WSR
WEBEQUIE
SUPPLY ROAD

WEBEQUIE SUPPLY ROAD FINAL ENVIRONMENTAL ASSESSMENT REPORT / IMPACT STATEMENT

January 30, 2026

AtkinsRéalis Ref: 661910

SECTION 24:
Effects of the Environment on the Project

WEBEQUIE FIRST NATION

AtkinsRéalis

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24 Effects of the Environment on the Project

This section describes how local environmental conditions and natural hazards, such as severe or extreme weather conditions and external events, could adversely affect the Project, including proposed mitigation measures to eliminate or reduce potential adverse effects. Proposed mitigation measures include engineering design solutions that will allow the proposed project components to sustain or adapt to current and future projected environmental conditions and events. Changes in the environment have the potential to affect the Project during both its construction and operations phases, particularly climate change effects that are more likely to be pronounced during the operations phase of the Project which is anticipated to be 75 years based on the expected timeline for when major refurbishment of road components (e.g., bridges) are anticipated.

24.1 Scope of the Assessment

The assessment presented in this section considers the requirements outlined in Section 23.2 of the Tailored Impact Statement Guidelines (TISG) and focuses on the construction and operations phases of the Project. As noted in Section 4 (Project Description), decommissioning of the Project is not anticipated. Effects of the Environment on the Project are assessed at the project level including the alternatives discussed in Section 3 (Evaluation of Project Alternatives) and based on results of the climate change vulnerability and risk analysis conducted on the proposed project components (Appendix I – Climate Change Resilience Review Report).

The scope of the assessment includes the following to fulfill the requirements outlined in the TISG:

- Project planning, design and construction strategies intended to minimize the potential adverse effects of the environment on the Project (**Section 24.1.1**);
- Areas of potential wind or water erosion, slumps and slope instability, geologic hazards, including but not limited to those caused by geologic movements (**Section 24.2.5**);
- Mitigation measures that can be implemented in anticipation or in preparation for effects of the environment on the Project, including possible mitigation measures to deal with adverse environmental, health, social and economic effects resulting from effects of the environment on the Project (**Section 24.1.5**, **Section 24.4**, and Appendix I – Climate Change Resilience Review Report);
- Identification of the Project's sensitivities/vulnerabilities to change in climate, climate resilience of the Project and how climate change effects have been incorporated into the project design (e.g., water crossings) and planning over the lifetime of the Project, including describing how climate projections and related information were used to evaluate these sensitivities (i.e., risks) over the full project lifetime (Appendix I – Climate Change Resilience Review Report);
- Identification of trends in meteorological events, weather patterns, or physical changes to the environment that are anticipated to result from climate change, possible accidents and malfunctions, and description of mitigation measures to minimize the frequency, severity and consequences of such projected effects (**Section 24.2** and Appendix I – Climate Change Resilience Review Report);
- How perspectives from Indigenous peoples on climate change may impact the Project were considered when describing possible effects from climate change on the Project (**Section 24.1.3**, **Section 24.1.4**, and Appendix I – Climate Change Resilience Review Report); and

- Measures to enhance positive environmental, health, social and economic effects resulting from effects of the environment on the Project (**Section 24.4** and **Section 24.8**).

24.1.1 Project Design

The Project is designed with consideration of existing conditions and external environmental risks including projected climate trends. The most current revisions of the following listed Canada's and Ontario's codes, guidelines, specifications, and standards, and other references were used in the design of all structures, foundations, and related facilities to mitigate potential effects of the environment on the Project. As outlined in Section 4.2.1, key design codes, standards and guidelines include, but are not limited to, the following:

- Design Supplement for Transportation Association of Canada Geometric Design Guide for Canadian Roads, Ontario Ministry of Transportation, April 2020;
- Preliminary Design Report Guideline, Ontario Ministry of Transportation, September 2016;
- Roadside Design Manual, Ontario Ministry of Transportation, May 2020;
- Highway Drainage Design Standards, Ontario Ministry of Transportation, November 2023;
- Pavement Design and Rehabilitation Manual, Ontario Ministry of Transportation, May 2013;
- Road Safety Audit Guidelines, University of New Brunswick, 1999;
- Structural Manual, Ontario Ministry of Transportation, August 2021;
- Canadian Highway Bridge Design Code CSA S6:19, CSA Group, 2019; and
- Maintenance Manual, Ontario Ministry of Transportation, August 2003.

Environmental issues and the social and economic well-being of Webequie First Nation and other Indigenous communities were considered in the earliest stages of Project planning and design and is an integral part of Webequie's overall approach for developing the Project. This approach allows for potential issues and interactions to be identified early so they can be considered in a proactive manner through appropriate Project planning and design. The objectives are to avoid adverse effects where possible and, where they cannot be avoided, establish mitigation measures to reduce potential effects to acceptable levels.

24.1.2 Climate and Environmental Hazards That May Affect the Project

As described in the Natural Environment Existing Conditions Report (Appendix F) and the Climate Change Resilience Review Report (Appendix I), there is low potential for geological hazards (such as seismic activities, landslides, sinkholes, and slope instability) in the Webequie Supply Road (WSR) area and potential effects of geological hazards on the Project are not anticipated. Based on information presented in the Climate Change Resilience Report (Appendix I), hazards and conditions resulted from extreme weather events or changing climate trends and deemed to have possible consequences on the Project include:

- Thick fog conditions;
- High-intensity short-duration rainfalls;
- Blizzards;
- Long-duration freezing rain (ice accumulation);
- Freeze-thaw cycles;

- Rain on snow events;
- Wind gust events;
- Permafrost degradation;
- Spring and torrential freshets; and
- Wildfires.

Other potential hazards such as heatwaves, extreme temperatures, extreme cold spell, and others are not anticipated to have significant interactions with project components as described in **Section 24.1.5**.

Effects of the environment on the Project may result in accidents or malfunctions such as construction and road accidents, or wildlife interactions. Extreme weather events such as persistent rain (causing flooding) at or near the WSR area may displace wildlife that potentially seek refuge resulting in potential interactions of wildlife with project components and workers. An assessment of effects of accidents and malfunctions that may occur during project activities is provided in Section 23 of this Environmental Assessment Report/Impact Statement (EAR/IS).

24.1.3 Consideration of Input from Engagement and Consultation Activities

Table 24-1 summarizes input related to potential effects of the environment on the Project received during the engagement and consultation and how the input is addressed in the EAR/IS. This input includes concerns raised by the public, stakeholders and Indigenous communities/groups prior to the formal commencement of the federal Impact Assessment (IA) and provincial Environmental Assessment (EA), during the Planning Phase of the IA and Terms of Reference 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 24-1: Summary of Input Received During Engagement and Consultation

Comment Theme	How are the Comments Addressed in this EAR/IS	Indigenous Community or Stakeholder
Concerns about how climate change during the lifespan of the all-season road will be investigated as part of the EA/IA.	A climate change resilience assessment has been conducted for the Project as part of the EA/IA (refer to **Section 24.1.5** and Appendix I – Climate Change Resilience Report). This assessment was based on the Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol, formerly from Engineers Canada, which respects the requirements from the Strategic Assessment for Climate Change and Ontario's guidelines within the framework of environmental impact assessments. The PIEVC and guidelines in the assessment were used to identify all potential interactions between climate hazards and project components and their impact on the infrastructure but also on the health and safety of users of the proposed road and the natural environment. The detailed methodology for the climate change resilience assessment is provided in Appendix I (Climate Change Resilience Report).	Attawapiskat First Nation

Comment Theme	How are the Comments Addressed in this EAR/IS	Indigenous Community or Stakeholder
Concerned that the EA/IA should address how the project construction will accommodate future climate change realities related to fluctuating seasonal temperatures, rainfall events, wildfires and the potential loss of permafrost conditions.	As noted above, a climate change resilience assessment has been conducted for the Project as part of the EA/IA (refer to Appendix I – Climate Change Resilience Report). The assessed climate hazards included thick fog conditions, high-intensity short-duration rainfalls, blizzards, freezing rain, freeze-thaw cycles, rain on snow events, extreme winds, permafrost degradation, freshets, riverbank erosion, and wildfires. Details on projected climate conditions for the region are also provided in Appendix I (Climate Change Resilience Report).	Constance Lake First Nation
Community members are concerned about climate change through Indigenous Knowledge interviews with Elders and Land Users.	A climate change resilience assessment has been conducted for the Project as part of the EA/IA (refer to Appendix I – Climate Change Resilience Report). The assessment analyzed risks to the Project due to climate change. A discussion on how the Project could impact global greenhouse gas (GHG) emissions is provided in Appendix H (Greenhouse Gas Emissions Report).	Webequie First Nation
Concerns about assessing impacts related to climate change (mitigation and adaptation).	Impacts related to climate change are assessed in the following sections and appendices of the EAR/IS: ▪ Section 9 (Assessment of Effects on Atmospheric Environment); ▪ **Section 24** (Effects of the Environment on the Project); ▪ Greenhouse Gas Emissions completed by AtkinsRéalis (Appendix H); and ▪ Climate Change Resilience Review completed by AtkinsRéalis (Appendix I).	Ministry of Environment, Conservation and Parks (MECP)
Use meteorological data from two available Lansdowne stations to capture the change in both mean climate conditions and extremes, especially to include recent changes.	Meteorological data from Lansdowne House stations were used to describe average climate conditions (**Section 24.2.1**) and extreme and changing climate trends (**Sections 24.2.2** and **24.2.3**). The detailed description is provided in Appendix I (Climate Change Resilience Report).	Impact Assessment Agency of Canada (IAAC)

24.1.4 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 (IKLRU) information to the Project Team:

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

Table 24-2 summarizes IKLRU information relating to potential effects of the environment on the Project and indicates where the information is incorporated in the EAR/IS.

