified to help inform the report structure and better assess and present the data and assessment results. The assessment of these subcomponents was conducted using the methodology as outlined in Section 5 (Environmental Assessment / Impact Assessment Approach and Methods). Subcomponents of the Fish and Fish Habitat VC were selected as these were projected to be where the effects of the Project are likely to be observed. The identified subcomponents for the Fish and Fish Habitat VC are:

- Fish habitat quantity and quality:
  - Harmful Alteration and Disruption, and/or Destruction of Instream Fish Habitat;
  - Harmful Alteration and Disruption, and/or Destruction of Riparian Habitat; and
  - Changes in Fish Access to Habitat.
- Fish populations:
  - Injury/Death of Fish; and
  - Changes to Public Access to Fish Habitats.

The following fish species were considered as part of the EA/IA process:

- Brook Trout;
- Lake Whitefish;
- Chain Pickerel;
- Yellow Perch;
- Cisco;
- Burbot;
- Longnose Sucker;
- White sucker;
- Lake Chub;
- Northern Pike;
- Walleye; and
- Lake Sturgeon (Detailed in EAR/IS Section 13 – Species at Risk).

Chain Pickerel were identified in the TISG as being a species that should be considered in the EA/IA; however, this species is unlikely to be found (and were not found) within the project area so further assessments regarding this species were not completed.

"Indicators", are used to assess potential effects to a VC. In general, indicators represent a resource, feature or issue related to a VC that, if changed from the existing conditions, may demonstrate a positive or negative effect.

**Table 10-4** shows the subcomponents and indicators identified for the Fish and Fish Habitat VC.



**Table 10-4: Fish and Fish Habitat VC – Subcomponents, Indicators, and Rationale**

Subcomponent(s)	Indicators	Rationale
Fish Habitat Quantity and Quality	<ul style="list-style-type: none"> <li>▪ Water quality guideline exceedances;</li> <li>▪ Quality and quantity of aquatic (instream) habitat (by fish species &amp; life stage);</li> <li>▪ Quality and quantity of riparian habitat (by fish species &amp; life stage);</li> <li>▪ Quality and quantity of habitat for fish food species (e.g., benthic invertebrates); and</li> <li>▪ Changes in fish access to habitats.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Project activities and/or components have potential for short-term and long-term effect on fish and fish habitat.</li> <li>▪ Social and cultural importance to Indigenous peoples.</li> <li>▪ From IKLRU information, fish and fish habitat are considered an important element in the livelihood, cultural and economic resources for Indigenous peoples.</li> </ul>
Fish Populations	<ul style="list-style-type: none"> <li>▪ Fish abundance;</li> <li>▪ Fish distribution;</li> <li>▪ Fish mortality and/or injury; and</li> <li>▪ Quality and quantity of food species (e.g., benthic invertebrate abundance and diversity).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Bridges, culverts and earth embankments will be used to construct the road, which may prevent fish from crossing under the road and accessing upstream habitats.</li> <li>▪ Fish may be injured or killed during in-water work or via releases of sediment and other deleterious substances (e.g., from a fuel spill).</li> <li>▪ Representative recreational species are present and may be harvested by angling.</li> <li>▪ Important harvested species (country foods) are present.</li> <li>▪ Social and cultural importance to Indigenous peoples.</li> </ul>

## 10.1.5 Spatial and Temporal Boundaries

The following assessment boundaries have been defined for the Fish and Fish Habitat VC, and reflect the ones identified in the Aquatic Habitat Study Plan prepared at the onset for the EA/IA.

### 10.1.5.1 Spatial Boundaries

The spatial boundaries for the Fish and Fish Habitat VC are shown on **Figure 10.1** and include the following:

- **Project Footprint (PF)** – the area of direct disturbance (i.e., the physical area required for project construction and operations). The PF is defined as the 35 m wide right-of-way (ROW) of the Webequie Supply Road (WSR); and temporary and permanent areas needed to support the Project that include access roads, construction camps, laydown and storage yards, aggregate pits/quarries, and a maintenance and storage facility.
- **Local Study Area (LSA)** – the area where potential largely direct and indirect effects of the Project are likely to occur and can be predicted or measured for assessment. The LSA for fish and fish habitat extends 1 km from the centreline of the preliminary recommended preferred route and 500 m from temporary or permanent support infrastructure.



- **Regional Study Area (RSA)** – the area where potential largely indirect and cumulative effects of the Project in the broader, regional context may occur. The RSA includes the LSA and further extends on each side of the LSA boundaries to include area of the tertiary watersheds crossed by the recommended preferred route.

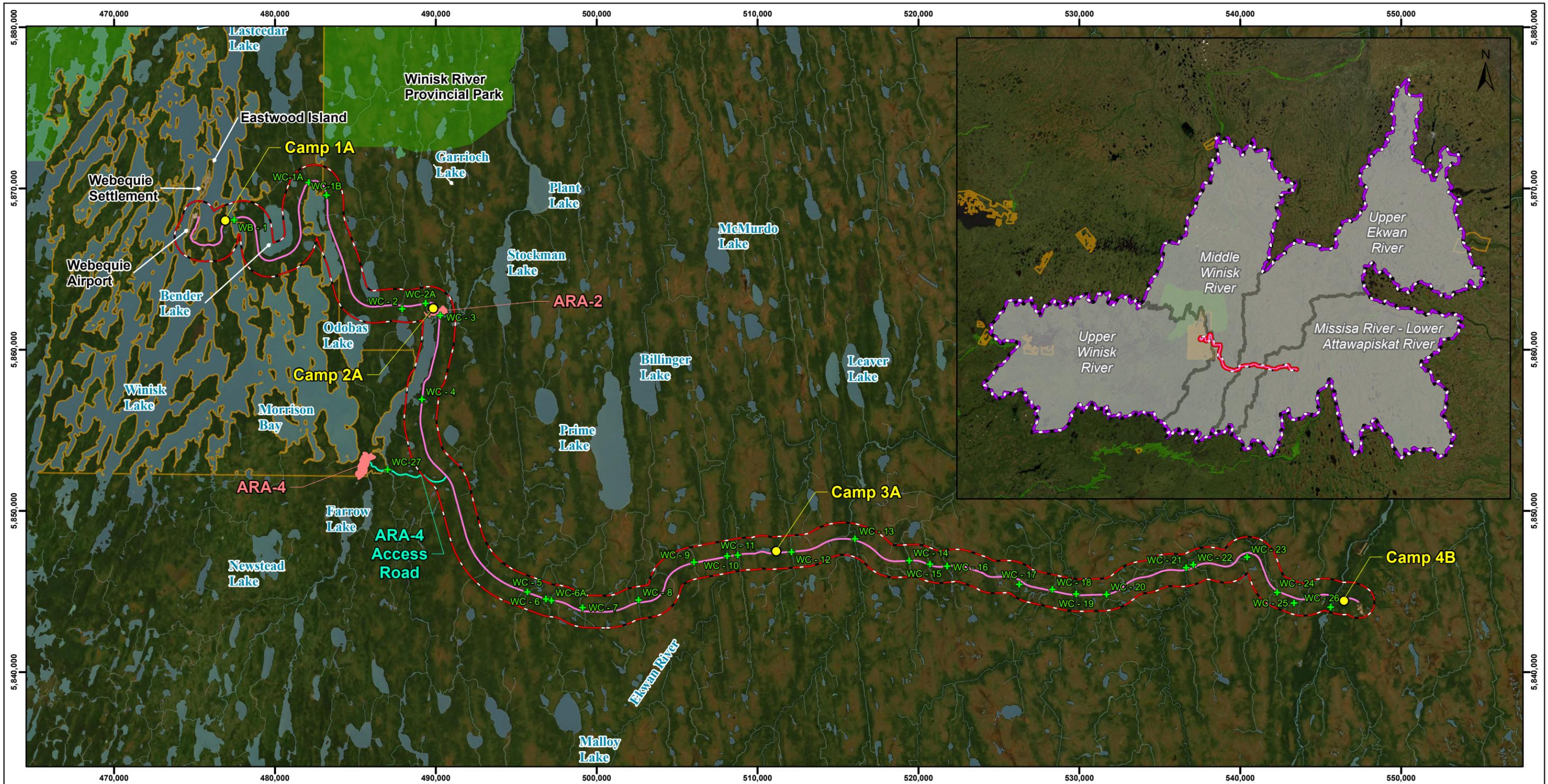
### 10.1.5.2 Temporal Boundaries

Temporal boundaries for the assessment address the potential effects of the Project over relevant timescales. The temporal boundaries for the Project consist of two main phases:

- **Construction Phase:** All activities associated with the initial development of the road and supportive infrastructure from the start of Project construction to the start of operation and maintenance of the Project and is estimated to be approximately 5 to 6 years in duration.
- **Operations Phase:** All activities associated with operation and maintenance of the road and permanent supportive infrastructure (e.g., operations and maintenance yard, aggregate extraction, and processing areas) that will start after construction activities are complete, including site restoration and decommissioning of temporary infrastructure (e.g., construction camps). The Operations Phase of the Project is anticipated to be 75 years based on the expected timeline for when major refurbishment of road components (e.g., bridges) is deemed necessary.

The Project is proposed to be operated for an indeterminate period; therefore, future suspension, decommissioning and eventual abandonment is not evaluated in the EA/IA (refer to Project Description, Section 4.4).





**Legend**

- Preliminary Recommended Preferred Route
- Local Study Area (LSA 1 km from Centreline of Preferred Route)
- Regional Study Area (RSA Includes Tertiary Watersheds Intersecting Preferred Route)
- First Nation Reserve
- Winisk River Provincial Park
- Waterbody
- Tertiary Watershed
- Watercourse
- ARA-4 Access Road
- Recommended Aggregate/Rock Source Areas
- Recommended Construction Camps  
\*Camp 2-A is proposed to include permanent Maintenance and Storage Facility (MSF) for operations of the WSR.
- + Waterbody or Watercourse Crossing



**NOTES**

1. Coordinate System: NAD 1983 UTM Zone 18N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information, and Land Information Ontario (LIO) Warehouse Open Data (<https://github.io.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date: 2021-02-04

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## Webequie Supply Road (WSR)

### Spatial Study Boundaries

<b>Figure Number:</b> 10.1		<b>REV:</b> PA	
<b>Client:</b> Webequie First Nation	<b>Project Number:</b> 661910	<b>Date:</b> 1/19/2026	
<b>DSC</b>	<b>DRN</b>	<b>CHK</b>	<b>APP</b>
AD	BD	BD	BD

## 10.1.6 Identification of Project Interactions with Fish and Fish Habitat

**Table 10-5** identifies the project activities that may interact with the Fish and Fish Habitat VC to result in a potential effect. The identification of project interactions with fish and fish habitat provides a basis for the subsequent assessment of the potential effects of the Project. The potential effects are described separately for subcomponents of Fish and Fish Habitat VC including fish habitat quantity and quality and fish populations.



**Table 10-5: Project Interactions with Fish and Fish Habitat VC and Potential Effects**

Project Activities	Potential Effects					
	Changes to Quantity and/or Quality of Fish Habitat				Changes to Fish Populations	
	Alteration, Disruption and/or Destruction/Loss of Instream Aquatic Habitat	Alteration, Disruption and/or Destruction/Loss of Riparian Habitat	Change in Fish Access to Habitat (Barriers to Fish Passage)	Change to Water and/or Sediment Quality and Quantity	Injury/Death of Fish	Change in Public Access to Fish/Fish Habitat (Increase in Harvesting)
<b>Construction</b>						
Mobilization of Equipment and Supplies: Transport of equipment, materials and supplies to the Project site area using the winter road network and airport in Webequie First Nation Reserve.	✓	✓	✓	-	✓	-
Surveying: Ground surveys are conducted to stake (physically delineate) the road right-of-way (ROW) and supportive infrastructure components of the Project (i.e., construction camps, access roads, laydown/storage areas, and aggregate extraction and processing areas).	-	-	-	-	✓	-
Vegetation Clearing and Grubbing: Clearing and grubbing of vegetation (forest & wetland), including removal, disposal and/or chipping.	✓	✓	✓	✓	✓	✓
Construction and Use of Supportive Infrastructure: This includes temporary construction camps, access roads and watercourse crossings, laydown/storage areas, and aggregate extraction (pits & quarries) and processing areas (screening, crushing), including blasting.	✓	✓	✓	✓	✓	✓
Construction of Road: removal and stockpiling of organics, subgrade excavation, placement of fill and gravel, grading and drainage work (e.g., road ditches, erosion protection, etc.).	✓	✓	✓	✓	✓	✓
Construction of Structures at Waterbody Crossings: Culverts and bridges – foundations (e.g., pile driving and concrete works), bridge girders, bridge decks, install of culverts.	✓	✓	✓	✓	✓	✓
Decommissioning / Closure of Temporary Aggregate Extraction and Processing Areas (pits and quarries): Demobilization of extracting and processing equipment, grading and site reclamation/revegetation. This also includes formalizing / re-purposing select pits and quarries proposed as permanent Project components during operations.	-	-	-	✓	-	✓
Decommissioning of Temporary Construction Camps, Access Roads and Laydown / Storage Areas: Grading and site reclamation/revegetation. This also includes formalizing / re-purposing select access roads to permanent pits and quarries and a construction camp to an operations and maintenance facility as Project components for use during operations.	✓	✓	✓	✓	✓	✓
Emissions, Discharges and Wastes <sup>1</sup> : Noise, air emissions / greenhouse gases (GHGs), water discharge, and hazardous and non-hazardous wastes.	✓	✓	✓	✓	✓	✓
Completion of Project-Wide Clean-up, Site Restoration / Reclamation and Demobilization: Clean-up of excess materials, site revegetation and demobilization of equipment and materials.	✓	✓	✓	-	✓	✓
Potential for Accidents and Malfunctions <sup>2</sup> : Spills, vehicle collisions, flooding, forest fire and vandalism.	✓	✓	✓	✓	✓	-
Employment and Expenditures <sup>3</sup>	-	-	-	-	-	-

Project Activities	Potential Effects					
	Changes to Quantity and/or Quality of Fish Habitat				Changes to Fish Populations	
	Alteration, Disruption and/or Destruction/Loss of Instream Aquatic Habitat	Alteration, Disruption and/or Destruction/Loss of Riparian Habitat	Change in Fish Access to Habitat (Barriers to Fish Passage)	Change to Water and/or Sediment Quality and Quantity	Injury/Death of Fish	Change in Public Access to Fish/Fish Habitat (Increase in Harvesting)
<b>Operations</b>						
Road Use <sup>4</sup> : Light and heavy vehicles and maintenance equipment with average annual daily traffic volume of less than 500 vehicles.	-	-	-	✓	✓	✓
Operation, Maintenance and Repair of Road <sup>4</sup> : Includes: vegetation management control within road ROW; repairs/resurfacing of road granular surface and shoulders; dust control; winter/seasonal maintenance (i.e., snow clearing); road drainage system cleanout/repairs to culverts, ditches and drainage outfalls; rehabilitation and repairs to structural culverts and bridges; and road patrols for inspection.	✓	✓	✓	✓	✓	✓
Operation of Pits, Quarries and Maintenance Yard/Facility: Includes periodic extraction and blasting and processing operations (i.e., crushing, screening) and stockpiling of rock and aggregate materials. Also includes operation and repairs of Maintenance Yard/Facility and components within (office buildings, parking, storage of equipment and materials).	✓	✓	✓	✓	✓	-
Emissions, Discharges and Wastes <sup>1</sup> : Noise, air emissions / greenhouse gases, water discharge, and hazardous and non-hazardous wastes.	-	✓	-	✓	✓	-
Potential for Accidents and Malfunctions <sup>2</sup> : Spills, vehicle collisions, flooding, forest fire and vandalism.	✓	✓	✓	✓	✓	-
Employment and Expenditures <sup>3</sup>	-	-	-	-	-	-

**Notes:**

✓ = Potential interaction

- = No interaction

<sup>1</sup> Emissions, Discharges, and Wastes (e.g., air, noise, light, solid wastes, and liquid effluents) can be generated by many project activities. Rather than acknowledging this by placing a checkmark against each of these activities, "Wastes and Emissions" is an additional component under each project phase.

<sup>2</sup> Accidents and Malfunctions including spills, vehicle collisions, flooding, forest fire and vandalism may occur at any time during construction and operations of the Project. Rather than acknowledging this by placing a checkmark against each of these activities, "Potential for Accidents and Malfunctions" is an additional component under each project phase. The potential effects of accidental spills are assessed in Section 23 – Accidents and Malfunctions.

<sup>3</sup> Project employment and expenditures are related to most project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, "Employment and Expenditures" is an additional component under each project phase.

<sup>4</sup> Any interconnected roads to the WSR in the RSA could experience increased traffic flow during Operations leading to potential down-road fish and fish habitat effects related to any additional maintenance and repair required.

## 10.2 Existing Conditions

This section summarizes the existing conditions of fish and fish habitat based on desktop review and field investigations conducted for the Project. Detailed descriptions of the methods for desktop review and field investigations and interpretations of the results are provided in Appendix F – NEEC Report.

### 10.2.1 Methods

The characterization of existing fish and fish habitat conditions involved a review of relevant background information sources including other environmental impact assessments in the project area, satellite imagery, aerial photography, and scientific literature. This information was used to develop a list of potential waterbody crossings, including those to be crossed by the proposed route and alternatives, as well as a list of aquatic species that may be affected by the Project. Field studies to characterize fish and fish habitat were conducted in 2019, 2020, 2021, and 2023 to assess the waterbodies that will potentially be crossed by the proposed WSR. These locations were targeted for field studies as water crossings are where potential effects to fish and fish habitat are most likely to occur. Results from the background information review and field studies were used for characterization of the existing aquatic environment.

#### 10.2.1.1 Desktop Review of Background Information

A desktop review of background information was conducted to obtain information on the existing conditions of fish and fish habitat within the Fish and Fish Habitat LSA and RSA and for the development of field survey methods. This included a review of the following primary and secondary information sources:

- Noront Resources Ltd. Eagle's Nest Project Environmental Impact Assessment and relevant Fish and Fish Habitat and Aquatic environment studies;
- MECP Ring of Fire Baseline Data (MECP, 2019a);
- Federal (DFO, SARA, COSEWIC) and Provincial Databases and species lists (MECP, MNR);
- Existing satellite imagery and aerial photography for the Project Footprint, LSA, and RSA (Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community), 2020;
- Project Light detection and ranging (LiDAR) imagery and elevation data gathered by J.D. Mollard and Associates (JDMA); 20 cm resolution (2016);
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC) reports and databases;
- The Species at Risk in Ontario List;
- Indigenous Knowledge and feedback received during engagement and consultation with Indigenous communities and stakeholders; and
- Webequie First Nation Community Based Land Use, (Draft, V4.3, 2019).

#### 10.2.1.2 Field Surveys

The survey methodologies included detailed field assessments of large, medium sized and small waterbodies or lotic habitat and also lakes/ponds or lentic habitat. Aerial assessments of waterbodies were conducted in areas where access was not safe or possible due to the difficult and wet terrain conditions. The fish and fish habitat field program included the following surveys:



- Fish habitat and fish community surveys;
- Spawning surveys;
- Benthic invertebrate surveys; and
- Environmental DNA (eDNA) surveys.

#### 10.2.1.2.1 Fish Habitat and Fish Community Surveys

A waterbody crossing list was developed for the proposed preliminary corridor and alternative routes for the WSR using GIS, LiDAR, and digital elevation model. This list was further refined during the assessment of route alternatives and an initial reconnaissance survey of the waterbody crossings was conducted. Each of the identified waterbody and watercourse crossings were assigned a unique site ID that consisted of a common, two-letter code (specifically “WC” for watercourse crossing, or “WB” for waterbody crossing [i.e., a lake]), and a unique number (e.g., WC-26).

The Project is located entirely within the Southwestern Hudson Bay Primary Watershed. All waterbodies in this watershed generally flow northeast towards Hudson Bay. Major rivers in the watershed in Ontario include the Severn River, Winisk River, Ekwon River, and the Attawapiskat River. The RSA extends into three secondary watersheds including the Ekwon River – Coast, Winisk River – Coast, and Attawapiskat River – Coast. The RSA for the Project extends into four tertiary watersheds and presented in

#### Figure 10.2:

- Upper Winisk Watershed;
- Middle Winisk Watershed;
- Upper Ekwon Watershed; and
- Lower Attawapiskat Watershed.

In the LSA and RSA, there are many different waterbodies, including streams, rivers, lakes, ponds, and wetlands that provide direct habitat and support many different fish species. Several large rivers are located in the project area including the Winisk, Ekwon, Attawapiskat, Fishbasket and the Muketei Rivers. A notable large lake includes Winisk Lake that provides year-round fish habitat. There are total of 31 watercourses or waterbodies that are projected to be crossed by the roadway. There is also a network of smaller connected headwater streams, ponds, and lakes, many of which are part of open fens in the peatlands. There are 10 of these smaller connected streams that have also been identified along the proposed roadway. These smaller, shallower lakes and wetlands may dry over the course of the summer but still offer suitable fish habitat for seasonal rearing and feeding, usually in early spring.

Aquatic field surveys were completed at water crossing locations that met one or more of the following criteria:

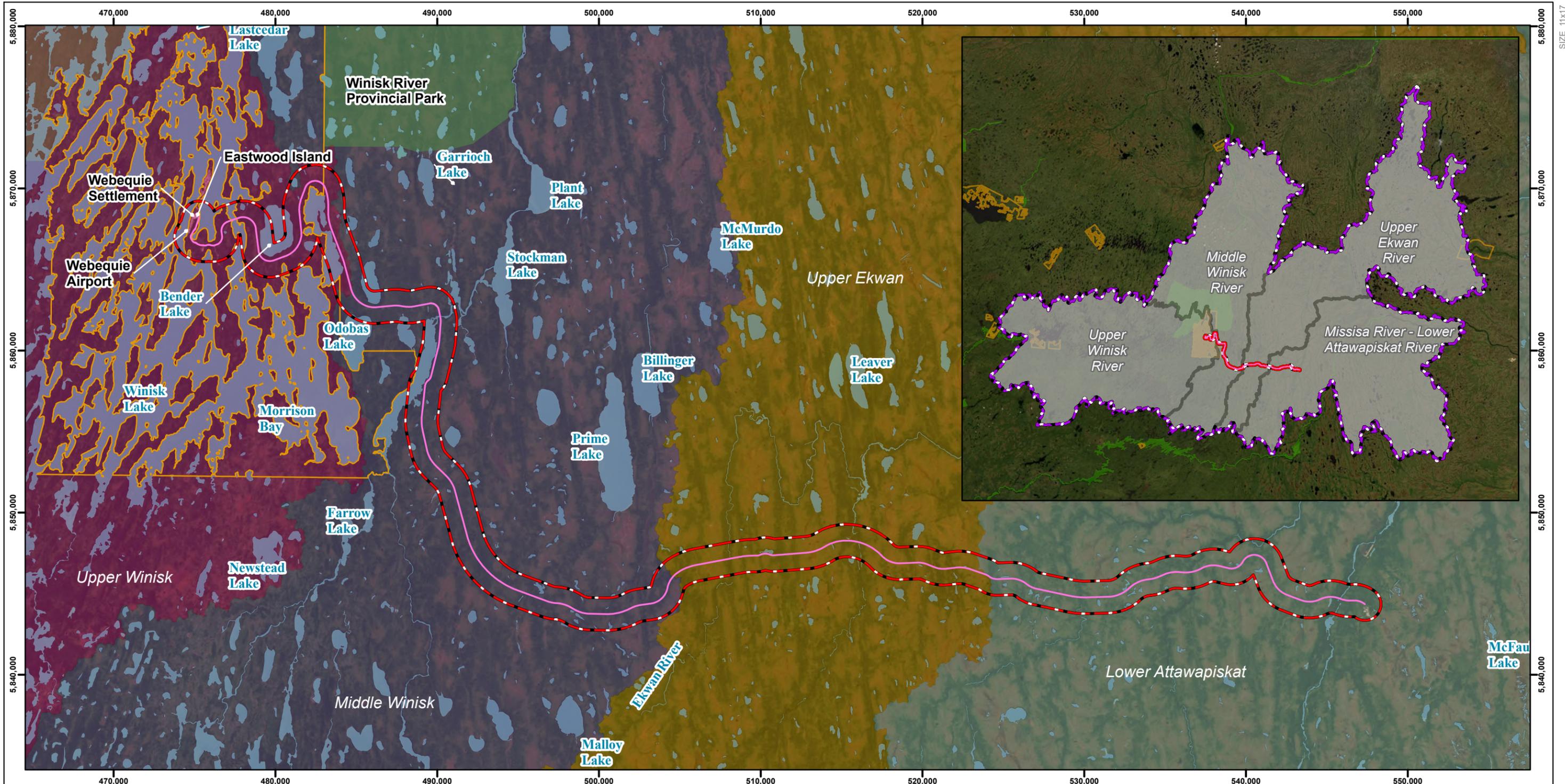
- Watercourses and/or waterbodies displayed the ability to support fish at the time of the field survey (dry water crossings were not assessed);
- Watercourses and/or waterbodies were likely to contain a criterion species, defined as a species of importance to Indigenous peoples for recreation, commercial and/or food source purposes and are also identified in the TISG; and/or
- Watercourses and/or waterbodies where no specific aquatic (instream) habitat field data of sufficient detail were available from the review of background information sources.



Watercourses and/or waterbodies that did not meet any of the above criteria were not sampled. Waterbody crossing sites that did meet the criteria, but could not be sampled, were photographed from the air.

A total of 31 waterbody crossings were assessed as part of the field program. A total of 30 of these were watercourses and a single crossing was over a lake (Winisk Lake). Each waterbody crossing was assigned an overall fish habitat sensitivity rating based on the species sensitivity, species' dependence on habitat, rarity (the relative strength of a species and prevalence of a certain habitat type), and habitat resiliency. The assessed waterbodies are presented in **Figure 10.3**. Flow regime, thermal regime and bankfull width data for each waterbody is shown in **Table 10-4**.





**Legend**

- Preliminary Recommended Preferred Route
- Local Study Area (LSA 1km from the Preferred Route)
- Regional Study Area (RSA Includes Tertiary Watersheds Intersecting Preferred Route)
- First Nation Reserve
- Provincial Park
- Waterbody
- Tertiary Watershed
- Watershed
  - Middle Winisk
  - Lower Attawapiskat
  - Upper Ekwan
  - Upper Winisk

**WSR WEBEQUIE SUPPLY ROAD**

**NOTES**

- Coordinate System: NAD 1983 UTM Zone 18N.
- Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
- Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information, and Land Information Ontario (LIO) Warehouse Open Data (<https://github.io.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date: 2021-02-04

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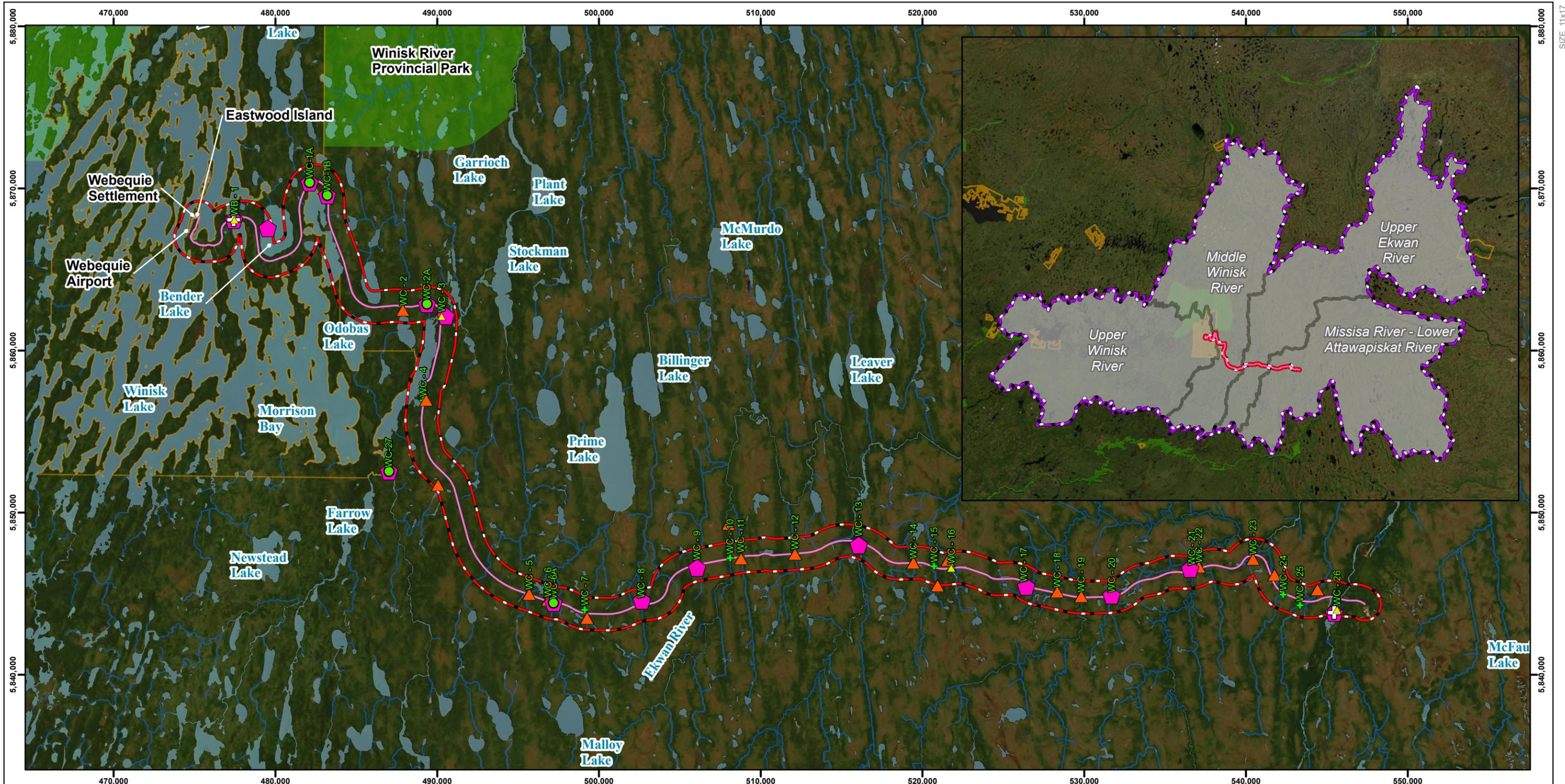
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0 5 10 km

**Webequie Supply Road (WSR)**

Tertiary Watersheds

<b>Figure Number:</b>	10.2	<b>REV:</b>	PA
<b>Client:</b>	Webequie First Nation	<b>Project Number:</b>	661910
	DSC	<b>Date:</b>	1/19/2026
		<b>DRN</b>	<b>CHK</b>
		AD	BD
			APP
			BD



**Legend**

- Preliminary Recommended Preferred Route
- Local Study Area (LSA 1km from the Preferred Route)
- Regional Study Area (RSA Includes Tertiary Watersheds Intersecting Preferred Route)
- First Nation Reserve
- Winisk River Provincial Park
- Waterbody
- Tertiary Watershed
- Fish Community Survey Locations
- Spring Spawning Survey Locations
- eDNA Sampling Locations
- Benthic Invertebrate Survey Locations
- Fish Habitat Assessment Locations
- Waterbody Crossing

**WSR**  
WEBEQUIE  
SUPPLY ROAD

**NOTES**

1. Coordinate System: NAD 1983 UTM Zone 18N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information, and Land Information Ontario (LIO) Warehouse Open Data (<https://github.io.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date: 2021-02-04

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<h2 style="margin: 0;">Webeque Supply Road (WSR)</h2> <h3 style="margin: 0;">Fish and Fish Habitat Assessment Locations</h3>							
<b>Figure Number:</b> 10.3	<b>REV:</b> PA						
<b>Client:</b> Webeque First Nation	<b>Project Number:</b> 661910						
<b>Date:</b> 1/19/2026							
<b>DSC</b>	<table border="1" style="border-collapse: collapse;"> <tr> <td style="width: 33%;"><b>DRN</b></td> <td style="width: 33%;"><b>CHK</b></td> <td style="width: 33%;"><b>APP</b></td> </tr> <tr> <td style="text-align: center;">AD</td> <td style="text-align: center;">BD</td> <td style="text-align: center;">BD</td> </tr> </table>	<b>DRN</b>	<b>CHK</b>	<b>APP</b>	AD	BD	BD
<b>DRN</b>	<b>CHK</b>	<b>APP</b>					
AD	BD	BD					

Fish community sampling was conducted concurrently with the fish habitat assessment surveys to determine fish presence, relative abundance and assemblages per sampling effort at 15 of the 31 waterbody crossings. Field survey methods followed standard practices for fish and fish habitat surveys, including those methods contained in the Ontario Stream Assessment Protocol (Stanfield, 2017). Additional methods based on the TISG (IAAC, 2020) were incorporated. Not all sites were sampled due to high-water levels, which prevented safe access to additional sites.

