WAASIGAN
TRANSMISSION LINE

FINAL ENVIRONMENTAL ASSESSMENT

Section 6.2 Surface Water

November 2023

Acknowledgements

We wish to acknowledge that the Waasigan Transmission Line Project is located within lands that represent the traditional territories and homelands of the Robinson-Superior Treaty (1850) and Treaty #3 (1873) First Nations, and traverse the Red Sky Métis Independent Nation, Northwestern Ontario Métis Community and Northern Lake Superior Métis Community.

Hydro One also wishes to acknowledge Indigenous artist, Storm Angeconeb, for developing the covering page and wildlife designs throughout the Final Environmental Assessment. Storm is a highly recognized visual artist from Lac Seul First Nation in Treaty #3 and currently resides in Red Lake. Many of her works include animals and birds as representations of herself or those close to her. The artist's description of the covering page is presented below.

Hydro One Environmental Study Art:

What stands out in this art piece is the symbolic representation of solar rays as "Bringing Power"; we can see the environment represented through the wildlife and Ojibwe floral visuals. This artwork is an excellent representation of Hope, Life, and Opportunity, visually portrayed through the Black Bear and her two cubs. The colour theme of this artwork comes from the Waasigan Transmission Line Project brand identity.

Artist: Storm Angeconeb

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6.2 Surface Water

Waasebiite

This section describes and summarizes the surface water baseline studies undertaken for the Project and presents an assessment of the effects of the Project on the surface water environment. The assessment follows the general approach and concepts described in Section 5.0.

For the purposes of this document, waterbodies are defined as areas with defined bed and banks, whether or not water is continuously present, and is consistent with the general definition used under the *Conservation Authorities Act* (Government of Ontario 2022a) and Ontario Stream Assessment Protocol (Stanfield 2017). A waterbody may be permanent, intermittent, or ephemeral. Types of waterbodies include watercourses (e.g., streams, rivers), lakes, and ponds (Government of Ontario 2021d).

6.2.1 Input from Engagement

Comments pertaining to surface water that were provided by Indigenous communities, government officials and agencies, and interested persons and organizations during engagement and how they are addressed in the environmental assessment (EA) are listed in Table 6.2-1. Comments and responses are provided in Section 4.0 – Engagement Summary. In addition, the Draft EA Report was provided to Indigenous communities, government officials and agencies, and interested persons and organizations for review and comment on May 17, 2023. A high-level summary of the key themes from the comments on the Draft EA Report and related engagement meetings are included in Table 6.2-1. The detailed responses to these comments are included in Appendix 4.0-A.

Indigenous communities and agencies noted during the Terms of Reference (ToR) process that additional field surveys should be completed on all alternative routes. The importance of water to Indigenous communities was recognized and factored into the decision to survey all alternative routes for baseline studies, which was not required in the Amended ToR.

The draft Aquatics Field Work Plan was provided to Indigenous communities and agencies for review on March 22, 2022. Comments were received from Indigenous communities throughout the field season and addressed before releasing the final Aquatics Field Work Plan in September 2022.

Notices were provided to Indigenous communities ahead of planned field activities, which provided details on the proposed field surveys, methods, locations, and a request for Indigenous participants in the surveys. Maps were available for download and an online platform was made available for Indigenous communities to review proposed field survey locations to identify any concerns. Hydro One also completed open house sessions with Indigenous communities where the field plans and maps were made available.

No concerns from Indigenous communities were received on the proposed aquatics field survey locations. There was one section of the Alternative Route 3B that was identified by an Indigenous community as being culturally sensitive and field surveys were avoided in this area. Bi-weekly field summary reports were provided to Indigenous communities to provide regular updates on the field survey progress throughout the field season.

Table 6.2-1: Summary of Comment Themes Raised during Engagement Related to Surface Water

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Concerns regarding the use of herbicides.	Through engagement during the draft EA process, Hydro One heard feedback from Indigenous communities and stakeholders regarding concerns with the use of herbicides to remove and manage vegetation on the Project. After extensive consideration of this feedback, herbicides will not be used during construction of the Project or for future maintenance of this transmission line. The Final EA has been updated to reflect this.	Gwayakocchigewin Limited Partnership Lac des Mille Lacs First Nation Mitaanjigamiing First Nation Northwestern Ontario Métis Community (NWOMC) and Region 2 Ministry of Natural Resources and Forestry (MNRF) Members of the public
Concerns regarding effects to water and watersheds.	Potential effects to water quality and quantity are assessed and the results of this assessment are considered in Section 6.2 – Surface Water and Section 6.6 - Fish and Fish Habitat of the Final EA. Recommended mitigation measures are identified in Sections 6.2 and 6.6. Further information on how potential effects to surface water are considered in the assessment of potential effects to First Nations rights, interests and land use are discussed in Section 7.7 and to Métis rights, interests and land use in Section 7.8.	Gwayakocchigewin Limited Partnership Lac des Mille Lacs First Nation Mitaanjigamiing First Nation NWOMC and Region 2 Members of the public

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Request for information summarizing the water quality data described for each watershed included in the assessment.	Summary of the observed water quality conditions for each watershed is provided in Attachment 6.2-A-1 in Appendix 6.2.	Gwayakocchigewin Limited Partnership
Concerns regarding turbid water near watercourses, construction crews should employ sediment bags attached to the end of discharge hoses and pipes to limit turbidity and excess sediments from reaching watercourses.	Sedimentation in the receiving environment will be controlled by directing sediment laden water to various temporary storage and settlement features (i.e., sumps, settling ponds or catch basins) prior to discharge. Alternately, where appropriate, the sediment laden water will be directed to drain/filter through low gradient, well-vegetated areas away from watercourses (i.e., using pumps, hoses, etc.). Sediment control measures will be incorporated prior to construction activities or immediately after disturbance on site-specific cases throughout the Project to avoid introduction of sediment to the environment, and, as part of this, to stabilize drifting soils or loss of topsoil, as practicable. Sediment control measures may include silt fences, filter bags, straw bale fences, berms, ponds and gravel or vegetative filters, check dams, erosion control blankets, and other features. Additional contingency measures will be implemented as appropriate in the event of excessive rain, wet weather or flood-like conditions (when the planned activity could cause significant damage to soils, such as rutting by traffic through the topsoil, soil structure damage during soil handling, or compaction and associated pulverization of topsoil structure damage due to heavy traffic) and are described in this section.	Gwayakocchigewin Limited Partnership

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Concern around the percentage of waterbodies and water crossings being surveyed during field studies.	The field programs aimed to capture 25% of sites for the alternatives assessment; however, additional surveys will be completed where necessary to support permitting. As a conservative approach, all sites that were not assessed in the field and/or where background data was unavailable were considered throughout the EA.	Grand Council Treaty #3
Concerns regarding the over-reliance of desk-top data sets provided by third parties which could be out-dated and not representative of Anishinaabe knowledge and processes.	The review of available desktop data was a first step in the baseline characterization process. Field data collected during the 2022 field programs was then used to inform the baseline and effects assessments presented in Appendix 6.2-A. Indigenous knowledge shared by communities has also been considered during the assessment, respecting any guidance shared on its use by the community.	Grand Council Treaty #3
The importance of providing a visual representation of the mapped impacts resulting from the field studies.	Results of field studies, including mapping, are available in EA Section 6.2 for the surface water component.	Grand Council Treaty #3
Request for sharing field data including the preliminary baseline environmental studies and desktop datasets.	A summary of the field survey results is presented in Appendix 6.2-A. The raw data from field surveys will be shared with Indigenous communities upon request.	Grand Council Treaty #3 Lac des Mille Lacs First Nation
Request for baseline information to be shared publicly or with other organizations to help the advancement of science and potential impact to First Nation values.	Baseline information is presented in Appendix 6.2-A. Consideration of the potential impacts to First Nation values is important to this Project and discussion with Indigenous communities regarding their values and potential impacts to their values is an important part of the EA process. Input received from field monitors and community engagement has been considered during the assessment and communicated with sensitivity in Project documentation.	Lac des Mille Lacs First Nation