Table 24-2: Summary of Indigenous Knowledge and Land and Resource Use Information

Topic	Key Information and Concerns	Response and/or Relevant EAR/IS Section
Observations on changes to weather/climate patterns	▪ Climate change has the potential to affect the land, resources, water and ecology in the proposed planning area. Based on Ontario climate research efforts, by 2050 northern Ontario may experience an annual temperature increase of as much as 4.5 to 6°C, resulting in changes to weather patterns and ecological systems. Climate change brings the potential of extreme weather events and could impact the distribution and abundance of plant and animal species. ▪ Webequie Elders and community members have documented projected and historic climate change, and changes in landscapes and weather patterns. For example, community members have shared their knowledge on changes in fish and wildlife populations, permafrost melt and a shortening winter road season. As weather patterns and the landscape changes, climate change may also hold the potential to affect the traditional way of life and social conditions in the community of Webequie. ▪ Community members shared that they noticed changes in weather patterns, milder winter temperatures, less rainfall, and less snowfall in recent years. ▪ Knowledge Holders said that changes in the weather have contributed to unsafe travelling conditions and that the amount of snow has decreased, and there has been less ice buildup on the river in the last twenty years, from 2000s to 2020s, making it unsafe for Webequie First Nation members to use the river as a travelway. ▪ One Knowledge Holder shared that winters in the 1970s were cold, but they have since become mild, with less snow and less blue ice developing on the river. ▪ Webequie First Nation uses winter roads to transport supplies to and from the Webequie community. Knowledge Holders said that the winter road season has been shortened due to a less snow and ice. ▪ Some members of Webequie First Nation have said that they have not noticed any change in the weather, beyond snowfall, and that fishing and hunting has not been affected by climate change. ▪ The landscape and natural environment are changing. Climate change impacts travel conditions and where the plants and animals are at certain times of year. This has affected harvesting, especially in the spring and fall. These changes disrupt the traditional way of life and affect access to food and sustenance.	▪ Shared information on projected and historic climate change have been considered in the climate change resilience assessment conducted for the Project as part of the EA/IA (refer to Appendix I – Climate Change Resilience Report). The assessment analyzed risks to the Project due to climate change. The assessment results and proposed mitigation measures are summarized and discussed in this EAR/IS **Section 24**. ▪ A discussion on how the Project could impact global GHG emissions that are considered to contribute to climate change, is provided in Appendix H (Greenhouse Gas Emissions Report) and summarized in Section 9.5.2.2. The maximum annual emissions caused by construction activities on carbon reservoir would generate an equivalent of 0.5% of the corresponding Canadian total for land-use changes into settlements (based on 2021 data from the National Inventory Report produced by Environment and Climate Change Canada) while the annual emissions for the operations phase were estimated to be 0.03% of the Canadian total. ▪ As noted in Greenhouse Gas Emissions Report (Appendix H) and Section 9.5.2.2.3, the proposed WSR will not have an impact on global GHG emissions. At least it will not displace emissions internationally, since it remains an infrastructure project intended to provide socio-economic benefits to

Topic	Key Information and Concerns	Response and/or Relevant EAR/IS Section
	▪ Peawanuck is in a remote location isolated from most goods and services available in more densely populated areas. The community receives most of its supplies via a winter road in winter months. Community members explained that, currently, the winter road takes a lot of effort to construct, and due to climate change and changing weather patterns, the shorter seasonal freeze means the road is not accessible for the same length of time that it used to be.	the Webequie community by providing access to future nearby mineral exploration and proposed future mining developments.

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

24.1.5 Approach and Methodology

The assessment of effects of the environment on the Project is conducted using the methodology as outlined in Section 5 (Environmental Assessment / Impact Assessment Approach and Methods). Due to the unpredictable and therefore unknown nature, timing, and extent of the potential occurrence of extreme weather events, wildfires and changing climate trends, the magnitude ratings of predicted net effects (refer to **Table 24-8**) are informed by a risk analysis of climate change effects on the project components as detailed in the Climate Change Resilience Review Report (Appendix I). The risk analysis was carried out following the general guidelines provided in the draft "Technical guide related to the Strategic Assessment of Climate Change: Assessing climate change resilience" from Environment and Climate Change Canada (ECCC, 2022) and the guidance document entitled "Considering Climate Change in the Environmental Assessment Process" from the Ontario Ministry of Environment, Conservation and Parks (MECP, 2021) and considering the climate hazards listed in **Table 24-3** that were selected based on potential impacts on one or more of the project components. The hazards can be discerned between meteorological events, whether intermittent (i.e., freezing rain) or progressive (i.e., increase in average temperatures) and socio-natural features that can be a result of climate change (e.g., landslides, droughts, wildfires, freshets, permafrost degradation). Selection of the climate hazards therefore depends on the site and/or type of infrastructure.

Table 24-3 summarizes the risk ratings of climate hazards calculated for the proposed project components or activities and outlines risk mitigation and control measures that have been or will be included in the project design and planning. For each hazard, the risk of impact was calculated based on the probability of hazard occurrence and consequence of the impact. Details of risk rating calculations are provided in Appendix I – Climate Change Resilience Review Report.

Table 24-3: Summary of Risk Ratings for Climate and Environmental Hazards That May Affect the Project

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
Thick fog conditions	▪ Construction activities during thick fog events can increase the probability of accidents occurring. ▪ A road geometry (curves and grades) inclinations coupled with reduced visibility due to fog can increase the potential of incidents.	Construction and Operations	▪ Fog is not known to be particularly severe in this area and is expected to occur on a seasonal basis. Shutting down construction activities or road closures will be done under severe cases. ▪ Thick fog reduces visibility on the road and can be hazardous for road users and construction and maintenance workers. Workers are expected to take appropriate precautions in their Health & Safety Plan or shut down activities to reduce or eliminate the potential for accidents due to thick fog. ▪ The WSR layout is designed with standard lane widths and geometry and the road profile has very limited grade variations. The presence of rest areas along the road allows the drivers to stop if needed. The 35 m right-of-way (ROW) and road geometry also allows for maximized visibility and site lines given the conditions.	Low
High-intensity short-duration rainfalls	▪ Heavy rainfall can decrease visibility and lead to slippery conditions with high likelihood of accidents in curves and on grades. ▪ Road damage from water runoff and infiltration can potentially increase during heavy rains. Also, there will be several water crossings that could be flooded during such events. ▪ Weakened embankment due to heavy rainfall and poor drainage can result in potholes in localized areas that would require normally minor repairs with time.	Construction and Operations	▪ The WSR layout is designed with standard lane width, curves and low grades. ▪ Workers are expected to take appropriate precautions in their Health & Safety Plan or shut down activities to reduce or eliminate the potential for accidents due to poor conditions (reduced visibility or slippery surface) from heavy rain. ▪ All waterbody crossing structures are sized to convey a minimum 100-year design flow (probable rainfall event within 100-year period) after accommodating for increases in rainfall intensities due to climate change. This proposed design standard exceeds Ontario Ministry of Transportation of Ontario (MTO) Highway Drainage Design Standards and include consideration of climate change with increased duration, frequency and intensity of precipitation. ▪ The road embankment will be constructed according to provincial standards with efficient water drainage system (i.e., ditches and swales draining to streams) and ponding and slippery conditions on the road are not expected. The presence of asphalt or chip seal on the road surface will also helps to prevent surface damage with water, and the associated hazard.	Low

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
	▪ When runoff is high, the flow into the receiving stream that is also connected to a sensitive area could cause flooding. ▪ Erosion may damage structures potentially requiring preventive repairs depending on the level of damage. ▪ Heavy rainfalls and runoff can erode surface soil from rehabilitated sites. ▪ Excess sediments or objects can slow down or obstruct drainage.		▪ Weaken structural integrity of the road embankment due to heavy rainfall can form potholes of road surface and/or slumping of embankment slopes of which can managed through routine maintenance and repair activities. ▪ Equalization cross-culverts will be installed at appropriate intervals along the road to allow for water to pass from upstream to downstream and prevent water levels from rising or ponding on one side of the road. Furthermore, cross-culverts will be oversized to reduce potential for blockage and allow for easier maintenance. ▪ When runoff is high, the flow into receiving streams can cause localized damage (including erosion and sedimentation) and can be addressed by the operation and maintenance crews. ▪ Stormwater quantity and quality analyses completed in the preliminary design phase will be finalized in detail design to ensure surrounding waterbodies can accommodate discharge from events. Mitigation measures will be incorporated in the road design to ensure proper drainage, as per provincial standards. ▪ As per provincial regulations, the WSR will be designed to handle stormwater within the road ROW and is not expected to impact areas where harvesting of country foods (e.g., wild berries) occurs, as identified in Webequie First Nation Indigenous Knowledge Study for the Webequie Supply Road (Stantec Consulting Ltd., 2024). Also, trapezoidal ditches will be constructed to accommodate road drainage and runoff. Operation and maintenance crews will regularly inspect ditches for issues and schedule repairs, as needed. ▪ The drainage system consisting of ditches, culverts and bridges will be sized to address projected climate change. Storm events that may exceed capacity of the drainage system and cause localized flooding into streams is not considered probable. Localized flooding is anticipated to recede quickly given that culverts will be sized accordingly with allowance for climate change. Erosion controls like riprap (rock) may be placed around structures to reduce the long-term damage potential erosion.	

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
			▪ If flooding occurs, it could impact the upstream section of watercourse at culvert crossings, although it is predicted to remain limited and localized (considering the incorporation of projected climate change into the project design) and can be reversed naturally or with help from the operation and maintenance crews. Depending on event and location, the extent of damages may be variable. ▪ Heavy rainfalls and runoff may erode surface soil from rehabilitated sites. Erosion is however expected to be limited after new vegetation becomes established. ▪ Excess sediments and objects deposited into roadside ditches can slow down drainage, but this is expected to be limited. Operation and maintenance crews are expected to make routine inspections and will maintain the ditches for conveyance of drainage.	
Blizzards	▪ Blizzards can cause poor conditions for construction activities and user during operations. ▪ A road layout with lots of curves and inclinations coupled with poor visibility can increase the potential of accidents (i.e., cross winds and snow accumulation). ▪ Blizzards can cause poor conditions for drivers and the road maintenance crew (windy conditions leading to reduced visibility and tire traction). Road maintenance (e.g., snowplowing) is anticipated for extreme events.	Construction and Operations	▪ Workers are expected to take appropriate precautions in their Health & Safety Plan or shut down activities to reduce or eliminate the potential for accidents. ▪ The WSR layout is designed with standard lane width, curves and low grades. Winter snow fencing may be installed in areas more prone to snow drifts occurring on the road to minimize risk to road users. ▪ Workers are expected to take appropriate precautions and use appropriate lights and signs to address visibility and safety concerns during blizzards. Low priority maintenance activities can be postponed eliminating the potential for accidents due to blizzards.	Very low to low