Fish communities were assessed using minnow traps, dip nets, and gill nets. Observations of uncaptured fish were also recorded. Minnow traps were of uniform size, but gill nets had panels with mesh measuring 25 mm to 127 mm so that fish of all body sizes could be captured where deployed. Seine netting and electrofishing using a backpack electrofisher were planned but could not be completed safely due to site conditions. Fish community sampling was completed as close to the planned road crossing locations as possible. The assessed waterbodies are presented in **Figure 10.3**.

In general, waterbodies in the LSA and RSA were considered to support a variety of cool and cold-water fish. The large rivers support populations of Walleye, Lake Sturgeon, Brook Trout, Lake Whitefish, and other fish species. Many lower energy watercourses connected to these rivers provide habitat for Walleye and Northern Pike. Typically, Yellow Perch, White Sucker, and other small forage fish species are present with these larger bodied fish. Smaller streams and lakes in the area also support a variety of smaller-bodied fish, including cyprinid species, Brook Stickleback, and Mottled Sculpin. Fish habitat sensitivity ratings were determined for all waterbodies. Of the 31 waterbodies, three were determined to be “rare”, 28 were determined to be “moderate”, and one was “low” as defined in the Ontario Stream Assessment Protocol.

A total of seventeen (17) species were captured during field sampling efforts. The most common species sampled were Northern Pike and White Sucker. Other species with a wide distribution included Walleye and Yellow Perch. Species such as Blacknose Shiner (*Notropis heterolepis*), Cisco, Ninespine Stickleback (*Pungitius pungitius*), and an unidentifiable Sculpin species were only caught at one location. Notable fish species that were not captured include Brook Trout and Lake Sturgeon. The fish community sampling program did not target either of those species, as Lake Sturgeon are bottom feeders typically found in deeper water below falls or large riffles. Brook Trout is typically found in deep, cold lake environments and the fish sampling program concentrated on the river and stream habitats.

#### 10.2.1.2.2 Spawning Surveys

Spring spawning surveys were conducted to determine the presence of Walleye and Lake Sturgeon and the extent of spawning habitat within the LSA of the proposed corridor for the WSR. Spawning surveys using egg mats were conducted at three (3) locations; two (2) within the LSA at Sites WB-1 and WC-26, and one (1) outside of the RSA approximately 15 km north of WB-1 near the mouth of the Winisk River where Lake Sturgeon had been historically found (Site WC-1). The spawning surveys consisted of the deployment of artificial substrate egg mats in suitable habitat. Artificial substrate egg mats were used as a proxy to confirm spawning by Walleye and Lake Sturgeon since it was not feasible to conduct typical visual spawning surveys due to health and safety reasons as well as accessibility (no helicopter flights permitted after sunset). The assessed waterbodies, including the location of spawning surveys, are presented in **Figure 10.2**.



#### 10.2.1.2.3 Benthic Invertebrate Surveys

Benthic invertebrate surveys were conducted at four crossings along the preliminary preferred route for the WSR in 2020, specifically at Sites WB-1, WC-3, WC-16, and WC-26. The intention of the sampling program was to sample at least one site in each tertiary watershed that had a waterbody crossing for the roadway. The benthic community samples were collected using either the near shore travelling-kick-and-sweep, grab sampling, or jab-and-sweep methods. A 500-micron D-net was used when the kick-and-sweep and jab-and-sweep collection methods were used, and an Ekman grab sampler was used for grab sampling. The near shore jab-and-sweep method was used in lakes and large rivers that had water depth that prevented wading, had limited access for a boat, and/or soft silty clay or muck type substrate that limited the opportunity to conduct the travelling kick-and-sweep transect method across the entire river width. Where a boat could be used in non-wadable streams, the jab-and-sweep method or an Ekman grab sampler was used. The assessed waterbodies, and locations where benthic invertebrate surveys were conducted, are presented in **Figure 10.2**.

All samples were field reduced through a 500-micron sieve to remove unnecessary silt and sand. Where Ekman grab sampling was conducted, a total of three samples were collected to ensure sufficient organisms for identification. These three grab samples were pooled together to make a single composite sample and a portion of that sample formed a replicate. Replicates were placed into labeled sample bottles with 95% ethanol for preservation. Only one or two replicates were completed upstream and downstream of each proposed waterbody crossing, regardless of the sampling method used.

#### 10.2.1.2.4 Environmental DNA (eDNA) Sampling

Environmental DNA (eDNA) refers to DNA present in aquatic or terrestrial environments, which organisms shed into their surroundings. By sampling eDNA, it is possible to identify what animals are using a habitat based on the DNA signatures found in the sample. To support the fisheries program, eDNA samples were collected between August 17-20, 2023, from waterbodies that had not been previously assessed, as well as from major waterbodies that had been examined in earlier conventional sampling efforts.

The Project Team collected eDNA samples from nine sites, including four previously sampled locations: Winisk Lake, Winiskisis Channel, Ekwan River, and Muketei River. The eDNA kits and sampling protocols were provided by NatureMetrics.

eDNA samples were collected using a NatureMetrics vampire pump, which drew water directly from the waterbody crossing site and passed it through an eDNA collection filter. The vampire pump consists of a peristaltic pump that creates a vacuum which draws water up a silicone hose and passes it through the collection filter. In order to obtain enough eDNA for a sample, each filter required a minimum of 1.5 L of water to be passed through it. At each site, three samples were taken, with the exception of site WC-MR, where a duplicate sample of WC-MR-E1 was collected for Quality Assurance / Quality Control (QA/QC) purposes for a total of 28 samples. The assessed waterbodies, including locations where eDNA sampling was conducted are presented in **Figure 10.2**.

#### 10.2.1.3 Species at Risk

Lake Sturgeon is the only species at risk identified in the project study areas. Lake Sturgeon have been previously identified in watersheds within the Regional Study Area, belonging to the Southern Hudson Bay – James Bay Population (COSEWIC 2006). Lake Sturgeon is classified as Special Concern by the federal *Species at Risk Act* (SARA) and the provincial *Endangered Species Act*. However, this designation does not grant the species additional protection beyond what is already afforded to other fish species in the area.



No Lake Sturgeon were captured during any field sampling programs; however, Indigenous Knowledge did provide information on locations where Lake Sturgeon have previously been captured, including Winisk Lake (WB-1) and the Winiskisis Channel (WC-3). Lake Sturgeon have also been detected in the Muketei River, although downstream from the WSR Project where it empties into the Attawapiskat River (Haxton et al., 2017). Details on existing conditions with respect to Lake Sturgeon, including the assessment of effects as a result of the Project, are presented in Section 13 (Assessment on the Effects to Species at Risk) of this EAR/IS.

## 10.2.2 Results

### 10.2.2.1.1 Fish Habitat and Fish Community Surveys

Fish habitat sensitivity ratings, fish community sampling results, waterbody restricted activity timing windows, waterbody tertiary watersheds, and predicted fish habitat that may be impacted by the road are summarized in **Table 10-6**, **Table 10-7**, **Table 10-8** and **Table 10-9**, respectively. The restricted activity timing periods in **Table 10-7** are considered preliminary based on the fish and fish habitat surveys completed and available background information. The restricted activity periods for in-water work, including thermal regime, will be confirmed in consultation with the Ministry of Natural Resources and Fisheries and Oceans Canada in the future detail design phase of the Project.



**Table 10-6: Summary of Habitat Characteristics for Waterbodies**

Site ID	Waterbody Name	Waterbody Type	Flow Regime	Thermal Regime <sup>1</sup>	Mean Bankfull Width (m)	Mean Wetted Width (m)	Mean Wetted Depth (m)	Left Bank Shape	Right Bank Shape	Dominant Instream Cover	Dominant Substrate
WB-1	Winisk Lake	Lake	Permanent	Cool	250	250	3.2	Sloped	Sloped	Instream vegetation / Boulders / Deep Lake	Muck
WC-1A	n/a	Watercourse	Permanent	Cool	2.4	1.8	0.5	Near vertical bank, but very shallow, slight undercut	Near vertical bank, but very shallow, slight undercut	Instream vegetation, some small woody debris	Muck
WC-1B	n/a	Watercourse	Permanent	Cool	0.35	0.25	0.15	Near vertical bank, but very shallow, slight undercut	Near vertical bank, but very shallow, slight undercut	Instream vegetation, some small woody debris	Muck
Bender Lake	Bender Lake	Lake	Permanent	Unknown	n/a	n/a	Unknown	n/a	n/a	Instream vegetation / Deep Lake	Muck
WC-2	n/a	Watercourse	Permanent	Cool	n/a	12	1	n/a	n/a	Instream vegetation	Muck
WC-2A	n/a	Watercourse	Permanent	Cool	1	0.5	0.20	Sloped	Sloped	Instream vegetation	Muck
WC-3	Winiskis Channel	Watercourse	Permanent	Cool	100	100	0.52	Sloped / Undercut	Sloped / Undercut	Instream vegetation / Boulders & cobble	Boulder, sand, muck
WC-4	n/a	Watercourse	Permanent	Cool	n/a	0.75	1	n/a	n/a	Overhanging vegetation	Muck
WC-5	n/a	Watercourse	Permanent	Cool	2.2	2.2	1	Vertical	Vertical	Small Woody Debris / Instream vegetation	Muck
WC-6	n/a	Watercourse	Permanent	Cool	n/a	10	1.5	n/a	n/a	Instream vegetation	Muck
WC-6A	n/a	Watercourse	Permanent	Cool	n/a	0.1	0.1	n/a	n/a	Diffuse flow, primarily a non-defined channel	Muck
WC-7	n/a	Watercourse	Permanent	Cool	n/a	12	0.45	n/a	n/a	Instream vegetation	Muck
WC-8	n/a	Watercourse	Permanent	Cool	n/a	20	1	n/a	n/a	Instream & Overhanging vegetation / Deep Pool/ Large woody debris	Muck
WC-9	Tributary of the Ekwan River	Watercourse	Permanent	Cool	2.7	2.5	0.53	Vertical / Undercut	Vertical / Undercut	Instream & Overhanging vegetation	Muck
WC-10	Ekwan River	Watercourse	Permanent	Warm	16	15	2	Sloped	Sloped	Instream & Overhanging vegetation / Boulders	Cobble, boulder
WC-11	Tributary of the Ekwan River	Watercourse	Permanent	Cool	4	4	0.73	Vertical / Undercut	Vertical / Undercut	Instream & Overhanging vegetation	Muck
WC-12	Tributary of the Ekwan River	Watercourse	Permanent	Cool	n/a	5	1	n/a	n/a	Instream vegetation	Muck
WC-13	Tributary of the Ekwan River	Watercourse	Permanent	Cool	30	30	1.5	Sloped	Sloped	Instream & Overhanging vegetation / Boulders	Muck, boulder
WC-14	n/a	Watercourse	Permanent	Cool	4	4	1.5	n/a	n/a	Instream vegetation	Muck
WC-15	Tributary of the Ekwan River	Watercourse	Permanent	Cool	n/a	5	1	n/a	n/a	Instream & Overhanging vegetation	Muck
WC-16	Tributary of the Ekwan River	Watercourse	Permanent	Cool	n/a	5	1	n/a	n/a	Instream & Overhanging vegetation	Muck
WC-17	Tributary of the Muketei River	Watercourse	Permanent	Cool	2	2	1.5	n/a	n/a	Instream & Overhanging vegetation	Muck
WC-18	Tributary of the Muketei River	Watercourse	Permanent	Cool	2	2	0.5	n/a	n/a	Instream & Overhanging vegetation	Muck

Site ID	Waterbody Name	Waterbody Type	Flow Regime	Thermal Regime <sup>1</sup>	Mean Bankfull Width (m)	Mean Wetted Width (m)	Mean Wetted Depth (m)	Left Bank Shape	Right Bank Shape	Dominant Instream Cover	Dominant Substrate
WC-19	Muketei River	Watercourse	Permanent	Warm	20.5	20	2	Sloped	Sloped	Instream & Overhanging vegetation / Boulders / Deep Pool	Boulder
WC-20	Tributary of the Muketei River	Watercourse	Permanent	Cool	4	4	1	n/a	n/a	Instream & Overhanging vegetation	Muck
WC-21	Tributary of Muketei River	Watercourse	Permanent	Cool	18	17	1.5	Sloped / Undercut	Sloped / Undercut	Overhanging vegetation / Small & Large Woody Debris / Deep Pool	Muck
WC-22	Tributary of the Muketei River	Watercourse	Permanent	Cool	2	2	1	Vertical	Vertical	Overhanging vegetation / Small and Large Woody Debris	Muck
WC-23	Tributary of the Muketei River	Watercourse	Permanent	Cool	3	3	1	n/a	n/a	Overhanging vegetation	Muck
WC-24	Tributary of the Muketei River	Watercourse	Permanent	Cool	3.5	3.5	1	Vertical	Vertical	Instream & Overhanging vegetation	Muck
WC-25	Tributary of the Muketei River	Watercourse	Permanent	Cool	2.4	2	0.24	Vertical / Undercut	Vertical / Undercut	Instream & Overhanging vegetation / Boulders	Boulder
WC-26	Muketei River	Watercourse	Permanent	Warm	31	30	1	Sloped / Undercut	Sloped	Instream & Overhanging vegetation / Boulders / Large Woody Debris / Deep Pool	Muck, Boulder
WC-27	n/a	Watercourse	Permanent	Cool	50	15	0.50	Gently sloping	Gently Sloping	Boulder / Cobble cover, minor contribution from instream vegetation	Cobble and Boulder

<sup>1</sup>, Ontario's Aquatic Ecosystem Classification (AEC) suggests that many of these watercourses are either cold-cool water or cold water and not warm water. This will be examined further and corrected as needed in the detailed design phase.

**Table 10-7: Waterbody Fish Presence and Restricted Activity Timing Windows**

Site ID	Fish Habitat Sensitivity Rating	Fish Presence During 2019 Sampling	Fish Presence During 2020 Sampling	Fish Presence During 2023 Sampling (Conventional and eDNA)	Species at Risk Presence	Water Body Restricted Activity Periods / In-Water Timing Window (RAPTW) <sup>(1)(2)</sup>	Tertiary Watershed	RATW Region	RATW Species <sup>(3)</sup>
WB-1	Rare	Northern Pike, Walleye, White Sucker, Yellow Perch, Spottail Shiner, Blacknose Shiner	Northern Pike, Walleye, White Sucker, Yellow Perch, Spottail Shiner, Cisco, Lake Whitefish, Johnny Darter	White Sucker, Lake Chub, Emerald Shiner, Blacknose Shiner, Spottail Shiner, Northern Pike, Burbot, Ninespine Stickleback, Iowa Darter, Johnny Darter, Walleye, Trout-Perch,	Not Anticipated	September 1 to June 30	Upper Winisk	Northwest	Northern Pike, Brook Trout, Lake Sturgeon (p)
WC-1A	Moderate	No Sampling	No Sampling	Finescale Dace, Northern Pearl Dace, Northern Pike, Yellow Perch, Brook Stickleback	Not Anticipated	April 1 to June 30	Upper Winisk	Northwest	Northern Pike, Lake Sturgeon (p)
WC-1B	Moderate	No Sampling	No Sampling	White Sucker, Northern Pearl Dace, Northern Pike, Yellow Perch, Walleye, Spoonhead Sculpin	Not Anticipated	April 1 to June 30	Upper Winisk	Northwest	Northern Pike, Lake Sturgeon (p)
Bender Lake	Moderate	No Sampling	Northern Pike, Walleye, Yellow Perch, Spottail Shiner, Johnny Darter, Iowa Darter, Brook Stickleback, Trout-perch	No Sampling	Not Anticipated	April 1 to June 15	Upper Winisk	Northwest	Northern Pike
WC-2	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Middle Winisk	Northwest	Northern Pike (p)
WC-2A	Moderate	No Sampling	No Sampling	Yellow Perch, Brook Stickleback, Iowa Darter, White Sucker, Burbot, Iowa Darter, Walleye,	Not Anticipated	April 1 to June 15	Middle Winisk	Northwest	Walleye
WC-3	Rare	Northern Pike, White Sucker	Northern Pike, White Sucker, Lake Whitefish, Shorthead Redhorse, Walleye, Yellow Perch	White Sucker, Shorthead Redhorse, Lake Chub, Longnose Dace, Northern Pike, Burbot, Johnny Darter, Yellow Perch, Walleye, Common Logperch, Walleye, Trout-Perch, Spoonhead Sculpin	Not Anticipated	April 1 to June 20	Middle Winisk	Northwest	Lake Sturgeon, Northern Pike, Walleye (p)
WC-4	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Middle Winisk	Northwest	Northern Pike (p)
WC-5	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Middle Winisk	Northwest	Northern Pike (p)
WC-6	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Middle Winisk	Northwest	Northern Pike (p)
WC-6A	Moderate	No Sampling	No Sampling	White Sucker, Lake Chub, Northern Pike, Burbot, Iowa Darter, Yellow Perch, Walleye	Not Anticipated	April 1 to June 15	Middle Winisk	Northwest	Northern Pike, Walleye
WC-7	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Middle Winisk	Northwest	Northern Pike (p)
WC-8	Moderate	Northern Pike	Northern Pike, Johnny Darter	No Sampling	Not Anticipated	April 1 to June 15	Middle Winisk	Northwest	Northern Pike
WC-9	Moderate	Northern Pike	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Upper Ekwan	Northwest	Northern Pike
WC-10	Moderate	No Sampling	No Sampling	White Sucker, Lake Chub, Longnose Dace, Northern Pike, Burbot, Johnny Darter, Yellow Perch, Common Logperch, Walleye, Trout-Perch, Spoonhead Sculpin	Not Anticipated	April 1 to June 20	Upper Ekwan	Northwest	Northern Pike, Walleye
WC-11	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Upper Ekwan	Northwest	Northern Pike (p)
WC-12	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Upper Ekwan	Northwest	Northern Pike (p)
WC-13	Moderate	White Sucker, Northern Pike, Yellow Perch, Sculpin sp.	White Sucker, Northern Pike, Yellow Perch, Walleye	No Sampling	Not Anticipated	April 1 to June 20	Upper Ekwan	Northwest	Walleye (p)

Site ID	Fish Habitat Sensitivity Rating	Fish Presence During 2019 Sampling	Fish Presence During 2020 Sampling	Fish Presence During 2023 Sampling (Conventional and eDNA)	Species at Risk Presence	Water Body Restricted Activity Periods / In-Water Timing Window (RAPTW) <sup>(1)(2)</sup>	Tertiary Watershed	RATW Region	RATW Species <sup>(3)</sup>
WC-14	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Upper Ekwan	Northwest	Northern Pike (p)
WC-15	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Upper Ekwan	Northwest	Northern Pike (p)
WC-16	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Upper Ekwan	Northwest	Northern Pike (p)
WC-17	Moderate	Northern Pike, White Sucker	Northern Pike, Johnny Darter, Finescale Dace	No Sampling	Not Anticipated	April 1 to June 15	Lower Attawapiskat	Northwest	Northern Pike
WC-18	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Lower Attawapiskat	Northwest	Northern Pike (p)
WC-19	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 20	Lower Attawapiskat	Northwest	Walleye (p)
WC-20	Low	Finescale Dace, Northern Pearl Dace, White Sucker, Brook Stickleback, Ninespine Stickleback, Johnny Darter, Iowa Darter, Unidentifiable cyprinid	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Lower Attawapiskat	Northwest	Other/Unknown Spring Spawning Species
WC-21	Moderate	Northern Pike, White Sucker, Walleye	No Sampling	No Sampling	Not Anticipated	April 1 to June 20	Lower Attawapiskat	Northwest	Walleye
WC-22	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Lower Attawapiskat	Northwest	Northern Pike (p)
WC-23	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Lower Attawapiskat	Northwest	Northern Pike (p)
WC-24	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 15	Lower Attawapiskat	Northwest	Northern Pike (p)
WC-25	Moderate	No Sampling	No Sampling	No Sampling	Not Anticipated	April 1 to June 20	Lower Attawapiskat	Northwest	Walleye (p)
WC-26	Rare	Northern Pike, White Sucker, Walleye, Yellow Perch	Northern Pike, White Sucker, Walleye, Yellow Perch, Trout-perch, Spottail Shiner, Shorthead Redhorse	White Sucker, Silver Redhorse, Shorthead Redhorse, Lake Chub, Spottail Shiner, Mimic Shiner, Longnose Dace, Northern Pike, Burbot, Ninespine Stickleback, Johnny Darter, Yellow Perch, Walleye, Common Logperch, Trout-Perch, Spoonhead Sculpin	Lake Sturgeon	April 1 to June 30	Lower Attawapiskat	Northwest	Walleye, Lake Sturgeon, Northern Pike
WC-27	Moderate	No Sampling	No Sampling	Spoonhead Sculpin, Northern Pike, White Sucker, Shorthead Redhorse, Spottail Shiner, Longnose Dace, Burbot, Iowa Darter, Johnny Darter, Yellow Perch, Walleye, Yellow Perch, Trout-Perch	Not Anticipated	Not Anticipated	Lower Attawapiskat	Northwest	Northern Pike, Walleye

**Notes:**

- 1 – Ministry of Natural Resources (MNR), 2013. In-Water Work Timing Window Guidelines. 2 pp. Based on limited fish sampling, MNR suggests that a precautionary approach be used and assume that fall/winter spawning (including Brook Trout) occurs in many of the watercourses where there is potential for these species. This will be addressed in the detailed design phase for the Project on a crossing-specific basis as required.
- 2 – Fisheries and Oceans Canada (DFO), 2013. Ontario Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat.
- 3 – (p) meaning probable as suitable habitat is present, but no Northern Pike, Walleye, or Brook Trout were caught or observed.

**Table 10-8: Fish Species Capture Summary**

Fish Species Common Name	Scientific Name	Captured by Noront in 2010-2012 <sup>(a)</sup>	Captured by Golder in 2013 <sup>(b)</sup>	Captured by AtkinsRéalis in 2019	Captured by AtkinsRéalis in 2020	Captured by AtkinsRéalis in 2023	Within RSA Range <sup>(c)</sup>
Brook Stickleback	<i>Culaea inconstans</i>	Yes		Yes	Yes	Yes <sup>e</sup>	Yes
Ninespine Stickleback	<i>Pungitius pungitius</i>	Yes		Yes		Yes <sup>f</sup>	Yes
Brook Trout	<i>Salvelinus fontinalis</i>	Yes					Yes
Northern Pike	<i>Esox lucius</i>	Yes	Yes	Yes	Yes	Yes <sup>e, f</sup>	Yes
Lake Sturgeon	<i>Acipenser fulvescens</i>	Yes					Yes
Walleye	<i>Sander vitreus</i>	Yes	Yes	Yes	Yes	Yes <sup>f</sup>	Yes
Yellow Perch	<i>Perca flavescens</i>	Yes	Yes	Yes	Yes	Yes <sup>e, f</sup>	Yes
Lake Whitefish	<i>Coregonus clupeaformis</i>	Yes			Yes		Yes
Round Whitefish	<i>Prosopium cylindraceum</i>						Yes
Fathead Minnow	<i>Pimephales promelas</i>	Yes					Yes
Finescale Dace	<i>Phoxinus neogaeus</i>	Yes	Yes	Yes	Yes	Yes <sup>f</sup>	Yes
Lake Chub	<i>Couesius plumbeus</i>	Yes	Yes			Yes <sup>f</sup>	Yes
Mottled Sculpin	<i>Cottus bairdii</i>	Yes	Yes	(d)			Yes
Slimy Sculpin	<i>Cottus cognatus</i>			(d)			Yes
Spoonhead Sculpin	<i>Cottus ricei</i>			(d)		Yes <sup>e</sup>	Yes
Mimic Shiner	<i>Notropis volucellus</i>					Yes <sup>f</sup>	Yes
Blacknose Shiner	<i>Notropis heterolepis</i>	Yes	Yes	Yes		Yes <sup>f</sup>	Yes
Emerald Shiner	<i>Notropis atherinoides</i>					Yes <sup>f</sup>	Yes
Spottail Shiner	<i>Notropis hudsonius</i>	Yes	Yes	Yes	Yes	Yes <sup>f</sup>	Yes
Northern Pearl Dace	<i>Margariscus margarita</i>	Yes	Yes	Yes			Yes
Longnose Dace	<i>Rhinichthys cataractae</i>	Yes	Yes				Yes
Trout-perch	<i>Percopsis omiscomaycus</i>	Yes	Yes		Yes	Yes <sup>f</sup>	Yes
White Sucker	<i>Catostomus commersonii</i>	Yes	Yes	Yes	Yes	Yes <sup>f</sup>	Yes
Longnose Sucker	<i>Catostomus catostomus</i>						Yes
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	Yes			Yes	Yes <sup>f</sup>	Yes
Silver Redhorse	<i>Moxostoma anisurum</i>					Yes <sup>f</sup>	Yes (on border)
Iowa Darter	<i>Etheostoma exile</i>	Yes		Yes	Yes	Yes <sup>e</sup>	Yes
Johnny Darter	<i>Etheostoma nigrum</i>	Yes	Yes	Yes	Yes	Yes <sup>f</sup>	Yes
Logperch	<i>Percina caprodes</i>	Yes					Yes
Burbot	<i>Lota lota</i>	Yes	Yes			Yes <sup>f</sup>	Yes
Sauger	<i>Sander canadensis</i>	Yes					Yes
Cisco (Lake Herring)	<i>Coregonus artedii</i>	Yes			Yes		Yes
<b>Total Number of Fish Species</b>		<b>25</b>	<b>14</b>	<b>13</b>	<b>13</b>	<b>19<sup>g</sup></b>	<b>32</b>

**Notes:**

- <sup>(a)</sup> Noront Resources Ltd. (Noront EA, 2013). Eagle's Nest: A Federal/Provincial Environmental Impact Statement/Environmental Assessment Report.
- <sup>(b)</sup> Golder, 2013a. Cliffs Chromite Project Environmental Assessment. Additional fish captures to the south, outside the LSA.
- <sup>(c)</sup> Holm, E., Mandrak, N., and Burridge, M. 2009. The ROM Field Guide to Freshwater Fishes of Ontario. Royal Ontario Museum. + 462 pp.
- <sup>(d)</sup> One unidentifiable sculpin (*Cottus* sp.) was sampled by SNC-Lavalin in August 2019.
- <sup>(e)</sup> Sampled using minnow traps.
- <sup>(f)</sup> Sampled using eDNA.

**Table 10-9: Fish Habitat Covered by Watercourse/Waterbody Crossing**

Crossing Type	Site ID	Crossing width (m)	Mean Bankfull Width (m)	Total Water Crossed (Bankfull Width x Road Width in m <sup>2</sup> )	Riparian Width (m)	Riparian Area Affected (Riparian Width x Road Width in m <sup>2</sup> )
Bridge	WB-1	11.5	250	2,875	10	115
Embankment	WC-1A	17	2.4	41	41	697
Embankment	WC-1B	17	0.35	6	25	425
Embankment	WC-2	17	12	204	59	1,003
Embankment	WC-2A	17	62	1,054	20	340
Bridge	WC-3	11.5	100	1,150	20	230
Embankment	WC-4	17	0.75	13	75	1,275
Embankment	WC-5	17	2.2	37	94	1,598
Embankment	WC-6	17	10	170	90	1530
Embankment	WC-6A	17	8	136	9	153
Embankment	WC-7	17	12	204	94	1,598
Embankment	WC-8	17	20	340	79	1,343
Embankment	WC-9	17	2.7	46	45	765
Bridge	WC-10	11.5	16	184	32	368
Embankment	WC-11	17	4	68	48	816
Embankment	WC-12	17	5	85	35	595
Embankment	WC-13	17	30	510	60	1,020
Embankment	WC-14	17	4	68	64	1,088
Embankment	WC-15	17	5	85	154	2,618
Embankment	WC-16	17	5	85	136	2,312
Embankment	WC-17	17	2	34	56	952
Embankment	WC-18	17	2	34	40	680
Bridge	WC-19	11.5	20.5	236	19	218.5
Embankment	WC-20	17	4	68	54	918
Embankment	WC-21	17	18	306	24	408
Embankment	WC-22	17	2	34	32	544
Embankment	WC-23	17	3	51	24	408
Embankment	WC-24	17	3.5	60	120	2,040
Embankment	WC-25	17	2.4	41	39	663
Bridge	WC-26	11.5	31	357	28	322
Bridge	WC-27	11.5	50	575	52	598
<b>Total</b>			<b>689.8</b>	<b>9,155</b>	<b>1,678</b>	<b>27,640</b>

Note: m<sup>2</sup> = square metres

#### 10.2.2.1.2 Spawning Surveys

Walleye and Lake Sturgeon fish eggs were not identified by DNA analysis in any of the samples of eggs collected during spawning surveys. This was likely due to the water temperature being in the upper limits or higher than the preferred spawning temperatures of Walleye during egg mat gang deployment. Additionally, more favourable spawning habitat for Lake Sturgeon may be elsewhere (notably downstream of the Winisk River Provincial Park boundary that was not accessible), or the collection period sampling was outside the periods of spawning activity. Many of the eggs collected were identified as Shorthead Redhorse, Trout-perch, Iowa Darter, Sculpin sp., and Yellow Perch.