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Concern regarding water quality downstream of water crossings due to runoff from dust suppression applications and concern regarding the water quality downstream of gravel pits.	Trained staff and best management practices will be utilized for dust suppression to reduce the risks of runoff to a watercourse or ground erosion occur. Mitigation outlined in Sections 6.2.7.8 and 6.2.7.11 will also protect against the risks of these activities. All aggregate pits will be located a minimum of 120 m away from the ordinary high-water mark of a waterbody, where possible. The aggregate pits will follow the guidelines and associated conditions/ requirements of the approved permits, including development of a rehabilitation plan, outlined in the Aggregate Permits on Crown Lands for Pits and Quarries above Water (MNRF 2014) and the Forest Management Planning Manual (OMNRF 2017).	Lac des Mille Lacs First Nation
The importance of measuring turbidity or Total Dissolved Solids (TDS) during field surveys to assess water quality.	Turbidity was recorded in the field and the results are presented in Appendix 6.6-A.	NWOMC and Region 2
Consideration of construction effects which could result in accidental release of high pH wash water beyond identification in mitigation measures alone.	The 30 m buffer applied to waterbodies as well as monitoring at wash out sites will protect against wash water impacting the pH of nearby fish habitat. Hydro One with their contractor(s) will prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill or accidental release occurs. Indigenous communities being engaged as part of the Project may choose to undertake community-defined monitoring to observe the implementation of mitigation defined in the EA.	NWOMC and Region 2

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Request for additional detail in relation to the mitigation measures for minimization of dust generating activities.	Construction will implement effective dust suppression techniques, such as on-site watering, as necessary to minimize fugitive dust at worksites and access roads as required. Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride will be completed in consultation with road authorities. These dust suppression mitigation measures will be included in Dust Control/Air Quality Plan.	NWOMC and Region 2
Concerns regarding the magnitude of potential impacts from concrete wash water and concrete dust on water quality.	Compliance with setbacks and validation through monitoring will limit potential impacts to surface water quality through management of concrete wash water. Deposition of dust to surface water is also considered in Section 6.2.7.2 Changes to Surface Water Quality from the Transport and Delivery of Airborne Particulate Matter to Nearby Waterbodies, where the mitigation measures are identified. With effective implementation of these measures and of the monitoring plans identified, no "measurable change (discernable) that is expected to be at or slightly exceed the limits of baseline conditions or guideline values" are anticipated. Accordingly, no change to the current determination of magnitude is evaluated to be warranted.	NWOMC and Region 2
Recommendation for the use of the qualifier "substantially" to increase the scale of magnitude to allow for fair consideration of net effects.	The magnitude effect level description for moderate magnitude and high magnitude have been updated to more closely align with the magnitude effect levels for fish and fish habitat. This includes removing the reference to "substantially".	NWOMC and Region 2

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Question around how surface water survey locations for field study were identified.	The field surveys targeted a subset of waterbodies that are crossed by the Project footprint for each alternative route (rather than the full list of crossing locations). The field surveys targeted approximately 25% of the total estimated number of mapped and unmapped (i.e., determined through air photo interpretation or field investigations) waterbody crossings along the Project footprint of each alternative route, which includes both the transmission line ROW and access roads. The site selection process for the subset of waterbody crossings relied primarily on the guidance and procedures under the *Crown Forest Sustainability Act* (Ontario 1994). Site selection also considered a scaled approach, with a plan to select a representative number of waterbody crossings under three different categories of watershed size: small (areas of 1 km^2 to 50 km^2), medium (areas of 50 to 500 km^2), and large (areas greater than 500 km^2). The scaled approach to the site selection process offered the opportunity to extrapolate the field data from a particular watershed category to other waterbody crossing locations in the same category. Further detail can be found in Section 5.2.1 of the Draft Waasigan Transmission Line Field Work Plan – Aquatics (Hydro One Inc. 2022).	Red Sky Métis Independent Nation
Suggestion to clearly articulate the differences in design standards and approval requirements between clear-span bridges and rig mats.	It is recognized that there are several layers of legislation for consideration within the EA. A rig mat is considered to bridge small watercourses and was considered to facilitate a span that would avoid interference with watercourse beds and banks as defined by DFO's Code of Practice for Clear Span bridges. The EA text has been updated to clarify that a rig mat crossing, though technically a clear span, is not a bridge as classified by the MNRF due to the definition in the Crown Land Bridge Management Guidelines. To clarify, rig mats will only be used for	Ministry of Natural Resources and Forestry (MNRF)

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
	crossings where the span is no greater than three metres. Clear-span bridges will undergo the permitting of a permanent crossing structure. However, rig mats are exempt from permitting of the permanent structures provided the installations are above the high-water mark, they are removed prior to spring freshet, appropriate erosion and sediment controls are utilized and no in-water work is required.	
Recommendation to use a slope-dependent buffer model when determining the width of riparian areas and when planning water crossing.	The 2010a MNRF guidelines for applying 30 m buffer was considered in the Final EA. The slope dependent calculations will be addressed as part of the detailed design.	MNRF
Request for further clarification regarding vegetation buffer clearing up to 10 m and placement of material from watercourses and to confirm a method of removal within a potential riparian zone. Request for practices adjacent to watercourses to follow MNRF Environmental Guidelines for Access Roads and Water Crossings and consider defining where the potentially erodible material will be placed in relation to the high-water mark.	Incompatible vegetation that may interfere with the transmission line will be removed. Compatible vegetation will be retained within riparian areas and within 10 m of watercourses. Timber, chips and other organic debris will be stored outside the buffer zone and above the high-water mark of any nearby waterbody. Earthworks will take into consideration buffer zones around waterbodies to the extent practicable. Placement of erodible materials below the high-water mark will be limited to the extent possible, and only in conjunction with sediment and erosion control measures prior to commencing construction work.	MNRF

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Concerns regarding the rationale for type of water crossing selected.	Prior to installation of a water crossing structure, a qualified professional will assess the stream characteristics to confirm the correct structure has been selected. The MNRF will be notified where any changes to proposed crossing structures are required. Log fills will only be prescribed in wet areas where there are no defined channels and are intended only to maintain natural drainage patterns. There will be no log fills installed in any waterbody with a defined channel, whether it is wet or dry. In effect, log fills will only be used where there is clearly no impact to fish or fish habitat. Language will be added to the EA to clarify this point.	MNRF
Ground truthing of the proposed activities in the Access Plan is required to ensure no duplication of water crossing installations (i.e., not installing new road crossings where existing crossings are present nearby) and that ice crossings are feasible at identified locations.	Field verification of waterbody crossings will be completed to confirm crossing type. The access plan has been updated to remove a proposed ice bridge at Finlayson Lake identified not to be feasible.	MNRF
Comment that the proposed access plan, with elevation mapped, should be reviewed and ground-truthed to ensure that the proposed access route will remain on land and to account for steep banks alongside waterbodies.	Additional ground truthing will be completed in advance of access development. The nature of the limits of work approach (Section 11.3) and alternative access identified are intended to facilitate changes to avoid obstacles.	MNRF

Comment Theme	How Addressed in the Environmental Assessment	Indigenous Community or Stakeholder
Request for further information of the type of risk to watercourses/fish and fish habitat and how they will be mitigated to assess the potential impact of the helicopter pad locations.	Helicopter pad locations will apply a 30 m buffer around waterbodies and all recommended erosion and sediment control and spill prevention mitigation measures will be implemented as appropriate.	MNRF

EA = Environmental Assessment; CFSA = *Crown Forest Sustainability Act*; LSA = Local Study Area; RSA = Regional Study Area; QA/QC = quality assurance/quality control; < = less than; km^2 = square kilometres.