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
Long-duration freezing rain (ice accumulation)	▪ Slippery conditions can cause slips and falls to workers. Icy conditions are particularly hazardous for workers on-foot. ▪ Ice accumulations do not cause issues for ground-level structures but may cause dangerous conditions for drivers.	Construction and Operations	▪ Workers are expected to take appropriate precautions in their Health & Safety Plan or shut down activities to reduce or eliminate the potential for accidents. ▪ The WSR layout is designed with standard lane width, curves and low grades. ▪ Icy conditions on the road are hazardous for drivers and road maintenance workers. Road maintenance vehicles (i.e., snowplows) will be equipped to operate in these conditions. Low priority maintenance activities can be postponed eliminating the potential for accidents. ▪ Operation and maintenance crews may spread sand to increase traction on the road surface. The proposed road surface treatment of chip seal or asphalt are also easier to maintain than aggregate roads. ▪ Traffic is expected to be very low during poor driving conditions. Operation and maintenance procedures are considered adequate for potential extreme events. ▪ Freezing rain can lead to slippery conditions and ice buildup on roofs or icy walkways which can be hazardous for workers at the Maintenance and Storage Facility (MSF). Workers are expected to mitigate safety concern in their Health & Safety Plan and take proper precautions. Low priority work activities can be postponed eliminating the hazards.	Very low
Freeze-thaw cycles	▪ Freeze-thaw cycles are known to cause damage to roads and ground-level structures. ▪ Freeze-thaw can weaken the embankment and road surface causing heaving resulting in potholes that could potentially require localized repairs depending on extent of damages.	Operations	▪ Repeated freeze-thaw cycle can destabilize the soil and gravel material around culverts which will however be designed and constructed according to codes to minimize heave or destabilization. ▪ The road embankment is designed according to provincial standards and groundwater is predicted to flow underneath the road. The embankment will be properly drained with subdrains if needed, to reduce the effects of freeze-thaw cycles.	Low

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
	▪ Freeze-thaw can create cracks in concrete that would, following inspections, be corrected by operation and maintenance crews.		▪ The MSF buildings and structures will be designed and built to Ontario Building Codes, and other applicable standards. Cracks in the foundation can be severe in extreme cases leading to uneven floors and doors that may require moderate repairs. ▪ All bridges will be designed according to provincial standards with regard to freeze-thaw degradation of concrete.	
Rain on snow events	▪ Formation of ice can cause road safety issues but also extra weight may cause damages on some structures (i.e., bridges and culverts). ▪ Snow in ditches with rain or melting conditions can impact runoff drainage potentially creating very localized flooding. ▪ Icy conditions are particularly hazardous for workers on-foot.	Construction and Operations	▪ Workers are expected to take appropriate precautions measures as outlined in their Health & Safety Plan with regard to slippery conditions due to presence of ice on ground or shut down activities to reduce or eliminate the potential for incidents. ▪ The WSR layout is designed with standard lane width, curves and low grades. Operation and maintenance staff will clear snow according to standards and procedures in the Health and Safety Plan. ▪ The presence of snow in ditches may increase runoff drainage and potentially create very localized flooding. Performance of the ditches and/or culverts may be affected but this impact is not expected to be long-lasting. In such events, operation and maintenance crews are expected to clear the snow to alleviate any issue. ▪ Road maintenance vehicles (i.e., snowplows) are equipped to operate in rain and snow events. Workers are expected to take appropriate precautions and use appropriate lights and signs for safety. Low priority maintenance activities can be postponed eliminating the potential for incidents.	Very low
Wind gust events	▪ Strong winds have the potential to generate dust and flying debris. ▪ Cross winds can be a safety hazard to drivers. ▪ Although the road would not be directly impacted, winds may cause problems for the MSF	Construction and Operations	▪ Small injuries may occur from flying dust or debris during wind gust events but is dependent on the severity of the event. Workers are expected to take appropriate precautions in their Health & Safety Plan or shut down activities to reduce or eliminate the potential for incidents. Large debris is not expected at the MSF as long as the facility is operated and maintained following best management practices. ▪ Most equipment at quarries is heavy and/or must be solidly anchored during operation or inactivity. Workers are also expected to take appropriate precautions during extreme wind conditions.	Very low to low

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
	(i.e., roofs, exterior components).		▪ Although cross winds can be a safety hazard to drivers, the road will be designed and the ROW managed to eliminate physical hazards (e.g., trees in close proximity to road), and where applicable safety guiderail will be placed along the road where standards dictate their use. ▪ The MSF building and outside supportive structures will be designed and built to Ontario Building Codes, and other applicable standards to prevent damage from high winds. With the exception of these buildings, no elevated structures (e.g., communication towers and electrical lines) vulnerable to wind will be constructed. Damaged materials (if any) are not expected to be of high value and can easily be replaced.	
Permafrost degradation	▪ Collapse (or at least movement) of soil by settlement due to the degradation (melting) of permafrost (or freezing of infiltrated water in the permafrost) can cause local damage to the road or possibly the MSF. ▪ Formation of sinkholes, although highly unlikely and localized, would require complex work with localized impact on traffic, but it could also result in road closure if it impacts both lanes. ▪ Accidents due to the presence of major potholes or sinkholes are considered very rare events and of low probability to occur.	Operations	▪ Geotechnical investigations to date have not identified the presence of permafrost under the road footprint and as such the potential for permafrost degradation is expected to be low. Any permafrost encountered during construction will be addressed at that time. Therefore, sinkholes or road fractures and/or settlement due to permafrost are not expected. ▪ Further geotechnical studies at MSF location will be carried out to verify the presence of permafrost underneath the facility footprint and design and/or construction may be modified to address potential impacts.	Low

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
Spring and torrential freshets	▪ The road will cross several different waterbody types (i.e., small and large rivers, lakes) and the impacts from flash floods may be variable. ▪ Overtopping from rainfall events is not likely to cause damage to structures or the road but water infiltration may cause damage in the long-term. Depending on location, the road may be subject to potential damage due to overtopping which may require extensive repair work with potential impacts on traffic. ▪ Soil movement may damage culverts potentially requiring major repairs (with impact on traffic) depending on the level of damage.	Operations	▪ The absence of flashy streams associated with large abutting impervious areas to a road reduces the probability of occurrence as well as potential damages. ▪ The road users can avoid driving into a flooded area of the road and there is low probability that severe flooding incidents will result in a closure of the road. ▪ Given the posted speed limits and driver adjustment to weather conditions, the impact on the health and safety of the drivers should be limited, although risk may increase depending on the extent of flooding. ▪ The road is to be elevated at sufficient height relative to the original ground that would prevent water from rising over the road surface (overtopping). Furthermore, surface water modelling has determined the appropriate sizing for drainage components (e.g., ditches, culverts). The presence of geotextile and geogrid and permeable granular material under the road is expected to help with drainage and stabilize the roadbed, including conveyance of groundwater flow. ▪ Excess sediments and objects deposited into road ditches after freshets near streams can slow down or obstruct drainage but this is expected to be limited and localized. Operation and maintenance crews are expected to make routine inspections and maintain the ditches. ▪ Bridges will be sized to accommodate the 100-year storm plus projected climate change. The rise of water to or above the bridge deck is considered unlikely to occur. ▪ The bridges will be located on streams and waterbodies that have low flow velocities and are not configured or designed to generate high water velocities during freshet events. Lower velocities are not expected to damage bridge decks (or culverts) to an extent that would require reconstruction.	Low

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
			▪ Like bridges, culverts will be sized to convey the 100-year storm and projected climate change. Flows that exceed the capacity of culverts is unlikely to occur. The design of culverts has also considered unwanted infiltration of water into the soil that could potentially move and/or damage a culvert. Operation and maintenance crews will systematically clean culverts following freshets.	
Riverbank erosion due to heavy rainfalls and freshets	▪ Depending on the watercourse, a change in stability of riverbanks may potentially have an impact on culverts or bridges in the longer term.	Operations	▪ Being elevated, the road embankment is subject to erosion over time in presence of water but drainage cross-culverts and other appropriate erosion control design measures at waterbody crossings are expected to minimize erosion potential. ▪ Erosion is typically a slow process that should not create excessive damage to the road but would need regular maintenance work to proactively prevent problems over time. Operation and maintenance crews are expected to inspect the road and intervene if necessary. ▪ Local erosion of the road embankment can impact adjacent wetlands or other sensitive features with aggregate or sediment deposited at some isolated locations. However, the road design including equalization cross-culverts, and the drainage design to manage runoff should limit the potential for erosion. Erosion and potential deposition of sediment into wetlands and other features would be localized and reversible with the intervention of operation and maintenance crews. ▪ Riverbanks near the bridges will be revegetated and/or have erosion control measures (e.g., rock/rip rap) following construction to prevent and limit erosion over time. Erosion control mitigation measures will only use clean non-erodible materials below the high-water mark and that revegetation will only be used above the high-water mark. Operation and maintenance crews are also expected to routinely inspect bridge and culvert structures and upstream and downstream riverbanks for signs of erosion and complete repairs where required. ▪ Scour caused by bridge piers and/or abutments in the water could affect the normal flow of a waterbody, however but this has been addressed during design and is not expected to be a major concern.	Very low to low

Hazard	Risk Description	Project Phase	Risk Mitigation and Control Measures	Risk Rating
			Operation and maintenance crews are also expected to inspect these areas and intervene if necessary. ▪ The presence and deposition of sediments overtime may affect the flow through culverts. This potential occurrence t will be managed by operation and maintenance staff in accordance with provincial standards.	
Wildfires	▪ The passage of wildfires may damage machinery, equipment, structures, the road and supportive infrastructure (MSF, pits/quarries). ▪ With the exception of potential oil stains from equipment and vehicles on the road, the road surface is generally not flammable and direct damages to the road due to fire should be limited.	Construction and Operations	▪ Wildfire risks on the eastern part of the WSR are anticipated to be low as the peatlands is saturated with primarily scattered low lying vegetation that is not considered very flammable. For the western part of the WSR, the 35 m ROW to accommodate the road should provide sufficient clearance from potential burning trees falling on the road surface. As such, damage to the road due to a wildfire is expected to be limited, but smoke and intense wildfires could cause cracks and potholes on the road surface due to heating or require temporary road closures or lane restrictions. ▪ Other road components that are made with metal such as road signs, guardrails and culverts are more susceptible to damages from heat and may require repairs following a wildfire event. The risk is also applicable to bridges composed of concrete and steel that may be impacted by heat associated with wildfires.	Low

The following hazards were excluded from the risk analysis mainly due to an absence of an interactions or potentially significant interactions with any project components.