#### 10.2.2.1.3 Benthic Invertebrate Surveys

Benthic invertebrate survey results showed species diversity typical of the region, with an even distribution of individuals across sites, and no dominance by a single species. This suggests that the waterbodies surveyed are relatively intact and unimpacted (Lydy et al., 2000; Rios and Bailey, 2006).

The Ephemeroptera, Plecoptera, and Trichoptera Index indicated that most sites had a high percentage of species and individuals from these Ontario Benthic Biomonitoring Network groups. Because these species are sensitive to disturbance and habitat degradation, higher percentages typically reflect better ecosystem health, suggesting relatively unimpacted aquatic environments along the WSR route (Gazendam et al., 2011).

Overall, the benthic invertebrate communities suggest that the aquatic environments are unimpaired, characterized by low to moderate currents and mixed substrates ranging from boulders to fine-textured organic sediments.

#### 10.2.2.1.4 Environmental DNA (eDNA) Sampling

Environmental DNA sampling was conducted in 2023 and the results identified fish species that had been captured during conventional sampling efforts, along with additional fish species. This method proved to be a valuable supplement to conventional sampling, especially given the challenging conditions that limited some traditional methods. The number of species identified by eDNA at each sample varied, but on average nine fish species were detected at each sample location. This ranged from a low of a single species detection at one of the WC-27 sampling locations, to a high of 18 species identified at a Muketei River sample. No species at risk (e.g., Lake Sturgeon) or Brook Trout were detected during the eDNA sampling.

## 10.3 Identification of Potential Effects, Pathways and Indicators

As indicated in **Table 10-3**, some project activities may interact with and impose potential effects on the Fish and Fish Habitat VC during the project construction and operations. This section describes the nature of the potential effects, the pathways that link the project activities and the effects, and the indicators that can be used to assess and measure the effects. **Table 10-10** summarizes the potential effects, effects pathways, and effect indicators for the Fish and Fish Habitat VC. The potential effects of accidental spills on fish and fish habitat are discussed in this section and are further assessed in Section 23 – Accidents and Malfunctions.



## 10.3.1 Changes to Quantity and Quality of Fish Habitat

The following potential effects to Quantity and Quality of Fish Habitat may occur as a result of project construction and operations.

### 10.3.1.1 Destruction/Loss of Fish Habitat

The destruction of fish habitat is described as a reduction in total available habitat for fish, as defined by the *Fisheries Act*. This loss renders the habitat no longer suitable for fish to utilize during any stage of their life cycle. This may include both instream habitat as well as riparian habitat. The pathways in which such effects may occur during construction and operations of the Project are described below.

#### **Construction of permanent structures (culverts and bridges) at waterbody crossings → Loss of instream and riparian habitat → Reduction in total available habitat for fish**

##### **Construction**

The construction of the road has the potential for direct and indirect effects that could cause negative changes to fish and fish habitat quantity and quality through the physical alteration of waterbodies. To construct the road and supportive infrastructure, 31 waterbody/watercourse crossing structures are required for the WSR. These water crossings have the potential to directly affect fish habitat quantity and quality in each of the waterbodies. The road width is expected to be 11.5 m along the route alignment, expanding up to 17 m at waterbody crossings where a fill embankment is required. Bridges will be approximately the same width as the roadway (11.5 m). Based on these dimensions, the direct placement of the road would result in a total approximately 9,150 square metres (m<sup>2</sup>) of fish habitat destruction/loss, considering the bankfull width of the waterbodies that will be crossed. However, the actual destruction or loss will be considerably less as there is a proposed total of six (6) bridge structures, 19 steel box culverts (steel plate arches) and six (6) large diameter (greater than 4 m width) corrugated steel pipe culverts identified that will accommodate or span the bankfull width of a waterbody. For example, steel box culvert crossings are designed so that the bankfull width of each stream crossed is fully preserved within the footprint of each culvert. All of the proposed bridge crossings structures will maintain fish habitat underneath the bridge deck. Indigenous communities have identified the loss of fish habitat as a concern related to the project construction and have emphasized that fish habitat loss should be avoided, especially in spawning areas (Bikowski, V.A. and Saddique 2024, in draft).

Temporary access roads will be required for the construction phase of the Project. During construction, a temporary access road/trail will be constructed within the ROW for WSR, along its length, to allow for vegetation clearing; to advance construction of culverts and bridges at select water crossings; and for earth movement/haulage. For the most part this access road will coincide with the footprint of the ultimate preferred route for the WSR, or in some cases may be located outside the road footprint but within the 35 m wide ROW. WC-27 is a watercourse crossing that is included for access to ARA-4, which will be used to source aggregate for the project.

As a result, the only direct impact or loss to the portion of streams within the bankfull width or below the high-water mark of waterbodies will be to the riparian areas and the locations where bridges have piers and associated footings in the water. Bridge footings will have a small individual footprint of approximately 12.5 m x 5 m in size (62.5 m<sup>2</sup> / footing). With approximately a total of 11 in-water footings/piers for the Project, there is an expected destruction of 687.5 m<sup>2</sup> of aquatic habitat. Overall, this impact represents a small loss of available fish habitat at select bridge sites where in-water piers and footings are required. The waterbody crossing structures for the Project are summarized in **Table 10-10**.



**Table 10-10: Waterbody Crossing Structure Types and Spans**

WC Number	Width (m)	Maximum Span (m)	Stream Width (m)	Number of Spans	Foundation Type	Number of Piers	Area of Aquatic Impact (m <sup>2</sup> )	Area of Riparian Impact (m <sup>2</sup> )
WB-1	253	253	250	7	Footing	7	437.5	115
WC-1A	2.1	2.1	1.90	1	Footing	0	0	697
WC-1B	1.8	1.8	0.70	1	Footing	0	0	425
WC-2	10.7	12.9	10.7	1	Footing	0	0	1,003
WC-2A	1.9	1.9	0.5	1	Footing	0	0	340
WC-3	48	48	46	2	Footing	1	62.5	230
WC-4	2.4	2.4	2.22	1	Footing	0	0	1,275
WC-5	2.7	2.7	2.20	1	Footing	0	0	1,598
WC-6	12.2	14.0	12.20	1	Footing	0	0	1,530
WC-6A	2 x 1.9	2 x 1.9	No channel	2	Footing	1	62.5	153
WC-7	3.7	4.0	3.30	1	Footing	0	0	1,598
WC-8	4.3	5.0	4.30	1	Footing	0	0	1,343
WC-9	2.5	6.5	2.5	1	Footing	0	0	765
WC-10	21.2	18	15	1	Pile	0	0	368
WC-11	5.0	5.0	5.00	1	Footing	0	0	816
WC-12	7.0	7.0	7.00	1	Footing	0	0	595
WC-13	23.0	23.0	20.0	1	Pile	0	0	1,020
WC-14	4.0	4.5	4.00	1	Footing	0	0	1,088
WC-15	5.0	7.5	5.00	1	Footing	0	0	2,618
WC-16	7.0	7.0	7.00	1	Footing	0	0	2,312
WC-17	2.0	3.0	2.00	1	Footing	0	0	952
WC-18	4.0	5.5	4.00	1	Footing	0	0	680
WC-19	20	23.0	20.00	1	Pile	0	0	218.5
WC-20	3.4	5.0	3.40	1	Footing	0	0	918
WC-21	24	24	23.90	1	Footing	0	0	408
WC-22	3.5	3.5	3.50	1	Footing	0	0	544
WC-23	3.3	3.3	3.30	1	Footing	0	0	408
WC-24	5.0	5.0	5.00	1	Footing	0	0	2,040
WC-25	4.24	6 and 4	4.24	2	Footing	1	62.5	663
WC-26	35.0	35.0	30	1	Footing	0	0	322
WC-27	48	48	48	2	Footing	1	62.5	598



Additional fish habitat destruction will occur from clearing riparian vegetation in buffer areas that are beside each waterbody crossing. It is anticipated that approximately 27,640 m<sup>2</sup> of riparian habitat will require removal to accommodate the road and cleared ROW at each crossing.

Most impacts on fish and fish habitat are expected to occur during the construction phase, as the WSR will span multiple habitats, including waterbodies. Additionally, the construction of a permanent access road to aggregate source area ARA-4 is also expected to impact one (1) large waterbody (WC-27).

A total of 250 m<sup>2</sup> of potential spawning habitat (gravel/cobble substrates) for Brook Trout, Walleye, Longnose Sucker, White Sucker, Lake Sturgeon, Yellow Perch, and Lake Chub are expected to be lost at waterbody crossing sites WC-3, WC-10, WC-25, and WC-27. In addition, approximately 500 m<sup>2</sup> of spawning habitat (dominated by a silty substrate with abundant riparian vegetation) for Northern Pike is expected to be lost at waterbody crossing sites at WC-6A and WB-1. Flooded riparian areas, of which 27,640 m<sup>2</sup> are expected to be cleared would also be good spawning and rearing habitats for Northern Pike during flooded conditions. Losses of spawning habitat for Burbot, Lake Whitefish and Cisco are predicted to be unlikely to occur. Winisk Lake does contain deeper substrates and suitable habitat for Burbot, Lake Whitefish and Cisco, but not at the proposed crossing location.

### **Operations**

Operation of the roadway is unlikely to result in additional loss of fish habitat, as repairs will be generally made to the roadway surface which are unlikely to cause any direct fish habitat loss. Should repair or rehabilitation of bridges and/or culverts be required that necessitate in-water works, it is predicted that only minor losses or temporary alterations of fish habitat may occur.

### **10.3.1.2 Harmful Alteration and Disruption of Fish Habitat**

The harmful alteration of fish habitat is defined as a change in the physical, chemical, or biological conditions in an aquatic system that could impair the ability for fish to complete one of more of its life processes (Fisheries and Oceans Canada, 1986). This could include changes in flow, substrate type, aquatic vegetation, and/or water quality that may affect the quantity or quality of fish habitat. The disruption of fish habitat is defined similarly but generally refers to short-term effects that might impair a fish's ability to complete one or more of its life processes, whereas alteration is a more permanent or long-term effect.

Roadway construction that is predicted to last up to 4 years is likely to result in alteration and disruption of fish habitat which could result in changes to fish community structure, abundance and distribution near the project (Woodcock, 2002; Taylor and Roff, 1986). Although fish may be able to utilize these altered and/or disrupted habitats, it is possible that the habitats will not provide the same habitat value or functionality when compared to undisturbed habitats such as those observed during existing conditions studies. The pathways in which harmful alteration and disruption of fish habitat may occur during construction and operations of the Project are summarized and described below.

**Placement of materials for construction of roadway and waterbody crossings (bridges and culverts) → Alteration and disruption of fish habitat**

**Construction and maintenance activities → Erosion, deposition and transportation of sediment into waterbodies → Reduction in surface water quality → Alteration and disruption of fish habitat**

**Accidental spills and air contaminant/GHG emissions during construction and maintenance activities → Reduction in surface water quality → Alteration and disruption of fish habitat**



**Construction of permanent or temporary structures (culverts and bridges) at waterbody crossings → Change in hydrology (change to surface water drainage patterns and flows) → Alteration and disruption of fish habitat**

**Construction of permanent or temporary structures (culverts and bridges) at waterbody crossings → Change to riparian habitat → Alteration and disruption of fish habitat**

**Construction and maintenance activities → Introduction of invasive species → Alteration and disruption of fish habitat**

### **Construction**

#### **Habitat Alteration/Disruption Due to Placement of Materials**

Materials such as rip-rap, boulder, or other armouring materials may be placed in the waters along watercourse banks or shoreline area of lakes (i.e., Winisk Lake) during construction to prevent erosion of the road embankment or provide scour protection near culverts and bridge crossings. These materials may be eventually covered in-water once the construction is complete and may continue to function as fish habitat; however, these will likely be a change from the baseline conditions and may change how fish utilize these areas. This effect is generally negative (Massey et al., 2017), but in instances where the habitat was relatively uniform (mudbanks, etc.), rip-rap and other engineered habitats may increase fish species diversity and abundance (White et al., 2010).

#### **Habitat Alteration/Disruption Due to Erosion or Sedimentation**

Increases in the concentration of suspended sediment can result directly from soil disturbance and grading activities during construction of the road, re-suspension of bed materials at water crossings and/or indirectly from site run-off. This could increase total suspended solids and turbidity in the downstream aquatic ecosystems and result in a negative effect on surface water quality. These suspended sediments might be naturally occurring and released due to disturbance or may be deposited from construction activities (in-fill for road embankment). Site run-off, caused by an increase in relatively non-permeable road surfaces may also increase suspended sediment concentrations and cause deposition downstream. These released sediments can affect fish species at all stages of their life cycles (Anderson et al., 1996; Kemp et al., 2011). Fine sediment can result in downstream sediment deposition that alters substrate composition or channel morphology and modifies the suitability of habitat for spawning, overwintering, foraging, and rearing. The availability of food, such as benthic invertebrates or vegetation, may also be affected due to smothering and/or substrate changes caused by deposited sediments (Jones et al., 2011). Effects could also include changes in invertebrate abundance and/or community structure (Rosenberg and Wiens, 1978). Increases in suspended and settled sediments may also interfere with gas exchange, such as reduction of available dissolved oxygen level that may be intolerable to some aquatic life, or in certain instances cause fish death. These effects may extend beyond the initial construction and can last several years before the systems are flushed of sediments (Taylor and Roff, 1986).

Lachance et al. (2011) found that the effects of increased sediment deposition, which can reduce fish spawning and rearing habitat quality, can extend between 358 to 1,442 m downstream of culvert crossings. These effects were most pronounced within the first year after construction but begin to subside after 2-3 years once the area stabilizes.



Overall, past studies have documented that deposited sediment from erosion and sedimentation can modify the availability and suitability of fish habitat through (CCME, 1999):

- **Changes in-water clarity:** reduced visibility due to turbid waters and available light penetration can create behavioral changes in local aquatic biota. Changes may be observed as alteration in movement patterns (i.e., migration) and foraging success, ultimately leading to reduction of habitat quality and/or quantity (Cavanagh et al. 2014; Wood and Armitage, 1997).
- **Potential effects on available forage species:** increases in suspended and settled sediments may lead to a reduction of available dissolved oxygen to levels intolerable by some benthic invertebrates and forage species, and may clog gills of zooplankton (Chapman et al., 2017). Coarse sediment transport may reduce the quantity of periphyton on substrates, and decreased light penetration may reduce phytoplankton, which has potential to cause trophic level changes in an ecosystem (Henley et al., 2000).
- **Deposited sediments:** suspended sediments mobilized by construction activities are ultimately deposited downstream from the point of release/mobilization. Deposition of such material can have direct effects on habitat quality and fish such as:
  - Primary production of macrophytes may be reduced as a result of diminished light penetration or smothering, reducing food availability for herbivore species (mainly forage for fish), and oxygen production;
  - Reduced specialized habitat areas such as a decrease in distinction between riffle-run-pool habitat types in a stream which reduces habitat quality and species richness;
  - Filling of interstitial spaces used by forage and benthic dwelling species (i.e., benthic invertebrates) (Lenat et al., 1981); and
  - Decreased reproduction success by reduction of spawning areas, smothering of eggs and emergence of fish fry (Bilotta and Brazier, 2008; Henley et al., 2000; Kjelland et al., 2015).

#### Water Quality Changes due to Accidental Spills and Emission of Air Contaminant, Fugitive Dust and Greenhouse Gases

Accidental spills of chemical or hazardous materials (e.g., petroleum products, ammonium nitrate) during construction has the potential to enter nearby waterbodies along the WSR. Changes to fish habitat and water quality from spills of fuel or other materials can negatively affect fish populations directly, or cause changes to their habitat. Release from spills may also affect food sources, such as plants or benthic invertebrate populations used as food sources (Kajpust, 2022; Barton and Wallace, 1979). These effects can be varied but are generally detrimental to fish and fish habitat (DeBofsky et al., 2020).

Changes in-water quality (and thus fish habitat quality) due to air contaminant and fugitive dust emissions, including greenhouse gas emissions, may also occur as result of the Project. Dust emissions during construction are predicted to be localized but have the potential to change water quality which may influence fish habitat availability. Fossil fuel emissions from vehicles, construction equipment and generators can release sulfite and nitrate species which can induce acidification and/or eutrophication of waterbodies (Environment Canada, 1994; Schindler, 1998). The effects of air contaminants are unlikely to be localized and caused exclusively by the Project but will be additive with increased greenhouse gas emissions.



### Habitat Alteration Due to Changes in Hydrology or Groundwater

Potential changes in surface water drainage patterns and increases or decreases in flows and surface water levels in waterbodies, as well changes to groundwater, are described in detail in Sections 7 and 8 of this EAR/IS. The installation of bridge structures and embankments, along with associated culverts, may change hydrology near the roadway beyond the natural range of variation and lead to changes in fish habitat quantity and quality. Culverts typically have a greater impact on fish habitat (Wellman et al., 2000) than bridges, but bridges also cause changes in fish habitat (Belcher, 2022). These disturbances generally are concentrated downstream of the effect but can also take place on the upstream side if channel restriction causes changes to water impoundment. This impoundment may flood or alter habitat outside of the typical watercourse boundaries and floodplains. In addition, these structures can reduce flow rates both upstream and downstream of the crossing. Changes to water levels and flow can affect spawning, rearing, feeding, migration, and overwintering habitat of fish-bearing waterbodies as well as affect waterbody productivity and food availability. Changes to water levels and flow can also alter the presence of macrophytes, which provide cover, spawning material or food for fish.

Groundwater inputs are seasonally important to the baseflow of local waterbodies and natural environment features (e.g., vegetation, fish and fish habitat, and wetlands). Construction activities have the potential to locally influence the contribution of groundwater discharge to the baseflow of waterbodies. Specifically, Project construction may lead to changes in the local hydrogeological environment by increasing, decreasing or redirecting groundwater flows. These changes in groundwater flow can result in local groundwater table lowering or raising and alteration of flow pathways. These potential changes in groundwater flow pathways are potentially linked to surface water quantity (i.e., water levels) and subsequently fish habitat quantity and quality

### Habitat Alteration Due to Removal of Riparian Vegetation

The removal of riparian vegetation adjacent to fish habitat is required for construction of the road. Removal of riparian zones is linked to changes in fish abundance and distribution (Jones III et al., 1999). The removal of vegetation could cause changes in-water temperature due to reduced shading potential (McGurk, 1989). This in turn could make habitats less suitable for spawning or feeding if temperatures exceed the tolerance range of cold or cool-water fish species or invertebrate species (MacDonald et al., 2003). Habitat structure of watercourses may also change if overhead cover or terrestrial inputs (such as the input of woody debris) into watercourses are reduced, decreasing the amount of available habitat for fish. Removal of riparian vegetation may also result in changes in food supply (plants and organic debris that fall into the waterbody and terrestrial insects.)

Dust emissions caused by construction of the roadway may also affect riparian vegetation by changing plant communities that may alter habitat structure, channel stability and overhead cover and a result adversely affect fish habitat.

### Introduction of Invasive Species

The introduction and spread of aquatic invasive plants during construction have the potential to reduce the suitability and availability of fish habitat as plant species may not be conducive to native fish or can change water quality from acidification and nutrient enrichment. The introduction of invasive plant species could occur as result of stowaways accidentally brought to the site. One example is construction equipment that is transported from outside the region that is not properly cleaned/disinfected may transfer invasives plants to the study area.



## **Operations**

### **Water Quality Changes due to Accidental Spills and Emission of Air Contaminant, Fugitive Dust and Greenhouse Gases**

Similar to the effects of construction, there could be effects to water quality during the operations phase of the Project from accidental spills and emission of air contaminant, fugitive dust and greenhouse gases. Although the exact frequency of spills is difficult to calculate, estimates show accident rates for trucks and releases at  $1.9 \times 10^{-7}$  spills per mile travelled for mine trucks (0.00000019 spills per mile, or 0.00000012 spills per kilometer), (Harwood and Russell, 1990). These estimates are also not developed strictly for the Project but show that spills over the course of the operation of the roadway are likely to occur. Although the initial usage of the roadway will be primarily personal and commercial vehicles and transport trucks with low traffic volumes, it is predicted that minor spills and release are probable over the lifetime of the Project. In addition, similar to construction, vehicles and equipment during operations will release air contaminants and also fugitive dust emission in areas where the road has a gravel surface.

### **Introduction of Invasive Species**

The introduction of invasive plants during operation will have similar potential effect that may reduce the availability and quality of fish habitat as plant species not conducive to fish become prevalent in areas. Road access also increases the likelihood of introduction of invasive fish species (Kaufman et al., 2009).

### **10.3.1.3 Changes in Fish Access to Habitats**

Placement of water crossing structures in waterbodies can potentially cause changes in fish accessibility to habitat through the introduction of obstructions or barriers to fish passage. Obstructions are identified by the *Fisheries Act* (1989) as an introduced impediment to the “free passage of fish”. Reduction of accessibility or elimination of fish passage can have adverse implications throughout the aquatic system, particularly where there is more than one crossing in the waterbody, or if there are multiple crossings in a small watershed. Linear features, such as roadways, that cross streams have the potential to impede fish movement by creating barriers to fish passage (Januchowski-Hartley et al., 2014). A barrier to fish passage is considered any structure or activity that would make it more difficult (or impossible) for a fish to traverse. Improperly installed or maintained culverts at waterbodies may prevent fish from passing through the structure, and limit fish access to habitat (Gibson et al., 2011; Price et al., 2011). The pathways in which changes in fish access to habitats from barriers to fish passage may occur during construction and operations of the Project are described below.

#### **Installation of temporary flow isolation structures for instream construction of bridges and culverts → Localized temporary barriers to fish access to habitats**

**Constructed culverts at waterbody crossings may become visual barriers or clogged with debris → Barriers to fish access to habitats**

**Constructed culverts at waterbody crossings with associated roadway embankments → Potential habitats for beavers to build beaver dams → Local temporary barriers to fish access to habitats**



## **Construction**

Road construction will require either bridge footings or culvert structures to cross waterbodies, while allowing water to flow past the road. Temporary obstructions, such as cofferdams, flume pipes, or pump systems would be required to complete construction in dry conditions. These temporary obstructions could result in restrictions to fish passage and will occur during construction.

Sites with bridge construction may also need temporary embankments for bridge footing construction. Construction will occur within dry, isolated streambeds, with temporary barriers in-place. While downstream flow will be maintained during construction, there may be brief interruptions in flow during construction to facilitate works.

## **Operations**

Installing temporary or permanent culverts in waterbodies can lead to habitat fragmentation in aquatic ecosystems (Fagan, 2002), which can also disrupt fish communities by isolating populations and their supporting habitats upstream and downstream of road crossings (Perkin and Gido, 2012). This effect is well understood with large, impassable barriers such as hydropower dams and roadways (Brown et al., 2013; Pess et al., 2005; Berglund, 2007). These barriers can lead to declines in species abundance and richness (Nislow et al., 2011) and isolation of habitats that are significant to specific life cycle processes (migration to spawning, rearing and overwintering areas) and can disrupt the stability of self-sustaining populations.

Culverts can become perched due to improper installation during construction or from road settlement over time or may become damaged or blocked through natural or human disturbances. Even appropriately installed culverts may become clogged with debris, restricting fish passage, if not appropriately maintained (Ottburg and Blank, 2015). This effect is most pronounced downstream of the culvert, as generally fish can move downstream of culverts but not upstream (Nislow et al., 2011). Fish passage barriers that change access to habitats are more likely to affect fish species with longer migration routes more severely, such as Lake Sturgeon (Wishingrad et al., 2014); however, even fish that do not migrate and use localized habitat in a waterbody may still be adversely affected as they may not be able to access nearby critical habitat (i.e., spawning, rearing).

Culverts in waterbodies if not designed and constructed appropriately can also restrict fish passage if the flow rate through the culvert is higher than fish are capable of swimming through (MacPherson et al., 2012). Culverts may also create low flows conditions with inadequate water depth that may also restrict fish passage, with some studies suggesting 76-85% of culverts may cause fish passage issues (Blank et al. 2005) to improper embedment of culverts below a streambed. When fish are not able to pass through the culverts, it effectively isolates certain populations and can cause habitat fragmentation (Diebel et al., 2014). Culverts may also present visual barriers that will cause fish to avoid passing through the culverts even if they are physically capable of passing through. Beavers also tend to exploit the habitats created by waterbody crossing structures and associated roadway embankments, which may increase the effects of the barriers to fish passage or increase the rate at which they accumulate (Jensen et al., 2001).

Spatially the effects of changes to fish access of habitats through potential barriers to fish passage are most likely to occur at waterbody crossings where culvert structures are proposed to facilitate the passage of water. There are 25 culverts of various types (e.g., open bottom arch culverts and corrugated steel pipes) proposed to be placed at small to medium size waterbody crossings. Changes to fish access from barriers to fish passage are not predicted to occur at large waterbodies where six (6) bridges are proposed. These include the following waterbody crossings:



- Winisk Lake (WB-1);
- WC-19 (Unnamed Tributary to Muketei River);
- Winiskisis Channel (WC-3);
- Muketei River (WC-26);
- Ekwan River (WC-10); and
- WC-27 Crossing.

Bridge footings, which support piers that are in the water, are not expected to restrict fish passage (Cocchiglia et al., 2012), as bridge footings occupy only a small portion of the available fish habitat at a bridge crossing.

The long-term effects of barriers to fish passage could be significant, as the roadway is expected to operate indefinitely. Without regular maintenance and monitoring during operations, the effects of fish barriers are likely to increase over time as culverts become plugged or modified due to beaver activity, ground movement, culvert damage, and/or sedimentation.

## 10.3.2 Changes to Fish Populations

### 10.3.2.1 Injury/Death of Fish

The injury/death effect is defined as physical injury to fish (fatal or non-fatal) as a result of the proposed works. This includes injuries or death to 'fish' as defined by the *Fisheries Act*. The pathways in which construction and operations of the Project may result in an injury or death effect to fish are described below.

**Placement of materials for construction of roadway and instream construction of waterbody crossings (bridges and culverts) → Injury or death of fish**

**Blasting (i.e., use of explosives) of rocks → Shockwaves/overpressure from explosion, chemical residues from explosives entering waterbodies → Injury or death of fish**

**Dewatering, fish salvage from areas isolated for in-water work and from beaver dam removal prior to construction → Injury or death of fish**

**Maintenance activities that require in-water work → Injury or death of fish**

**Accidental spills → overland flow with surface run-off → Reduction in surface water quality → Injury or death of fish**

Accidental releases of contaminant substances (oils, fuels, etc.) may cause the death of fish during both the construction and operation phases of the Project. The potential effects of spills are assessed in Section 23 – Accidents and Malfunctions.

#### **Construction**

There may be multiple causes of potential fish injury/death during construction, including but not limited to:

- Physical injury or mortality of fish caused by placement of materials in watercourses or equipment maneuvering in watercourses.



- Blasting near waterbodies could potentially cause the death of fish (Dunlop, 2009). Blasting work is currently not expected within waterbodies but will be required during construction for the extraction of bedrock to process aggregate at locations near waterbodies.
- Pumps will be used to dewater locations for construction of waterbody crossing structures, and this could potentially cause fish to be impinged or otherwise trapped on pump intakes or screens if not properly designed.
- Fish salvage operations during construction are proposed to prevent death/injury to the majority of fish, but there is potential for injury/death of fish during salvage operations as well.

During instream construction of the water crossings, there is the potential for physical injury or mortality of fish to occur. This can occur from the operation of heavy machinery in the water or the placement of fill or other materials in the waterbody where fish are present. The use of intakes or pumps can also cause entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.

Explosives will be used at aggregate source areas (i.e., ARA-2 and ARA-4) as part of the extraction/mining of bedrock rock material needed for the construction and operation phases of the Project (refer to Section 4). Based on the relatively low volumes of rock needed for the Project (5,500 m<sup>3</sup>) the blasting of rock using explosives during construction and operation activities is expected to occur on an infrequent basis. Blasting has the potential to cause the death or injury of fish if completed in-water or adjacent to water. This occurs from the release of shockwaves that can cause internal damage to the fish (Wright and Hopky, 1998) or fish eggs (Faulkner et al., 2006). The effects and their magnitude can be variable, and is based on the distance, type of explosive, and amount of explosive used in detonation but even relatively small charges can cause fish death if placed close to water (Hubbs and Rechnitzer, 1952). Blast residues can also cause changes in nutrient concentrations and contaminant concentrations in the watercourse that may harm fish.

Mitigation measures will be implemented to avoid/prevent the injury and/or death of fish. However, the potential for death and/or injury to fish exists, particularly in waterbodies within Project Footprint and LSA. Risk of injury and/or death of fish is expected to be highest during in-water works for installation of waterbody crossing structures conducted during the construction phase of the Project.

### **Operations**

Similar to the construction phase, during operations injury/death of fish may occur during bridge and/or culvert repairs and/or other maintenance activities where in-water work are required.

### **10.3.2.2 Change in Public Access to Fish/Fish Habitat**

The development of the WSR could result in a negative effect on the abundance of fish species, through increased access to waterbodies where populations are present. Access to previously undisturbed areas introduces opportunity for increased harvesting by First Nations and public recreational fishing in populations that have not previously experienced such pressure. This potential effect could be amplified where other proposed roads in the region (i.e., Northern Road Link and Marten Falls Community Access Road) are constructed and connect the WSR to the provincial highway system (refer to Section 21 – Cumulative Effects). The introduction of the WSR ROW and additional access road to aggregate source area ARA-4 will increase land quantity and access for harvesting, including potential expansion of outdoor tourism and recreational land use, which are currently limited within the LSA. The primary potential effect identified by increased access is pressure on historically inaccessible or remote waterbodies to an



increase in harvesting/fishing. Increased harvest is described as increased mortality and removal of fish from waterbodies and watercourses caused by recreational or commercial fishing. Indigenous harvesting may also occur with increased access for First Nations traditional harvesting. Potential for increased harvesting is likely to come from a number of different groups including; recreational and tourism outfitters, workers during the construction and operations phases of the Project, and local Indigenous community members. The pathways in which construction and operations of the Project may result in a change in public access to fish/fish habitat are described below.