6.2.2 Information Sources

A desktop study of surface water conditions was completed to characterize baseline water quantity and quality for the Project. This study involved the review and compilation of relevant information from the following sources:

Table 6.2-2: Summary of Background Data Review including Record Sources and Records Reviewed

Record Source	Records Reviewed or Obtained
WSP (formerly WSP Golder) Aerial (helicopter) Reconnaissance.	• Confirmation (presence or absence) of mapped and unmapped waterbody features; • Estimated dimensions of water bodies; and • Description of general flow conditions and erosion-sedimentation patterns in the water bodies.
Land Information Ontario (LIO) data requested and/or accessed (MNRF 2022a, c, d).	• Active aggregate pits; • Conservation reserves (CLUPA, GapTool); • Forest Resource Inventory Ecosite and Wetland Layers (LIO); • Hydroelectric generation locations; • Waterbodies/watercourses; • Wetlands; • Watershed boundaries; • National parks; • Provincial parks (CLUPA, GapTool); and • Recreation and tourism features, such as canoe routes, trails, portages, and campsites.

Record Source	Records Reviewed or Obtained
ArcGIS World Imagery, published by Environmental Systems Research Institute (ESRI 2022a) and updated in December 2022.	• Satellite and aerial imagery.
Environment and Climate Change Canada (ECCC 2022a).	• Canadian Climate Normals (i.e., 1981-2010).
Ministry of Northern Development and Mines (MNDM 2006).	• Geology Terrain Data (1:100K) from the Northern Ontario Engineering Geology Terrain Study.
Ontario Geological Survey (OGS 1997).	• Quaternary geology of Northern Ontario.
ArcGIS World Topographic Map, published by Environmental Systems Research Institute (ESRI 2022b) and updated in December 2022.	• ArcGIS World Topographic Map.
Ministry of Environment, Conservation and Parks (MECP) published in April 2022 (MECP 2022b).	• Permits to Take Water (PTTW) Data Catalogue.
Capstone Infrastructure (2022), H2O Power (2020), North Vista (2022), and Ontario Power Generation reports (OPG 2022a, b).	• Hydroelectric generation locations.
Environment and Climate Change Canada (ECCC 2022b).	• Archived hydrometric data from Water Survey of Canada (WSC) records.
MECP Provincial (Stream) Water Quality Monitoring Network (PWQMN) (MECP 2022c).	• Archived water quality data.
MECP Source Protection Information Atlas (MECP 2022d).	• Source water protection zones.
Fisheries and Environment Canada (January 1978).	• Hydrological Atlas of Canada.

Record Source	Records Reviewed or Obtained
Ontario Hydro Network (OHN) (MNRF 2022a, b) and Ontario Watershed Information Tool (OWIT) (MNRF 2022c).	• Watershed details and return period flow estimates.

CLUPA = Crown Land Use Policy Atlas; ECCC = Environment and Climate Change Canada; LIO = Land Information System; MECP = Ministry of the Environment, Conservation and Parks; MNDM = Ministry of Northern Development and Mines; MNRF = Ministry of Natural Resources and Forestry; OGS = Ontario Geological Survey; OHN = Ontario Hydro Network; OWIT = Ontario Watershed Information Tool; PTTW = Permit to Take Water; PWQMN = Provincial Water Quality Monitoring Network; WSC = Water Survey of Canada.

The background information from the desktop analysis was relied on to specifically characterize the following considerations, with the understanding that the results of the ground-based field investigations were used to further augment this baseline characterization:

- Watershed and river system characteristics;
- Surface water use;
- Surface water yield and its seasonal distribution, noting that surface water yield represents the average outflow from a catchment over a given time and is calculated by dividing the mean volume of streamflow over a specified period by the surface area of the watershed or catchment; and
- Surface water quality.

Each of these considerations are described in the following subsections:

Watershed and River System Characteristics

The available mapping and imagery from the OHN and other sources, coupled with the hydrometric data from the OWIT, were used to identify and characterize the watersheds intersected by the Project footprint. This review process was also used to develop the water crossing list for the Project (detailed in Section 2.3.1)

Surface Water Use

A review of the PTTW Data Catalogue, in combination with various sources of publicly available information on hydroelectric generation in Ontario, was used to identify existing surface water use.

Surface Water Yield

Surface water yields for the subject watersheds were inferred and interpreted based on historical streamflow records from regional hydrometric stations (maintained by WSC) and related information from the OWIT and atlases. The compilation of this data involved conventional statistical methods to assess mean flows and seasonal distributions, as well as exceedance probabilities for return periods.

Surface Water Quality

A review of PWQMN datasets was used to characterize water quality conditions for available monitoring stations. For the purpose of this study, stations with recent data, albeit discontinued from regular operation, were considered.

6.2.3 Criteria and Indicators

Criteria are components of the environment that are considered to have economic, social, biological, conservation, aesthetic, or ethical value, as described in Section 5.2. This includes surface water, which is defined as the water that collects at the surface of the ground.

Indicators are an aspect or characteristic of a criterion that, if changed as a result of the Project, may demonstrate a physical, biological or socio-economic effect.

The indicators for the surface water criteria are defined as follows:

- **Surface Water Quantity**: The amount or abundance and spatial configuration of surface water - streamflows and/or water levels. This is measured qualitatively or quantitatively as a change in overall representation (abundance and distribution) of the criterion in the assessment area.
- **Surface Water Quality**: The physical, chemical, and biological characteristics of surface water, typically defined by suspended solids and chemical constituents present.

The criteria and indicators for surface water were initially outlined in the Draft ToR. Feedback from Indigenous communities, government officials and agencies, and interested persons and organizations received during engagement was incorporated into the preliminary criteria and indicators approved in the Amended ToR.

No concerns have been raised during the EA process regarding the preliminary criteria and indicators proposed in the Amended ToR. A summary of the criteria, and indicators selected for the assessment of Project effects on surface water, and the rationale for their selection, are provided in Table 6.2-3. Of note, the indicators that have been reported herein for the surface water discipline include one minor revision (relative to the information that had been presented in the Amended ToR). The considerations related to the types and timing of water crossings to be used or constructed and surface water withdrawal volumes during construction (conditions that had been previously identified as indicators for surface water quantity and quality) have since been assigned as specific components or activities of the Project that could have an effect on the surface water environment (i.e., Project-environment interactions that could result in changes to streamflows, water levels, water chemistry, etc.).

Table 6.2-3: Surface Water Criteria and Indicators

Criteria	Indicators	Rationale for Selection	Measurement of Potential Effects
Surface Water Quality and Quantity	• Change to surface water quantity with consideration of: ◦ Stream flows; ◦ Water levels; ◦ Cross-section hydraulics; ◦ Erosion and sedimentation processes; and ◦ Drainage patterns. • Change to surface water quality with consideration of: ◦ Turbidity and Total Suspended Solids; ◦ Water chemistry; and ◦ Water temperature.	• IK and Indigenous community feedback regarding the importance of water which has spiritual, social, cultural, and ecological value. • Represents the freshwater habitat for fish, aquatic organisms, and aquatic vegetation; • Important for recreational use and aesthetics; • Important to fauna and flora abundance and diversity; and • Important to human use (drinking water or other consumption and travel).	• Potential effects are measured quantitatively and/or qualitatively as a possible change in streamflows, water levels, cross-section hydraulics, erosion, and sedimentation processes in water bodies, as well as overall drainage patterns within the study areas. • Potential effects are measured quantitatively and/or qualitatively as an increase to concentrations of suspended solids or chemical constituents in receiving waters within the study areas.