- **Heatwaves and extreme hot temperatures:** Although temperatures should significantly increase in northern Ontario, hotter temperatures in the future, while remaining infrequent and below 40°C, do not have any particular impact on the road infrastructure like the road base, culverts, and bridges. In the event of heatwaves and extreme temperatures affecting the health and safety of construction or maintenance crews and the operation of machinery/equipment, workers are expected to take appropriate precautions in accordance with their Health & Safety Plan or shut down activities to reduce or eliminate the potential for accidents or adverse effects.
- **Hail of large dimensions:** The impact of hail on the road and bridges do not cause damages (other than cosmetic). No impact is also expected from the interaction of hail with a project component on health and safety, natural and built environments covered in this study.
- **Lightning storms:** The project components are not predicted to be impacted by lightning and are not expected to add to the danger for road users. Note that wind gusts, heavy precipitations, and wildfires that can be associated with lightning are already covered as individual climate hazards.
- **Extreme cold spell:** While extreme cold temperatures can impact some materials and cause cracking for example, such conditions are already well taken into consideration in Canada for the design of infrastructure and are expected to significantly decrease in frequency and intensity. As noted in **Section 24.2.3**, warm spells and the trend toward fewer days of extreme cold have been observed in northern Ontario in recent decades (e.g., average number of days of -25°C or lower decreased from 79 days in the mid-1950s to 57 days in the mid-2010s). In the event of extreme cold spell affecting the health and safety of construction or maintenance crews and the operation of machinery/equipment, workers are expected to take appropriate precautions in accordance with their Health & Safety Plan or shut down activities to reduce or eliminate the potential for accidents or adverse effects.
- **Topsoil droughts, hydrological droughts, and sinkhole formation from droughts:** With cooler conditions in the Far North, severe droughts that would displace or alter groundwater and/or its movement to cause the land surface to collapse is deemed impossible. Topsoil and hydrological droughts are also not considered to be an issue with regard to the road integrity.
- **Freezing depth:** This hazard is relevant to buried infrastructure like water or gas lines. The hazard associated with freeze-thaw cycles or permafrost degradation are covered in the individual climate hazards.
- **Tornado / downburst / derecho:** The region where the Project is located is not known for such events and are not expected to occur in the future. No control measures other than those already proposed for “wind gusts” hazard would be available, so a risk analysis specific to tornados has been excluded.
- **Ice breakup season:** This hazard applies to the change on the timing and extent of ice breakup on large waterbodies. Although the road traverses some large watercourses, this potential change will not have any direct impact on culverts and bridges components of the Project. Hazard and risk related to spring freshets are covered in the individual climate hazards.
- **Landslide / rockslide:** The topography along the road is relatively flat and there are no hazardous slopes or geological anomalies nearby.

24.1.6 Spatial Boundaries

The spatial boundaries for the assessment of effects of the environment on the Project are variable and can include various environmental and socio-economic study areas. For example, damage to project components or equipment would occur within the Project Footprint; however, potential delays to the construction schedule would be felt within the socio-economic boundaries of the Project (e.g., Community Services and Community Infrastructure Regional Study Area [RSA]).

24.2 Climate and Environmental Conditions

This section describes climate and environmental conditions that have a potential to affect the Project as outlined in **Table 24-3**. Detailed description of these conditions is provided in the Natural Environment Existing Conditions Report (Appendix F) and the Climate Change Resilience Review Report (Appendix I).

24.2.1 Average Climate Trends

The proposed WSR is located within the Big Trout Lake and James Bay ecoregions as part of the Hudson Bay Lowlands Ecozone characterized by a subarctic climate with cool short summer, with only three months with a mean temperature above 10°C. It is subjected to cold and extended winters with relatively low precipitations (compared to southern Canada) due to low temperature and related evapotranspiration. Most precipitations will occur during summertime while winter precipitations are generally associated with cyclonic storms. The relatively flat terrain associated with the Hudson Bay Lowlands Ecozone provides a few barriers to the weather system sweeping down from the north. As a result, the area can experience a variety of weather events.

The characterization of existing local and regional climatic conditions in the WSR area was obtained from the review of historical records of relevant meteorological information including precipitation, temperature, wind and evapotranspiration from two meteorological stations operated by (ECCC, 2024) and located in Lansdowne House and Pickle Lake which are located respectively 100 km and 250 km from the community of Webequie (**Table 24-4** and **Figure 24.1**). Annual mean temperatures in the project study area were estimated at about -2°C considering that Pickle Lake and Lansdowne House communities are located to the south. During summer months, mean temperatures reach 13°C to 17°C with a maximum daily average temperature slightly above 20°C at Lansdowne House (but most likely slightly lower in Webequie). During winter, the average temperature oscillates between -18°C and -22°C, with a minimum daily temperature of -28°C in January as measured at Lansdowne House station (**Figure 24.2**). Temperatures in Webequie have the potential to be much lower as described in **Section 24.2.2**.

Precipitation levels in the area can range between 550 and 650 mm per year, considering that dryer conditions are typically observed when going northward (compared to Pickle Lake and Lansdowne House stations). In fact, precipitations in the Hudson Bay Lowlands Ecozone are said to range between 500 and 700 mm, with the latter being predominant in the James Bay area. A large portion of precipitations falls as rain during summertime (40% of total annual precipitations) while precipitations during wintertime represent low levels for a typical year (13% of total annual precipitations). Hence, about 30% of total precipitations fall as snow. Most precipitation falls as rain from May to September and as snow from November to March, with April and October as transition months.

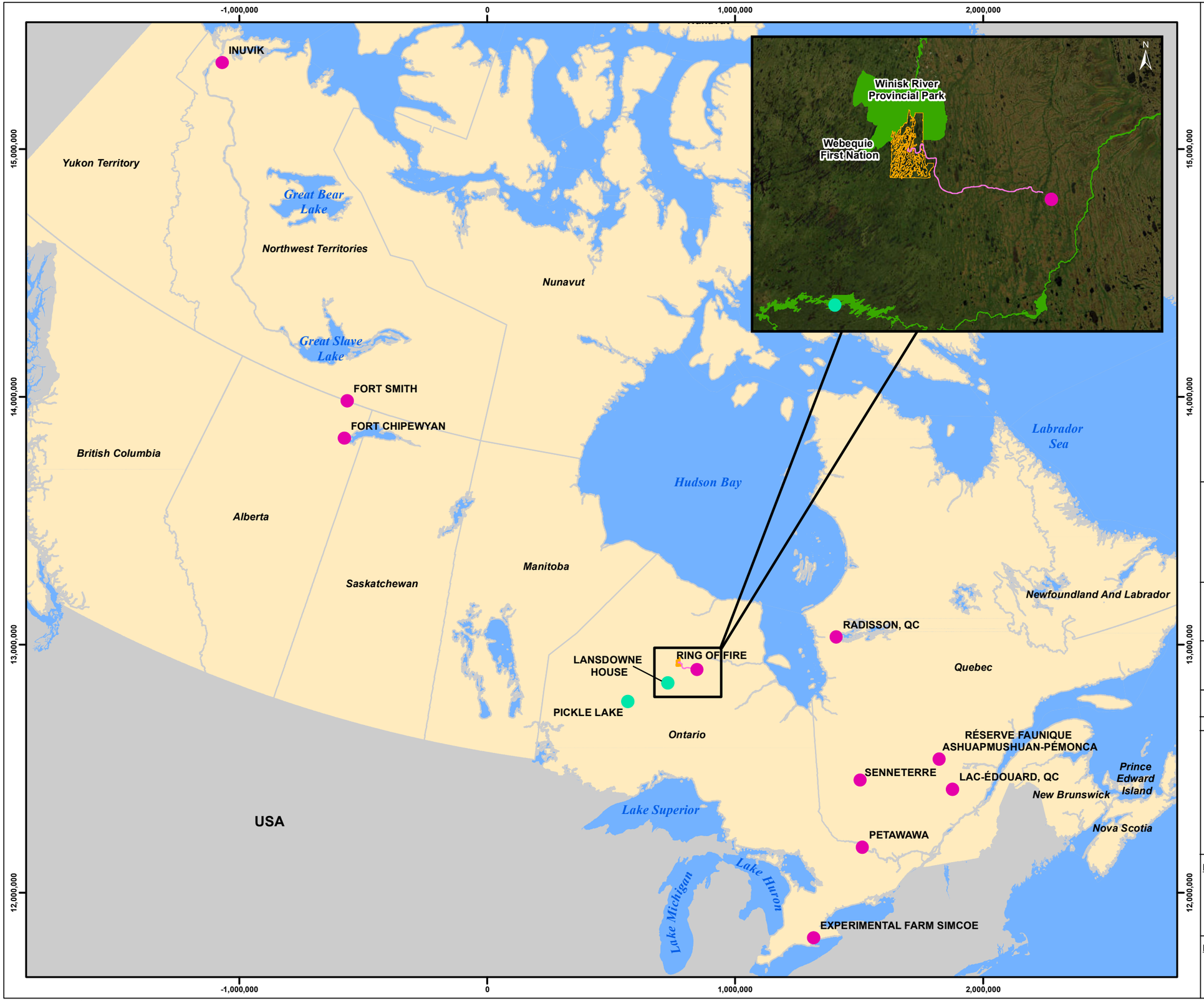
Table 24-4: Past Climate Norms for Stations Nearest to Webequie (ECCC, 2024)

Station	Period	Mean Daily Temperature (°C)	Annual Precipitations (mm)			Mean Wind Speed (km/h)
			Rainfall	Snowfall	Total	
Pickle Lake (250-300 km away) (1)	1991-2010	0.5	522	257	779	n/a
Lansdowne House (100-150 km away) (1)	1961-1990	-1.4	461	257	718	14.2
	1971-2000	-1.3	489	242	730	

(1) Both stations are located to the south-west relative to the WSR.