**Project construction → Increased access to fish habitat for work crews → Increased harvest of fish**

**Project operations → Increased public and First Nations access to fish habitat for the public → Increased harvest of fish**

### **Construction**

Construction and other temporary workers may contribute to increased harvest during construction of the Project. These workers may exploit the local waterbodies to capture fish during their time-off or post-shift. This may result in increase in angling pressure near waterbody crossings that may result in detrimental effect on fish populations.

### **Operations**

The majority of potential effects of excessive harvesting as result of an increase in access to fish habitats are expected to occur during the operations phase of the Project. The road itself and access road to aggregate source area ARA-4 are in previously undisturbed and inaccessible areas which could cause effects to the local fish populations through additional harvest (Hunt and Lester, 2009). Studies suggest that the higher quality road, the more pressure is expected on a fishery (Hunt, 2011). A lake trout study in Ontario showed reduction of a lake trout population by approximately 72% in only a few months once a new forestry access road was built that was able to access Michaud Lake (Gunn and Sein, 2000). Road density, and associated overfishing also was shown to be a contributing factor on salmon habitats in British Columbia (Bradford and Irvine, 2000). Small lakes in the LSA are especially susceptible to over-harvesting, such as oligotrophic lakes <50 ha that often support a smaller population of fish. First Nations communities are most likely to utilize the area and in particular Webequie First Nation, being in close proximity to the road. However, many community members of First Nations have raised concerns regarding a potential influx of southern Ontario fishers reducing their ability to harvest fish (Bikowski and Saddique, 2024, in draft; Stantec 2024, in draft).

Spatially, it is expected that effects from increased harvesting will not be evenly spread throughout the waterbodies crossed by the road. Studies have shown that angling effort increases based on the type and proximity of the road to waterbodies and watercourses (Kaufman et al., 2009). In addition, the proximity of a population centre greatly increases the pressure on fish, with fish stocks generally being more highly exploited near these centers (de Kerckhove et al., 2015). Therefore, it is conceivable that the greatest pressure on the waterbodies will be in proximity to Webequie First Nation, and any other developments that may occur along the roadway in the future.

The roadway may also increase the opportunity for new business or development opportunities (such as the tourism outfitters or lake-side development) which could have negative effects on the fish population (Hunt and Lester, 2009). Many remote fish lodges are currently fly-in only and some could be established relatively close on lakes that display suitable fish populations.



Recreational fishing, although not currently present in the LSA could also place additional pressure on the more frequently edible sport-fish species found in the area. First Nations have identified Walleye and Whitefish as the primary country food source that is routinely consumed by community members in the area.

Overall, access to previously undisturbed areas that may increase harvesting could include any of the following fish species (which have been identified as species generally taken by Indigenous peoples in the area):

- Northern Pike;
- Walleye;
- Brook Trout;
- Lake Whitefish;
- Yellow Perch;
- Cisco;
- Burbot;
- White Sucker;
- Longnose Sucker; and
- Lake Sturgeon.

The proposed WSR current straddles two Ontario Fisheries Management Zones (FMR 2 and FMR 3). Beyond the fisheries limits typical of the zone, none of the waterbodies within the project area are subject to any current fishing restrictions or enforcement and it acknowledged that First Nations actively exercise their Aboriginal and Treaty Rights to harvest fish. The potential for an increase in harvesting of fish is expected to be limited to the Project Footprint and the LSA, as additional roads would be required for recreational anglers to access and harvest fish in the RSA.



**Table 10-11: Potential Effects, Pathways and Indicators for Fish and Fish Habitat VC**

Potential Effect	Project Phase	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
<b>Fish Habitat Quantity and Quality</b>					
Destruction/Loss of fish habitat	Construction	<ul style="list-style-type: none"> <li>Filling in of watercourses/wetlands will result in a loss of fish habitat.</li> <li>Filling in of riparian areas will result in a loss of fish habitat.</li> <li>Placing piers of bridges and culverts in fish habitat will result in a loss of fish habitat.</li> </ul>	<ul style="list-style-type: none"> <li>Area of Waterbodies crossed (m<sup>2</sup>).</li> <li>Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>Habitat quantity and quality changes (m<sup>2</sup>):                             <ul style="list-style-type: none"> <li>Aquatic habitat destruction (in m<sup>2</sup>); and</li> <li>Riparian habitat destruction (in m<sup>2</sup>).</li> </ul> </li> </ul>	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: <ul style="list-style-type: none"> <li>Surface Water Resources (Section 7)</li> <li>Groundwater Resources (Section 8)</li> <li>Atmospheric Environment (Section 9)</li> <li>Vegetation and Wetlands (Section 11)</li> </ul> The assessment of this VC informs the effects assessment for other VCs: <ul style="list-style-type: none"> <li>Species at Risk – Lake Sturgeon (Section 13)</li> <li>Non-Traditional Land and Resource Use (Section 16)</li> <li>Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>
Harmful Alteration and Disruption of Fish Habitat	Construction	<ul style="list-style-type: none"> <li>Clearing of vegetation could lead to increased sedimentation into the waterbodies.</li> <li>Material placed in-water may alter fish habitat substrates.</li> <li>Construction of permanent or temporary structures (culverts and bridges) at waterbody crossings could change hydrology.</li> <li>Construction of permanent or temporary structures (culverts and bridges) at waterbody crossings could change riparian habitat.</li> <li>Climate change and/or releases (GHG, dust) to the atmospheric environment could cause changes to water quality.</li> <li>Introduction of invasive species due to construction and maintenance activities.</li> </ul>	<ul style="list-style-type: none"> <li>Number of Waterbodies Crossed.</li> <li>Area of Waterbodies crossed (m<sup>2</sup>).</li> <li>Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: <ul style="list-style-type: none"> <li>Surface Water Resources (Section 7)</li> <li>Groundwater Resources (Section 8)</li> <li>Atmospheric Environment (Section 9)</li> <li>Vegetation and Wetlands (Section 11)</li> </ul> The assessment of this VC informs the effects assessment for other VCs: <ul style="list-style-type: none"> <li>Species at Risk – Lake Sturgeon (Section 13)</li> <li>Non-Traditional Land and Resource Use (Section 16)</li> <li>Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>
Change in fish access to habitats (barriers to fish passage)	Construction	<ul style="list-style-type: none"> <li>Culvert structures, and the associated road culverts or bridge piers in waterbodies could cause a potential barrier to fish movement and access to habitats.</li> <li>Changes in flow and/or water levels due to culvert construction (affecting flow rates/regimes or causing perched culverts).</li> </ul>	<ul style="list-style-type: none"> <li>Number of Waterbodies Crossed.</li> <li>Area of Waterbodies crossed (m<sup>2</sup>).</li> <li>Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Direct and Indirect	The assessment of this VC informs the effects assessment for other VCs: <ul style="list-style-type: none"> <li>Species at Risk – Lake Sturgeon (Section 13)</li> <li>Non-Traditional Land and Resource Use (Section 16)</li> <li>Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>
Destruction/Loss of fish habitat	Operations	<ul style="list-style-type: none"> <li>Maintenance related to clearing of vegetation could lead to increased sedimentation into the watercourse.</li> <li>Maintenance of roadway for structural integrity (repair and rehabilitation of culverts/bridges material additions).</li> <li>Spills/releases of contaminants could impact fish habitat.</li> </ul>	<ul style="list-style-type: none"> <li>Number of Waterbodies Crossed.</li> <li>Area of Waterbodies crossed (m<sup>2</sup>).</li> <li>Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Direct and Indirect	The assessment of this VC is informed by the effects assessment for other VCs: <ul style="list-style-type: none"> <li>Surface Water Resources (Section 7)</li> <li>Groundwater Resources (Section 8)</li> <li>Atmospheric Environment (Section 9)</li> <li>Vegetation and Wetlands (Section 11)</li> </ul> The assessment of this VC informs the effects assessment for other VCs: <ul style="list-style-type: none"> <li>Species at Risk – Lake Sturgeon (Section 13)</li> <li>Non-Traditional Land and Resource Use (Section 16)</li> <li>Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>

Potential Effect	Project Phase	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
Alteration and disruption of fish habitat	Operations	<ul style="list-style-type: none"> <li>Spills/releases could impair water quality and reduce fish habitat quality.</li> <li>Road maintenance related to the potential release of deleterious substances (e.g., fuel, oil, etc.) that could impair water quality and reduce fish habitat quality.</li> </ul>	<ul style="list-style-type: none"> <li>Number of Waterbodies Crossed.</li> <li>Area of Waterbodies crossed (m<sup>2</sup>).</li> <li>Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Direct and Indirect	<p>The assessment of this VC is informed by the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>Surface Water Resources (Section 7)</li> <li>Groundwater Resources (Section 8)</li> <li>Atmospheric Environment (Section 9)</li> <li>Vegetation and Wetlands (Section 11)</li> </ul> <p>The assessment of this VC informs the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>Species at Risk – Lake Sturgeon (Section 13)</li> <li>Non-Traditional Land and Resource Use (Section 16)</li> <li>Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>
Change in fish access to habitats (barriers to fish passage)	Operations	<ul style="list-style-type: none"> <li>Temporary water flow diversion control structures (culverts, cofferdams, dam and pump systems) in watercourses during repairs of water crossing structures could cause a potential barrier to fish movement and access to critical habitats (spawning, rearing, overwintering).</li> <li>Changes in flow and/or water levels due to culvert construction (affecting flow rates/regimes or causing perched culverts).</li> <li>Culverts may become visual or physical barriers as they clog with debris.</li> <li>Constructed culverts and roadway embankments may increase beaver activity.</li> </ul>	<ul style="list-style-type: none"> <li>Number of Waterbodies Crossed.</li> <li>Area of Waterbodies crossed (m<sup>2</sup>).</li> <li>Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Direct and Indirect	<p>The assessment of this VC informs the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>Species at Risk – Lake Sturgeon (Section 13)</li> <li>Non-Traditional Land and Resource Use (Section 16)</li> <li>Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>
<b>Fish Populations</b>					
Injury/death of fish	Construction	<ul style="list-style-type: none"> <li>Placement of materials of roadway and instream construction may injure or kill fish.</li> <li>Physical injuries may result from blasting.</li> <li>Fish death as a result of fish salvage or dewatering.</li> <li>Spills/releases of contaminants resulting in-water quality degradation and could kill fish directly.</li> </ul>	<ul style="list-style-type: none"> <li>Fish Abundance and Distribution for the following species: <ul style="list-style-type: none"> <li>Brook Trout;</li> <li>Lake Whitefish;</li> <li>Chain Pickerel;</li> <li>Yellow Perch;</li> <li>Cisco;</li> <li>Burbot;</li> <li>Longnose Sucker;</li> <li>White sucker;</li> <li>Lake Chub;</li> <li>Northern Pike;</li> <li>Walleye; and</li> <li>Lake Sturgeon (Detailed in Species at Risk [SAR] Section).</li> </ul> </li> </ul>	Direct and Indirect	<p>The assessment of this VC is informed by the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>Surface Water Resources (Section 7)</li> <li>Groundwater Resources (Section 8)</li> </ul> <p>The assessment of this VC informs the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>Species at Risk – Lake Sturgeon (Section 13)</li> <li>Non-Traditional Land and Resource Use (Section 16)</li> <li>Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>
Change in public access to fish/fish habitat	Construction	<ul style="list-style-type: none"> <li>Fishing access may improve during construction resulting in increased harvest by workers, First Nations, and recreational anglers.</li> </ul>	<ul style="list-style-type: none"> <li>Fish Abundance and Distribution for the following species: <ul style="list-style-type: none"> <li>Brook Trout;</li> <li>Lake Whitefish;</li> <li>Chain Pickerel;</li> <li>Yellow Perch;</li> <li>Cisco;</li> <li>Burbot;</li> </ul> </li> </ul>	Direct and Indirect	<p>The assessment of this VC informs the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>Species at Risk – Lake Sturgeon (Section 13)</li> <li>Non-Traditional Land and Resource Use (Section 16)</li> <li>Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>

Potential Effect	Project Phase	Effect Pathway	Effect Indicators	Nature of Interaction and Effect (Direct or Indirect)	Linked VCs
			<ul style="list-style-type: none"> <li>▫ Longnose Sucker;</li> <li>▫ White sucker;</li> <li>▫ Lake Chub;</li> <li>▫ Northern Pike;</li> <li>▫ Walleye; and</li> <li>▫ Lake Sturgeon (Detailed in SAR Section).</li> </ul>		
Injury/death of fish	Operations	<ul style="list-style-type: none"> <li>▪ Maintenance activities requiring in-water work may injure or kill fish.</li> <li>▪ Fish death as a result of fish salvage or dewatering.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fish Abundance and Distribution for the following species: <ul style="list-style-type: none"> <li>▫ Brook Trout;</li> <li>▫ Lake Whitefish;</li> <li>▫ Chain Pickerel;</li> <li>▫ Yellow Perch;</li> <li>▫ Cisco;</li> <li>▫ Burbot;</li> <li>▫ Longnose Sucker;</li> <li>▫ White sucker;</li> <li>▫ Lake Chub;</li> <li>▫ Northern Pike;</li> <li>▫ Walleye; and</li> <li>▫ Lake Sturgeon (Detailed in SAR Section).</li> </ul> </li> </ul>	Direct and Indirect	<p>The assessment of this VC is informed by the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>▪ Surface Water Resources (Section 7)</li> <li>▪ Groundwater Resources (Section 8)</li> </ul> <p>The assessment of this VC informs the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>▪ Species at Risk – Lake Sturgeon (Section 13)</li> <li>▪ Non-Traditional Land and Resource Use (Section 16)</li> <li>▪ Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>
Change in public access to fish/fish habitat	Operations	<ul style="list-style-type: none"> <li>▪ Fishing access may improve during operations resulting in increased harvest by First Nations and recreational anglers.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fish Abundance and Distribution for the following species: <ul style="list-style-type: none"> <li>▫ Brook Trout;</li> <li>▫ Lake Whitefish;</li> <li>▫ Chain Pickerel;</li> <li>▫ Yellow Perch;</li> <li>▫ Cisco;</li> <li>▫ Burbot;</li> <li>▫ Longnose Sucker;</li> <li>▫ White sucker;</li> <li>▫ Lake Chub;</li> <li>▫ Northern Pike;</li> <li>▫ Walleye; and</li> <li>▫ Lake Sturgeon (Detailed in SAR Section).</li> </ul> </li> </ul>	Direct and Indirect	<p>The assessment of this VC informs the effects assessment for other VCs:</p> <ul style="list-style-type: none"> <li>▪ Species at Risk – Lake Sturgeon (Section 13)</li> <li>▪ Non-Traditional Land and Resource Use (Section 16)</li> <li>▪ Aboriginal and Treaty Rights and Interests (Section 19)</li> </ul>

Note: m<sup>2</sup> = square metres

## 10.4 Mitigation and Enhancement Measures

This section describes the proposed mitigation measures to eliminate, reduce, control, or offset potential adverse effects to fish and fish habitat during construction and operations of the Project as detailed in **Section 10.3**. Many potential effects on Fish and Fish Habitat VC can be successfully mitigated to reduce the effects of the Project. In addition to the mitigation measures described in this section, the preliminary recommended preferred route selected through the alternative's evaluation process (refer to Section 3 – Evaluation of Project Alternatives) has minimized the number of waterbody crossings, including avoiding large lakes and watercourses that support fish and fish habitat, where possible. However, complete avoidance of waterbodies is not feasible due to the numerous waterbodies in the study area and the length of the WSR.

Enhancement measures are not currently proposed for the Project. However, it is anticipated that the Project will result in the harmful habitat alteration, disruption or destruction (HADD) of fish habitat or may cause death to fish, as defined under the *Fisheries Act*, and an authorization under Act will be required for the Project. It is expected that habitat offsetting measures (including habitat enhancement) will be required as a result of this authorization process and the proponent is committed to engaging First Nations in the future development, implementation and monitoring of habitat offsetting measures.



Indigenous community members will have an active role in developing and implementing environmental management plans.



An Environment Committee will be established to facilitate communication and engagement during construction and operations of the Project. Committee members will include Webequie First Nation Elders and Knowledge Holders, other First Nations with interesting in participating, and appropriate project representatives, to: facilitate communication and engagement during construction and operations of the Project; facilitate use of Indigenous Knowledge in project activities; facilitate evaluation of land use information; and facilitate development of appropriate monitoring programs, protocols and management plans as it relates to Fish and Fish Habitat VC.

This section and the following sections in Appendix E (Mitigation Measures) outline the key mitigation measures to reduce potential adverse effects of the Project on fish and fish habitat. These mitigation measures reflect environmental protection guidelines to protect “Environmentally Sensitive Areas” as described in the Webequie First Nation On-Reserve Land Use Plan (Webequie First Nation, 2019a). Further measures will be provided in the Construction Environmental Management Plan (CEMP) and the Operation Environmental Management Plan (OEMP) that will be developed for the Project. Refer to Section 4.6 for details of the proposed framework for the development of the CEMP and the OEMP.

- Section 5.1 – Clearing and Grubbing;
- Section 5.2 – Petroleum Handling and Storage;
- Section 5.3 – Spill Prevention and Emergency Response;
- Section 5.5 – Materials Handling and Storage;
- Section 5.6 – Working Within or Near Fish-Bearing Watercourses;
- Section 5.7 – Watercourse Crossings;
- Section 5.8 – Temporary Watercourse Diversions;



- Section 5.9 – Fish Passage;
- Section 5.10 – Fish Salvage;
- Section 5.11 – Culvert Maintenance and Installation;
- Section 5.12 – Blasting Near a Watercourse;
- Section 5.16 – Erosion and Sediment Control;
- Section 5.17 – Concrete Washout Management Practices;
- Section 5.18 – Dust Control Practices;
- Section 5.19 – Aggregate Pit Decommissioning;
- Section 5.20 – Quarry Site Selection and Development Requirements;
- Section 5.21 – Site Decommissioning and Rehabilitation;
- Section 5.22 – Water Quality Monitoring; and
- Section 5.23 – Prevention of the Transfer of Invasive Species.

## 10.4.1 Changes to Quantity and Quality of Fish Habitat

The following mitigation and enhancement measures are recommended to reduce the potential changes to Quantity and Quality of Fish Habitat. A summary of all the recommended mitigation and enhancement measures are presented in **Table 10-12**.

### 10.4.1.1 Destruction/Loss of Fish Habitat

During road construction and operations, the following key mitigation measures will be implemented to avoid and minimize the reduce the destruction/loss of fish habitat. Each of these measures will help reduce one or more of the potential effects of the Project on the quantity and/or quality of fish habitat.

#### 10.4.1.1.1 General Avoidance Measures and Project Planning and Design

Potential effects to fish and fish habitat were avoided to the extent possible during the planning phase and through the alternate route evaluation and preferred route selection process. Key avoidance and project planning measures proposed to reduce or eliminate effects on fish habitat include:

- Applicable best management strategies, avoidance and mitigation measures will be applied using the practices within the MNR Environmental Guidelines for Access Roads and Water Crossings (MNR, 1990), MNR and DFO protocol for the review and approval of forestry water crossings (MNR and DFO, 2021), DFO’s Measures to Protect Fish and Fish Habitat (DFO, 2022a) and applicable Codes of Practice (DFO, 2022c), and standard mitigation measures presented in the Ministry of Transportation/Fisheries and Oceans/Ministry of Natural Resources (MTO/DFO/MNR) Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings (MTO/DFO/MNR, 2020).
- The above guidelines will be followed to the extent practicable, realizing that deviations from these guidelines may be necessary and additional authorization may be required under relevant legislation, as necessary.
- The additional relevant legal authorization includes the *Lakes and Rivers Improvement Act* and the federal *Fisheries Act* which includes any channel realignment or infilling activities which are beyond the MNR permitting.



- The Project Team will work closely with MNR to review and approve the detailed designs for each crossing at the permitting phase to assist in preparing the Construction Environmental Management Plans (CEMPs)/Operational Environmental Management Plans (OEMPs).
- The preferred route has been selected with consideration to minimize the number of waterbody crossings for the road, where feasible, as well as the Project Footprint will be minimized to the extent possible.
- Permanent culverts and bridge crossings have been designed to accommodate the existing bankfull channel width of a watercourse, preserving and minimizing impacts to fish habitat.
- For culverts (i.e., open bottom steel arch) at 17 watercourse crossing locations, the design mitigation will include the infilling of the culvert with material (i.e., aggregate) that resembles the natural substrate present at the watercourse, as well as the creation of a low flow channel that mimics the existing stream channel. The same will be done for corrugated steel culverts found at the remaining eight crossings requiring culverts. The purpose is to minimize habitat loss by enabling the channel to function as “naturally” as possible to convey flow; maintain channel form and function; and retain fish passage.
- For larger waterbody crossings, bridges have been selected for design and construction which are expected to reduce the total fish habitat loss. These locations are:
  - Winisk Lake crossing (WB-1);
  - Unnamed Tributary to Muketei River crossing (WC-19);
  - Winiskisis Channel crossing (WC-3);
  - Muketei River crossing (WC-26);
  - Ekwan River crossing (WC-10); and
  - Unnamed watercourse crossing (WC-27).
- Fish habitat delineation and mapping, Standards, and specifications for protection of fish/fish habitat will be developed in the CEMP and OEMP for implementation to limit accidental disturbances (habitat loss) beyond the Project Footprint. These measures include:
  - Construction and/or silt fencing will be installed to clearly delineate the boundaries of the work areas to prevent habitat damage and destruction beyond work area boundaries. Where feasible, 30 m buffers will be established around riparian areas.
  - Construction personnel and equipment will be directed to avoid entering and crossing any watercourses or areas not required for construction.
  - Work vehicles and equipment will be restricted to designated work areas and access roads.
  - Maps identifying fish habitat, riparian buffers and no-go zones will be created and distributed to construction and operation personnel.
  - Signage and setbacks will be used to identify fish habitat and communicate restrictions for entering riparian areas.
- Channel realignments/infilling will be avoided through Project planning and design to the extent practicable. Channel realignments/infilling will only be undertaken in locations where specific conditions are met and/or where required based on the detail design for each permanent waterbody crossing structure to be determined in the future developed stage of the Project. If required, DFO/MNR permitting and consultation will be undertaken to reduce the risk of negatively impacting the aquatic environment.
- Sensitive habitats will be avoided (e.g., SAR/SOCC habitats, spawning areas, groundwater upwellings, etc.) where permit conditions apply and through project planning and design.



- All temporary construction camps and temporary laydown areas and aggregate source areas (i.e., ARA-2 and ARA-4) and permanent supportive infrastructure (e.g., maintenance and storage facility, rest areas and maintenance turn-around areas) will be located a minimum of 50 m back from the ordinary high-water mark (HWM) of a waterbody through detailed planning.
- Refuelling, service, and maintenance of construction and operation vehicles and equipment will generally be carried out in designated areas at temporary construction camps, temporary laydown areas, and operations and maintenance facility located a minimum of 100 from waterbodies. These areas will be designed and constructed to collect and contain minor leaks and spills. If refuelling within 100 of a waterbody cannot be avoided, enhanced spill containment measures will be used. There may be locations where this is not possible due to the prevalence of wetlands (i.e., peatland areas); however, in these locations enhanced spill containment measures will be used.
- The number of temporary water crossings required for the Project will be minimized, where possible.

#### 10.4.1.1.2 Habitat Offsetting and Enhancement

The number of temporary and permanent water crossings for the Project will be minimized, where possible; however, even with this avoidance strategy, it is understood that the Project will result in death of fish and HADD of fish habitat within the Project Footprint. As a result, waterbodies where HADD and/or death of fish occur will require habitat offsetting in order to comply with the *Fisheries Act* and conditions anticipated in the *Fisheries Act* authorization(s). Once the Project design is finalized, any net effects to fish/fish habitat will be offset through habitat creation or habitat enhancement to achieve no net loss of fish habitat and/or productive capacity. Habitat offsetting and enhancement requirements will be determined in consultation with DFO and First Nations during the detail design permitting phase of the Project.

#### 10.4.1.2 Harmful Alteration and Disruption of Fish Habitat

During road construction and operations, the following key mitigation measures will be implemented and monitored to reduce the harmful alteration and/or disruption of fish habitat. Each of these measures will help reduce one or more of the potential effects of the road.

##### 10.4.1.2.1 Temporary Watercourse Crossings

Where temporary watercourse crossings within road ROW are identified to facilitate construction of structures or for haulage of earth/fill for the construction of the WSR, they will be designed and constructed using best management practices and guidance, along with proposed mitigation measures for permanent watercourse crossings identified as part of this EA/IA. Where temporary waterbody crossings are required, these will be minimized to the extent where appropriate. Waterbody crossings may involve temporary bridges (i.e., clear-span bridges, rig mats), ice bridges/snow fills (for winter construction); and may potentially include culverts. As appropriate, some waterbody crossings may use a very short-term rig mat to facilitate clearing and access equipment, before being immediately replaced with a temporary bridge. Where temporary waterbody crossing structures are proposed, the primary preferred structures to be used in order of preference are clear-span bridges, ice bridges/snow fills (for winter construction), culverts, and rig mats.

Where in-water work is required to install a temporary waterbody crossing structure, such as a culvert, water management may include the use of cofferdams, diversion channels or by-pass pumps to isolate the work zone. Fish within the isolated work zone will be rescued (i.e., safely relocated) by qualified professionals prior to construction under the conditions of a MNR Licence to Collect Fish for Scientific Purposes.



The proponent, or its contractor, will incorporate best management practices for temporary watercourse crossings in the MNR Environmental Guidelines for Access Roads and Water Crossings (MNR 1990), and DFO's Measures to Protect Fish and Fish Habitat (DFO, 2022) and applicable Interim Codes of Practice for Temporary Stream Crossings. Note: the requirements outlined in **Section 10.4.1.1.1 General Avoidance Measures and Project Planning and Design** will apply including MNR review and any required legislative requirements pertinent to the temporary crossing.

To avoid any permanent loss or alteration of fish habitat, temporary crossing materials, if used, will be removed immediately following the completion of construction activities. Upon removal of the crossing materials, the waterbody bed and banks will be returned to their original conditions if needed and disturbed areas will be stabilized, as necessary, to prevent soil erosion.

#### 10.4.1.2.2 Project Planning and Design

Several water crossings have design mitigation that is proposed to reduce and or eliminate effects of alteration and disruption of fish habitat. Specifically, these will limit the placement of materials in water and/or project clearing that will be required, reducing alteration of substrates or vegetation. These include:

- Culverts and bridges are designed to match or exceed expected flow rates to provide capacity for expected water levels and water volumes. This includes consideration of site-specific discharge rates at crossing to inform on the appropriate sizing of the water crossing structures.
- Bridge designs have been adopted for larger watercourse crossings which are expected to reduce harmful alteration and/or disruption of fish habitat by spanning over the waterbody and minimizing the placement of the structures in-water.
- Similar to the mitigation identified in **Section 10.4.2.1** for habitat loss, culvert design criteria have been used to replicate existing functions at watercourse including the minimum and maximum water levels in culverts for fish passage, erosion control and the proper hydraulic conveyance. Culverts will be embedded a minimum of 10% to consider low flow conditions, with potential additional embedment considered on the crossing-specific requirements and feasibility. Culverts will be aligned parallel to the waterbody channel on a straight section of uniform gradient. Culverts will be designed for fish passage at the lowest trophic levels of each system and will meet DFO's species specific passage requirements. This will aid in the ability to reduce the risk of the culvert installation introducing velocities which surpass swimming abilities of a waterbody's fishery (MNR and DFO, 2021). Open bottom culverts (i.e., steel arch structure culverts with no bottom that do not disturb the bed of a waterbody) have been considered for 17 water crossings that has been determined to be sensitive in the fish/fish habitat assessment. Additional mitigation options may also be implemented for culverts to minimize net habitat alteration or loss and optimize usage and passage by fish such use of baffles, gradient pools, keyed stones, etc., where required. For proposed open bottom culverts and closed culverts (e.g., corrugated steel pipes), substrates will be placed inside the culvert to mimic the existing substrates upstream of the crossing to reduce habitat alteration.
- Culvert length will be minimized to reduce habitat alteration and disruption, where possible.
- Materials placed in-water will be erosion-resistant, or covered with such materials, to reduce erosion and sedimentation and limit downstream habitat alteration and disruption.
- During the construction phase a CEMP will be implemented and during operations an OEMP will be implemented. Management plans will be developed in consultation with MNR to be consistent with the requirements of the Project's permits and authorizations to minimize the potential effects of construction and operations activities on fish and fish habitat through effective mitigation measures. Management Plans will guide the proponent and its contractors in complying with applicable environmental legislation by providing criteria, standard protocols, and commitments to mitigation



measures in the EA/IA to eliminate, reduce, and/or offset potential adverse effects to fish and fish habitat. During construction and/or operations, the following key environmental management plans relevant to the Fish and Fish Habitat VC within the broader CEMP and OEMP will be developed and implemented.

- Erosion and Sediment Control Plan;
- Fish and Fish Habitat Management Plan;
- Surface Water and Storm Water Management and Monitoring Plan;
- Air Quality and Dust Control Management Plan;
- Construction Blasting Management Plan; and
- Vegetation and Invasive Species Management Plan.

The CEMP and OEMP will include the environmental monitoring requirements during the construction and operation phases of the Project to confirm and document compliance with the provisions of the CEMP and OEMP and conditions of applicable permits and approvals. During the construction phase, Environmental Monitor(s) and/or Indigenous Monitor(s) will be on-site to observe and document/log the implementation of mitigation measures implemented to minimize the potential effects of construction on fish and fish habitat. The documentation log will identify any deficiencies and record the actions taken to correct any issues of concern.

#### **10.4.1.2.3 Vegetation Clearing**

A vegetation clearing standard will be established to limit the potential effects of the Project on riparian and in-water vegetation (i.e., aquatic plants) that is important for fish and fish habitat and thereby minimizing the alteration of fish habitat. Key mitigation measures to be implemented include the following:

- Vegetation clearing will be conducted using appropriate equipment to prevent tree dragging and minimal earth disturbance in riparian areas of waterbodies.
- Clearing of riparian habitat will be minimized, where possible, as riparian habitat provides a buffer to fish habitat, regulates water levels, and controls erosion and sediment.
- Vegetation removal within the ROW will be limited to the footprint of structures placed at water crossing and where feasible to retain a 30 m riparian buffer upstream and downstream of the structure crossings to limit habitat alteration and disruption.
- Allow for compatible vegetation to grow back within the ROW, including riparian areas, to heights compatible with safe operation of the road.
- Develop and implement a Vegetation and Invasive Species Management Plan detailing that includes details on vegetation restoration/reclamation and riparian area stabilization using native riparian / wetland seed mixes, if applicable, to stabilize soils/banks to pre-construction condition or better.
- Use of only approved seed mix species and/or plant species of importance to Indigenous communities for site restoration of riparian areas.
- Details on implementation of a post-construction monitoring plan, which will include activities such as examining and documenting the success of revegetation and restoration measures.
- An Erosion and Sediment Control Plan will be developed and implemented to contain, manage site drainage and run-off.