6.2.4 Assessment Boundaries

6.2.4.1 Temporal Boundaries

The Project is planned to occur during three stages:

- **Construction stage**: The period from the start of construction to the start of operation (in-service date);
- **Operation and maintenance stage**: The period from the start of operation and maintenance activities through to the end of the Project life; and
- **Retirement stage**: The period from the start of retirement activities though to the end of final reclamation of the Project.

As described in Section 5.3.2, the Project will be operated for an indefinite period and the timing of retirement, or decommissioning, is not known at this time as it is anticipated that upgrades to reinforce or rebuild portions of the Project may occur over its lifetime to maintain its longevity. Further, potential effects and mitigation measures to be identified during the EA for the construction of the Project will likely equally apply to the potential removal of the Project at a future point in time, should it ever be required. Therefore, the construction scenario assessed as part of the EA is considered bounding and potential effects and mitigation measures for retirement are not identified separately in this EA.

Based on the above, the assessment of Project-related effects on surface water quality and quantity considers the anticipated effects during the construction and operation and maintenance stages alone. This timeframe is intended to be sufficient to capture the full effects of the Project on the surface water environment, given that the potential effects and associated mitigation requirements during retirement or decommissioning are typically the same as those during construction.

6.2.4.2 Spatial Boundaries

Study areas were developed for the fish and fish habitat and surface water components to define the spatial extent of the baseline and effects assessments for the Project. These study areas are described in Table 6.2-4.

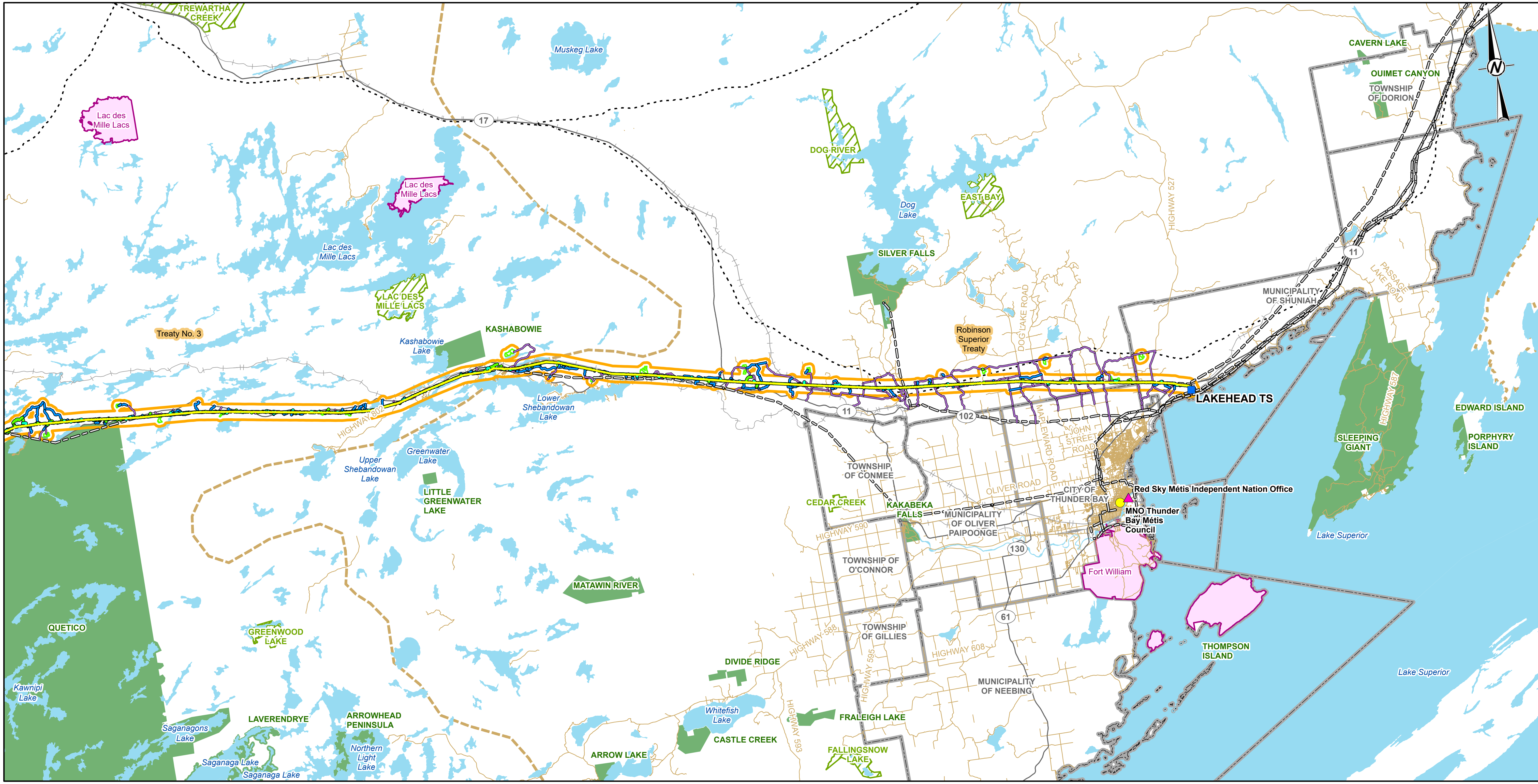
A Project footprint was developed for the Project and includes the components listed in Table 6.2-4. The Project includes the development of new access roads and the use of existing access roads. Existing access roads include roads that require no improvements and roads that will require improvements such as additional clearing, expansion of the graded area and new or upgraded water crossings (i.e., the crossing of a body of water by the transmission line or access road/tails). The existing access roads that do not require improvements were not evaluated during the aquatics baseline surveys or assessed during the EA for surface water as the potential for direct impacts resulting from driving along the roads during construction was considered nil.

Table 6.2-4: Surface Water Study Areas

Spatial Boundaries	Area (ha)	Description	Rationale
Project Footprint	4,073	The Project footprint includes: • Typical 46 m wide transmission ROW; • Widened ROW for the separation of circuits F25A and D26A for 1 km; • Modification of the Lakehead Transformer Station (TS), Mackenzie TS, and Dryden TS; • Access roads (improved existing roads and new); and • Temporary supportive infrastructure associated with construction including fly yards, construction / stringing pads, laydown areas, construction camps, and helicopter pads; and aggregate pits.	• Designed to capture the potential direct effects of the physical footprint of the Project.
Surface Water LSA	89,098	Includes the Project footprint, as well as an area that extends approximately 1 km from the ROW boundary and approximately 500 m from the boundaries of any access roads (excluding the Trans Canada Highway), storage yards, laydown yards, construction camps, and temporary construction easements, up to the shoreline of Lake Superior (in instances where Lake Superior is crossed by the study area).	• Represents the area where measurable, Project-related changes to the surface water environment could be observed.

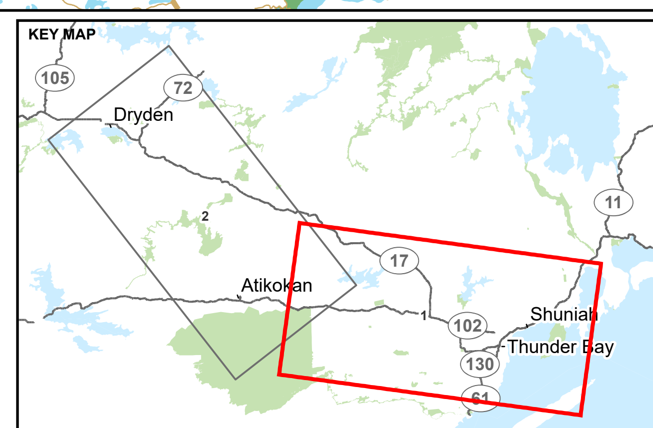
Spatial Boundaries	Area (ha)	Description	Rationale
Surface Water RSA	7,029,988	Encompasses the seven tertiary watersheds that are intersected by the Project footprint (021B – North Lake Superior, 02AB – Kaministiquia River, 05PAB – Rainy Headwaters, 05PBB – Rainy Lake, 05PBA – Big Turtle River, 05QA – Upper English River, and 05QD – Wabigoon River), upstream to the headwaters and downstream to Lake Superior and Lake Winnipeg. Note: The boundaries of the tertiary watersheds are based on MNRF (2015b).	• Represents the area where Project-related effects to the surface water environment may interact with commensurate effects from other projects (resulting in cumulative effects).

ha = hectare; km= kilometre; LSA = Local Study Area; m = metre; MNRF = Ministry of Natural Resources and Forestry; ROW = Right-of-way; RSA = Regional Study Area; TS = Transformer Station.