Other observations of existing weather conditions include:

- Winter winds are typically from the west to northwest, with the summer winds usually from the west to southwest. Lakes typically begin to freeze in mid-October, with spring thaws typically initiating in mid-May.
- Fog is common, with extended periods typically expected in the transition months of ice ‘freeze-up’ in the fall months and ice ‘breakup’ or freshet in the spring. It is also not unusual to have fog occurring during the summer months.
- Annual ice formation in the Hudson Bay Lowlands Ecozone is caused by air temperatures consistently falling below freezing and the subsequent lowering of surface water temperatures starting in September / October. Thawing begins in spring, even before the mean daily air temperatures rise above freezing. Hudson Bay exerts a cooling effect on the Hudson Bay Lowlands Ecozone extending a substantial distance inland well into the summer.
- Snow coverage in the Hudson Bay Lowlands Ecozone often remains until June, reflecting much of the arriving radiant energy back into the atmosphere. In recent years, spring thaw has been observed at early dates.



Legend

- WSR Preliminary Preferred Route
- Ambient Air Monitoring Station
- Meteorological Station
- Webequie First Nation Reserve
- Provincial Park

Webequie Supply Road (WSR)

Location of Climate and Air Quality Monitoring Stations

Figure Number:	REV
24.1	PA

Client:	Project Number:	Date:
Webequie First Nation	661910	1/13/2025

	DRN	CHK	APP
DSC	AD	JV	JV

0 10 20 40 Km

WSR WEBEQUIE SUPPLY ROAD

NOTES

1. Coordinate System: NAD 1983 Ontario MNR Lambert.
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://geohub.lio.gov.on.ca/), Ontario Ministry of Natural Resources and Forestry (OMNRF) Download Date : 2021-02-04

DISCLAIMER

Figure 24.2: Climate Norms (1971-2000) at Lansdowne House Meteorological Station (ECCC, 2024)

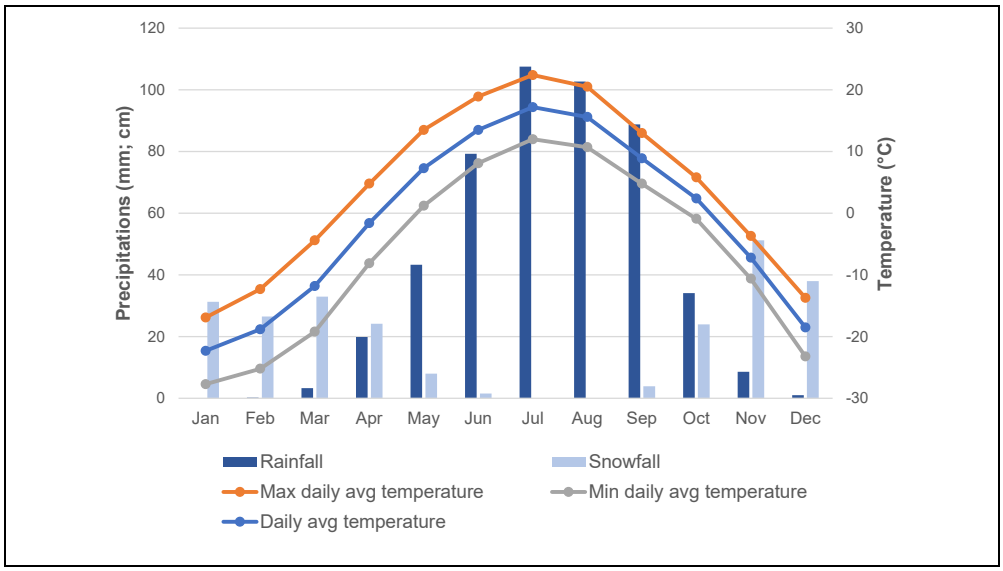


Figure 24.3: Mean Annual Temperature and Total Annual Precipitations over Several Decades at the Pickle Lake Meteorological Station (ECCC, 2024)

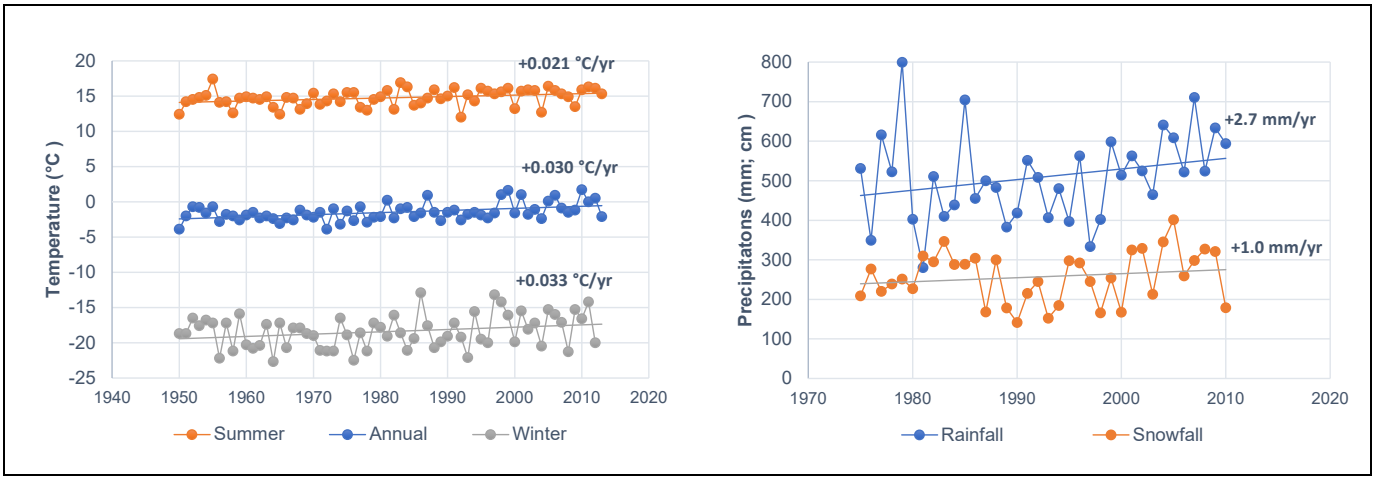


Figure 24.3 illustrates the historical trend for the last decades in terms of mean temperature and total precipitations observed in Pickle Lake. Like many other regions in Canada, the average temperature has been slowly increasing at an apparent rate of +0.03°C per year, meaning that over the last 50 years the average temperature has increased by approximately 1.5°C. The variation of temperature over the last decades is most noticeable during wintertime although the interannual variation is more noticeable compared to summertime (**Figure 24.3**). Although Pickle Lake is located 250 km away from Webequie, similar conditions are more than likely for the WSR area.

Total precipitations monitored over a 35-years period (1975 – 2010) also appear to have slightly increased, but it is less definite due to the large annual variations. The annual increase in precipitations illustrated in **Figure 24.3** is equivalent to less than 1% of total annual precipitations seemingly showing

that it does not and is not expected to increase much more than the current rate of 1% of total annual precipitations in the near future (over a 35-years period similar to the monitored period shown in **Figure 24.3**). Extreme precipitations are however expected to increase at a greater rate, as explained in **Section 24.2.2**.

24.2.2 Extreme Weather Events

The relatively flat Canadian Shield provides a few barriers to the weather system sweeping down from the north. As a result, the WSR area experiences a variety of weather events. **Table 24-5** summarizes extreme weather conditions that were recorded at Lansdowne House and Pickle Lake meteorological stations in the past decades (ECCC, 2024). The following observations can be inferred from the recorded extreme conditions:

- Maximum temperatures historically reached 36.7°C in Lansdowne House while the temperature exceeded 30°C for a total of 2.1 days per year in average from May to August. However, when considering data from Pickle Lake, it is likely that past extreme temperatures in the Webequie area are lower by probably 1 to 2°C since it is located northward of the meteorological stations.
- Minimum temperatures historically reached -47.8°C in Lansdowne House while the temperature went below -30°C for a total of 34 days per year on average. In fact, temperatures have dropped below -40°C during the month of December to March in the past. Similarly, Webequie has likely seen lower minimum temperatures in the past and a higher frequency of days with temperatures below -30°C and -40°C.
- Extreme rainfall has reached 108 mm per day in Lansdowne House but only 78 mm per day in Pickle Lake even though higher precipitation events are to be expected in more southern localities like Pickle Lake. However, the number of days with substantial (>10 mm/d) and heavy (>25 mmm/d) precipitations is more significant in Pickle Lake meaning that Lansdowne House has probably seen a 1:100-year event or so in 1974 while the frequency of high daily precipitations remain lower. Again, Webequie has likely less frequent extreme rainfall events compared to Lansdowne House and especially Pickle Lake, although such events are also conditional to local topography. High rainfall events occur during summertime including September.
- The maximum hourly wind speed reached 80 km/h in Lansdowne House but given that wind is highly specific to location, it is likely not entirely relevant to the Local Study Area. In fact, different wind regimes are to be expected along the proposed road ROW depending on terrain, the presence of lakes, vegetation and so forth. As it is the case for most of northern Ontario, the maximum hourly wind speed should be expected to range between 50 and 60 km/h (Tang, 2016) and wind gusts can be expected to exceed 100 km/h in the WSR area.

Table 24-5: Extreme Values at Meteorological Stations Nearest to Webequie (ECCC, 2024)

Indicator		Lansdowne House (1971-2000) (100-150 km away) [1]	Pickle Lake (1981-2010) (250-300 km away) [1]
Extreme temperature (°C)	Maximum	36.7°C in 1975	38.8°C in 1995
	Minimum	-47.8°C in 1943	-42.8°C in 2004
Number of days in average with temperatures exceeding 30°C		2.1	4.8
Number of days in average with temperatures below -30°C		34	17

Indicator		Lansdowne House (1971-2000) (100-150 km away) (1)	Pickle Lake (1981-2010) (250-300 km away) (1)
Extreme precipitations	Rainfall (mm)	108 mm in 1974	78 mm in 2002
	Snowfall (cm)	50 cm in 1971	44 cm in 2008
Number of days in average with precipitations exceeding:	10 mm	15	20
	25 mm	2.6	3.7
Extreme sustained hourly wind speed		80 km/h in 1957	61 km/h in 1999
Number of days in average with winds exceeding 52 km/h		6.8	1.3
Extreme wind gust speed		117 km/h in 1987	111 km/h in 1996

(1) Both stations are located to the south-west relative to the WSR.