Unless prompt revegetation is required for erosion control, most riparian areas will be left to naturally revegetate following grading and stabilizing activities. However, restoration may include site-specific measures to promote the natural revegetation of disturbed areas, where feasible. Erosion control during construction will be maintained until the disturbed ground has been adequately stabilized with vegetation.



#### 10.4.1.2.4 Storage and Handling of Materials

Standards and procedures for the storage, handling and stockpiling of non-hazardous materials will be established to reduce the potential for erosion and accidental deposition of materials that may impair surface water quality and impact fish or fish habitat. This will reduce/limit the effects of accidental spills and/or changes to water quality. These measures will also limit the introduction of invasive species during construction or operations. Key mitigation measures will include, but are not limited to, the following:

- The temporary storage, handling and disposal of materials used or generated (e.g., organics, soils, woody debris, temporary earth stockpiles, construction debris, etc.) during site preparation, construction and clean-up will be located a minimum 30 m from waterbodies to reduce the risk of that sediment or deleterious substances entering a waterbody.
- Excess material will be managed and monitored to prevent sediment-laden water from entering watercourses and/or waterbodies and affecting fish habitat.
- Materials stored long-term will be covered and stabilized to reduce erosion and sedimentation.
- Waste materials will be hauled off-site for disposal or placed in environmentally stable locations.
- An Erosion and Sediment Control Plan will be developed and implemented to contain, manage site drainage and run-off.

#### 10.4.1.2.5 Erosion and Sediment Control

An Erosion and Sediment Control Plan will be developed as part of the CEMP and OEMP. This plan will be prepared prior to construction and will include site-specific erosion and sediment control (ESC) drawings and specifications to control erosion and sedimentation from construction and operation activities. The ESC measures as set out in the Erosion and Sediment Control Plan (and approved by relevant regulators) will be installed prior commencing work with the objective to reduce erosion and sediment deposition in fish habitat, and potential habitat alteration or degradation. This will reduce/limit the potential effects of accidental spills and/or changes to water quality. The ESC measures and procedures will include, but are not limited to:

- Sediment fencing, silt curtains, and erosion control stabilization materials (e.g., straw mulch, wood chips, erosion control blanket, etc.) will be installed to limit the migration of sediment or release of deleterious substances into fish habitat.
- Work will be restricted during high precipitation or run-off events to reduce erosion potential to the extent practicable and in-water work associated with water crossing will be conducted in the dry season or ice-on conditions to minimize risk to negatively impact fish habitat.
- Temporary and/or permanent erosion control measures such as rip-rap or other materials will be placed along road where it interacts with water, to reduce erosion potential.
- Seeding and revegetation will be completed as soon as the final surfaces are prepared to control erosion and help promote establishment of native vegetation. A healthy native vegetation community will also limit the introduction of invasive species.
- Sediment-laden water generated on-site will be pumped into a well-vegetated area at least 30 m from fish habitat to prevent infiltration into fish habitat.
- ESC measures will be installed, monitored, and managed as appropriate to reduce the risk of sediment reaching a waterbody prior to and during construction.
- Disturbed areas will be re-contoured to restore drainage patterns to the approximate pre-construction conditions, where practicable.



- Complete instream construction in isolation of flowing water (i.e., use isolation methods where surface water exists at the time of construction). Isolation measures will follow the DFO Interim Standard for In-water Site Isolation (DFO, 2023a).
- Environmental Monitor(s) will be on-site during construction to monitor the installation, use and removal of temporary water crossing structures and during installation of permanent water crossing structures.
- Temporary ESC measures must be:
  - Installed according to the plan;
  - Installed before or immediately after initial disturbance; and
  - Monitored and effectively maintained (e.g., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established, or restoration is complete.

#### 10.4.1.2.6 Spill Prevention and Response

Spills during construction and operations that occur in high enough concentrations could negatively affect water and sediment quality and cause direct acute/chronic toxicity to fish, affect reproduction survival, and as a result changes in abundance and diversity of fish and/or fish habitat. Spills, should they occur, are predicted to be generally local in nature; however, literature suggest that the introduction of deleterious materials into a waterbody can have acute and chronic impacts on the aquatic environment. Considering the nature of work associated with the Project, the most plausible types of spills have been identified as petroleum hydrocarbons (i.e., fuel and/or oil) products from machinery and equipment, and potential release of cementitious materials for concrete work at waterbody crossings that may increase water pH and cause mortality or long-term health issues to fish.

Mitigation measures to prevent and respond to accidental spills and protect fish and fish habitat are summarized below and further described in Appendix E (Section 5.2 – Petroleum Handling and Storage, Section 5.3 – Spill Prevention and Emergency Response, Section 5.5 – Material Handling and Storage, Section 5-17 Concrete Washout Management Practices). A Spill Prevention and Emergency Response Management Plan will be developed and implemented during construction. After construction is complete, this plan will be adapted for the operations phase of the Project. Spill prevention and emergency response management measures will include, but not be limited to:

- All vehicles and equipment will be stored at least 30 m from waterbodies and operated in a way that prevents the release of deleterious substances into a waterbody, irrespective of their fish-bearing status.
- Re-fueling, service and maintenance of equipment and vehicles will generally be carried out in designated areas at temporary construction camps, and laydown areas along the road, and will be located at least 50 m away from waterbodies, and outside of fish habitat.
- Any vehicle or equipment that enters a waterbody must be free of fluid leaks and externally cleaned and degreased.
- Storage of above ground fuel storage tanks and other hazardous materials will be located at least 50 m from waterbody, irrespective of their fish-bearing status.
- Fuel and hazardous materials will be transported in approved containers in licensed vehicles and stored in such a way to reduce the risk of any deleterious substances from entering a waterbody.
- Vehicles and equipment will not be permitted to work in-water, unless required. In these cases, works will be conducted under observation by a qualified environmental monitor.



- Concrete truck washout areas will be located a minimum of 50 m away from the ordinary high-water mark of a waterbody and in a non-porous soil location and will be cleaned up at the end of the construction activities.
- Fuels and other liquid contaminants will be stored in containers with secondary containment able to store 110% of the capacity of the container.
- Containers will be routinely inspected for leaks.
- Spill mitigation measures (spill kits) will be present on-site in all laydown areas, vehicles, equipment, and other designated locations. In the event of a spill/leak, the following precautions will be implemented:
  - The spill/leak will be contained and either disposed of through site waste handling systems or removed for disposal in approved facilities;
  - Reportable spills (as defined under O.Reg. 675/98) of potentially deleterious materials will be reported to the MECP Spills Action Centre; and
  - If the spill is in fish-bearing water or where potential for harm to fish or fish habitat is likely, the MNR, DFO and Webequie First Nation and other select First Nations will also be contacted.
- Construction will be modified or delayed during heavy precipitation or run-off events.
- Signage or reduced speed limits will be considered for implementation over bridges to reduce the risk of vehicle accidents and spills.
- Individuals working on-site and handling petroleum or other hazardous materials will be trained in best practices related to the transportation and handling of dangerous goods.

#### 10.4.1.2.7 Dewatering Activities

Dewatering refers to the process of removing groundwater or surface water from a construction site in order to create a dry, stable work environment for excavation, temporary stream flow diversion and/or structural foundation work at waterbody crossings. Dewatering has the potential to change local hydrology and groundwater conditions and may negatively impact the quality and quantity of fish habitat. Dewatering measures to prevent potential harm to fish and fish habitat will include but not be limited to:

- All dewatering will be conducted in compliance with the Ontario Provincial Standard Specification (OPSS) 517 – Construction Specifications for Control of Water from Dewatering Operations, and OPSS 518 – Construction Specification for Dewatering of Pipeline, Utility, and Associated Structure Excavation.
- Dispersal mechanisms (e.g., tarping, filter bags) will be used to minimize risk of erosion, as required.
- Existing stream flows will be maintained without interruption or diminishment during construction, where feasible.
- Fish screens to prevent impingement or entrainment will be utilized to reduce fish mortality. DFO guidance for fish screens (2020) will be followed.
- Complete instream activity in the shortest timeframe practical to minimize the duration and reduce the risk of severe disturbance from dewatering activities.
- Manage temporary flows, withdrawal, and discharge, including all water from dewatering operations to reduce the risk of erosion and/or release of sediments to a waterbody.
- Monitor turbidity and total suspended solids according to permit requirements.



#### 10.4.1.2.8 Air Contaminants and Dust Emissions

Construction and operations of the Project are expected to generate air contaminants and fugitive dust emissions that could lead to changes in-water quality, which could affect fish habitat quantity and quality. The air quality measures in Section 9 of this EAR/IS include the development and implementation of a Dust and Air Quality Management Plan prior to construction and for this plan to be updated for the operations phase of the Project. Section 9 described the specific measures in detail and the following key mitigation measures will be applied to minimize impacts to fish habitat:

- Limit vehicle emissions;
- Vehicles and equipment will be regularly serviced, maintained and inspected to ensure they are good working order per manufacturer specifications;
- Obey all speed limits to limit fugitive dust;
- Exposed excavations, disturbed ground surfaces and the road surface will be sprayed with water as a dust control practice, where deemed necessary;
- Slash pile burning from clearing operations will be subject to permits and approvals by appropriate regulatory agencies and in compliance with O. Reg. 207/96;
- Minimize dust-generating activities, where required, during periods of high wind to limit dust emissions and spread;
- Restore disturbed areas as soon as reasonably possible to minimize duration of soil exposure; and
- Multi-passenger vehicles will be used to transport construction personnel to the job site, where practicable.

#### 10.4.1.3 Change in Fish Access to Habitats

Placement of water crossing structures in waterbodies can potentially cause changes in fish accessibility to habitat through the introduction of obstructions or barriers to fish passage during construction and operations, the following key mitigation measures will be implemented and monitored to limit the creation of barriers to fish passage and resulting potential changes in fish access to habitats.

##### 10.4.1.3.1 Project Planning and Design

As part of the project planning and design mitigation is proposed to reduce or eliminate potential changes to access to fish habitat from the placement of water crossing structures in waterbodies, associated with effects of the introduction of barriers to fish passage. Mitigation measures will reduce the effects of both temporary flow isolation structures, as well as those caused by permanent culvert/bridge installations. These design mitigation measures include, but are not limited to:

- Larger watercourse crossings will incorporate bridge designs that span the waterbody and avoid the potential for creation of barriers to fish passage.
- Bridges will be installed at up to six of the larger watercourses along the roadway to reduce barriers to fish passage. The specific locations include:
  - Winisk Lake (WB-1);
  - WC-19 (Unnamed Tributary to Muketei River);
  - Winiskisis Channel (WC-3);
  - Muketei River (WC-26);
  - Ekwan River (WC-10); and
  - WC-27 Crossing.



- Flow and migratory fish passage routes will be maintained at all crossings including bridges and culverts.
- For temporary crossing mitigation flow and fish passage measures refer to **Appendix E, Section 5.7 Temporary Watercourse Crossings** and **Section 5.8 Temporary Watercourse Diversions. Measures.** Examples cited include:
  - Use existing watercourse crossings, where possible;
  - Crossings will be in straight sections of the stream, avoiding meandering bends, braided streams, alluvial fans or other unstable areas;
  - Minimize the number crossings constructed;
  - Build under low flow conditions; and
  - Provide fish passage during low flow and fish migration periods.
- **Appendix E, Section 5.9 Fish Passage** discusses fish passage during in-stream construction activities including:
  - Minimum water depth of 200 mm (or eight inches) or natural stream depth at the location;
  - Flow to be maintained at all times to permit to permit safe and unimpeded passage of fish; and
  - In some watercourses, a pumped diversion may be used instead of a diversion channel to maintain flows downstream.
- Cleared trees, vegetation or construction materials shall not obstruct waterways during any season and shall be stored above the ordinary high-water mark. **Appendix E, Section 5.11 Bridge and Culvert Installation** provides a similar discussion for flow and fish passage for permanent structures. Key points include:
  - No construction activities in fish-bearing watercourse will be undertaken during Ontario RATWs;
  - If in-water work is required, appropriate permits and authorizations will be obtained;
  - Beaver dams will be as per Beaver Dam Breaching and Removal (DFO, 2024);
  - Restore bed and banks to pre-existing conditions;
  - If works are being conducted under a DFO Authorization, all conditions outlined within the Authorization shall be adhered to;
  - Downstream flows shall be maintained at all times. If isolated sites are required, flows shall be detoured around the sites, and original flows through the site shall be restored as soon as work is completed;
  - Maintain a culvert gradient as close to the natural stream grade as possible; and
  - Proper backfill shall be compacted to avoid settling, hydrostatic uplifting or side movements of the culvert that may lead to blockage of fish passage or washouts.
- Snow fill and ice bridge crossings will not impede natural water flow or fish passage at any time, except for brief, controlled construction periods. Where winter water flow is expected or confirmed, culverts will be installed beneath snow fills to maintain connectivity and fish passage (especially where fall-spawning species occur). Any culverts installed as temporary winter watercourse crossings will include removal mechanisms that allow timely extraction before the spring thaw.
- Culvert inlets, outlets, and substrates at water crossings will be designed to replicate existing habitat conditions and characteristics of the watercourse channel upstream and downstream of the crossing.
- Culverts will be appropriately sized to allow for fish passage and will maintain the flow and water depth characteristics observed during existing conditions studies.



- Similar to the mitigation identified in **Section 10.4.2.1** culverts will be embedded by 10% or greater to consider low flow conditions and aligned parallel to the watercourse on a straight section of uniform gradient. Culverts will be designed for fish passage at the lowest trophic levels of each system and will meet DFO's species specific passage requirements. This will aid in the ability to reduce the risk of the culvert installation introducing velocities which surpass swimming abilities of a waterbody's fishery (MNR and DFO, 2021). Open bottom culverts (i.e., steel arch structure culverts with no bottom that do not disturb the bed of a waterbody) have been considered for 17 water crossings that has been determined to be sensitive in the fish/fish habitat assessment. Additional mitigation options may also be implemented for culverts to minimize and avoid the introduction of barrier to fish passage and facilitate passage by fish such use of baffles, gradient pools, keyed stones, etc., where required.
- Where possible, culverts will be oversized to prevent affects associated with beaver activity.

#### 10.4.1.3.2 Culvert Maintenance and Monitoring

A regular culvert inspection, maintenance program and monitoring will be implemented during the construction and operation phases of the Project. These programs will reduce the effects of culverts being clogged with debris, which could present visual of physical barriers to fish passage. This includes, but is not limited to:

- Culverts will be regularly monitored and maintained during construction and operation to allow for fish passage. Debris removal activities will follow DFO's Code of Practice: Culvert Maintenance (2023) (i.e., gradual removal such that flooding downstream, extreme flows downstream, release of suspended sediment, and avoidance of fish stranding).
- Implement the fish and fish habitat protection procedures for culvert maintenance as documented in the Ministry of Transportation Fisheries – Best Management Practices Manual (MTO, 2025).
- Adjusting maintenance and inspection schedules according to how quickly culverts fill with debris.
- Implementing a beaver dam removal plan to minimize potential effects on fish habitat availability. Where beaver dam removals are required to facilitate the installation or maintenance/repair of water crossing structures, the activity will be completed in consideration of best management practices and environmental permit/approval conditions (once available), including MNR guidelines for access roads (MNR 1990, 2010a,b), DFO's Measures to Protect Fish and Fish Habitat (DFO, 2022a), Code of Practice for Beaver Dam Removal (DFO, 2022c) and Fisheries – Best Management Practices Manual (MTO, 2025).

## 10.4.2 Changes to Fish Populations

The following mitigation and enhancement measures are recommended to reduce the potential changes to fish populations:

### 10.4.2.1 Injury/Death of Fish

During instream construction of water crossing structures and or where blasting (i.e. use of explosives) occurs in or near a waterbody there is the potential for physical injury or death of fish. During project construction and operations, the following key mitigation measures will be implemented to reduce the unintentional injury/death of fish.



#### 10.4.2.1.1 Blasting Restrictions

Where blasting in or near water is proposed to support road construction or in bedrock for aggregate during operations, additional mitigation measures will be implemented to reduce the potential for Injury/Death of fish. These measures include but are not limited to:

- Follow the general avoidance measures and project planning in **Section 10.4.2.1** such as reducing the risk of fish death through applying restricted activity periods (timing windows). Conducting fish rescues/relocations and avoiding blasting in or near water, unless absolutely necessary.
- A Blasting Management Plan will be prepared and implemented by the proponent or their contractor(s) for the Project that describes specific measures that would be implemented if blasting is required.
- Use blasting mats to reduce the percussive, or risk of fly rock, injures to fish, and /or death of fish.
- Establishing setbacks from fish-bearing waters that are protective of fish.
- When blasting is unavoidable, following the DFO Blasting Guidance (Wright and Hopky, 2008) and Ontario Provincial Standard Specification 120 General Specifications for the Use of Explosives (Ontario Provincial Standards 2019).
- Permitting all blasting works appropriately, including applying for Fisheries Act authorization where the potential for HADD and/or death of fish exists.
- Limiting blasting to areas where other methods, such as drilling and standard excavation, are not possible.
- Preparing site-specific blasting plans when blasting is likely to be required.
- No ammonium nitrate-fuel oil mixtures will be used, due to the production of toxic byproducts (i.e., ammonia).

#### 10.4.2.1.2 Restricted Activity Periods / Timing Windows

Activities with the potential to impact fish and fish habitat (e.g., in-water work) or cause risk of injury/death to fish during the construction and operation phases of the Project will be conducted within the appropriate restricted activity period or commonly referred to as in-water timing window, as determined by the MNR and DFO. Timing in-water work to avoid sensitive life stages is typically considered an effective means of reducing the risk of negative effects to fish. The typical periods when in-water work should be avoided (i.e., restricted activity periods/timing windows) are identified for each waterbody in **Table 10-5**. The following measures will be implemented:

- Restricted activity periods will include both Spring and Fall windows to protect fish populations during their spawning, rearing and migratory periods. Based on the species present in the study area, these windows are estimated to typically be:
  - April 1 to June 30 (spring window);
  - September 1 to June 15 (fall/winter window); and
  - Restricted activity periods will be based on the species discovered in each specific waterbody.
- Construction of watercourse crossings will occur outside of restricted activity periods to minimize or avoid risk of injury or death to fish.
- Where fish sampling has not been conducted, the most restrictive activity period will be applied to each individual watercourse to protect fish and fish habitat.



- For waterbody crossings, the proposed restricted activity periods will be applicable to:
  - Any work below the high-water mark (installation of culverts, construction of bridge piers in-water);
  - Temporary water crossings where an ice bridge, fording or snow fill is proposed; and
  - Where beaver dam removals are required.

#### **10.4.2.1.3 Work Isolation and Fish Rescue**

To complete in-water works associated with waterbody crossings, isolation of the work site and fish rescue operations will be conducted. The following measures will be implemented:

- In-water work to allow for construction and repair of waterbody crossing structures will be isolated (i.e., will occur in the dry) from surrounding fish habitat using cofferdams, aquadams, or other methods acceptable to the MNR and DFO such as the requirements in the Interim Code of Practice: Temporary Cofferdams and Diversion Channels [DFO 2023b].
- Submission of appropriate notification and acquisition of necessary permits/approvals from regulatory agencies.
- Temporary dam structures to isolate the work zone will be constructed using clean materials that minimize suspended sediment generation.
- Flow will be maintained during in-water works at a level sufficient to sustain aquatic life and prevent upstream impoundment.
- Fish rescues will be conducted to relocate fish prior to in-water work, dewatering or conducting works in wetted channels or wetlands. Fish within the isolated workspaces will be rescued (i.e., salvaged and relocated) by qualified professionals under the conditions of a MNR License to Collect Fish for Scientific Purposes to be acquired, and in accordance with requirements in the DFO Interim Standard for In-water Site Isolation.
- Fish handling will be minimized, including limiting time spent weighing and measuring fish.
- For diversions during isolations, appropriately screened pumps will be used to reduce the risk of entrainment or impingement of fish following the guidance within the interim DFO Code of Practice for end-of-pipe fish protection screens for small water intakes in freshwater (DFO 2020).

#### **10.4.2.2 Changes to Public Access to Fish Habitats**

The development of the WSR could result in a negative effect on the abundance and distribution of species, through increased public access to waterbodies where fish populations are present. During project construction and operations, the following key mitigation and monitoring measures will be implemented to reduce the effect of increased harvest on fish populations from changes in access.

##### **10.4.2.2.1 Project Planning and Design**

Project planning and design will incorporate measures to prevent and/or minimize public access that may lead to increased harvest, including, but not limited to, the following:

- Installing restrictive fencing and/or barricades near waterbody crossing sites, including on bridge structures to deter fishing.
- Siting designated rest areas along the road as far as practical from potential fishing locations.



#### 10.4.2.2.2 Employee Wildlife Orientations and Restrictions

The following restrictions will be implemented for employees and visitors at the project site to limit the increase in fish harvesting:

- Employees or visitors on-site in temporary construction camps or at the permanent maintenance and storage facility will be prohibited from hunting, fishing, or harvesting wildlife.
- Temporary access routes, especially those at or approaching waterbody crossings as well as temporary construction camps and laydowns areas will be revegetated as soon as possible.
- Firearms and angling gear will be prohibited on-site.
- Wildlife orientation and education programs will be delivered on-site to inform personnel about best environmental practices for fish and wildlife in the area.

#### 10.4.2.2.3 Public Access Restrictions

To reduce public access to waterbodies and limit the potential increase in fish harvesting, the following mitigation measures will be implemented:

- Temporary access routes, construction camps and laydown areas that are not required for operation of the roadway will be reclaimed (i.e., revegetated and blocked from public access as soon as feasible).
- Public access to the road route and supportive infrastructure areas (camps, etc.) will be prohibited during construction unless authorized by the proponent.
- Stopping on the roadway during its operations will be prohibited, except in designated rest areas and in emergency situations.
- Fencing or other barricades will be installed near watercourses and on bridges to deter fishing.
- Increased access may require regulatory changes, such as restrictions on fishing in certain locations or changes to harvesting by First Nation community members to prevent additional fishing pressure. However, these legislative changes or changes to First Nation exercise of their rights to harvesting of fish are beyond the direct control the Project.

**Table 10-12: Summary of Potential Effects, Mitigation Measures and Predicted Net Effects for Fish and Fish Habitat VC**

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Fish Habitat Quantity and Quality	<ul style="list-style-type: none"> <li>▪ Number of waterbodies crossed.</li> <li>▪ Area of waterbodies crossed (m<sup>2</sup>).</li> </ul>	Construction	<ul style="list-style-type: none"> <li>▪ Construction and Use of Supportive Infrastructure.</li> <li>▪ Construction of Road.</li> <li>▪ Construction of Structures at Waterbody Crossings.</li> <li>▪ Decommissioning of Temporary Construction Camps, Access Roads and Laydown/Storage Areas.</li> <li>▪ Emissions, Discharges and Wastes.</li> <li>▪ Completion of Project-Wide Clean-up, Site Restoration / Reclamation and Demobilization.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Filling in of watercourses/wetlands will result in a loss of fish habitat.</li> <li>▪ Filling in of riparian areas will result in a loss of fish habitat.</li> <li>▪ Placing piers of bridges and culverts in fish habitat will result in a loss of fish habitat.</li> </ul>	Destruction/Loss of fish habitat	<ul style="list-style-type: none"> <li>▪ Project Routing and Crossing Design:                             <ul style="list-style-type: none"> <li>▫ The preferred route has been selected with consideration to minimize the number of waterbody crossings for the road, where feasible, as well as the Project Footprint will be minimized to the extent possible.</li> <li>▫ Permanent culverts and bridge crossings have been designed to accommodate the existing bankfull channel width of a watercourse, preserving and minimizing impacts to fish habitat.</li> <li>▫ For larger waterbody crossings bridges have been selected for design and construction which are expected to reduce the total fish habitat loss.</li> </ul> </li> <li>▪ Habitat Delineation and Mapping:                             <ul style="list-style-type: none"> <li>▫ Construction and/or silt fencing will be installed to clearly delineate the boundaries of the work areas to prevent habitat damage and destruction beyond work area boundaries. Where feasible, 30 m buffers will be established around riparian areas.</li> <li>▫ Construction personnel and equipment will be directed to avoid entering and crossing any watercourses or areas not required for construction.</li> <li>▫ Work vehicles and equipment will be restricted to designated work areas and access roads.</li> <li>▫ Maps identifying fish habitat, riparian buffers and no-go zones will be created and distributed to construction and operation personnel.</li> <li>▫ Signage and setbacks will be used to identify fish habitat and communicate restrictions for entering riparian areas.</li> </ul> </li> <li>▪ Vegetation Clearing Standard (See Section 5.1 in Appendix E):                             <ul style="list-style-type: none"> <li>▫ Clearing of riparian habitat will be minimized, where possible, as riparian habitat provides a buffer to fish habitat, regulates water levels, and controls erosion and sedimentation.</li> <li>▫ Vegetation removal within the ROW will be limited to the footprint of structures placed at water crossing and where feasible to retain a 30 m riparian buffer upstream and downstream of the structure crossings to limit habitat alteration and disruption.</li> </ul> </li> <li>▪ Erosion and Sediment Control (See Section 5.16, Section 5.22 and Section 5.23 in Appendix E):                             <ul style="list-style-type: none"> <li>▫ Sediment fencing, silt curtains, and erosion control stabilization materials (e.g., straw mulch, wood chips, erosion control blanket, etc.) will be installed to limit the migration of sediment or release of deleterious substances into fish habitat.</li> <li>▫ Work will be restricted during high precipitation or run-off events to reduce erosion potential to the extent practicable and in-water work associated with water crossing will be conducted in the dry season or ice-on conditions to minimize risk to negatively impact fish habitat.</li> <li>▫ Temporary and/or permanent erosion control measures such as rip-rap or other materials will be placed along road where it interacts with water, to reduce erosion potential.</li> <li>▫ Seeding and revegetation will be completed as soon as the final surfaces are prepared to control erosion and help promote establishment of native vegetation. A healthy native vegetation community will also limit the introduction of invasive species.</li> </ul> </li> </ul>	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
						<ul style="list-style-type: none"> <li>▫ Sediment-laden water generated on-site will be pumped into a well-vegetated area at least 30 m from fish habitat to prevent infiltration into fish habitat.</li> <li>▫ ESC measures will be installed, monitored, and managed as appropriate to reduce the risk of sediment reaching a waterbody prior to and during construction.</li> <li>▫ Disturbed areas will be re-contoured to restore drainage patterns to the approximate pre-construction conditions, where practicable.</li> <li>▪ Habitat Offsetting and Enhancement: <ul style="list-style-type: none"> <li>▫ Waterbodies where HADD and/or death of fish occur will require habitat offsetting in order to comply with the <i>Fisheries Act</i> and conditions anticipated in the <i>Fisheries Act</i> authorization(s). Once the Project design is finalized, any net effects to fish/fish habitat will be offset through habitat creation or habitat enhancement to achieve no net loss of fish habitat and/or productive capacity. Habitat offsetting and enhancement requirements will be determined in consultation with DFO and First Nations during the detail design permitting phase of the Project.</li> </ul> </li> </ul>	
Fish Habitat Quantity and Quality	<ul style="list-style-type: none"> <li>▪ Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>▪ Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Construction	<ul style="list-style-type: none"> <li>▪ Vegetation Clearing and Grubbing.</li> <li>▪ Construction and Use of Supportive Infrastructure.</li> <li>▪ Construction of Road.</li> <li>▪ Construction of Structures at Waterbody Crossings.</li> <li>▪ Decommissioning of Temporary Construction Camps, Access Roads and Laydown/Storage Areas.</li> <li>▪ Emissions, Discharges and Wastes.</li> <li>▪ Completion of Project-Wide Clean-up, Site Restoration / Reclamation and Demobilization.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Filling in of watercourses/wetlands will result in a loss of fish habitat.</li> <li>▪ Filling in of riparian areas will result in a loss of fish habitat.</li> <li>▪ Placing piers of bridges and culverts in fish habitat will result in a loss of fish habitat.</li> <li>▪ Clearing of vegetation could lead to increased sedimentation in watercourses from erosion of disturbed areas and decrease in the amount of shaded areas along watercourses, in turn, increasing water temperature.</li> <li>▪ Channelization due to culvert construction (affecting flow rates/regimes).</li> <li>▪ Air contaminant/fugitive dust/GHG emissions could cause changes to water quality.</li> </ul>	Destruction/Loss of fish habitat	<ul style="list-style-type: none"> <li>▪ Project Routing and Crossing Design: <ul style="list-style-type: none"> <li>▫ Permanent culverts and bridge crossings have been designed to accommodate the existing bankfull channel width of a watercourse, preserving and minimizing impacts to fish habitat.</li> <li>▫ For culverts (i.e., open bottom steel arch) at 17 watercourse crossing locations, the design mitigation will include the infilling of the culvert with material (i.e., aggregate) that resembles the natural substrate present at the watercourse, as well the creation of a low flow channel that mimics the existing stream channel. The same will be done for corrugated steel culverts found at the remaining eight crossings requiring culverts. The purpose is to minimize habitat loss by enabling the channel to function as “naturally” as possible to convey flow; maintain channel form and function; and retain fish passage.</li> <li>▫ For larger waterbody crossings, bridges have been selected for design and construction which are expected to reduce the total fish habitat loss. These locations are: <ul style="list-style-type: none"> <li>- Winisk Lake crossing (WB-1);</li> <li>- Unnamed Tributary to Muketei River crossing (WC-19);</li> <li>- Winiskisis Channel crossing (WC-3);</li> <li>- Muketei River crossing (WC-26);</li> <li>- Ekwan River crossing (WC-10); and</li> <li>- Unnamed watercourse crossing (WC-27).</li> </ul> </li> </ul> </li> <li>▪ Habitat Delineation and Mapping: <ul style="list-style-type: none"> <li>▫ Construction and/or silt fencing will be installed to clearly delineate the boundaries of the work areas to prevent habitat damage and destruction beyond work area boundaries. Where feasible, 30 m buffers will be established around riparian areas.</li> <li>▫ Construction personnel and equipment will be directed to avoid entering and crossing any watercourses or areas not required for construction.</li> </ul> </li> </ul>	