LEGEND

- 230 kV TRANSMISSION STATION (TS)
- RED SKY MÉTIS INDEPENDENT NATION OFFICE
- MNO COUNCIL OFFICE
- RAILWAY
- LOCAL ROAD
- SECONDARY HIGHWAY
- NATURAL GAS PIPELINE
- EXISTING TRANSMISSION LINE
- EXISTING ACCESS ROAD - NO IMPROVEMENTS REQUIRED
- EXISTING ACCESS ROAD - POTENTIAL IMPROVEMENTS
- NEW ACCESS ROAD - PREFERRED
- NEW ACCESS ROAD - ALTERNATE
- PREFERRED ROUTE TRANSMISSION LINE RIGHT-OF-WAY
- AGGREGATE SITE
- FLY YARD
- LOCAL STUDY AREA
- FIRST NATIONS RESERVE
- TREATY BOUNDARY
- MUNICIPAL BOUNDARY
- CONSERVATION RESERVE
- PROVINCIAL PARK
- WATERBODY



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1:500,000 KILOMETRES

REFERENCE(S)

BASE DATA COURTESY OF LAND INFORMATION ONTARIO MNRF. IMAGERY COPYRIGHT © ESRI AND ITS LICENSORS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: CSRS UTM ZONE 15 DATUM: NAD 83

CLIENT
HYDRO ONE NETWORKS INC.

PROJECT
WAASIGAN TRANSMISSION LINE

CONSULTANT

wsp

YYYY-MM-DD	2023-10-26
DESIGNED	AV
PREPARED	DB
REVIEWED	HK
APPROVED	CS

TITLE
SURFACE WATER AND FISH AND FISH HABITAT LOCAL STUDY AREA

PROJECT NO.	CONTROL	REV.	FIGURE
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25mm

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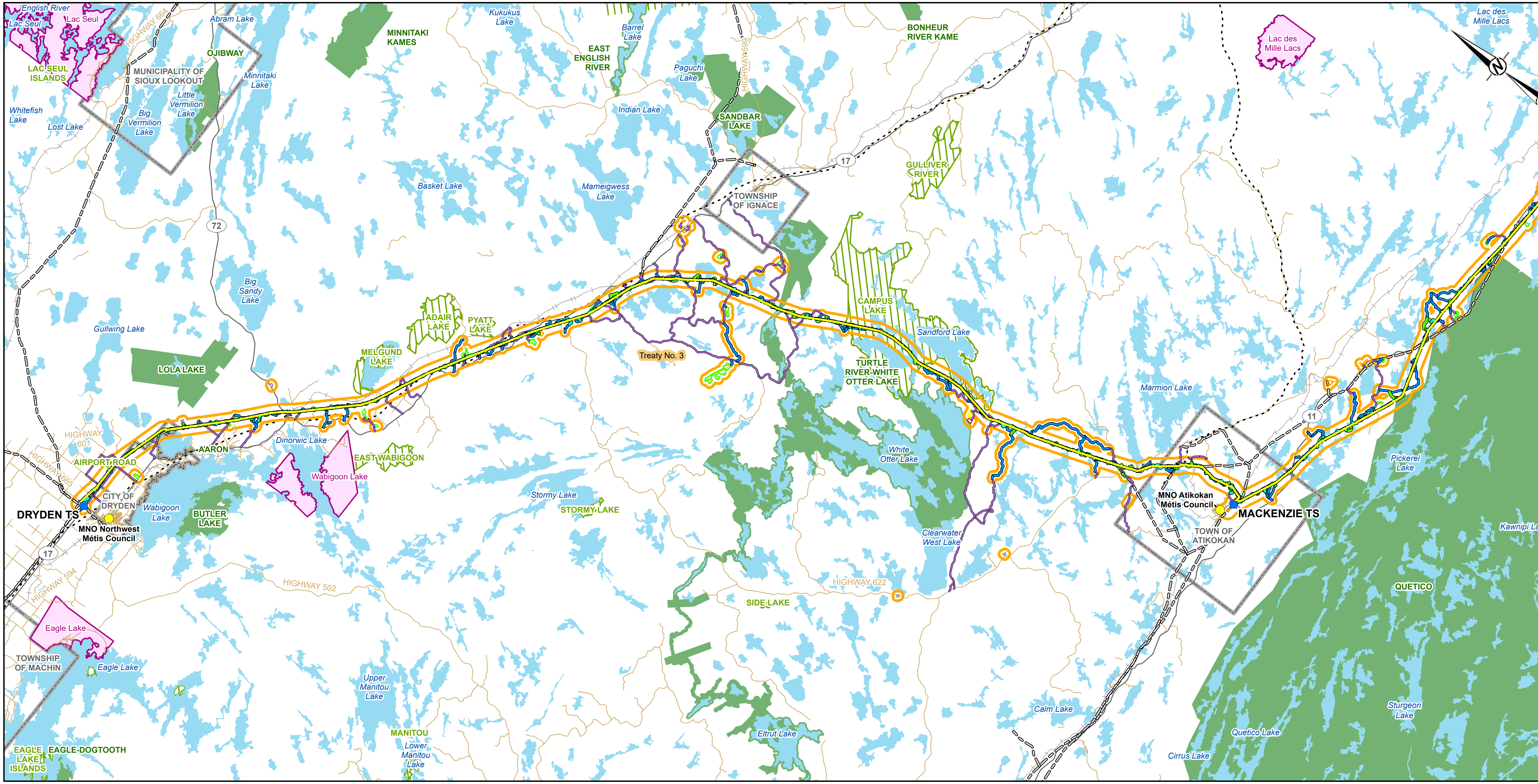
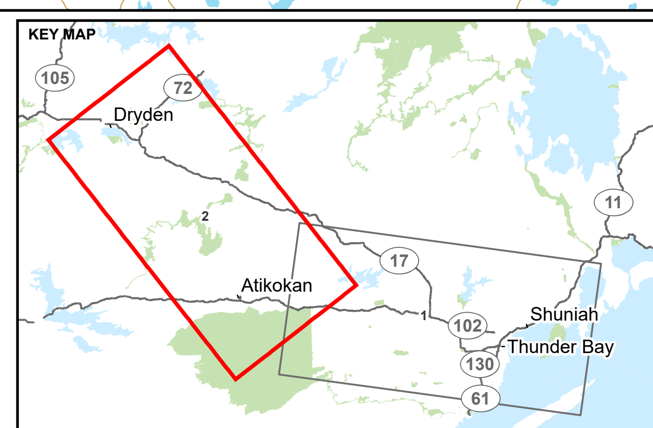


LEGEND

- 230 kV TRANSMISSION STATION (TS)
- MNO COUNCIL OFFICE
- RAILWAY
- LOCAL ROAD
- SECONDARY HIGHWAY
- NATURAL GAS PIPELINE
- EXISTING TRANSMISSION LINE
- EXISTING ACCESS ROAD - NO IMPROVEMENTS REQUIRED
- EXISTING ACCESS ROAD - POTENTIAL IMPROVEMENTS
- NEW ACCESS ROAD - PREFERRED
- NEW ACCESS ROAD - ALTERNATE
- PREFERRED ROUTE TRANSMISSION LINE RIGHT-OF-WAY
- D26A / F25A CIRCUIT SEPARATION
- AGGREGATE SITE
- FLY YARD
- CAMP / LAYDOWN
- CONSTRUCTION CAMP (NO LONGER TO BE USED)
- FLY YARD / CAMP / LAYDOWN
- LOCAL STUDY AREA
- FIRST NATIONS RESERVE
- TREATY BOUNDARY
- MUNICIPAL BOUNDARY
- CONSERVATION RESERVE
- PROVINCIAL PARK
- WATERBODY

KEY MAP



0 20 40

1:500,000 KILOMETRES

REFERENCE(S)
BASE DATA COURTESY OF LAND INFORMATION ONTARIO MNRF. IMAGERY COPYRIGHT © ESRI AND ITS LICENSORS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: CSRS UTM ZONE 15 DATUM: NAD 83

CLIENT
HYDRO ONE NETWORKS INC.