24.2.3 Changing Climate Trends

There are uncertainties surrounding the projections of future changes in climate, due to uncertainties in future greenhouse gas (GHG) emission trajectories and continued development of policies and environmental processes to manage GHG emissions, and the unpredictive nature of the climate system. For the purposes of this assessment, rainfall and runoff (intensity, duration, frequency) and temperature are anticipated to have a larger effect than other climate changes, and consideration of climate change has focused primarily on hydrometeorological and temperature projections. Since Lansdowne House is projected with an annual temperature of 0.8°C comparing to 0.2°C for the WSR region, actual precipitation in the WSR region is expected to be less and the results from the Intensity-Duration-Frequency curves (refer to Section 4.2 of Appendix I for details) are likely overestimated. There are regional climate information and data gathered to describe climate change trends over the past few decades in Ontario (Douglas and Pearson, 2022). Warm spells and the trend toward fewer days of extreme cold (e.g., average number of days of -25°C or lower decreased from 79 days in the mid-1950s to 57 days in the mid-2010s) observed in northern Ontario present challenges for construction and maintenance of winter roads. Over recent years, winter road operations observed that operating seasons have been shortening due to early thaw in the spring and warm spells in mid-season (Douglas and Pearson, 2022). According to the Ontario Provincial Climate Change Impact Assessment Technical Report (CRI, 2023), the northern regions are expected to see an increase in snowfalls initially but will be followed by declines and more precipitation falling as rain. With the increase of precipitations projected during fall and winter, the rise of maximum daily temperatures in winter, and an increase of frost-free days annually, it is likely that freezing rain events will be more frequent in the future which includes the Far North.

The climate change observations described in the Webequie First Nation draft Community Based Land Use Plan (2019) include:

- Based on Ontario climate research efforts, by 2050 northern Ontario may experience an annual temperature increase of as much as 4.5 to 6°C, resulting in changes to weather patterns and ecological systems. Climate change brings the potential of extreme weather events and could impact the distribution and abundance of plant and animal species.

- Webequie Elders and community members have documented projected and historic climate change, and changes in landscapes and weather patterns. For example, community members have shared their knowledge on changes in fish and wildlife populations, permafrost melt and a shortening winter road season.
- Community members shared that they noticed changes in weather patterns, milder winter temperatures, less rainfall, and less snowfall in recent years.
- Knowledge Holders noted that the amount of snow has decreased, and there has been less ice buildup on the river in the last twenty years, from 2000s to 2020s.
- One Knowledge Holder shared that winters in the 1970s were cold, but they have since become mild, with less snow and less blue ice developing on the river.
- Webequie First Nation uses winter roads to transport supplies to and from the Webequie community. Knowledge Holders said that the winter road season has been shortened due to a less snow and ice.
- Some members of Webequie First Nation have said that they have not noticed any change in the weather, beyond snowfall, and that fishing and hunting has not been affected by climate change.

24.2.4 Hydrology and Hydrogeology

Streams in the region have low velocity flow throughout most of the year. Stream flow peaks in the spring and early summer (May to June) as a result of snowmelt runoff and rainfall runoff from saturated soils. Flows recede through the summer and increase in the fall due to an increase in rainfall and a decrease in evaporation. Flows are normally lowest in the winter, and some small streams freeze completely to the stream channel bed. Through much of the area, surface waters move as diffuse flow through broad, densely vegetated fens, with occasional consolidation in defined channels. The stream banks are typical of low gradient and are well defined by earth, boulders, bedrock outcrops and natural levees.

The primary source for groundwater recharge is precipitation including rain and snowfall (melting) which flows in shallow water bearing zones (overburden or shallow bedrock zones) towards nearby waterbodies. However, during major storm events, surface water levels within the waterbodies may rise quickly and recharge groundwater for a short period of time. The groundwater contribution rates to the stream flows along the proposed WSR are estimated to be ranging typically from 20% to 30% at major streams and tributaries. The groundwater contribution tends to be smaller at small tributaries compared to major streams and tributaries, and greater during dry seasons compared to wet seasons.

Localized eskers are scattered along the north-south section and towards the east end of the WSR. These eskers are comprised predominantly of sand and gravel and so, the charge rates are expected to be higher than the remaining sections of the WSR.

Thirty-one (31) waterbody crossings have been identified for the proposed WSR. Twenty-seven (27) have a defined channel/flow path and do not include wetlands or areas that may experience ephemeral flow. The estimated highwater levels (water depth above the stream bed) at the water crossings based on field observations and measurements range from 0.4 m to 4.1 m.

Fish habitat surveys conducted in August and October 2020 for the Project observed localized flooding by beaver activities at some watercourses identified along the proposed road ROW (refer to Section 8.3.2 of the Natural Environment Existing Conditions Report [Appendix F of the EAR/IS]).

24.2.5 Terrain and Geotechnical Conditions

The WSR will cross extensive organic terrains along the east-west section and glacial terrains with mineral soils (sand to silty sand till, silt to silty clay till) on the roughly north-south section leading to the community of Webequie. The organic deposits include peat, muck, and marl from a vast network of bogs (open and treed), fens (open, treed and shore) and swamps with glaciofluvial in-contact deposits of gravel and sand as the eastern terminus. The road will pass through layers of peat and organic clays from 0.5 to 2 m in thickness with some locations greater than 3 m. The organic layer is underlain by a clay/silt till layer of up to 2 m thick, and a Quaternary till layer of up to 5 m thick. Depth to bedrock ranges from 5 to 12 m below the surface.

The terrain and topography along the proposed WSR are relatively flat with two distinct sections: the north-south trending section consisting of a high relief plateau; and the east-west trending section which is an area of low relief. The region has a very low level of seismic activity with the Local Study Area being classified generally as having a “very dense soil and soft and soft rock profile”.

24.2.5.1 Permafrost

The proposed WSR is located within a band of sporadic permafrost where areas have permafrost beneath the land surface while other areas are free of permafrost. Based on this classification, it is estimated that 10-50% of the land area is underlain by permafrost of a few meters thickness with the upper 10-20 m of the ground containing less than 10% of ice (NRC, 1995). However, no observed areas of permafrost were documented along the WSR during soil and terrain field investigations. In fact, dense/hard till and bedrock have no challenges with thaw consolidation while the overburden thickness along the WSR is generally small; therefore, thaw strain is not expected to be substantial. Taliks, supra-permafrost, sub-permafrost and/or intra-permafrost groundwater are not expected either.

24.2.5.2 Erosion

Erosion is the physical dislodgement of soil particles from the earth surface by the action of wind, rain, or other weather processes. This occurs naturally over time, but human interference can cause it to accelerate. The degree of erosion risk at a given site is a function of its regional climate, the erodibility of the soil, and the terrain. For example, erosion risk is increased in regions with heavy rainfall and high winds. Based on prevalent soils along the WSR (silty clay, sandy silt, and organic material), their erodibility is classified as medium. However, the primary connection between terrain and erosion is the way in which terrain affects hydrology. Higher flow velocities cause increased erosion. The flat and heavily vegetated terrain along the WSR slows overland water flow velocities substantially, resulting in low erosion risk in general.

24.2.5.3 Geohazards

There are no major hazardous slopes within 1 km of the proposed WSR ROW. No landslide hazards were identified, nor were sinkholes or major geological depressions or geological anomalies observed along the proposed WSR ROW.

Other potential geohazards include isostatic rise or subsidence, or more commonly referred to as isostatic rebound associated ice sheet retreat. In the general project area, uplift rates are in the order of 8 to 10 millimetres (mm) per year. Generally, the potential risks from isostatic rebound to inland (i.e., non-marine) infrastructure and infrastructure projects are perceived to be negligible. However, the potential effects of isostatic rebound in the project area will be evaluated, and its implications to the design and/or operation

of the Project will be considered and documented (e.g., effects of rebound on seismic conditions, structure design, etc.).

24.2.6 Vegetation

Sparse forest covers approximately 21% of the ecosystem in the Big Trout Lake Ecoregion. Coniferous and mixed forests grow on 19.4% and 8.4% of the area, respectively, and small pockets of deciduous forest grow along river valleys. Burns occupy 8.1% of the ecoregion, the highest percentage in Ontario. This ecoregion is therefore susceptible to fire; however, they are generally smaller than those in more southerly ecosystems in northwestern Ontario. Throughout the western and central portions of the ecoregion, fires are fairly evenly distributed across the landscape, with the exception of the extreme northern fringe. However, in the eastern, wetter part of the ecoregion, burned patches are smaller and further apart (MNR, 2022).

24.2.7 Wildfires

Wildfires result either from anthropogenic causes such as campfires or from natural causes such as lightning. During the summer months, the fire danger rating in the WSR area can be moderate to high (NRC, 2024).

Wildfires are becoming more frequent across Ontario due to climate change (Wotton et al., 2017 as cited in Douglas and Pearson, 2022). The frequency will likely continue to increase over the duration of the project life. Surface fires are not likely to occur on the project site during construction as the Project Footprint includes a buffer (i.e., road ROW) that will be cleared of vegetation.

24.3 Potential Effects and Effect Pathways

As noted in **Table 24-3**, climate and environmental hazards that can affect the project proponents or activities include thick fog conditions, high-intensity short-duration rainfalls, blizzards, long-duration freezing rain (ice accumulation), freeze-thaw cycles, rain on snow events, wind gust events, permafrost degradation, spring and torrential freshets, and wildfires. Potential consequences of these hazards for the Project are damage to project components and delays to the project schedule that may involve potential suspension to activities during the construction and operations phases of the Project. The pathways in which damage to project components or delays to the project schedule may occur during construction and operations include:

- Thick fog conditions, high-intensity short-duration rainfalls, blizzards, long-duration freezing rain, rain on snow events → Reduced visibility and slippery conditions → Suspension of construction or maintenance activities → Risk of project schedule delays during construction and planned maintenance activities during operations.
- High-intensity short-duration rainfalls, rain on snow events, spring and torrential freshets → Water runoffs, infiltration, or flooding → Weakened embankment, potholes, erosion and sedimentation → Risk of project component damage (resulting in repair/replacement costs) during construction and operations.
- Freeze-thaw cycles, permafrost degradation → Weakened embankment, heaving of road surface resulting in potholes, and cracks in concrete of MSF buildings and bridge structures → Risk of project component damage (resulting in repair/replacement costs) during operations.

- Wind gust events → Generating dust and flying debris → Suspension of construction or maintenance activities → Risk of project schedule delays during construction and planned maintenance activities during operations.
- Wind gust events → Causing damage to machinery, equipment or structures at quarries or MSF → Risk of project component damage (resulting in repair/replacement costs) during construction and operations.
- Wildfires → Safety hazard for workers, reduce visibility (due to smoke) for equipment operators, or delay planned construction and maintenance activities → Risk of project schedule delays during construction and planned maintenance activities during operations.
- Wildfires → Causing damage to machinery, equipment, the proposed road structure, bridges, culverts, or structures at quarries or MSF → Risk of project component damage (resulting in repair/replacement costs) during construction and operations.