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						<ul style="list-style-type: none"> <li>▫ Work vehicles and equipment will be restricted to designated work areas and access roads.</li> <li>▫ Maps identifying fish habitat, riparian buffers and no-go zones will be created and distributed to construction and operation personnel.</li> <li>▫ Signage and setbacks will be used to identify fish habitat and communicate restrictions for entering riparian areas.</li> <li>▪ Vegetation Clearing Standard (See Section 5.1 in Appendix E): <ul style="list-style-type: none"> <li>▫ Clearing of riparian habitat will be minimized, where possible, as riparian habitat provides a buffer to fish habitat, regulates water levels, and controls erosion and sediment.</li> </ul> </li> <li>▪ Vegetation removal within the ROW will be limited to the footprint of structures placed at water crossing and where feasible to retain a 30 m riparian buffer upstream and downstream of the structure crossings to limit habitat alteration and disruption.</li> <li>▪ Erosion and Sediment Control (See Section 5.16, Section 5.22 and Section 5.23 in Appendix E): <ul style="list-style-type: none"> <li>▫ Sediment fencing, silt curtains, and erosion control stabilization materials (e.g., straw mulch, wood chips, erosion control blanket, etc.) will be installed to limit the migration of sediment or release of deleterious substances into fish habitat.</li> <li>▫ Work will be restricted during high precipitation or run-off events to reduce erosion potential to the extent practicable and in-water work associated with water crossing will be conducted in the dry season or ice-on conditions to minimize risk to negatively impact fish habitat.</li> <li>▫ Temporary and/or permanent erosion control measures such as rip-rap or other materials will be placed along road where it interacts with water, to reduce erosion potential.</li> <li>▫ Seeding and revegetation will be completed as soon as the final surfaces are prepared to control erosion and help promote establishment of native vegetation. A healthy native vegetation community will also limit the introduction of invasive species.</li> <li>▫ Sediment-laden water generated on-site will be pumped into a well-vegetated area at least 30 m from fish habitat to prevent infiltration into fish habitat.</li> <li>▫ ESC measures will be installed, monitored, and managed as appropriate to reduce the risk of sediment reaching a waterbody prior to and during construction.</li> <li>▫ Disturbed areas will be re-contoured to restore drainage patterns to the approximate pre-construction conditions, where practicable.</li> </ul> </li> <li>▪ Habitat Offsetting + Enhancement: <ul style="list-style-type: none"> <li>▫ Waterbodies where HADD and/or death of fish occur will require habitat offsetting in order to comply with the <i>Fisheries Act</i> and conditions anticipated in the <i>Fisheries Act</i> authorization(s). Once the Project design is finalized, any net effects to fish/fish habitat will be offset through habitat creation or habitat enhancement to achieve no net loss of fish habitat and/or productive capacity. Habitat offsetting and enhancement requirements will be determined in consultation with DFO and First Nations during the detail design permitting phase of the Project.</li> </ul> </li> </ul>	Yes

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Fish Habitat Quantity and Quality	<ul style="list-style-type: none"> <li>▪ Number of waterbodies crossed.</li> <li>▪ Area of waterbodies crossed (m<sup>2</sup>).</li> <li>▪ Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>▪ Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Operations	<ul style="list-style-type: none"> <li>▪ Operation, Maintenance and Repair of Road.</li> <li>▪ Operation of Pits, Quarries and Maintenance Yard/Facility.</li> <li>▪ Potential for Accidents and Malfunctions.</li> <li>▪ Emissions, Discharges and Wastes.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Maintenance related to clearing of vegetation could lead to increased sedimentation into the watercourse.</li> <li>▪ Maintenance of roadway for structural integrity (repair and rehabilitation of culverts/bridges material additions).</li> <li>▪ Spills/releases of contaminants could impact fish habitat.</li> </ul>	Destruction/Loss of fish habitat	<ul style="list-style-type: none"> <li>▪ Habitat Delineation and Mapping: <ul style="list-style-type: none"> <li>▫ Construction and/or silt fencing will be installed to clearly delineate the boundaries of the work areas to prevent habitat damage and destruction beyond work area boundaries. Where feasible, 30 m buffers will be established around riparian areas.</li> <li>▫ Construction personnel and equipment will be directed to avoid entering and crossing any watercourses or areas not required for construction.</li> <li>▫ Work vehicles and equipment will be restricted to designated work areas and access roads.</li> <li>▫ Maps identifying fish habitat, riparian buffers and no-go zones will be created and distributed to construction and operation personnel.</li> <li>▫ Signage and setbacks will be used to identify fish habitat and communicate restrictions for entering riparian areas.</li> </ul> </li> <li>▪ Vegetation Clearing Standard (See Section 5.1 in Appendix E): <ul style="list-style-type: none"> <li>▫ Clearing of riparian habitat will be minimized, where possible, as riparian habitat provides a buffer to fish habitat, regulates water levels, and controls erosion and sediment.</li> <li>▫ Vegetation removal within the ROW will be limited to the footprint of structures placed at water crossing and where feasible to retain a 30 m riparian buffer upstream and downstream of the structure crossings to limit habitat alteration and disruption.</li> </ul> </li> <li>▪ Erosion and Sediment Control (See Section 5.16, Section 5.22 and Section 5.23 in Appendix E): <ul style="list-style-type: none"> <li>▫ Sediment fencing, silt curtains, and erosion control stabilization materials (e.g., straw mulch, wood chips, erosion control blanket, etc.) will be installed to limit the migration of sediment or release of deleterious substances into fish habitat.</li> <li>▫ Work will be restricted during high precipitation or run-off events to reduce erosion potential to the extent practicable and in-water work associated with water crossing will be conducted in the dry season or ice-on conditions to minimize risk to negatively impact fish habitat.</li> <li>▫ Temporary and/or permanent erosion control measures such as rip-rap or other materials will be placed along road where it interacts with water, to reduce erosion potential.</li> <li>▫ Seeding and revegetation will be completed as soon as the final surfaces are prepared to control erosion and help promote establishment of native vegetation. A healthy native vegetation community will also limit the introduction of invasive species.</li> <li>▫ Sediment-laden water generated on-site will be pumped into a well-vegetated area at least 30 m from fish habitat to prevent infiltration into fish habitat.</li> <li>▫ ESC measures will be installed, monitored, and managed as appropriate to reduce the risk of sediment reaching a waterbody prior to and during construction.</li> </ul> </li> <li>▪ Disturbed areas will be re-contoured to restore drainage patterns to the approximate pre-construction conditions, where practicable.</li> </ul>	Yes

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						<ul style="list-style-type: none"> <li>▪ Habitat Offsetting and Enhancement: <ul style="list-style-type: none"> <li>▫ Waterbodies where HADD and/or death of fish occur will require habitat offsetting in order to comply with the <i>Fisheries Act</i> and conditions anticipated in the <i>Fisheries Act</i> authorization(s). Once the Project design is finalized, any net effects to fish/fish habitat will be offset through habitat creation or habitat enhancement to achieve no net loss of fish habitat and/or productive capacity.</li> <li>▫ Habitat offsetting and enhancement requirements will be determined in consultation with DFO and First Nations during the detail design permitting phase of the Project.</li> </ul> </li> </ul>	
Fish Habitat Quantity and Quality	<ul style="list-style-type: none"> <li>▪ Number of waterbodies crossed.</li> <li>▪ Area of waterbodies crossed (m<sup>2</sup>).</li> <li>▪ Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>▪ Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Construction	<ul style="list-style-type: none"> <li>▪ Vegetation Clearing and Grubbing.</li> <li>▪ Construction and Use of Supportive Infrastructure.</li> <li>▪ Construction of Road.</li> <li>▪ Construction of Structures at Waterbody Crossings.</li> <li>▪ Decommissioning of Temporary Construction Camps, Access Roads and Laydown/Storage Areas.</li> <li>▪ Emissions, Discharges and Wastes.</li> <li>▪ Completion of Project-Wide Clean-up, Site Restoration / Reclamation and Demobilization.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Clearing of vegetation could lead to increased sedimentation into the waterbodies.</li> <li>▪ Material placed in-water may alter fish habitat substrates.</li> <li>▪ Construction of permanent or temporary structures (culverts and bridges) at waterbody crossings could change hydrology.</li> <li>▪ Construction of permanent or temporary structures (culverts and bridges) at waterbody crossings could change riparian habitat.</li> <li>▪ Climate change and/or releases (GHG, dust) to the atmospheric environment could cause changes to water quality.</li> <li>▪ Introduction of invasive species due to construction and maintenance activities.</li> </ul>	Alteration and disruption of fish habitat	<ul style="list-style-type: none"> <li>▪ Construction Environmental Management and Monitoring: <ul style="list-style-type: none"> <li>▫ During the construction phase a CEMP will be implemented. Management plans will be consistent with the requirements of the Project's permits and authorizations to minimize the potential effects of construction and operations activities on fish and fish habitat. Management Plans will guide the proponent and its contractors in complying with applicable environmental legislation by providing criteria, standard protocols, and commitments to mitigation measures in the EA/IA to eliminate, reduce, and/or offset potential adverse effects to fish and fish habitat. During construction and/or operations, the following key environmental management plans relevant to the Fish and Fish Habitat VC within the broader CEMP will be developed and implemented: <ul style="list-style-type: none"> <li>- Erosion and Sediment Control Plan;</li> <li>- Fish and Fish Habitat Management Plan;</li> <li>- Surface Water and Storm Water Management and Monitoring Plan;</li> <li>- Air Quality and Dust Control Management Plan;</li> <li>- Construction Blasting Management Plan; and</li> <li>- Vegetation and Invasive Species Management Plan.</li> </ul> </li> <li>▫ The CEMP and OEMP will include the environmental monitoring requirements during the construction and operation phases of the Project to confirm and document compliance with the provisions of the CEMP and conditions of applicable permits and approvals. During the construction phase, Environmental Monitor(s) and/or Indigenous Monitor(s) will be on-site to observe and document/log the implementation of mitigation measures implemented to minimize the potential effects of construction on fish and fish habitat. The documentation log will identify any deficiencies and record the actions taken to correct any issues of concern.</li> </ul> </li> <li>▪ Vegetation Clearing Standard (See Section 5.1 in Appendix E): <ul style="list-style-type: none"> <li>▫ Vegetation clearing will be conducted using appropriate equipment to prevent tree dragging and minimal earth disturbance in riparian areas of waterbodies.</li> <li>▫ Clearing of riparian habitat will be minimized, where possible, as riparian habitat provides a buffer to fish habitat, regulates water levels, and controls erosion and sediment.</li> <li>▫ Vegetation removal within the ROW will be limited to the footprint of structures placed at water crossing and where feasible to retain a 30 m riparian buffer upstream and downstream of the structure crossings to limit habitat alteration and disruption.</li> </ul> </li> </ul>	Yes

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						<ul style="list-style-type: none"> <li>▫ Allow for compatible vegetation to grow back within the ROW, including riparian areas, to heights compatible with safe operation of the road.</li> <li>▫ Develop and implement a Vegetation and Invasive Species Management Plan detailing that includes details on vegetation restoration/reclamation and riparian area stabilization using native riparian/wetland seed mixes, if applicable, to stabilize soils/banks to pre-construction condition or better: <ul style="list-style-type: none"> <li>- Use of only approved seed mix species and/or plant species of importance to Indigenous communities for site restoration of riparian areas.</li> <li>- Details on implementation of a post-construction monitoring plan, which will include activities such as examining and documenting the success of revegetation and restoration measures.</li> </ul> </li> <li>▪ Stockpiled Materials Standard (See Section 5.5 in Appendix E): <ul style="list-style-type: none"> <li>▫ The temporary storage, handling and disposal of materials used or generated (e.g., organics, soils, woody debris, temporary earth stockpiles, construction debris, etc.) during site preparation, construction and clean-up will be located a minimum 30 m from waterbodies to reduce the risk of that sediment or deleterious substances entering a waterbody.</li> <li>▫ Excess material will be managed and monitored to prevent sediment-laden water from entering watercourses and/or waterbodies and affecting fish habitat.</li> <li>▫ Materials stored long-term will be covered and stabilized to reduce erosion and sedimentation.</li> <li>▫ Waste materials will be hauled off-site for disposal or placed in environmentally stable locations.</li> </ul> </li> <li>▪ Erosion and Sediment Control (See Section 5.16, Section 5.22 and Section 5.23 in Appendix E): <ul style="list-style-type: none"> <li>▫ Sediment fencing, silt curtains, and erosion control stabilization materials (e.g., straw mulch, wood chips, erosion control blanket, etc.) will be installed to limit the migration of sediment or release of deleterious substances into fish habitat.</li> <li>▫ Work will be restricted during high precipitation or run-off events to reduce erosion potential to the extent practicable and in-water work associated with water crossing will be conducted in the dry season or ice-on conditions to minimize risk to negatively impact fish habitat.</li> <li>▫ Temporary and/or permanent erosion control measures such as rip-rap or other materials will be placed along road where it interacts with water, to reduce erosion potential.</li> <li>▫ Seeding and revegetation will be completed as soon as the final surfaces are prepared to control erosion and help promote establishment of native vegetation. A healthy native vegetation community will also limit the introduction of invasive species.</li> <li>▫ Sediment-laden water generated on-site will be pumped into a well-vegetated area at least 30 m from fish habitat to prevent infiltration into fish habitat.</li> <li>▫ ESC measures will be installed, monitored, and managed as appropriate to reduce the risk of sediment reaching a waterbody prior to and during construction.</li> </ul> </li> </ul>	

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						<ul style="list-style-type: none"> <li>▫ Disturbed areas will be re-contoured to restore drainage patterns to the approximate pre-construction conditions, where practicable.</li> <li>▫ Complete instream construction in isolation of flowing water (i.e., use isolation methods where surface water exists at the time of construction). Isolation measures will follow the DFO Interim Standard for In-water Site Isolation (DFO 2023a).</li> <li>▫ Environmental Monitor(s) will be on-site during construction to monitor the installation, use and removal of temporary water crossing structures and during installation of permanent water crossing structures.</li> <li>▫ Temporary ESC measures must be: <ul style="list-style-type: none"> <li>- Installed according to the plan;</li> <li>- Installed before or immediately after initial disturbance; and</li> <li>- Monitored and effectively maintained (e.g., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established, or restoration is complete.</li> </ul> </li> <li>▪ Spill Prevention and Response (See Section 5.3, Section 5.17 in Appendix E): <ul style="list-style-type: none"> <li>▫ All vehicles and equipment will be stored at least 30 m from waterbodies and operated in a way that prevents the release of deleterious substances into a waterbody, irrespective of their fish-bearing status.</li> <li>▫ Re-fueling, service and maintenance of equipment and vehicles will generally be carried out in designated areas at temporary construction camps, and laydown areas along the road, and will be located at least 50 m away from waterbodies, and outside of fish habitat.</li> <li>▫ Any vehicle or equipment that enters a waterbody must be free of fluid leaks and externally cleaned and degreased.</li> <li>▫ Storage of above ground fuel storage tanks and other hazardous materials will be located at least 50 m from waterbody, irrespective of their fish-bearing status.</li> <li>▫ Fuel and hazardous materials will be transported in approved containers in licensed vehicles and stored in such a way to reduce the risk of any deleterious substances from entering a waterbody.</li> <li>▫ Vehicles and equipment will not be permitted to work in-water, unless required. In these cases, works will be conducted under observation by a qualified environmental monitor.</li> <li>▫ Concrete truck washout areas will be located a minimum of 50 m away from the ordinary high-water mark of a waterbody and in a non-porous soil location and will be cleaned up at the end of the construction activities.</li> <li>▫ Fuels and other liquid contaminants will be stored in containers with secondary containment able to store 110% of the capacity of the container.</li> <li>▫ Containers will be routinely inspected for leaks.</li> <li>▫ Spill mitigation measures (spill kits) will be present on-site in all laydown areas, vehicles, equipment, and other designated locations. In the event of a spill/leak, the following precautions will be implemented:</li> </ul> </li> </ul>	

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						<ul style="list-style-type: none"> <li>- The spill/leak will be contained and either disposed of through site waste handling systems or removed for disposal in approved facilities;</li> <li>- Reportable spills (as defined under O.Reg. 675/98) of potentially deleterious materials will be reported to the MECP Spills Action Centre; and</li> <li>- If the spill is in fish-bearing water or where potential for harm to fish or fish habitat is likely, the MNR and DFO will also be contacted.</li> </ul> <ul style="list-style-type: none"> <li>▫ Construction will be modified or delayed during heavy precipitation or run-off events.</li> <li>▫ Signage or reduced speed limits will be considered for implementation over bridges to reduce the risk of vehicle accidents and spills.</li> <li>▫ Individuals working on-site and handling petroleum or other hazardous materials will be trained in best practices related to the transportation and handling of dangerous goods.</li> </ul> <ul style="list-style-type: none"> <li>▪ Dewatering Standard (See Section 5.8 in Appendix E): <ul style="list-style-type: none"> <li>▫ All dewatering will be conducted in compliance with the Ontario Provincial Standard Specification (OPSS) 517 – Construction Specifications for Control of Water from Dewatering Operations, and OPSS 518 – Construction Specification for Dewatering of Pipeline, Utility, and Associated Structure Excavation.</li> <li>▫ Dispersal mechanisms (e.g., tarping, filter bags) will be used to minimize risk of erosion, as required.</li> <li>▫ Existing stream flows will be maintained without interruption or diminishment during construction, where feasible.</li> <li>▫ Fish screens to prevent impingement or entrainment will be utilized to reduce fish mortality. DFO guidance for fish screens (2020) will be followed.</li> <li>▫ Complete instream activity in the shortest timeframe practical to minimize the duration and reduce the risk of severe disturbance from dewatering activities.</li> <li>▫ Manage temporary flows, withdrawal, and discharge, including all water from dewatering operations to reduce the risk of erosion and/or release of sediments to a waterbody.</li> </ul> </li> </ul>	
Fish Habitat Quantity and Quality	<ul style="list-style-type: none"> <li>▪ Number of waterbodies crossed.</li> <li>▪ Area of waterbodies crossed (m<sup>2</sup>).</li> <li>▪ Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>▪ Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Operations	<ul style="list-style-type: none"> <li>▪ Operation, Maintenance and Repair of Road.</li> <li>▪ Operation of Pits, Quarries and Maintenance Yard/Facility.</li> <li>▪ Potential for Accidents and Malfunctions.</li> <li>▪ Emissions, Discharges and Wastes.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Maintenance related to clearing of vegetation could lead to increased sedimentation into the watercourse.</li> <li>▪ Maintenance of roadway for structural integrity (repair and rehabilitation of culverts/bridges material additions).</li> <li>▪ Spills/releases of contaminants could impact fish habitat.</li> </ul>	Alteration and disruption of fish habitat	<ul style="list-style-type: none"> <li>▪ Operations Environmental Management and Monitoring: <ul style="list-style-type: none"> <li>▫ During the construction phase a OEMP will be implemented. Management plans will be consistent with the requirements of the Project's permits and authorizations to minimize the potential effects of construction and operations activities on fish and fish habitat. Management Plans will guide the proponent and its contractors in complying with applicable environmental legislation by providing criteria, standard protocols, and commitments to mitigation measures in the EA/IA to eliminate, reduce, and/or offset potential adverse effects to fish and fish habitat. During operations, the following key environmental management plans relevant to the Fish and Fish Habitat VC within the broader OEMP will be developed and implemented: <ul style="list-style-type: none"> <li>- Erosion and Sediment Control Plan;</li> <li>- Fish and Fish Habitat Management Plan;</li> <li>- Surface Water and Storm Water Management and Monitoring Plan;</li> </ul> </li> </ul> </li> </ul>	Yes

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						<ul style="list-style-type: none"> <li>- Air Quality and Dust Control Management Plan;</li> <li>- Construction Blasting Management Plan; and</li> <li>- Vegetation and Invasive Species Management Plan.</li> <li>▫ The OEMP will include the environmental monitoring requirements during the construction and operation phases of the Project to confirm and document compliance with the provisions of the OEMP and conditions of applicable permits and approvals.</li> <li>▪ Vegetation Clearing Standard (See Section 5.1 in Appendix E): <ul style="list-style-type: none"> <li>▫ Vegetation clearing will be conducted using appropriate equipment to prevent tree dragging and minimal earth disturbance in riparian areas of waterbodies.</li> <li>▫ Clearing of riparian habitat will be minimized, where possible, as riparian habitat provides a buffer to fish habitat, regulates water levels, and controls erosion and sediment.</li> <li>▫ Vegetation removal within the ROW will be limited to the footprint of structures placed at water crossing and where feasible to retain a 30 m riparian buffer upstream and downstream of the structure crossings to limit habitat alteration and disruption.</li> <li>▫ Allow for compatible vegetation to grow back within the ROW, including riparian areas, to heights compatible with safe operation of the road.</li> <li>▫ Develop and implement a Vegetation and Invasive Species Management Plan detailing that includes details on vegetation restoration/reclamation and riparian area stabilization using native riparian/wetland seed mixes, if applicable, to stabilize soils/banks to pre-construction condition or better: <ul style="list-style-type: none"> <li>- Use of only approved seed mix species and/or plant species of importance to Indigenous communities for site restoration of riparian areas.</li> <li>- Details on implementation of a post-construction monitoring plan, which will include activities such as examining and documenting the success of revegetation and restoration measures.</li> </ul> </li> </ul> </li> <li>▪ Stockpiled Materials Standard (See Section 5.5 in Appendix E): <ul style="list-style-type: none"> <li>▫ The temporary storage, handling and disposal of materials used or generated (e.g., organics, soils, woody debris, temporary earth stockpiles, construction debris, etc.) during site preparation, construction and clean-up will be located a minimum 30 m from waterbodies to reduce the risk of that sediment or deleterious substances entering a waterbody.</li> <li>▫ Excess material will be managed and monitored to prevent sediment-laden water from entering watercourses and/or waterbodies and affecting fish habitat.</li> <li>▫ Materials stored long-term will be covered and stabilized to reduce erosion and sedimentation.</li> <li>▫ Waste materials will be hauled off-site for disposal or placed in environmentally stable locations.</li> </ul> </li> <li>▪ Erosion and Sediment Control (See Section 5.16 in Appendix E): <ul style="list-style-type: none"> <li>▫ Sediment fencing, silt curtains, and erosion control stabilization materials (e.g., straw mulch, wood chips, erosion control blanket, etc.) will be installed to limit the migration of sediment or release of deleterious substances into fish habitat.</li> </ul> </li> </ul>	

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						<ul style="list-style-type: none"> <li>▫ Work will be restricted during high precipitation or run-off events to reduce erosion potential to the extent practicable and in-water work associated with water crossing will be conducted in the dry season or ice-on conditions to minimize risk to negatively impact fish habitat.</li> <li>▫ Temporary and/or permanent erosion control measures such as rip-rap or other materials will be placed along road where it interacts with water, to reduce erosion potential.</li> <li>▫ Seeding and revegetation will be completed as soon as the final surfaces are prepared to control erosion and help promote establishment of native vegetation. A healthy native vegetation community will also limit the introduction of invasive species.</li> <li>▫ Sediment-laden water generated on-site will be pumped into a well-vegetated area at least 30 m from fish habitat to prevent infiltration into fish habitat.</li> <li>▫ ESC measures will be installed, monitored, and managed as appropriate to reduce the risk of sediment reaching a waterbody prior to and during construction.</li> <li>▫ Disturbed areas will be re-contoured to restore drainage patterns to the approximate pre-construction conditions, where practicable.</li> <li>▫ Complete instream construction in isolation of flowing water (i.e., use isolation methods where surface water exists at the time of construction). Isolation measures will follow the DFO Interim Standard for In-water Site Isolation (DFO 2023a).</li> <li>▫ Environmental Monitor(s) will be on-site during construction to monitor the installation, use and removal of temporary water crossing structures and during installation of permanent water crossing structures.</li> <li>▫ Temporary ESC measures must be: <ul style="list-style-type: none"> <li>- Installed according to the plan;</li> <li>- Installed before or immediately after initial disturbance; and</li> <li>- Monitored and effectively maintained (e.g., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established, or restoration is complete.</li> </ul> </li> <li>▪ Spill Prevention and Response (See Section 5.2, Section 5.3, and Section 5.17 in Appendix E): <ul style="list-style-type: none"> <li>▫ All vehicles and equipment will be stored at least 30 m from waterbodies and operated in a way that prevents the release of deleterious substances into a waterbody, irrespective of their fish-bearing status.</li> <li>▫ Re-fueling, service and maintenance of equipment and vehicles will generally be carried out in designated areas at temporary construction camps, and laydown areas along the road, and will be located at least 50 m away from waterbodies, and outside of fish habitat.</li> <li>▫ Any vehicle or equipment that enters a waterbody must be free of fluid leaks and externally cleaned and degreased.</li> <li>▫ Storage of above ground fuel storage tanks and other hazardous materials will be located at least 50 m from waterbody, irrespective of their fish-bearing status.</li> </ul> </li> </ul>	

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
						<ul style="list-style-type: none"> <li>▫ Fuel and hazardous materials will be transported in approved containers in licensed vehicles and stored in such a way to reduce the risk of any deleterious substances from entering a waterbody.</li> <li>▫ Vehicles and equipment will not be permitted to work in-water, unless required. In these cases, works will be conducted under observation by a qualified environmental monitor.</li> <li>▫ Concrete truck washout areas will be located a minimum of 50 m away from the ordinary high-water mark of a waterbody and in a non-porous soil location and will be cleaned up at the end of the construction activities.</li> <li>▫ Fuels and other liquid contaminants will be stored in containers with secondary containment able to store 110% of the capacity of the container.</li> <li>▫ Containers will be routinely inspected for leaks.</li> <li>▫ Spill mitigation measures (spill kits) will be present on-site in all laydown areas, vehicles, equipment, and other designated locations. In the event of a spill/leak, the following precautions will be implemented: <ul style="list-style-type: none"> <li>- The spill/leak will be contained and either disposed of through site waste handling systems or removed for disposal in approved facilities;</li> <li>- Reportable spills (as defined under O.Reg. 675/98) of potentially deleterious materials will be reported to the MECP Spills Action Centre; and</li> <li>- If the spill is in fish-bearing water or where potential for harm to fish or fish habitat is likely, the MNR and DFO will also be contacted.</li> </ul> </li> <li>▫ Construction will be modified or delayed during heavy precipitation or run-off events.</li> <li>▫ Signage or reduced speed limits will be considered for implementation over bridges to reduce the risk of vehicle accidents and spills.</li> <li>▫ Individuals working on-site and handling petroleum or other hazardous materials will be trained in best practices related to the transportation and handling of dangerous goods.</li> <li>▫ Dewatering Standard (Section 5.9 in Appendix E).</li> <li>▫ All dewatering will be conducted in compliance with the Ontario Provincial Standard Specification (OPSS) 517 – Construction Specifications for Control of Water from Dewatering Operations, and OPSS 518 – Construction Specification for Dewatering of Pipeline, Utility, and Associated Structure Excavation.</li> <li>▫ Dispersal mechanisms (e.g., tarping, filter bags) will be used to minimize risk of erosion, as required.</li> <li>▫ Existing stream flows will be maintained without interruption or diminishment during construction, where feasible.</li> <li>▫ Fish screens to prevent impingement or entrainment will be utilized to reduce fish mortality. DFO guidance for fish screens (2020) will be followed.</li> <li>▫ Complete instream activity in the shortest timeframe practical to minimize the duration and reduce the risk of severe disturbance from dewatering activities.</li> </ul>	