PROJECT
WAASIGAN TRANSMISSION LINE

CONSULTANT
wsp

YYYY-MM-DD	2023-10-26
DESIGNED	AV
PREPARED	DB
REVIEWED	HK
APPROVED	CS

TITLE
SURFACE WATER AND FISH AND FISH HABITAT LOCAL STUDY AREA

PROJECT NO.	CONTROL	REV.	FIGURE
20137728	0036	1	6.2-1-2

PATH: S:\Clients\HydroOne\Waasigan\99_PROJ\20137728\40_PROD\0036_Surface_Water\20137728-0036-G-0000.aprx PRINTED ON: AT: 9:43:54 AM

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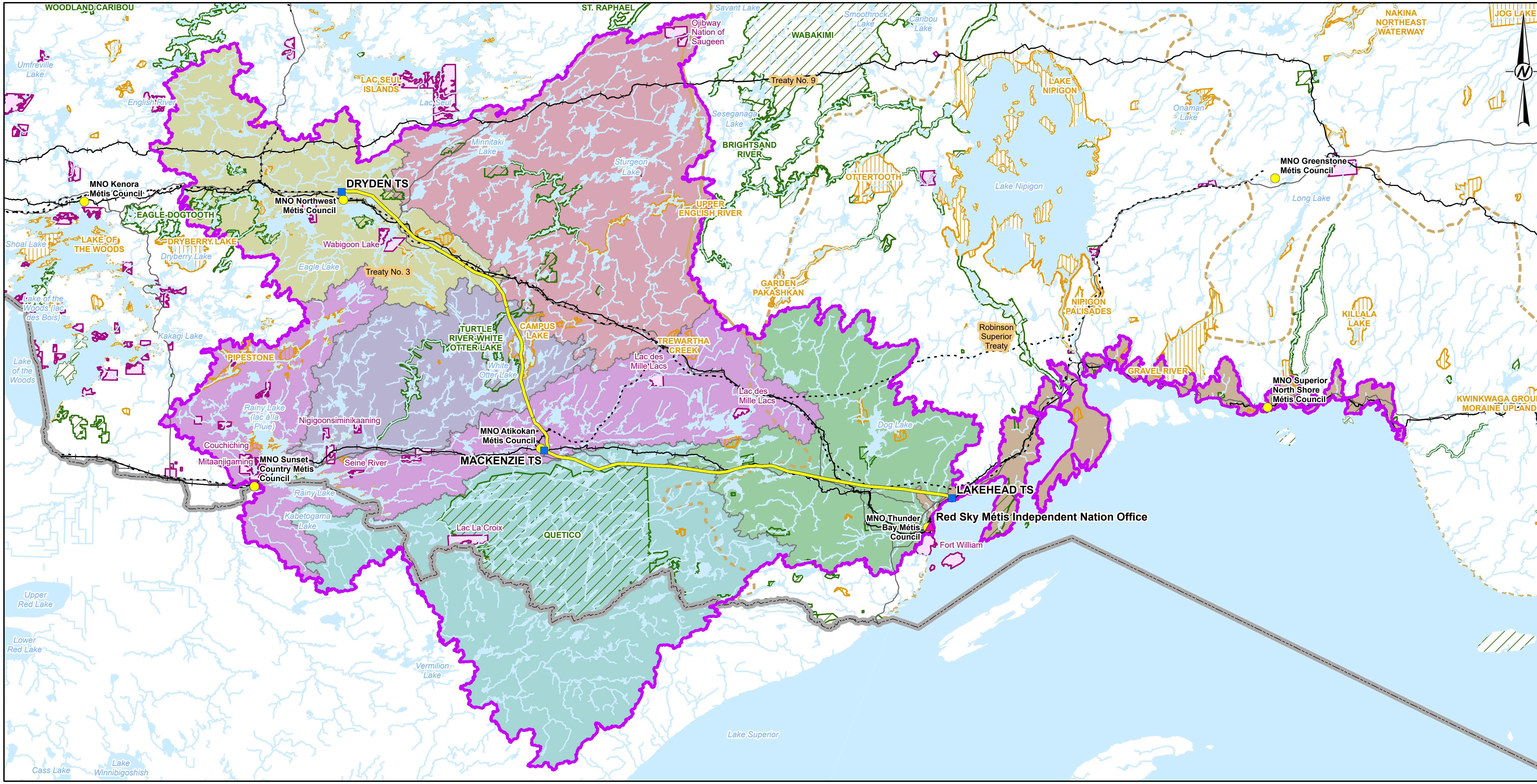


LEGEND

- 230 KV TRANSMISSION STATION (TS)
- RED SKY MÉTIS INDEPENDENT NATION OFFICE
- MNO COUNCIL OFFICE
- RAILWAY
- SECONDARY HIGHWAY
- NATURAL GAS PIPELINE
- INTERNATIONAL BORDER
- WATERCOURSE
- PREFERRED ROUTE TRANSMISSION LINE RIGHT-OF-WAY
- REGIONAL STUDY AREA
- FIRST NATIONS RESERVE
- TREATY BOUNDARY
- CONSERVATION RESERVE
- PROVINCIAL PARK
- WATERBODY
- BIG TURTLE RIVER
- KAMINISTIQUIA RIVER
- NORTH LAKE SUPERIOR SHORELINE
- RAINY HEADWATERS
- RAINY LAKE
- UPPER ENGLISH RIVER
- WABIGOON RIVER

0 50 100
1:1,750,000 KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM THE MNRF JUNE 2020
2. ROUTE ALTERNATIVES PROVIDED BY HYDRO ONE, AUGUST 2020
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 15N

CLIENT
HYDRO ONE NETWORKS INC.

PROJECT
WAASIGAN TRANSMISSION LINE

CONSULTANT

YYYY-MM-DD	2023-09-27
DESIGNED	AV
PREPARED	DB
REVIEWED	HK
APPROVED	CS

TITLE
SURFACE WATER AND FISH AND FISH HABITAT REGIONAL STUDY AREA

PROJECT NO.	CONTROL	REV.	FIGURE
20137728	0036	1	6.2-2

6.2.5 Description of the Existing Environment

This section provides a summary of the existing environment for the surface water criteria based on review of desktop information.

6.2.5.1 Baseline Data Collection Methods

A desktop study was completed to characterize the baseline conditions for the surface water environment within the LSA and RSA. This involved a review of the relevant background information (listed in Section 6.2.2) to provide a general understanding of the following:

- Watershed and river system characteristics;
- Surface water use;
- Surface water yield and its seasonal distribution; and
- Surface water quality.