Effects of the Environment on the Project may result in accidents or malfunctions such as construction and road accidents, or wildlife interactions. An assessment of effects of accidents and malfunctions that may occur during project activities is provided in Section 23 of this EAR/IS.

Section 24.3.1 and **Section 24.3.2** describe the potential effects of damage to project components and delays to the project schedule. **Table 24-6** summarizes hazards/events, pathways, and potential effects of the environment on the Project.

24.3.1 Damage to Project Components

Damage to project components from extreme weather events (such as high-intensity short-duration rainfalls, rain on snow events, spring and torrential freshets, and wind gusts), freeze-thaw cycles and permafrost degradation due to change climate trends, or wildfires may result in a financial loss to the project owner, interruption of service, damage that may require long-term repairs, or increased potential risks to safety of workers or road users.

The proposed project components will be built in accordance with the codes and standards noted in **Section 24.1.1** and described in Section 4.2.1. The proponent will routinely monitor the condition of the road ROW to remediate any damage and protect the integrity of project components. Damage to project components as a result of effects of the environment would be confined to the Project Footprint and is anticipated to be a rare occurrence (i.e., very low to low risk) after considering project design and risk mitigation and control measures (refer to **Table 24-3**). If a project component is damaged, it may be considered of low to moderate magnitude, depending on the extent and location of the damage, and whether the damage results in adverse effects to surrounding biophysical features and sensitivities (e.g., peatlands, fish habitat) or the social-economic environment (e.g., temporary short-term closure of the road during operations). However, the potential effects are not expected to cause a long-term or permanent effect on the Project.

24.3.2 Delays in the Project Schedule

The potential adverse effects associated with delays in the project schedule will vary, depending on the severity, proximity, and duration of the source of the delay (i.e., extreme weather or wildfire). Extreme weather events (i.e., high winds, heavy or persistent precipitation, and blizzards) have the potential to delay project construction or planned maintenance activities during operations phase by reducing visibility for equipment operators, delaying the delivery or receipt of supplies or workers, damaging machinery,

equipment or vehicles, restricted or changing access to the Project Footprint. A wildfire in the WSR area during construction and operations may present a safety hazard for workers and road users or reduce visibility for equipment operators and may delay the delivery or receipt of supplies or workers within the Community Services and Community Infrastructure RSA, depending on the scale and location of the wildfire.

Table 24-6: Hazards/Events, Pathways, and Potential Effects of the Environment on the Project

Hazard/Event	Project Phase	Effect Pathways	Potential Effects	Linkage to VCs
▪ High-intensity short-duration rainfalls ▪ Rain on snow events ▪ Spring and torrential freshets ▪ Wind gust events ▪ Freeze-thaw cycles ▪ Permafrost degradation ▪ Wildfires	Construction and Operations	▪ Extreme weather events such as high-intensity short-duration rainfalls, rain on snow events, and spring and torrential freshets may cause water runoffs, infiltration, or flooding resulting in weakened embankment, potholes, erosion and sedimentation. ▪ Wind gust events may cause damage to machinery, equipment or structures at quarries or MSF. ▪ Changing climate trends may affect freeze-thaw cycles or cause permafrost degradation resulting in weakened embankment, heaving of road surface resulting in potholes, and cracks in concrete of MSF buildings and bridge structures. ▪ In extreme case, wildfires may result in damage to machinery, equipment, the proposed road structure, bridges, culverts, or structures at quarries or MSF.	Risk of project component damage (resulting in repair/replacement costs) during construction and operations	▪ Geology, Terrain, and Soils ▪ Surface Water Resources ▪ Groundwater Resources ▪ Fish and Fish Habitat ▪ Vegetation and Wetlands ▪ Wildlife and Wildlife Habitat ▪ Species at Risk ▪ Atmospheric Environment (Air Quality subcomponent) ▪ Human Health ▪ Social Environment (Community Services and Community Infrastructure subcomponents) ▪ Economic Environment
▪ Thick fog conditions ▪ High-intensity short-duration rainfalls ▪ Blizzards ▪ Long-duration freezing rain ▪ Rain on snow events ▪ Wind gust events ▪ Wildfires	Construction and Operations	▪ Depending on the nature and extent of extreme weather events (such as thick fog conditions, high-intensity short-duration rainfalls, blizzards, long-duration freezing rain, rain on snow events, and wind gust events), construction or maintenance activities may be suspended resulting in delayed schedule. ▪ A wildfire on or near the Project Footprint during construction or operation activities may present a safety or health hazard for workers, reduce visibility (due to smoke) for equipment operators, or delay planned construction and maintenance activities. ▪ Wildfires may result in the temporary suspension of construction or operations activities, either directly, or as a result of evacuation procedures or travel restrictions imposed by emergency response services.	Risk of project schedule delays during construction and operations	▪ Social Environment (Community Services and Community Infrastructure subcomponents) ▪ Economic Environment

24.4 Mitigation Measures

In addition to mitigation and control measures outlined in **Table 24-3** that have been or will be included in the project design and planning to manage risk levels of climate and environmental hazards, **Table 24-7** describes other the key mitigation measures that will be implemented to eliminate or reduce potential effects of the environment on the Project. The proposed mitigation measures were developed based on standards, and proven mitigation measures and construction best management practices and guidelines, including the CSA S6 and Transportation Association of Canada (TAC) Geometric Design Standards, to eliminate or reduce potential effects of the environment on the Project. As described in Section 4 (Project Description), the Construction Environmental Management Plan (CEMP) and Operation Environmental Management Plan (OEMP) to be developed and implemented for the Project will include detailed mitigation measures for construction and operations phases of the Project.

Indigenous community members will have an active role in developing and implementing 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 interest 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.

Table 24-7: Potential Effects and Key Mitigation Measures for Effects of the Environment on the Project

Potential Effect	Key Mitigation Measures
Risk of project component damage (resulting in repair / replacement costs) due to extreme weather events, changing climate trends, and wildfires during construction and operations.	▪ Design the Project in accordance with codes and standards described in **Section 24.1.1** and detailed in Section 4.2.1 of the EAR/IS. ▪ Suspend construction and operations/maintenance activities during extreme weather events (summer/winter storms, flooding, extreme winds). ▪ Implement additional erosion protection and sediment control measures as required. ▪ Prepare and implement an Emergency Response Plan for the Project's construction and operations to include response procedures for extreme weather events and wildfires. ▪ Implement operational monitoring and maintenance procedures and standards. ▪ Inspect and repair project components as required after extreme weather events or a wildfire event. ▪ Post signs advising road users to check media weather from ECCC and local radio and television stations during severe weather events for advisories on potential hazards and measures to take to avoid accidents (that might in turn cause environmental effects). ▪ The need and location of signage (e.g., weather conditions, posted speed limit, awareness of wildlife habitat or crossing, upcoming rest areas, etc.) will be determined in the Detail Design Phase of the Project. Signage shall be according to the Ontario Traffic Manuals for Regulatory, Warning and Guide signage.

Potential Effect	Key Mitigation Measures
	▪ Prior to commencement of construction, the proponent's Construction Contractor will designate a staff as Fire Boss. The Fire Boss will be familiar with firefighting techniques, equipment and procedures. ▪ Do not burn slash/brush and debris when the fire hazard is high or extreme. ▪ A burning permit will be obtained for open fires between April 1 and October 31, including compliance with any stipulated conditions. ▪ Prohibit smoking by workers when the fire hazard is high or extreme; provide designated smoking areas for workers under all other conditions. ▪ Maintain a water truck on the construction site when the fire hazard is high. ▪ Refer to Appendix E – Mitigation Measures: Section 5.15 – Wildfires. ▪ Manage vegetation along the proposed road ROW during construction and operations to reduce risk of damage to project components.
Risk of project schedule delays due to extreme weather events and wildfires during construction and operations.	▪ Contingency and notification procedures will be coordinated by the proponent's Contract Administrator or Owner's Representative with Indigenous communities, Nishnawbe Aski Police Services, and the Ontario Provincial Police if roads are closed due to unsafe conditions. ▪ Adjust schedules for construction activities and planned maintenance activities during the operations phase to account for potential occurrences of extreme weather events by adding additional time as a buffer.

24.5 Characterization of Net Effects for Effects of the Environment on the Project

Effects of the Environment on the Project may remain after the implementation of mitigation measures. The net effects that are predicted to remain following implementation of the proposed mitigation measures are:

- Damage to project components; and
- Delays in the project schedule.

24.5.1 Net Effects Description Criteria

Table 24-8 presents definitions for net effects criteria, developed with specific reference to effects of the environment on the Project. There is no timing criteria defined due to the unpredictable and unknown nature, timing, scope and extent of the potential occurrence of extreme weather events, wildfires and changing climate trends, as noted in **Section 24.1.5**.

Table 24-8: Criteria for Characterization of Predicted Net Effects for Effects of the Environment on the Project

Characterization Criteria	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	Direction relates to the value of the effect in relation to the existing conditions.	**Positive** – Net gain or benefit; effect is desirable. **Neutral** – No change compared with baseline conditions and trends. **Negative** – Net loss or adverse effect; effect is undesirable.
Magnitude	Magnitude is the amount of change in measurable parameters relative to existing conditions.	**Negligible** – No change to project schedule and no risk to integrity of project components. **Low** – Change is detectable but has no effect on the project schedule beyond that of an inconvenience or nuisance value and does not pose a risk to integrity of project components. **Moderate** – Change is detectable and results in moderate modification to the project schedule or poses a low or moderate risk to integrity of project components, which could result in a minor or moderate modification to the biophysical or social-economic conditions. **High** – Change is detectable and is large enough to result in a severe modification to the project schedule or poses a high risk to integrity of project components, which could result in a severe modification to the biophysical or social-economic conditions.
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.	**Project Footprint** – The effect is confined to the Project Footprint. **Local Study Area** – The effect is confined to the Local Study Area. **Regional Study Area** – The effect extends beyond the Local Study Area boundary but is confined within the Regional Study Area.
Timing	Timing criteria indicate the timing (e.g., dates or seasons) importance of the net effect.	Not applicable – There is no timing criteria defined due to the unpredictable and unknown nature, timing, scope and extent of the potential occurrence of extreme weather events, wildfires and changing climate trends.
Duration	Duration is the period of time required until the measurable parameter return to its existing (baseline) condition, or the net effect can no longer be measured or otherwise perceived.	**Short-term** – Net effect restricted to no more than the duration of the construction phase (approximately 5 years). **Medium-term** – Net effect extends through the Operations Phase of the Project (75-year life cycle). **Long-term** – Net effect extends beyond the Operations Phase (greater than 75 years). **Permanent** – Recovery to baseline conditions unlikely.
Frequency	Frequency refers to the rate of occurrence of an effect over the duration of the Project or in a specific phase.	**Infrequent** – The effect is expected to occur rarely. **Frequent** – The effect is expected to occur intermittently. **Continuous** – The effect is expected to occur continually.