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
						<ul style="list-style-type: none"> <li>▫ Manage temporary flows, withdrawal, and discharge, including all water from dewatering operations to reduce the risk of erosion and/or release of sediments to a waterbody.</li> </ul>	
Fish Habitat Quantity and Quality	<ul style="list-style-type: none"> <li>▪ Number of waterbodies crossed.</li> <li>▪ Area of waterbodies crossed (m<sup>2</sup>).</li> <li>▪ Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>▪ Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Construction	<ul style="list-style-type: none"> <li>▪ Vegetation Clearing and Grubbing.</li> <li>▪ Construction and Use of Supportive Infrastructure.</li> <li>▪ Construction of Road.</li> <li>▪ Construction of Structures at Waterbody Crossings.</li> <li>▪ Decommissioning of Temporary Construction Camps, Access Roads and Laydown/Storage Areas.</li> <li>▪ Emissions, Discharges and Wastes.</li> <li>▪ Completion of Project-Wide Clean-up, Site Restoration / Reclamation and Demobilization.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Culvert structures, and the associated road culverts or bridge piers in waterbodies could cause a potential barrier to fish movement and access to habitats.</li> <li>▪ Changes in flow and/or water levels due to culvert construction (affecting flow rates/regimes or causing perched culverts).</li> </ul>	Changes in fish access to habitats	<ul style="list-style-type: none"> <li>▪ Project Routing and Crossing Design (Section 5.9 and Section 5.11 in Appendix E): <ul style="list-style-type: none"> <li>▫ Larger watercourse crossings will incorporate bridge designs that span the waterbody and avoid the potential for creation of barriers to fish passage.</li> <li>▫ Bridges will be installed at up to six of the larger watercourses along the roadway to reduce barriers to fish passage.</li> <li>▫ Flow and migratory fish passage routes will be maintained at all crossings including bridges and culverts.</li> <li>▫ Culvert inlets, outlets, and substrates at water crossings will be designed to replicate existing habitat conditions and characteristics of the watercourse channel upstream and downstream of the crossing.</li> <li>▫ Culverts will be appropriately sized to allow for fish passage and will maintain the flow and water depth characteristics observed during existing conditions studies.</li> <li>▫ Similar to the mitigation identified in <b>Section 10.4.2.1</b> culverts will be embedded by 10% to consider low flow conditions and aligned parallel to the watercourse on a straight section of uniform gradient. Culverts will be designed for fish passage at the lowest trophic levels of each system and will meet DFO's species specific passage requirements. This will aid in the ability to reduce the risk of the culvert installation introducing velocities which surpass swimming abilities of a waterbody's fishery (MNR and DFO 2021). Open bottom culverts (i.e., steel arch structure culverts with no bottom that do not disturb the bed of a waterbody) have been considered for 17 water crossings that has been determined to be sensitive in the fish/fish habitat assessment. Additional mitigation options may also be implemented for culverts to minimize and avoid the introduction of barrier to fish passage and facilitate passage by fish such use of baffles, gradient pools, keyed stones, etc., where required.</li> <li>▫ Where possible, culverts will be oversized to prevent affects associated with beaver activity.</li> </ul> </li> <li>▪ Culvert Maintenance Programs (See Section 5.11 in Appendix E): <ul style="list-style-type: none"> <li>▫ Culverts will be regularly monitored and maintained during construction and operation to allow for fish passage. Debris removal activities will follow DFO's Code of Practice: Culvert Maintenance (2023) (i.e., gradual removal such that flooding downstream, extreme flows downstream, release of suspended sediment, and avoidance of fish stranding).</li> </ul> </li> <li>▪ Implement the fish and fish habitat protection procedures for culvert maintenance as documented in the Ministry of Transportation Fisheries – Best Management Practices Manual (MTO, 2025).</li> <li>▪ Adjusting maintenance and inspection schedules according to how quickly culverts fill with debris.</li> </ul>	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
						<ul style="list-style-type: none"> <li>Implementing a beaver dam removal plan to minimize potential effects on fish habitat availability. Where beaver dam removals are required to facilitate the installation or maintenance/repair of water crossing structures, the activity will be completed in consideration of best management practices and environmental permit/approval conditions (once available), including MNR guidelines for access roads (MNR 1990, 2010a,b), DFO's Measures to Protect Fish and Fish Habitat (DFO 2022a), Code of Practice for Beaver Dam Removal (DFO 2022c) and Fisheries – Best Management Practices Manual (MTO, 2025).</li> </ul>	
Fish Habitat Quantity and Quality	<ul style="list-style-type: none"> <li>Number of waterbodies crossed.</li> <li>Area of waterbodies crossed (m<sup>2</sup>).</li> <li>Fish spawning, nursery or rearing areas (m<sup>2</sup>).</li> <li>Habitat quantity and quality changes (m<sup>2</sup>).</li> </ul>	Operations	<ul style="list-style-type: none"> <li>Operation, Maintenance and Repair of Road.</li> <li>Operation of Pits, Quarries and Maintenance Yard/Facility.</li> <li>Potential for Accidents and Malfunctions.</li> <li>Emissions, Discharges and Wastes.</li> </ul>	<ul style="list-style-type: none"> <li>Culvert structures, and the associated road culverts or bridge piers in waterbodies could cause a potential barrier to fish movement and access to habitats.</li> <li>Changes in flow and/or water levels due to culvert construction (affecting flow rates/regimes or causing perched culverts).</li> </ul>	Change in fish access to habitats	<ul style="list-style-type: none"> <li>Culvert Maintenance Programs (See Section 5.9 and Section 5.11 in Appendix E): <ul style="list-style-type: none"> <li>Culverts will be regularly monitored and maintained during construction and operation to allow for fish passage. Debris removal activities will follow DFO's Code of Practice: Culvert Maintenance (2023) (i.e., gradual removal such that flooding downstream, extreme flows downstream, release of suspended sediment, and avoidance of fish stranding).</li> <li>Implement the fish and fish habitat protection procedures for culvert maintenance as documented in the Ministry of Transportation Fisheries – Best Management Practices Manual (MTO, 2025).</li> <li>Adjusting maintenance and inspection schedules according to how quickly culverts fill with debris.</li> <li>Implementing a beaver dam removal plan to minimize potential effects on fish habitat availability. Where beaver dam removals are required to facilitate the installation or maintenance/repair of water crossing structures, the activity will be completed in consideration of best management practices and environmental permit/approval conditions (once available), including MNR guidelines for access roads (MNR 1990, 2010a,b), DFO's Measures to Protect Fish and Fish Habitat (DFO, 2022a), Code of Practice for Beaver Dam Removal (DFO, 2022c) and Fisheries – Best Management Practices Manual (MTO, 2025).</li> </ul> </li> </ul>	Yes
Fish Populations	<ul style="list-style-type: none"> <li>Fish abundance;</li> <li>Fish distribution;</li> <li>Fish mortality and/or injury; and</li> <li>Quality and quantity of food species (e.g., benthic invertebrate abundance and diversity).</li> </ul>	Construction	<ul style="list-style-type: none"> <li>Vegetation Clearing and Grubbing.</li> <li>Construction and Use of Supportive Infrastructure.</li> <li>Construction of Road.</li> <li>Construction of Structures at Waterbody Crossings.</li> <li>Decommissioning of Temporary Construction Camps, Access Roads and Laydown/Storage Areas.</li> <li>Emissions, Discharges and Wastes.</li> <li>Completion of Project-Wide Clean-up, Site Restoration / Reclamation and Demobilization.</li> </ul>	<ul style="list-style-type: none"> <li>Placement of materials of roadway and instream construction may injure or kill fish</li> <li>Physical injuries may result from blasting.</li> <li>Fish death as a result of fish salvage or dewatering.</li> <li>Spills/releases of contaminants resulting in-water quality degradation and could kill fish directly.</li> </ul>	Injury/death of fish	<ul style="list-style-type: none"> <li>Blasting Restrictions (See Section 5.12 in Appendix E): <ul style="list-style-type: none"> <li>A Blasting Management Plan will be prepared and implemented by the proponent or their contractor(s) for the Project that describes specific measures that would be implemented if blasting is required.</li> <li>Use blasting mats to reduce the percussive, or risk of fly rock, injures to fish, and /or death of fish.</li> <li>Establishing setbacks from fish-bearing waters that are protective of fish.</li> <li>When blasting is unavoidable, following the DFO Blasting Guidance (Wright and Hopky, 2008) and Ontario Provincial Standard Specification 120 General Specifications for the Use of Explosives (Ontario Provincial Standards 2019).</li> <li>Permitting all blasting works appropriately, including applying for Fisheries Act authorization where the potential for HADD and/or death of fish exists.</li> <li>Limiting blasting to areas where other methods, such as drilling and standard excavation, are not possible.</li> <li>Preparing site-specific blasting plans when blasting is likely to be required.</li> </ul> </li> </ul>	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
						<ul style="list-style-type: none"> <li>▫ No ammonium nitrate-fuel oil mixtures will be used, due to the production of toxic byproducts (i.e., ammonia).</li> <li>▪ Timing Windows for Construction: <ul style="list-style-type: none"> <li>▫ Restricted activity periods will include both Spring and Fall windows to protect fish populations during their spawning, rearing and migratory periods. Based on the species present in the study area, these windows are estimated to typically be: <ul style="list-style-type: none"> <li>- April 1 to June 30 (spring window);</li> <li>- September 1 to June 15 (fall/winter window); and</li> <li>- Restricted activity periods will be based on the species discovered in each specific waterbody.</li> </ul> </li> <li>▫ Construction of watercourse crossings will occur outside of restricted activity periods to minimize or avoid risk of injury or mortality to fish.</li> <li>▫ Where fish sampling has not been conducted, the most restrictive activity period will be applied to each individual watercourse to be protective of fish and fish habitat.</li> <li>▫ For waterbody crossing, the proposed restricted activity periods will be applicable to: <ul style="list-style-type: none"> <li>- Any work below the high-water mark (installation of culverts, construction of bridge piers in-water);</li> <li>- Temporary water crossings where an ice bridge, fording or snow fill is proposed; and</li> <li>- Where beaver dam removals are required.</li> </ul> </li> </ul> </li> <li>▪ Work Isolation and Fish Rescue (See Section 5.10 in Appendix E): <ul style="list-style-type: none"> <li>▫ In-water work to allow for construction and repair of waterbody crossing structures will be isolated (i.e., will occur in the dry) from surrounding fish habitat using cofferdams, aquadams, or other methods acceptable the MNR and DFO such as the requirements in the Interim Code of Practice: Temporary Cofferdams and Diversion Channels [DFO 2023b].</li> <li>▫ Submission of appropriate notification and acquisition of necessary permits/approvals from regulatory agencies.</li> <li>▫ Temporary dam structures to isolate the work zone will be constructed using clean materials that minimize suspended sediment generation.</li> <li>▫ Flow will be maintained during in-water works at a level sufficient to sustain aquatic life and prevent upstream impoundment.</li> <li>▫ Fish rescues will be conducted to relocate fish prior to in-water work, dewatering or conducting works in wetted channels or wetlands. Fish within the isolated workspaces will be rescued (i.e., salvaged and relocated) by qualified professionals under the conditions of a MNR License to Collect Fish for Scientific Purposes to be acquired, and in accordance with requirements in the DFO Interim Standard for In-water Site Isolation.</li> <li>▫ Fish handling will be minimized, including limiting time spent weighing and measuring fish.</li> </ul> </li> <li>▪ For diversions during isolations, appropriately screened pumps will be used to reduce the risk of entrainment or impingement of fish following the guidance within the interim DFO Code of Practice for end-of-pipe fish protection screens for small water intakes in freshwater (DFO 2020).</li> </ul>	

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
Fish Populations	<ul style="list-style-type: none"> <li>▪ Fish abundance;</li> <li>▪ Fish distribution;</li> <li>▪ Fish mortality and/or injury; and</li> <li>▪ Quality and quantity of food species (e.g., benthic invertebrate abundance and diversity).</li> </ul>	Operations	<ul style="list-style-type: none"> <li>▪ Operation, Maintenance and Repair of Road.</li> <li>• Operation of Pits, Quarries and Maintenance Yard/Facility.</li> <li>• Potential for Accidents and Malfunctions.</li> <li>• Emissions, Discharges and Wastes.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Maintenance activities requiring in-water work may injure or kill fish.</li> <li>▪ Fish death as a result of fish salvage or dewatering.</li> </ul>	Injury/death of fish	<ul style="list-style-type: none"> <li>▪ Blasting Restrictions (See Section 5.12 in Appendix E): <ul style="list-style-type: none"> <li>▫ A Blasting Management Plan will be prepared and implemented by the proponent or their contractor(s) for the Project that describes specific measures that would be implemented if blasting is required.</li> <li>▫ Use blasting mats to reduce the percussive, or risk of fly rock, injures to fish, and /or death of fish.</li> <li>▫ Establishing setbacks from fish-bearing waters that are protective of fish.</li> <li>▫ When blasting is unavoidable, following the DFO Blasting Guidance (Wright and Hopky, 2008) and Ontario Provincial Standard Specification 120 General Specifications for the Use of Explosives (Ontario Provincial Standards, 2019).</li> <li>▫ Permitting all blasting works appropriately, including applying for Fisheries Act authorization where the potential for HADD and/or death of fish exists.</li> <li>▫ Limiting blasting to areas where other methods, such as drilling and standard excavation, are not possible.</li> <li>▫ Preparing site-specific blasting plans when blasting is likely to be required.</li> <li>▫ No ammonium nitrate-fuel oil mixtures will be used, due to the production of toxic byproducts (i.e., ammonia).</li> </ul> </li> <li>▪ Timing Windows for Construction: <ul style="list-style-type: none"> <li>▫ Restricted activity periods will include both Spring and Fall windows to protect fish populations during their spawning, rearing and migratory periods. Based on the species present in the study area, these windows are estimated to typically be: <ul style="list-style-type: none"> <li>- April 1 to June 30 (spring window);</li> <li>- September 1 to June 15 (fall/winter window); and</li> <li>- Restricted activity periods will be based on the species discovered in each specific waterbody.</li> </ul> </li> <li>▫ Construction of watercourse crossings will occur outside of restricted activity periods to minimize or avoid risk of injury or mortality to fish.</li> <li>▫ Where fish sampling has not been conducted, the most restrictive activity period will be applied to each individual watercourse to be protective of fish and fish habitat.</li> <li>▫ For waterbody crossing, the proposed restricted activity periods will be applicable to: <ul style="list-style-type: none"> <li>- Any work below the high-water mark (installation of culverts, construction of bridge piers in-water);</li> <li>- Temporary water crossings where an ice bridge, fording or snow fill is proposed; and</li> <li>- Where beaver dam removals are required.</li> </ul> </li> </ul> </li> <li>▪ Work Isolation and Fish Rescue (See Section 5.8, Section 5.8, and Section 5.10 in Appendix E): <ul style="list-style-type: none"> <li>▫ In-water work to allow for construction and repair of waterbody crossing structures will be isolated (i.e., will occur in the dry) from surrounding fish habitat using cofferdams, aquadams, or other methods acceptable the MNR and DFO such as the requirements in the Interim Code of Practice: Temporary Cofferdams and Diversion Channels [DFO 2023b].</li> </ul> </li> </ul>	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
						<ul style="list-style-type: none"> <li>▫ Submission of appropriate notification and acquisition of necessary permits/approvals from regulatory agencies.</li> <li>▫ Temporary dam structures to isolate the work zone will be constructed using clean materials that minimize suspended sediment generation.</li> <li>▫ Flow will be maintained during in-water works at a level sufficient to sustain aquatic life and prevent upstream impoundment.</li> <li>▫ Fish rescues will be conducted to relocate fish prior to in-water work, dewatering or conducting works in wetted channels or wetlands. Fish within the isolated workspaces will be rescued (i.e., salvaged and relocated) by qualified professionals under the conditions of a MNR License to Collect Fish for Scientific Purposes to be acquired, and in accordance with requirements in the DFO Interim Standard for In-water Site Isolation.</li> <li>▫ Fish handling will be minimized, including limiting time spent weighing and measuring fish.</li> <li>▪ For diversions during isolations, appropriately screened pumps will be used to reduce the risk of entrainment or impingement of fish following the guidance within the interim DFO Code of Practice for end-of-pipe fish protection screens for small water intakes in freshwater (DFO 2020).</li> </ul>	
Fish Populations	<ul style="list-style-type: none"> <li>▪ Fish abundance;</li> <li>▪ Fish distribution;</li> <li>▪ Fish mortality and/or injury; and</li> <li>▪ Quality and quantity of food species (e.g., benthic invertebrate abundance and diversity).</li> </ul>	Construction	<ul style="list-style-type: none"> <li>▪ Construction of Road.</li> <li>▪ Construction of Structures at Waterbody Crossings.</li> <li>▪ Decommissioning of Temporary Construction Camps, Access Roads and Laydown/Storage Areas.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fishing access may improve during construction resulting in increased harvest by workers, First Nations, and recreational anglers.</li> </ul>	Changes to Public Access to Fish Habitats	<ul style="list-style-type: none"> <li>▪ Employee Wildlife Orientations and Restrictions: <ul style="list-style-type: none"> <li>▫ Employees or visitors on-site in temporary construction camps or at the permanent maintenance and storage facility will be prohibited from hunting, fishing, or harvesting wildlife.</li> <li>▫ Temporary access routes, especially those at or approaching waterbody crossings as well as temporary construction camps and laydowns areas will be revegetated as soon as possible.</li> <li>▫ Firearms and angling gear will be prohibited on-site.</li> <li>▫ Wildlife orientation and education programs will be delivered on-site to inform personnel about best environmental practices for fish and wildlife in the area.</li> </ul> </li> <li>▪ Public Access Restrictions: <ul style="list-style-type: none"> <li>▫ Temporary access routes, construction camps and laydown areas that are not required for operation of the roadway will be reclaimed (i.e., revegetated and blocked from public access as soon as feasible).</li> <li>▫ Public access to the road route and supportive infrastructure areas (camps, etc.) will be prohibited during construction unless authorized by the proponent.</li> <li>▫ Stopping on the roadway during its operations will be prohibited, except in designated rest areas and in emergency situations.</li> <li>▫ Fencing or other barricades will be installed near watercourses and on bridges to deter fishing.</li> <li>▫ Increased access may require regulatory changes, such as restrictions on fishing in certain locations or changes to harvesting by First Nation community members to prevent additional fishing pressure. However, these legislative changes or changes to First Nation exercise of their rights to harvesting of fish are beyond the direct control the Project.</li> </ul> </li> </ul>	Yes

VC Subcomponent	Indicators	Project Phase	Project Component or Activity	Effect Pathway	Potential Effect	Key Mitigation Measures	Predicted Net Effect
						<ul style="list-style-type: none"> <li>▪ Project Design: <ul style="list-style-type: none"> <li>▫ Installing restrictive fencing and/or barricades near waterbody crossing sites, including on bridge structures to deter fishing.</li> <li>▫ Siting designated rest areas along the road as far as practical from potential fishing locations.</li> </ul> </li> </ul>	
Fish Populations	<ul style="list-style-type: none"> <li>▪ Fish abundance;</li> <li>▪ Fish distribution;</li> <li>▪ Fish mortality and/or injury; and</li> <li>▪ Quality and quantity of food species (e.g., benthic invertebrate abundance and diversity).</li> </ul>	Operations	<ul style="list-style-type: none"> <li>▪ Road Use.</li> <li>▪ Operation, Maintenance and Repair of Road.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fishing access may improve during operations resulting in increased harvest by First Nations and recreational anglers.</li> </ul>	Changes in Public Access to Fish/Fish Habitats	<ul style="list-style-type: none"> <li>▪ Public Access Restrictions: <ul style="list-style-type: none"> <li>▫ Temporary access routes, construction camps and laydown areas that are not required for operation of the roadway will be reclaimed (i.e., revegetated and blocked from public access as soon as feasible).</li> <li>▫ Public access to the road route and supportive infrastructure areas (camps, etc.) will be prohibited during construction unless authorized by the proponent.</li> <li>▫ Stopping on the roadway during its operations will be prohibited, except in designated rest areas and in emergency situations.</li> <li>▫ Fencing or other barricades will be installed near watercourses and on bridges to deter fishing.</li> <li>▫ Increased access may require regulatory changes, such as restrictions on fishing in certain locations or changes to harvesting by First Nation community members to prevent additional fishing pressure. However, these legislative changes or changes to First Nation exercise of their rights to harvesting of fish are beyond the direct control the Project.</li> </ul> </li> <li>▪ Project Design: <ul style="list-style-type: none"> <li>▫ Installing restrictive fencing and/or barricades near waterbody crossing sites, including on bridge structures to deter fishing.</li> <li>▫ Siting designated rest areas along the road as far as practical from potential fishing locations.</li> </ul> </li> </ul>	Yes

## 10.5 Characterization of Net Effects

Net effects are defined as the effects of the Project that remain after application of proposed mitigation measures. The effects assessment follows the general process described in Section 5 – Environmental Assessment / Impact Assessment Approach. The focus of the effects assessment is on predicted net effects, which are the effects that remain after application of proposed mitigation measures. Potential effects with no predicted net effect after implementation of mitigation measures are not carried forward to the net effects characterization or the cumulative effects assessment.

**Table 10-13** presents definitions for net effects criteria, developed with specific reference to Fish and Fish Habitat VC. These criteria are considered together in the assessment, along with context derived from existing conditions and proposed mitigation measures, to characterize predicted net effects from the Project on Fish and Fish Habitat VC.

**Table 10-13: Criteria for Characterization of Predicted Net Effects on Fish and Fish Habitat VC**

Characterization Criteria	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	Direction relates to the value of the potential effect in relation to the existing conditions.	<p><b>Positive</b> – Net gain or benefit; effect is desirable.</p> <p><b>Neutral</b> – No change compared with existing conditions and trends.</p> <p><b>Negative</b> – Net loss or adverse effect; effect is undesirable.</p>
Magnitude	Magnitude is the amount of change in measurable parameters or the VC relative to existing conditions.	<p><b>Negligible</b> – No measurable change.</p> <p><b>Low</b> – A measurable change that is at or slightly above annual variation and may cause a minor and measurable reduction in fish populations of fish habitat availability.</p> <p><b>Moderate</b> – A measurable change that could cause impacts to fish and/or fish habitats within the area but likely can be managed. This effect would cause an observable effect to fish species but would be within the adaptive capability of the species.</p> <p><b>High</b> – An effect that may not be manageable and the change exceeds the ability for a species to continue sustained existence within the area.</p>
Geographic Extent	Geographic extent refers to the spatial area over which a net effect is expected to occur or can be detected within the Project Footprint, Local Study Area and Regional Study Area.	<p><b>Project Footprint</b> – The effect is confined to the Project Footprint.</p> <p><b>Local Study Area</b> – The effect is confined to the Local Study Area.</p> <p><b>Regional Study Area</b> – The effect extends beyond the Local Study Area boundary but is confined within the Regional Study Area.</p>
Timing	Timing criteria indicate the timing (e.g., dates or seasons) importance of the net effect.	<p><b>Non-Spawning</b> – Effect may occur outside of restricted spawning windows for species present.</p> <p><b>Within-Spawning</b> – The effect may occur during the Restricted Activity Period for one or more of the species present.</p>

Characterization Criteria	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	Duration is the period of time required until the measurable indicators or the VC returns to its existing condition, or the net effect can no longer be measured or otherwise perceived.	<p><b>Short-term</b> – Net effect restricted to no more than the duration of the construction phase (approximately 5 to 6 years).</p> <p><b>Medium-term</b> – Net effect extends through the Operations Phase of the Project (75-year life cycle).</p> <p><b>Long-term</b> – Net effect extends beyond the Operations Phase (greater than 75 years).</p> <p><b>Permanent</b> – Net effects are permanent.</p>
Frequency	Frequency refers to the rate of occurrence of an effect over the duration of the Project or in a specific phase.	<p><b>Infrequent</b> – The effect is expected to occur rarely (one-time).</p> <p><b>Frequent</b> – The effect is expected to occur intermittently (once or twice per year).</p> <p><b>Continuous</b> – The effect is expected to occur continually (multiple times per year).</p>
Context	Context considers sensitivity and resilience of the VC to project-related change.	<p><b>Sensitive</b> – Effect may occur on species or habitats that are only present in within the study area and effects may reduce the ability of the species to persist in the region.</p> <p><b>Resilient</b> – Effect may occur on species or habitats that common throughout the region and will not affect the broader fish populations on the whole.</p>
Input from Indigenous Peoples	Views of the Indigenous communities and groups in assigning the criteria to be used and in characterizing the effects.	Refer to <b>Table 10-2</b> and <b>Table 10-3</b> of those views and concerns of Indigenous Peoples that were considered in characterizing the effects.
Reversibility	Reversibility describes whether a measurable indicator or the VC can return to its existing condition after the project activity ceases.	<p><b>Reversible</b> – The net effect is likely to be reversed after activity completion and rehabilitation.</p> <p><b>Irreversible</b> – The net effect is unlikely to be reversed.</p>
Likelihood of Occurrence	Likelihood of occurrence is a measure of the likelihood that an activity will result in an effect.	<p><b>Unlikely</b> – The effect is not likely to occur, even if mitigation and avoidance measures are not implemented.</p> <p><b>Possible</b> – The effect may occur if mitigation measures and avoidance measures are not properly implemented.</p> <p><b>Probable</b> – The effect is likely to occur, even with mitigation and avoidance measures implemented.</p> <p><b>Certain</b> – The effect will occur even with all mitigation and avoidance measures.</p>

## 10.5.1 Potential Effect Pathways Not Carried Through for Further Assessment

The potential effects outlined in **Table 10-11** cannot be entirely mitigated; even with mitigation measures some effects are expected in each of the identified effects categories. Effects that remain following the implementation of mitigation measures are carried forward for further assessment (**Section 10.5.2**).



## 10.5.2 Predicted Net Effects

Although potential effects will be reduced with the implementation of the proposed mitigation measures outlined in **Section 10.4**, net effects on Fish and Fish Habitat VC may remain. Predicted net effects on the Fish and Fish Habitat VC are:

- Changes to Quantity and Quality of Fish Habitat:
  - Destruction/Loss of fish habitat;
  - Harmful alteration and disruption of fish habitat; and
  - Changes to fish access to habitats.
- Changes to Fish Populations:
  - Injury/death of fish; and
  - Changes to public access resulting in increased harvest of fish.

### 10.5.2.1 Changes to Quantity and Quality of Fish Habitat

The following net effects to Quantity and Quality of Fish Habitat may occur as a result of project construction and operations.

#### 10.5.2.1.1 Destruction/Loss of Fish Habitat

The destruction of fish habitat refers to a reduction in the overall available fish habitat, making it unsuitable for fish to use during any stage of their life cycle. Despite mitigation efforts, destruction of fish habitat caused by construction activities is an expected net effect on fish and fish habitat. This section describes destruction of fish habitat across relevant project phases.

#### Construction

The road width is expected to be 11.5 m throughout the route, expanding to 17 m at waterbody crossings with culverts and higher fill embankments for the road are required. Bridges will be approximately the same width as the roadway (11.5 m). After mitigation through project planning and design, the fish habitat will be preserved in most locations, with arch open bottom culverts spanning the entire bankfull width of the watercourses where proposed. However, some destruction of fish habitat will be unavoidable during construction of bridge pier footings in-water that will have a small individual footprint of approximately 12.5 m x 5 m in size (62.5m<sup>2</sup> / footing). With approximately 11 in-water footings for piers, there is an expected destruction of 687.5 m<sup>2</sup> of aquatic habitat lost. Fish habitat provided by the adjacent riparian areas of a waterbody are also expected to be destroyed along the road alignment. Approximately 27,640 m<sup>2</sup> of riparian habitat is predicted to be lost based on the proposed road width and riparian width at each water crossing.

A spatial analysis indicated that, within the LSA for the preliminary recommended preferred route, the total water coverage or area (primarily waterbodies) is approximately 1.6x10<sup>8</sup> m<sup>2</sup>. This estimate includes waterbodies but does not include the footprint of select small ephemeral or poorly defined streams as they did not appear in the waterbody data layer or from aerial imagery but are likely abundant. Based on the assessment it is estimated that 687.5 m<sup>2</sup> of in-water fish habitat (below the HWM) and 27,640 m<sup>2</sup> of riparian habitat will be lost or destroyed, which represents approximately 0.017% of the available fish habitat in the LSA. A summary of the net effects of destruction of fish habitat caused by construction based on the characterization criteria is presented in **Table 10-14**.



**Table 10-14: Criteria Results for Destruction of Fish Habitat – Construction**

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as there will be destruction of fish habitat as a result of the Project.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable destruction of fish habitat, but very small in relation to the available fish habitat in the area.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	Non-Spawning	Work within the waterbodies will be restricted to outside of the restricted activity periods for fish that are present.
Duration	Long-term	The duration of the net effects is expected to be long-term, lasting the length of the Project.
Frequency	Infrequent	The net effect is infrequent, likely only occurring at project construction.
Context	Resilient	Effects are likely to affect habitats that are common throughout the study area and throughout the larger region. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Certain	The net effects of the Project are certain. Avoidance of all fish habitat is not possible should the Project occur.

**Operations**

Destruction of fish habitat is not expected as a result of roadway operations. Repairs to the roadway and water crossing structures may be required over time, but these are not expected to result in destruction of fish habitat. Where in-water work may be required to complete repairs of culverts and bridges, no new destruction of fish habitat is predicted at that time. A summary of the net effects of destruction of fish habitat caused by operations activities based on the characterization criteria is presented in **Table 10-15**.

**Table 10-15: Criteria Results for Destruction of Fish Habitat – Operations**

Characterization Criteria	Result	Rationale
Direction	Neutral	The direction of this effect will be neutral, as no destruction of additional habitat is expected as a result of project operation.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible, as the effect is not expected to increase during the operations phase.
Geographic Extent	Project Footprint	The effect will be limited primarily to the Project Footprint.
Timing	Non-Spawning	Additional destruction of fish habitat is not expected during operations, so there will be no effect on spawning fish.
Duration	Short-term	Any destruction of fish habitat, if it did occur, would be short-term during the repairs or maintenance where in-water work is required.
Frequency	Infrequent	Additional destruction of fish habitat during operations is not expected.



Characterization Criteria	Result	Rationale
Context	Resilient	Effects are likely to affect habitats that are common throughout the study area and throughout the larger region. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Unlikely	Additional net effects of the Project during operations are unlikely.

### 10.5.2.1.2 Harmful Alteration and Disruption of Fish Habitat

The harmful alteration of fish habitat is defined as a change in the physical, chemical, or biological conditions in an aquatic system that could impair the ability for fish to complete one of more of its life processes. The disruption of fish habitat is defined similarly but generally refers to short-term effects that might impair a fish's ability to complete one or more of its life processes, whereas alteration is a more permanent/or long-term effect. Despite mitigation efforts, harmful alteration and/or disruption of fish habitat caused by construction activities is an expected net effect on fish and fish habitat. This section describes harmful alteration and/or disruption of fish habitat across relevant project phases.

#### **Construction**

##### *Habitat Alteration/Disruption Due to Material Placement*

Habitat alteration due to material placement is expected to be restricted to armouring (e.g., rock) at bridge abutments, bridge pier footings and inlet and outlet areas of culverts. This armouring is itself a mitigation measure to reduce erosion and sedimentation (and maintain road integrity) but will still act as a modified habitat. However, natural shorelines and streambeds generally tend to function as habitat better than armoured shorelines (Happel et al., 2023). The armouring is expected at all bridge footings (11 footings) as well as bridge abutments with road embankment fill and culverts.

##### *Riparian Vegetation Clearing*

The loss of riparian vegetation that may be utilized by fish species is expected to be minimal once mitigation measures are implemented. Any temporarily cleared riparian vegetation within the ROW beyond the road footprint will be allowed to regrow so the loss of riparian vegetation is predicted to be limited to the permanent footprint associated with the road.

##### *Habitat Alteration Due to Changes in Hydrology*

Changes to hydrology or groundwater are not expected to significantly alter fish habitat. Mitigation measures implemented will ensure sufficient flow of both surface and groundwater through existing streams. Flow rates or water depths should not be significantly affected, and fish should be able to utilize the same locations as habitat once construction is completed. There may be temporary effects if culverts become blocked, but maintenance programs should ensure these effects would be temporary.

##### *Habitat Alteration Due to Erosion or Sedimentation*

Is it expected that some increased sediment accumulation may be expected as a result of construction. Wellman et al. (2000) found that sediment accumulation increased downstream and immediately at culvert entrances (inlet and outlet areas). This effect did not appear to have a significant effect on the fish presence. Wellman et al. also found that this accumulation was not detected at locations with bridge



crossings. Project design has planned for bridge crossings at the locations (such as WC-3) where Lake Sturgeon spawning habitat may be present, so the effect on rare species is expected to be negligible. The effect on other species in the area may be present, but the availability of habitat nearby is high so effects are predicted to be minimal.

The distance at which culverts will affect the environment is dependent on many factors; however, studies have found these effects are generally (and as expected) concentrated downstream of watercourse crossings. A study by Lachance et al. (2011) found these effects (especially increased sediment deposition, which can reduce fish spawning and rearing habitat quality) can extend between 358 to 1,442 m downstream of culvert crossings. The study also found that these effects are most pronounced up to a year after construction has completed but begin to reduce after 2-3 years once the area begins to stabilize. Using the maximum of 1,442 m as the conservative potential for sediment deposition downstream of each culvert water crossing its predicted that approximately 254,000 m<sup>2</sup> of downstream fish habitat may be affected by increased sedimentation. This applies only to those water crossings where culverts are proposed with associated fill for road embankments. However, many of these watercourses are slow moving and have finely sedimented bottoms already so the actual effect to fish habitat is expected to be relatively small.

Habitat Alteration Due to Introduction of Invasive Species

The introduction of invasive species, and the effect it will have on fish habitat is expected to be negligible once mitigation measures are implemented. Vehicles will arrive on site clean and free from invasives, and those that do get introduced will be monitored and eradicated during construction and operations.