To further characterize surface water baseline conditions, a ground-based field investigation was completed at a subset of the waterbody crossing locations (i.e., a subset of 25% of the total number of expected crossing locations along the preferred and alternative routes) that were identified from the desktop study, including a review of aerial imagery, and aerial reconnaissance completed in 2020 (Golder 2021). This ground-based field investigation was conducted from June through September of 2022 and was completed in tandem with the corresponding studies for fish and fish habitat assessment. To note, a small amount of the subset of water crossing locations relied on helicopter support for access. The results of this field investigation were used to further augment the baseline characterization of surface water quantity and quality conditions for the Project.

6.2.5.1.1 Water Crossing List Development

The initial task for the surface water baseline characterization program involved the preparation of a waterbody crossing list to identify all the waterbodies that are expected to be crossed by the Project footprint. This crossing list was first generated based on the preliminary design of each of the alternative routes that was developed by Hydro One’s contractor. It was subsequently refined to account for the specific placement of connection facilities, modifications to existing transformer stations, temporary laydown areas, temporary construction camps, and new and existing access roads or trails (all of which were associated with the design of the preferred route).

The waterbody crossing list was developed using Geographic Information Systems (GIS). This involved overlaying the proposed Project footprint with the OHN datasets for watercourses and waterbodies (MNRF 2022a, b) to identify “mapped” waterbody crossing locations along the length of the preferred route (i.e., MNRF-mapped waterbodies that are expected to be bisected by the Project footprint). The mapped features from MNRF (2022a, b) were then further assessed based on a review and interpretation of aerial imagery and associated digital elevation model (DEM) information to confirm, to the extent possible, the presence of defined bed or banks (i.e., the criterion for the definition of a waterbody in Ontario [Government of Canada 2019a, Government of Ontario 2019; Stanfield 2017]). This same imagery and DEM information was also relied on to identify the presence of unmapped waterbody crossing locations (i.e., surface water features with defined channel conditions that are not included on MNRF mapping but are expected to be crossed by the Project footprint).

Each of the identified waterbody crossings from the crossing list were assigned a unique, site ID that consisted of a common, two-letter code (specifically “WC” that signifies Waterbody Crossing) and a unique number (e.g., WC-1090.00). This unique number corresponded to the numerical sequence and geographic location of the crossing within the Project footprint (i.e., generally ascending from east to west) and were generally arranged/grouped by segments of the alignment, noting the following:

- Site IDs ending in “.00” represented crossings at mapped waterbodies (as identified based on the OHN data layers), while site IDs ending in “0.1, 0.2, 0.3….” and “0.11, 0.12, 0.13…” represented crossings at unmapped waterbodies that were inferred based on desktop review and field reconnaissance, respectively; and
- Site IDs ranging from WC-1000 to WC-1999 corresponded to transmission line crossings between Lakehead TS and Mackenzie TS, while site IDs ranging from WC-2000 to WC-2999 corresponded to transmission line crossings between Mackenzie TS and Dryden TS. Access Road Crossings were assigned WC-3000 to 3999.

The full list of waterbody crossing locations is provided in Table 6.2-B of Appendix 6.2-B.

6.2.5.2 Baseline Conditions

6.2.5.2.1 Watersheds and River Systems

The surface water RSA is located in the secondary watersheds of the English River, the Winnipeg River and Northwestern Lake Superior, and is composed of the following seven tertiary watersheds: 02AB – Kaministiquia River, 021B – North Lake Superior Shoreline, 05PAB – Rainy Headwaters, 05PBA – Big Turtle River, 05PBB – Rainy Lake, 05QA – Upper English River, and 05QD – Wabigoon River. The number and two letters that precede the watershed names are used to identify the primary, secondary, and tertiary watersheds based on the naming convention from MNRF (2015c):

- **First and Second Characters –** “02” and “05” represents the primary watersheds of the Nelson River and Great Lakes – St. Lawrence River, respectively;
- **Third Character –** “A”, “P”, and “Q” represents the secondary watersheds of the Northwestern Lake Superior, Winnipeg River, and English River, respectively; and
- **Fourth Character –** “A” through “D” represents the tertiary watershed identifiers.

These watersheds generally drain either west towards Lake Winnipeg or east towards Lake Superior. The watersheds are mostly located within the jurisdiction area of the MNRF, except for sections of the Kaministiquia River and North Lake Superior Shoreline that are located in the jurisdiction of the Lakehead Region Conservation Authority (LRCA) administrative area. As such, construction activities that are implemented within or adjacent to a waterbody, such as the installation, maintenance, and/or removal of temporary and permanent crossing structures, will require permit approvals under O. Reg. 180/06 (Government of Ontario 2022c) of the *Conservation Authorities Act* (for water crossings located within the jurisdiction of the LRCA) or O. Reg. 239/13 (Government of Ontario 2021b) of the *Public Lands Act* (administered by MNRF for water crossings on Crown land) or O. Reg. 454/96 (Government of Ontario 2020a) under the *Lakes and Rivers Improvements Act* (administered by MNRF for water crossings on private or Crown land).

The main characteristics of each tertiary watershed are summarized in the following sections. This includes descriptions of drainage area, surficial geology, land cover, catchment length, catchment shape factor, topographic relief, and catchment slope. The definitions for each of these items are listed below:

- **Drainage area**: The geographical area drained by a river and its tributaries where surface water from rain, melting snow, or ice converges to a single point at a lower elevation, usually where the water joins another waterbody.
- **Surficial geology**: The unconsolidated sediment overlying bedrock within the drainage area watershed catchment, which is indicative of the soil cover and its drainage properties.
- **Land cover**: The surface cover on the ground whether urban infrastructure, vegetation, water, bare soil, or other. Land cover affects hydrologic processes by intercepting precipitation, altering water infiltration into the soil, affecting energy budgets and evaporation, and influencing water and sediment conveyance.
- **Catchment length**: The distance measured along the longest flow path from the catchment divide to the outlet of the drainage area. The length of a catchment influences the flow through its outlet. For the same rainfall, a longer flow path may generate a lower instantaneous outlet flow than a shorter flow path.

- **Catchment shape factor**: Represents how the surface runoff flows are collected through the drainage network" (Guo 2009). Shape factor is calculated as the square of the catchment length divided by the catchment area. The shape of a catchment influences the flow through its outlet. For the same rainfall, a longer shape may generate a lower instantaneous outlet flow than that from a fan-shaped catchment.

- **Topographic relief**: The difference in elevation from the lowest point to the highest point within the catchment. The relief of a catchment influences the flow through its outlet. For the same rainfall, a high relief may generate a higher instantaneous outlet flow than a low relief.

- **Catchment slope**: The rate of change of elevation along the catchment length. Similar to topographic relief, a steep slope may generate a higher instantaneous outlet flow than a shallower slope for the same rainfall.

021B – Great Lakes – North Lake Superior Shoreline - Tertiary Watershed

The Great Lakes – North Lake Superior Shoreline watershed area consists of several small contributing watershed systems that drain the northern shore of Lake Superior between Mission River to the west near Thunder Bay to the Pic River in the east near Marathon (Figure 6.2-1). The Great Lakes system (including all connecting channels), in turn, ultimately drains to the St. Lawrence River (which then flows to the Atlantic Ocean). The Project crosses a total of 15 watercourses and two lakes/ponds in the Great Lakes – North Lake Superior Shoreline watershed, of which 14 were found to have permanent flow (Table 6.2-5).

The watershed of the Great Lakes – North Lake Superior Shoreline includes a total catchment area of approximately 2,970 km^2. There are no waterbody systems in the overall watershed with a catchment size larger than 1,000 km^2 (MNR 2011, MNRF 2019).