Characterization Criteria	Description	Quantitative Measure or Definition of Qualitative Categories
Context	Context considers sensitivity and resilience of the measurable parameter to project-related change.	**Sensitive** – With measurable changes in the short-term. **Resilient** – No measurable changes in the short-term.
Input from Indigenous Peoples	Views of the Indigenous communities and groups in assigning the criteria to be used and in characterizing the effects.	Not applicable – No inputs on net effects criteria were received during the engagement and consultation.
Reversibility	Reversibility describes whether a measurable indicator can return to its existing condition after the project activity ceases.	**Reversible** – The net effect is likely to be reversed after activity completion and rehabilitation. **Irreversible** – The net effect is unlikely to be reversed.
Likelihood of Occurrence	Likelihood of occurrence is a measure of the likelihood that an activity will result in an effect.	**Unlikely** – The effect is not likely to occur. **Possible** – The effect may occur, but is not likely. **Probable** – The effect is likely to occur. **Certain** – The effect will occur.

24.5.2 Damage to Project Components

Based on extreme weather events expected for the region and design considerations of the Project, potential adverse effects of an extreme weather or wildfire event are expected to be eliminated or reduced. The project design (refer to **Section 24.1.1,** Section 4 (Project Description), and Appendix D-1 (Preliminary Design Report) of the EAR/IS), has incorporated the CSA S6, TAC Geometric Design Standards, and MTO standards that are expected to mitigate potential effects of flooding, erosion and sedimentation that may result from typical and predictable weather events and severe/extreme weather events expected to occur in the WSR area.

All waterbody crossing structures are sized to convey a minimum 100-year design flow (probable rainfall event within 100-year period) after accommodating for increases in rainfall intensities due to climate change. This proposed design standard exceeds MTO Highway Drainage Design Standards and include consideration of climate change. Should flooding occur, contingency procedures and notifications will be implemented and coordinated with Indigenous communities, Nishnawbe Aski Police Service and the Ontario Provincial Police if roads are closed due to unsafe conditions.

Wetlands and vegetated areas are increasingly being valued as tools for flood prevention and attenuation. Restoration of disturbed areas associated with temporary project components will include appropriate erosion and sediment control measures and natural revegetation or seeding with approved/recommended seed mixes. Valued components (VC) or VC subcomponents potentially at risk from effects of the environment on the Project include:

- Geology, Terrain and Soils, Surface Water Resources, Groundwater Resources, Vegetation and Wetlands, Wildlife and Wildlife Habitat, and Fish and Fish Habitat – in the event of runoff, erosion, sedimentation, or an accident resulting from extreme precipitation, wildfires, or flooding.
- Air Quality and Human Health – in the event of high winds or wildfires generating dust and smoke.
- Human Health and Community Services and Infrastructure – in the event of an accident resulting from extreme precipitation, flooding, high winds, or blizzards.
- Community Services and Infrastructure – in the event of wildfire or extreme weather delay construction and/or operations.

The likelihood of a severe and intense fire occurring during the life of the Project is possible. The project design criteria are expected to eliminate or reduce potential adverse effects of an extreme weather or wildfire event. Effects of the Environment on the Project will be further reduced by the implementation of proposed mitigation measures outlined in **Section 24.4,** which in turn will reduce the potential of risk on the VCs. The interaction between the Project and wildfires is expected to be limited to the sustainability of its components since health and safety hazards and damages to the environment (natural and built) would be directly impacted by wildfires and not due to the presence of the road. With the exception of oil stains on the road, the road surface is generally not flammable and direct damages to the road due to fire should remain limited. Wildfire risks on the eastern part of the WSR is anticipated to be low as the peatlands is saturated and not very flammable. For the western part of the WSR, the 35 m ROW for the road should provide sufficient clearance from potential burning trees that may fall on the road surface. As such, damage to the road due to a wildfire is expected to be limited to cracks and potholes due to heating. Other components that are made with metal such as road signs, guardrails and culverts are more susceptible to damages from heat and may require repairs following a wildfire event. The same applies to bridges composed of concrete and steel that would also be impacted by heat.

The proponent will routinely monitor the condition of the road ROW to remediate damages and protect the integrity of project components. Damage to project components as a result of effects of the environment would be confined to the Project Footprint and is anticipated to be a rare occurrence with consideration of project-specific design measures. If a project component is damaged, it may be considered of low to medium magnitude, depending on the extent and location of the damage, and whether the damage results in changes to the relevant VCs.

24.5.3 Delays in the Project Schedule

Delays in the project schedule may be immediate to long-term in duration. An extreme weather event or wildfire may last less than a day (e.g., heavy rainstorm), but is not anticipated to extend longer than one season. Re-establishment of vegetation where required following construction may take longer (e.g., long-term) than expected if extreme weather events, wildfires, or changing climate trends resulting in drought condition that affect vegetation growth. Additional site-specific remedial measures will be determined as required to address issues related to vegetation re-establishment. Project materials, machinery, and equipment used will be suitable for the expected climate conditions in the project area, including potentially high precipitation and temperatures. In case of a wildfire, the proponent will report relevant information to applicable Indigenous communities, Nishnawbe Aski Police Services and emergency and fire services in Webequie. Fire control efforts by project personnel will be limited, if warranted, due to safety issues, and will consider fire conditions, safety, fitness of personnel, and equipment availability in response to a fire. Project construction and operations will be suspended in potentially affected areas if conditions are considered to be unsafe by the proponent or if requested by the appropriate authorities. The project schedule can be modified to address delays (i.e., reversible).

Delays to the project schedule are confined to the construction phase of the Project or the duration planned for maintenance activities during operations. This net effect could be low to medium magnitude, depending on the length of delay (e.g., if a substantial change in the construction schedule could influence the required in-service date).

24.5.4 Summary of Net Effects

Table 24-9 summarizes the characterization of the predicted net effects associated with effects of the environment on the Project.

Table 24-9: Summary Net Effects Characterization for Effects of the Environment on the Project

Predicted Net Effects	Direction	Magnitude	Spatial Boundary	Duration	Frequency	Context	Reversibility	Likelihood
Damage to project components	Negative	Low to moderate (depending on the extent and location of the damage)	Project Footprint to Community Services and Infrastructure RSA	Immediate to long-term (damage to project components may require long-term repairs)	Infrequent (effects expected to occur rarely after considering project design)	Resilient to sensitive (depending on the extent and location of the damage)	Reversible (damage to project components can be repaired)	Possible
Delays in the project schedule	Negative	Low to moderate (depending on the length of delay)	Project Footprint to Community Services and Infrastructure RSA	Immediate to long-term (re-establishment of vegetation after construction may be long-term due drought condition)	Infrequent (effects expected to occur rarely after considering project planning and mitigation)	Resilient to sensitive (depending on the length of delay)	Reversible (project schedule can be modified to address delays)	Possible

Note: Refer to **Table 24-8** for definitions of categories for net effects characterization.

24.6 Significance Determination

For effects of the environment on the Project, a net effect is considered significant if it is predicted to be either of the following:

- Irreversible and of high magnitude; or
- Reversible, but long-term or permanent in duration, and of high magnitude.

Based on the characterization of net effects described in **Section 24.5** and summarized in **Table 24-9**, there are no ratings of a net effect of the environment on the Project that are expected to be irreversible and of high magnitude, or reversible with long-term or permanent duration and of high magnitude. Therefore, a damage to project components or a delay in the project schedule as a result of effects of the environment on the Project is considered to be not significant.

24.7 Prediction Confidence in the Assessment

Prediction confidence is considered moderate as there is a good understanding by the Project Team on the potential effects of the environment on the Project. As described in Appendix B (Climate Risk Analysis Approach) of the Climate Change Resilience Review Report (Appendix I), there are uncertainties regarding projected climate change trends. However, the risk analysis was conducted considering the worst-case scenario (refer to Section 4 and Appendix A within Appendix I for details); therefore, the assessment of effects of the environment on the Project is conservative.

24.8 Follow-up and Monitoring

Follow-up and monitoring on effects of the environment on the Project will be integrated as part of the CEMP and OEMP that will be developed for the Project and includes implementation of post-construction monitoring procedures and reporting. Follow-up and monitoring activities will include, but are not limited to, the following:

- Monitor implementation of the proposed risk control and mitigation measures during construction and operations;
- Regularly inspect and evaluate the integrity of the project components;
- Inspect and repair project components as warranted after extreme weather events; and
- Implement adaptive management to mitigate climate risks, depending on future climate projections.

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.

24.9 Conclusion

According to the climate risk analysis, there are no moderate and high risks associated with this Project. However, climate change is expected to cause more severe weather in the future, particularly with respect to hydrometeorological and temperature parameters, and these effects will likely continue to escalate for the duration of the Project. The project design incorporates measures to withstand an increase in extreme weather events, however the extent of this increase or the damages that may occur cannot be meaningfully predicted with high confidence.

Taking into consideration the risk of weather events, the project design, and the implementation of mitigation measures, and follow-up actions, net adverse effects of the environment on the Project are predicted to be not significant.

Given that climate change trends have the potential to increase risks to winter/ice roads in northern Ontario region (Reid, 2015 as cited in Douglas and Pearson, 2022), the Project by design as an all-season road will result in increasing self-sufficiency with respect to consumables should future mining and other road projects (i.e., Northern Road Link and Marten Falls Community Access Road) proceed to the McFaulds Lake area and provide opportunities for year-round access to the provincial highway system, which is considered as a positive effect on social and economic conditions for Webequie First Nation and neighbouring Indigenous communities. Potential effects of the Project on local and regional economy are assessed in Section 15 and the assessment of the Social Environment is presented in Section 14.

24.10 References

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