**Table 10-16: Criteria Results for Harmful Alteration and Disruption of Fish Habitat– Construction**

Characterization Criteria	Result	Rationale
Direction	Negative	The net effect relating to harmful alteration and disruption of fish habitat will be negative.
Magnitude	Low	The magnitude of the effect is predicted to be low, as the effect will cause a measurable harmful alteration and disruption of fish habitat, but the amount disturbed relative to the available fish habitat in the area will be very low.
Geographic Extent	Project Footprint and LSA	The extent of the harmful alteration and disruption is not expected to be beyond the LSA. Direct harmful alterations to habitat will be caused by construction (substrate modification, loss of riparian vegetation), while increases in erosion and sedimentation may extend to the LSA.
Timing	Within-Spawning	In-water work will be completed outside the restricted activity periods to avoid negative impacts fish spawning. However lingering net effects (such as erosion and sedimentation) may potentially occur and affect spawning areas for several years until the site is adequately stabilized and regrown.
Duration	Short-term to Long-term	The duration of the effect for modified substrates is expected to be long-term, lasting the length of the Project. Erosion and sedimentation, vegetation clearing, hydrology changes, and invasive species introduction is only expected to be short-term in duration.
Frequency	Infrequent	The frequency of these harmful alterations will be infrequent.



Characterization Criteria	Result	Rationale
Context	Resilient	Effects are likely to impact habitats that are common throughout the study area and throughout the larger region. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Certain	The net effects of the Project are certain. Some harmful alteration is expected as part of the project construction.

### **Operations**

Harmful alteration and disruption of fish habitat is not expected as a result of roadway operations. Repairs to the roadway and crossing structures may be required over time, but these are not expected to result in measurable net effects. There may however be temporary effects due to erosion and/or sedimentation or clearing of riparian vegetation habitat during maintenance events. The pathways will be the same as those in the construction phase, but of smaller scope when road maintenance is required.

**Table 10-17: Criteria Results for Harmful Alteration and Disruption of Fish Habitat – Operations**

Characterization Criteria	Result	Rationale
Direction	Negative	The net effect relating to harmful alteration and disruption of fish habitat will be negative.
Magnitude	Negligible	The magnitude of the effect is predicted to be negligible as the effects are likely only to occur during roadway maintenance.
Geographic Extent	Project Footprint and LSA	The extent of the harmful alteration and disruption during operations is not expected to be beyond the LSA. Direct harmful alterations to habitat will be caused by construction (Substrate modification, loss of riparian vegetation) in the project footprint, while increases in erosion and sedimentation during maintenance events may extend to the LSA.
Timing	Non-Spawning	Maintenance work, if required will be conducted during non-spawning. - seasons to avoid negative effects.
Duration	Short-term	The duration of the effects is expected to be short-term, lasting only slightly beyond the maintenance period.
Frequency	Infrequent	The frequency of these harmful alterations will be infrequent.
Context	Resilient	Effects are likely to impact habitats that are common throughout the study area and throughout the larger region. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Probable	The net effects of the Project are probable, as some in-water work may need to occur as part of road maintenance and repair during the operations phase.



### 10.5.2.1.3 Fish Access to Habitats

#### Construction

##### Temporary barriers to fish passage for instream construction

During construction, there will be temporary restrictions to fish passage during the installation of culverts and bridge piers, but this is expected to be very short in duration. In order to install culverts in-water and work in the dry, the work area will need to be isolated, and flow alteration may temporarily restrict fish access to habitats.

Major watercourses will have bridges and are not predicted to limit fish passage. Corrugated steel pipe type of culverts may restrict fish passage, but these are generally proposed over smaller watercourses that will have fewer or no long-distance migratory fish species, such as Brook Trout or Lake Sturgeon. For Lake Sturgeon, where the fish have been documented (Winisk Lake, Winiskis Channel, and the Muketei River), the planned bridge structures will significantly reduce the effects on this species. A summary of the net effects relating to changes in access to fish habitat as a result of potential creation of barriers to fish passage during the construction phase based on the characterization criteria is presented in **Table 10-18**.

**Table 10-18: Criteria Results for Change to Fish Access to Habitats – Construction**

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as there will be barriers to fish habitat created during the construction phase of the Project.
Magnitude	Low	The magnitude of the effect is predicted to be low.
Geographic Extent	Project Footprint and LSA	The effect will be limited primarily to the Project Footprint and LSA.
Timing	Non-Spawning	Work within the waterbodies will be restricted to outside of the restricted activity periods for fish that are present.
Duration	Short-term	The duration of the effect is expected to be short-term, lasting only a short time while bridges and/or culverts are installed.
Frequency	Infrequent	Installations during the construction phase will only occur once.
Context	Resilient	Effects are likely to impact habitats and species that are common throughout the study area and throughout the larger region. As such, these habitats should be resilient to disturbance.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Certain	The net effects for the Project are certain. Isolation will be required to install the crossing structures.



## Operations

### Barriers to Fish Passage due to visual barriers, clogged culverts, or increased beaver activity

It is expected that there will be some net effects related to fish access to habitats from potential barriers to fish passage as a result of the Project. Previous studies have shown that road crossings with appropriately installed flow-through structures can have a minimal impact on fish abundance and diversity (Pluym and Eggleston, 2008). Mitigation and monitoring measures should reduce the barriers to fish passage, but it is possible that passages may become blocked due to natural erosion, fluvial processes in watercourses, beaver dams, and collection of debris (trees, brush, etc.).

These effects will be generally limited to locations with culverts. Sensitive species with longer migration routes, like Lake Sturgeon, and expected to only be found in locations with bridge structures, which are not expected to reduce the ability for fish to navigate and access upstream and downstream habitats from the road. It is expected that the net effects from barriers to fish passage are probable to occur, and where applicable the duration of this effect would be short-term and may arise frequently during the operations; however, a monitoring and maintenance program will reduce the duration of the effect. A summary of the net effects of changes in access to fish habitat as a result of the creation of barriers to fish passage during the operations phase based on the characterization criteria is presented in **Table 10-19**.

**Table 10-19: Criteria Results for Change to Fish Access to Habitats – Operations**

Characterization Criteria	Result	Rationale
Direction	Negative	The direction of this effect will be negative, as there are likely to be barriers created as culverts become blocked. The negative impact is likely only to be present near culverted streams.
Magnitude	Low	The magnitude of the effect is predicted to be low, as fish should still be able to pass through unless culverts become completely blocked.
Geographic Extent	Project Footprint and LSA	The effect will be limited primarily to the Project Footprint and Local Study Area.
Timing	Spawning	The effect will occur both within and outside of fish spawning windows.
Duration	Short-term	The duration of the effect is expected to be long-term, lasting as long as the road is in-place. However, the effect will not be permanent, as the maintenance programs will remove the obstructions as they are observed.
Frequency	Frequent	Culverts are likely to become partially blocked relatively frequently, especially during flow events that move debris through culverts, or through wildlife (such as beaver) activity.
Context	Resilient	Effects are likely to impact species that are common throughout the study area and throughout the larger region. Sensitive species, like Lake Sturgeon are likely not present in the culverted water crossings.
Reversibility	Reversible	The net effect is reversible if the roadway was removed.
Likelihood of Occurrence	Probable	The net effects for the Project are certain. Isolation will be required to install the crossing structures.



## 10.5.2.2 Changes to Fish Populations

The following net effects to fish populations are expected as result of project construction and operations:

### 10.5.2.2.1 Injury/Death of Fish

#### Construction

##### Injury/Death of Fish due to material placement, blasting, dewatering, and fish salvage

It is expected that some injury or mortality to fish will occur during construction that have potential to effect fish populations. This will include effects from works in-water and at riparian areas from equipment movement and use, material placement, blasting, and pump impingement and entrainment during dewatering activities. The magnitude is expected to be low and will be limited to the Project Footprint and the Local Study Area. The effect will be negative, but the expected changes to fish abundance or distribution are predicted to be negligible. For timing, the work will occur outside the timing windows. The duration of the effect is expected to be short-term, with effects only occurring during the construction period. The frequency of the effect will be frequent. The effect is irreversible once a fish is injured or killed. The likelihood of occurrence is probable.

Although the best efforts to remove fish via fish rescues will be completed, it is expected that some fish will be missed during these salvages, despite using multiple capture strategies. It is likely that small numbers of fish will also be killed even if successfully recovered, as not all fish captured through any method survive. Some estimates place mortality rates at approximately 7-10% for electrofishing (Habera et al., 1996). However, survival rates of greater than 95% of northern pike can be expected through proper fish capture and handling methods (Arlinghaus et al., 2008). It is difficult to estimate the number of fish lost or injured, but the number is expected to be low and not cause significant impacts to local populations. A summary of the net effects of injury/death of fish during the construction phase based on the characterization criteria is presented in **Table 10-20**.

**Table 10-20: Criteria Results for Injury/Death of Fish – Construction**

Characterization Criteria	Result	Rationale
Direction	Negative	Injury/death of fish will be a negative effect during the construction phase.
Magnitude	Negligible	The number of fish injured and killed is expected to be negligible, as fish salvages will take place prior to in-water work. Some estimates place mortality rates at approximately 7-10% for electrofishing (Habera et al., 1996).
Geographic Extent	Project Footprint and LSA	The effect will be limited primarily to the Project Footprint but may extend into the LSA where construction work may need temporary access.
Timing	Non-Spawning	Work within the waterbodies will be restricted to outside of the restricted activity periods for fish that are present.
Duration	Short-term	The duration of the effect is expected to be short-term, as the impacts will be limited to the construction period.
Frequency	Infrequent	The net effect is infrequent, likely only occurring at project construction.
Context	Resilient	Effects are likely to impact species that are common throughout the study area and throughout the larger region. As such, the fish populations in the area are unlikely to be affected by the road.



Characterization Criteria	Result	Rationale
Reversibility	Irreversible	Injuries/death caused by the project will be irreversible. However, if removal of the project and rehabilitation is completed fish populations should recovered to pre-disturbance levels.
Likelihood of Occurrence	Probable	The net effects for the Project are probable.

### Operations

#### Injury/Death of Fish due to material placement, blasting, dewatering, and fish salvage

Injury and fish death are likely to be minimal during operations. Road crossing maintenance which requires isolation may result in the occasional injury/death to fish via similar pathways as construction, but these will be very infrequent and short-term. Other than in emergency situations, these will be planned outside spawning windows. Accidents and releases may occur but are not considered during the scope of this assessment. A summary of the net effects of injury/death of fish during the construction phase based on the characterization criteria is presented in **Table 10-21**.

**Table 10-21: Criteria Results for Injury/Death of Fish – Operations**

Characterization Criteria	Result	Rationale
Direction	Negative	Injury/death of fish will be a negative effect during the operations phase.
Magnitude	Negligible	The number of fish injured and killed is expected to be negligible as fish salvages will take place prior to in-water work only when maintenance is required.
Geographic Extent	Project Footprint and LSA	The effect will be limited primarily to the Project Footprint but may extend into the LSA where construction work may need temporary access.
Timing	Non-Spawning	Work within the waterbodies will be restricted to outside of the restricted activity periods for fish that are present.
Duration	Short-term	The duration of the effect is expected to be short-term.
Frequency	Infrequent	The net effect is infrequent, likely occurring only occasionally during major maintenance efforts.
Context	Resilient	Effects are likely to impact species that are common throughout the study area and throughout the larger region. As such, the fish populations in the area are unlikely to be affected by the road.
Reversibility	Irreversible	Injuries/death caused by the project will be irreversible.
Likelihood of Occurrence	Probable	The net effects for the Project are probable.



### 10.5.2.2.2 Changes in Public Access to Fish Habitats

#### Construction

##### Increased harvest due to increased access to fish habitat for work crews

The net effect of a change to public access that may increase harvesting or pressure on fish populations during construction is expected to be minimal. Mitigation measures, such as the prohibition on fishing from construction workers, and access restrictions for the public (until construction is completed) will be implemented and therefore it is expected that the magnitude of the net effects will be low during construction of the Project. Pressure from increased harvest is likely limited to those who are fishing in contravention of construction site procedures.

A summary of the net effects of changes to public access to fish habitat that could increase harvest of fish during the construction phase based on the characterization criteria is presented in **Table 10-22**.

**Table 10-22: Criteria Results for Change to Public Access to Fish Habitats – Construction**

Characterization Criteria	Result	Rationale
Direction	Negative	Although mitigation measures are in-place to reduce harvest, it is possible some members of the construction team, or the general public will access the site during the construction phase of the project and conduct harvest.
Magnitude	Low	The overall magnitude of this effect during construction is expected to be low.
Geographic Extent	Project Footprint and LSA	The effect will be generally restricted to the Project Footprint and LSA and this is the area that will be made accessible by the construction works.
Timing	Within-Spawning	The effects may extend into fish spawning windows.
Duration	Short-term	The effect during the construction phase will be short-term, as the effect caused by construction workers will end shortly after the project is completed.
Frequency	Frequent	The effect during the construction phase will likely be frequent, likely concentrated in the ice-off seasons when fisheries are easier to exploit.
Context	Resilient	Fish species that expected to be harvested re common throughout the study area and throughout the larger region. As such, the fish populations in the area are unlikely to affected increased harvest during construction.
Reversibility	Reversible	The net effect is reversible should the road be removed and habitat is restored; however, there is planned removal of the road at this time.
Likelihood of Occurrence	Possible	The net effects for construction phase are possible.

## Operations

### Increased harvest due to increased access to fish habitat for the public

The exact number of fish that will be harvested as a result of road operations is difficult to quantify and predict. Previous studies do exist that show how roadways can cause substantial effects on the fish populations due to increased harvest from road access. The effects of potential increased harvest will likely be concentrated at larger lakes and rivers with larger fish populations. As a result, it will be critical to monitor and enforce the mitigation and monitoring measure aimed at minimizing harvest to fish species utilized by Indigenous communities. This would likely include waterbodies such as Winisk Lake, Winiskisis Channel, the Muketei River, and the Ekwan River. The greatest fishing pressure is likely to occur at Winisk Lake, where the local Webequie community members already uses the lake for recreation and harvesting of fish as a food source (Hopper and Power, 1991). Webequie First Nation community members (and many other First Nations in the area) generally harvest game fish species such as:

- Northern Pike;
- Brook Trout;
- Lake Whitefish;
- Yellow Perch;
- Cisco;
- Burbot;
- White Sucker;
- Longnose Sucker; and
- Lake Sturgeon.

The remote nature of the WSR area is likely to limit the number anglers willing to travel for access to this fishery. A past study by Hunt (2011) also noted improved road quality and network caused increases in fishing pressure, but that distance (and especially costs to travel) from a community reduced the overall fishing pressure. The non-local population is unlikely to be utilizing the remote project area due to the excessive distance from existing population centers and a lack of available accommodations and services. The presence of more easily accessible productive fisheries much closer to the populations centers also means that increased pressure would likely be moderate at its highest. There are no commercial fisheries operations ongoing in the region. Recreational fishing lodges are also not present in the area, with the closest lodges being located on the Albany River well south of the proposed roadway.

A summary of the net effects regarding change to public access to fish habitats that could increase harvest of fish during the operations phase based on the characterization criteria is presented in **Table 10-23**.



**Table 10-23: Criteria Results for Change to Public Access to Fish Habitats – Operations**

Characterization Criteria	Result	Rationale
Direction	Negative	Although mitigation measures are in-place to reduce harvest, it is expected that increased access will cause an increased rate of fish harvest, which in turn will cause a negative impact to fish populations.
Magnitude	Moderate	Previous studies do exist that show how roadways can cause substantial effects on the fish populations due to increased harvest access. Although the harvest would not result in extirpation of the species in the streams, there may be local reductions in the fish populations. This effect may be limited to larger streams that are more likely to contain sport-fish.
Geographic Extent	Project Footprint and LSA	The effect will be generally restricted to the Project Footprint and LSA and this is the area that will be made accessible by the presence of the road.
Timing	Within-Spawning	The effects may extend into fish spawning windows, as anglers may capture fish year-round.
Duration	Long-term	The effect during the operations phase will be long-term, as the effect will likely persist so long as the road is present
Frequency	Continuous	The effect during the operation phase will likely be continuous, likely concentrated in the ice-off seasons when fisheries are easier to exploit.
Context	Resilient	Fish species that expected to be harvested re common throughout the study area and throughout the larger region. As such, the fish populations in the area are unlikely to affected increased harvest during operations.
Reversibility	Reversible	The net effect is reversible once the road is removed and habitat is restored.
Likelihood of Occurrence	Probable	The net effects for phase are probable, as it is expected that even with mitigation measures implemented, recreational fishing may take place.

### 10.5.3 Summary

A summary of the characterization of net effects is provided in **Table 10-24**. These effects are predicted after the implementation of all mitigation measures.



**Table 10-24: Summary of Predicted Net Effects on Fish and Fish Habitat VC**

Predicted Net Effect	Project Phase	Net Effects Characterization								
		Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Context	Reversibility	Likelihood of Occurrence
<b>Destruction/Loss of Fish Habitat</b>										
Loss of aquatic habitat and riparian habitat due to placement of bridge footings/piers and culverts at waterbody crossings.	Construction	Negative	Low	Project Footprint	Non-Spawning	Long-term	Infrequent	Resilient	Reversible	Certain
Loss of fish habitat due to road maintenance activities.	Operations	Neutral	Negligible	Project Footprint	Non-Spawning	Short-term	Infrequent	Resilient	Reversible	Unlikely
<b>Harmful Alteration and Disruption of Fish Habitat</b>										
Habitat alteration/disruption due to material placement.	Construction	Negative	Low	Project Footprint, LSA	Within-Spawning	Long-term	Infrequent	Resilient	Reversible	Certain
Habitat alteration/disruption due to removal of riparian vegetation.	Construction	Negative	Low	Project Footprint, LSA	Within-Spawning	Short-term	Infrequent	Resilient	Reversible	Certain
Habitat alteration/disruption due to change in hydrology from construction of waterbody crossings.	Construction	Negative	Low	Project Footprint, LSA	Within-Spawning	Short-term	Infrequent	Resilient	Reversible	Certain
Habitat alteration/disruption due to reduced surface water quality from erosion, sedimentation, and depositions of contaminants.	Construction	Negative	Low	Project Footprint, LSA	Within-Spawning	Short-term	Infrequent	Resilient	Reversible	Certain
Habitat alteration/disruption due to introduction of invasive species.	Construction	Negative	Low	Project Footprint, LSA	Within-Spawning	Short-term	Infrequent	Resilient	Reversible	Possible
Habitat alteration/disruption due to change in hydrology from construction of waterbody crossings.	Operations	Negative	Low	Project Footprint, LSA	Within-Spawning	Short-term	Infrequent	Resilient	Reversible	Certain
Habitat alteration/disruption due to reduced surface water quality from erosion, sedimentation, and depositions of contaminants.	Operations	Negative	Low	Project Footprint, LSA	Within-Spawning	Short-term	Infrequent	Resilient	Reversible	Certain
Habitat alteration/disruption due to introduction of invasive species.	Operations	Negative	Low	Project Footprint, LSA	Within-Spawning	Short-term	Infrequent	Resilient	Reversible	Possible
Habitat alteration/disruption due to road maintenance activities.	Operations	Negative	Negligible	Project Footprint, LSA	Non-Spawning	Short-term	Infrequent	Resilient	Reversible	Probable
<b>Changes in Fish Access to Habitats</b>										
Localized temporary barriers to fish passage due to isolation structures for instream construction of bridges and culverts.	Construction	Negative	Low	Project Footprint, LSA	Non-Spawning	Short-term	Infrequent	Resilient	Reversible	Certain
Barriers to fish passage due to constructed culverts creating visual barriers, being clogged with debris, or creating habitats for beavers to build beaver dams.	Operations	Negative	Low to Moderate	Project Footprint, LSA	Within-Spawning	Short-term	Frequent	Resilient	Reversible	Probable
<b>Injury/Death of Fish</b>										
Injury or death of fish due to material placement, blasting, dewatering, and fish salvage.	Construction	Negative	Negligible	Project Footprint, LSA	Non-Spawning	Short-term	Infrequent	Resilient	Irreversible	Probable
Injury or death of fish due to maintenance activities that require in-water work.	Operations	Negative	Negligible	Project Footprint, LSA	Non-Spawning	Short-term	Infrequent	Resilient	Irreversible	Probable
<b>Changes in Public Access to Fish Habitats</b>										
Increased harvest due to increased access to fish habitat for work crews.	Construction	Negative	Low	Project Footprint, LSA	Within-Spawning	Short-term	Frequent	Resilient	Reversible	Possible
Increased harvest due to increased access to fish habitat for the public.	Operations	Negative	Moderate	Project Footprint, LSA	Within-Spawning	Long-term	Continuous	Resilient	Reversible	Probable

**Note:** Refer to **Table 10-13** for definitions of categories for net effect characterization

## 10.6 Determination of Significance

Several methodologies can be used to determine whether an adverse environmental effect is significant or not. One of the methodologies recommended by The Draft Technical Guidance Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under the *Canadian Environmental Assessment Act* (CEA Agency, 2018) and relevant to the *Impact Assessment Act* (2019). As presented in Section 5.2.6 and Table 5-7, a qualitative aggregation assessment is used for the determination of significance based on the sequential interaction among the magnitude, geographic extent, and duration criteria for net effects. The net effects criteria are presented in **Table 10-13**. Consideration is also given to potential management concerns and concerns of Indigenous communities and groups, the public, government agencies, and stakeholders raised during engagement and consultation activities conducted for the Project (**Table 10-2** and **Table 10-3**).

As summarized in **Table 10-24**, there are no situations where a predicted net effects on the Fish and Fish Habitat VC are considered moderate to high in magnitude, regional in extent, and long-term to permanent in duration. Therefore, it is concluded that the predicted net effects of construction and operations of the Project on Fish and Fish Habitat VC are not significant. Discussions regarding significance determination for each net effect are presented in the following subsections.

### 10.6.1 Destruction/Loss of Fish Habitat

The net effects of destruction or loss of fish habitat are predicted to be low and negligible in magnitude for construction phase and operations phase of the Project, respectively. The destruction of fish habitat is predicted to occur primarily during the construction phase of the Project. There is an expected destruction of 687.5 m<sup>2</sup> of aquatic habitat lost, all caused by construction of culverts and bridge pier footings in locations where structures are required to cross waterbodies. In addition, fish habitat provided by the riparian areas surrounding waterbodies is expected to be lost along the road ROW at water crossing locations. It is estimated that 27,640 m<sup>2</sup> of riparian habitat will be destroyed based on the proposed road width and documented riparian width at each water crossing. This habitat, while important, is abundant throughout the LSA and RSA and the effect of the road is not expected to cause a significant effect on the availability of fish habitat.

### 10.6.2 Harmful Alteration and Disruption of Fish Habitat

The net effects of harmful alteration and disruption of fish habitat during construction and operations phases are predicted to be low in magnitude. As there are likely some substrate changes that will occur as part of the Project, the effect of material placement within fish habitat during the construction phase is predicted to be long-term in nature but reversible.

Increased sedimentation and erosion are also expected to occur downstream for a short period of time (2-3 years) post-construction, which may cause some temporary habitat avoidance (disruption), but this will resolve once the site conditions are stabilized with vegetation. Potential erosion and sedimentation effects may temporarily disrupt up to 25.4 hectares of downstream aquatic habitat.



### 10.6.3 Change to Fish Access to Habitats

The magnitude of net effects due to a change to fish access to habitats from the potential introduction of barriers to fish passage are predicted to be low for the construction phase and low to moderate for the operations phase of the Project, respectively. Barriers to fish passage will temporarily occur during construction but will be very short in duration as culverts are installed. Bridges over larger waterbody crossings will eliminate the potential for creation of barriers to fish passage at the six waterbody crossings for the Project. For the remaining waterbodies, open bottom arch culverts will reduce the potential for establishment of barriers to fish passage. Where CSP culverts are required, their installation and operation will be monitored to reduce any changes to fish access to habitats. It is expected however, that temporary barriers may be established as these crossings become clogged by debris or beaver activity. This potential effect will be reduced with the implementation of regular culvert inspection and maintenance programs during the operations phase of the Project.

### 10.6.4 Injury/Death of Fish

The net effects of injury/death of fish are predicted to be negligible in magnitude for the construction phase and operations phase of the Project. It is expected that a small number of fish will be killed as a result of construction, as fish salvage efforts are never 100% effective. However, the mitigation measures selected will likely limit this effect to fish on an individual and will not affect the local or regional populations of fish species.

### 10.6.5 Change in Public Access to Fish Habitat

The net effect of change in public access to fish habitat, which may increase the harvest of fish are predicted to be low in magnitude for the construction phase. For the operations phase of the Project, the net effect of change in public access to fish habitat resulting in a potential increase in fish harvesting is predicted to be moderate in magnitude.

All of the species documented within the Project RSA are widespread in the greater James Bay Lowlands and Boreal Forest. Most of the waterbodies in the LSA and RSA for the Project will remain generally inaccessible. Although there may be low to moderate changes to population abundance for sport-fish species within some waterbodies where access is improved, the long travel distance between the Project and major population centers will limit this effect.

## 10.7 Cumulative Effects

In addition to assessing the net environmental effects of the Project, the assessment for Fish and Fish Habitat VC also evaluates and assesses the significance of net effects from the Project that overlap temporally and spatially with effects from other past, present and reasonably foreseeable developments (RFDs) and activities (i.e., cumulative effects).

For a VC that has identified net effects where the magnitude was determined to be higher than low, it is necessary to determine if the effects from the Project interact both temporally and spatially with the effects from one or more past, present RFDs or activities, since the combined effects may differ in nature or extent from the effects of individual Project activities. Where information is available, the cumulative effects assessment estimates or predicts the contribution of effects from the Project and other human activities on the criteria, in the context of changes to the natural, health, social or economic environments.



For this Fish and Fish Habitat VC assessment, the net effects described in **Section 10.5.2** that are characterized as having a likelihood of occurrence of “probable” or “certain” and a “moderate” to “high” magnitude have been carried forward to the cumulative effects assessment. Net effects with this characterization are most likely to interact with other RFD and activities.

The predicted net effects of the Project on the Fish and Fish Habitat VC that are carried forward for the assessment of cumulative effects within the Fish and Fish Habitat RSA include:

- Changes to Quantity and Quality of Fish Habitat:
  - Changes to fish access to habitats (during operations phase).
- Changes to Fish Populations:
  - Changes to public access resulting in increased harvest of fish (during operations phase).

Results of the cumulative effects assessment for the Fish and Fish Habitat VC with consideration of RFDs and activities are presented in Section 21.

## 10.8 Prediction Confidence in the Assessment

The overall confidence in the assessment of net effects on fish and fish habitat is high as the destruction of fish habitat is relatively well known (the area of the project components that completely cover surface water bodies). Although there may be future refinements to the project design (such as pier footings for bridges or specific orientations of culverts) as the Project proceeds to the Detail Design Phase, the effects are expected to be similar as assessed in this EAR/IS. The level of confidence for fish habitat disruption/alteration assessment is also considered high.

The confidence in the assessment of net effects of changes to fish access to habitats as a result barriers to fish passage and injury/death of fish is also considered high, as the effects of roads are generally well documented and understood and can be effectively mitigated with best management practices and proposed mitigation measures outlined in **Section 10.4**. The exact maintenance schedule for maintaining fish passage will need to be determined based on how quickly water crossings become blocked, but monitoring programs will determine this once the road is constructed.

The confidence in the assessment of net effects of change in public access that may lead to increased harvest is moderate. There are some unknowns in how recreational fisheries from outside of the Indigenous communities in the area will exploit this new access. The location is still quite distance from significant population centers, so it is expected that the increase in harvest pressure will not be significant at this time. However, this assumption relies on what typical recreational fisherman are likely to do and may be subject to change over time if increasing access to the north brings additional residents/workers. The ongoing developments that may result from the Project are also not currently known and may affect the rates of harvest as well.



## 10.9 Predicted Future Condition of the Environment if the Project Does Not Proceed

If the Project does not proceed, the future condition of fish and fish habitat in the area is likely to be unchanged from existing conditions. Long-term impacts due to climate change may occur regardless of whether the Project proceeds. In addition, extreme weather events in the region may increase over time may cause a reduction or creation of fish habitat as certain areas flood and others experience drought.

## 10.10 Follow-up and Monitoring

The purposes of the follow-up and monitoring programs are to:

- Verify environmental effects predictions made during the EA/IA for the Project;
- Provide data with which to evaluate the effectiveness of mitigation measures and modify or enhance these measures, where necessary;
- Provide data with which to implement adaptive management measures for improving future environmental protection activities;
- Document additional measures of adaptive measures to improve future environmental protection activities; and
- Document compliance with required conditions as stipulated in permits, approvals, licenses and/or authorizations.



The Project invites community members to participate in developing and implementing monitoring programs to assess the effectiveness of proposed mitigation measures and potential adverse effects to the environment. Where effects are considered unacceptable and/or based on concerns raised by Indigenous community members or other stakeholders, further mitigation options will be considered by the road operator in consultation with Indigenous communities and stakeholders.

The recommended monitoring program related to Fish and Fish Habitat VC will include:

- Monitoring will be conducted by qualified individual(s) during instream construction (e.g., installation of culverts or bridges) or where active water taking and discharge occurs to observe implementation and report on the effectiveness of the procedures and mitigation measures for minimizing potential effects to fish and fish habitat. Monitoring will occur during installation works and be ongoing for the duration of the Project.
- Regular inspections and monitoring of installed ESC measures to verify they are effective and to identify corrective action(s), where applicable.
- Culvert monitoring programs to remove debris, prevent fish passage interruptions, and assess blockages and/or ponding.
- Monitoring streamflow, turbidity, total suspended solids and other related water quality parameters during construction to confirm effectiveness of ESC measures.
- Periodic fish community and habitat surveys to detect changes in fish assemblages.



- Pre- and post-construction fish habitat assessments to evaluate habitat alterations, including monitoring changes to stream morphology and substrate caused by increased sediment loads or changes in streamflow.
- Where a DFO *Fisheries Act* authorization is required, a qualified fisheries specialist will also conduct the following construction monitoring tasks, in addition to the conditions specified in the authorization:
  - Review existing plans for the Project, including but not limited to, ESC plans, temporary flow management, dewatering plans and environmental management plans, to ensure these are being followed with the appropriate measures in-place.
  - Confirm the mitigation measures identified in the EA/IA are being installed/implemented and maintained as designed including providing field advice and necessary corrective actions for non-compliance, and documents whether these measures are protecting fish and fish habitat effectively throughout construction.
  - Undertake monitoring of offsetting measures outlined in the authorization, including that offsetting measures were constructed as designed.
  - Undertake post-construction monitoring and prepare annual reporting to confirm that the offsetting measures are functioning as designed and successful in providing fish habitat.
- Additional details on the proposed follow-up and monitoring for the Project are described in Section 22 of this EAR/IS, Follow-up and Compliance Monitoring Programs.

## 10.11 References

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