The surficial geology in the watershed of the Great Lakes – North Lake Superior Shoreline is primarily a mix of Precambrian bedrock and Pleistocene till with scattered Glaciofluvial and Glaciolacustrine deposits (MNDM 2006). Land cover in the watershed largely consists of marsh, fen, and swamp (accounting for more than 50% of the catchment area) (MNRF 2019). In addition, part of the watershed includes the City of Thunder Bay, noting that approximately 1.1% of the total watershed area consists of community and infrastructure projects.

02AB –Kaministiquia River Tertiary Watershed

The Kaministiquia River watershed is situated in the southeast end of the surface water RSA (Figure 6.2-2), noting that the mainstem and associated tributary streams in the Kaministiquia River watershed drain into the Kaministiquia River, which branches into the Mission River, McKellar River and Kaministiquia River before flowing into northwestern Lake Superior. The Project crosses a total of 100 watercourses and 20 lakes/ponds in this watershed, of which 107 were found to have permanent flow (Table 6.2-5).

The Kaministiquia River watershed includes a total catchment area of approximately 8,883 km^2. Apart from the Kaministiquia River, there is one significant river system in the overall watershed with a catchment size larger than 1,000 km^2 in the watershed: the Dog River (with a catchment area of approximately 2,352 km^2 and mainstem channel length of 138 km) (MNR 2011, MNRF 2019). There are also two smaller river systems: the McIntyre River (with a catchment area of approximately 384 km^2 and main channel length of 189 km), and the Current River (with a catchment area of approximately 659 km^2 and main channel length of 72 km) (MNR 2011, MNRF 2019).

The surficial geology in the watershed of the Kaministiquia River is primarily a mix of Pleistocene till, silt, and clay Glaciolacustrine deposits, and Precambrian bedrock (MNDM 2006). Land cover in the watershed consists largely of bog, fen, and forested areas (accounting for more than 79% of the total catchment area) (MNRF 2019). The watershed also includes portions of the City of Thunder Bay (with community/infrastructure and agricultural rural lands amounting to approximately 0.5% and 1.0% of the total catchment, respectively).

The length of the mainstem channel of the Kaministiquia River from Dog Lake to the confluence of the Kaministiquia River, McKellar River, and Mission River is approximately 249 km. The shape factor for the watershed is 7.9, suggesting a relatively wider catchment (i.e., shorter distance from headwaters to outlet), while topographic relief in the watershed varies from approximately 180 m to 679 m, with a mean elevation of 451 m and a mean slope of 5.1% (MNRF 2019).

05PAB –Rainy Headwaters Tertiary Watershed

The Rainy Headwaters watershed is situated in the southwest end of the RSA (Figure 6.2-2), noting that the mainstems and associated tributary streams in the Rainy Headwaters watershed primarily drain east to west into Lac la Croix and Namakan Lake before flowing into the southeast of arm of Rainy Lake. The Rainy Lake Watershed ultimately flows north into Hudson's Bay after flowing through the Winnipeg River and Nelson River. The Project crosses a total of 71 watercourses and 51 lakes/ponds in this watershed, of which 99 were found to have permanent flow (Table 6.2-5).

The Rainy Headwaters watershed includes a total catchment area of approximately 16,390 km^2. There is one other significant river system in the overall watershed with a catchment size larger than 1,000 km^2: the Namakan River (with a catchment area of approximately 14,398 km^2 and mainstem channel length of 333 km). The catchment area of the Namakan River in turn includes two other significant river systems: the Malgine River (with a catchment area of approximately 6,175 km^2 and mainstem channel length of 273 km) and the Quetico River (with a catchment area of approximately 795 km^2 and mainstem channel length of 82 km) (MNR 2011, MNRF 2019).

The surficial geology in the watershed is primarily Precambrian bedrock (MNDM 2006). Land cover in the watershed consists largely of bog, fen, and forested areas (accounting for more than 70% of the catchment area) (MNRF 2019). The Rainy Headwaters watershed also includes Quetico Provincial Park (4,600 km^2 of wilderness class park with over 200 lakes) and spans the Province of Ontario and State of Minnesota.

The length of the mainstem channel of the Namakan River from the Lac la Croix confluence to Crooked Lake is approximately 333 km. The shape factor for the catchment is 7.7, suggesting a relatively wider catchment (i.e., shorter distance from headwaters to outlet), while topographic relief in the watershed varies from approximately 335 m to 680 m with a mean slope of roughly 6.4% (MNRF 2019).

05PBB Rainy Lake Tertiary Watershed

The Rainy Lake watershed is situated in the southeast end of the RSA (Figure 6.2-2), noting that the mainstem channel and associated tributary streams in the Rainy Lake watershed primarily drain east to west through the Seine River (and tributaries) and north to south from Upper and Lower Manitou Lake. The Rainy Lake Watershed ultimately drains to Hudson's Bay after flows are conveyed through the Winnipeg River and Nelson River. The Project crosses a total of 52 watercourses and 15 lakes/ponds in this watershed, of which 64 were found to have permanent flow (Table 6.2-5).

The Rainy Lake watershed includes a total catchment area of approximately 12,3732 km^2, recognizing that Rainy Lake itself includes a total surface area of approximately 92 km^2. There are three other significant river systems in the overall watershed with a catchment size larger than 1000 km^2: the Seine River (with a catchment area of approximately 6,300 km^2 and mainstem channel length of 398 km), the Manitou River (with a catchment area of approximately 1,196 km^2 and mainstem channel length of 106 km), and the Whitehorse River (with a catchment area of approximately 1,044 km^2 and main channel length of 100 km) (MNR 2011, MNRF 2019).

The surficial geology in the watershed of the Kaministiquia River is primarily a mix of Precambrian bedrock and Pleistocene Till (MNDM 2006). Land cover in the watershed consists largely of bog, fen, and forested area (accounting for more than 72% of the catchment area) (MNRF 2019). The Rainy Lake watershed spans the Province of Ontario and the northern State of Minnesota.

The length of the mainstem channel of the Seine River from the Lac des Mille Lacs to Rainy Lake 398 km. The shape factor for the watershed is 25.2, suggesting a relatively elongated catchment (i.e., longer distance from headwaters to outlet), while topographic relief in the watershed varies from approximately 330 m to 573 m with a mean slope of roughly 4.5% (MNRF 2019).

05PBA –Big Turtle River Tertiary Watershed

The Big Turtle River watershed is situated in the west end of the surface water RSA (Figure 6.2-2), noting that mainstem and associated tributary streams of the Big Turtle River watershed drain to the mainstem of the Turtle River and Big Turtle River and, in turn, discharge to Rainy Lake. The Project crosses a total of 60 watercourses and 17 lakes/ponds in this watershed, of which 67 were found to have permanent flow (Table 6.2-5).

The tertiary watershed of the Big Turtle River includes a total catchment area of 6,449 km^2. There are three other major river systems in the overall watershed with a catchment size larger than 1,000 km^2: the Turtle River (with a catchment area of approximately 2,574 km^2 and mainstem channel length of 202 km), the Big Turtle River (with a catchment area of approximately 3,272 km^2 and mainstem channel length of 243 km), and the Trout River (with a catchment area of approximately 1,090 km^2 and mainstem channel length of 107 km) (MNR 2011, MNRF 2019).

The surficial geology in the watershed of the Big Turtle River is primarily a mix of Pleistocene till and Precambrian bedrock (MNDM 2006). Land cover in the watershed consists of largely treed, fen and bog terrain (accounting for more than 70% of the catchment area) (MNRF 2019).

The length of the mainstem channel of the Big Turtle River from Eltrut Lake to Rainy Lake is approximately 243 km. The shape factor for the watershed is 18.1, suggesting a relatively elongated catchment (i.e., longer distance from headwaters to outlet), while topographic relief in the watershed varies from approximately 343 m to 534 m, with a mean elevation of 425 m and a mean slope of 5.4% (MNRF 2019).

05QA – Upper English River Tertiary Watershed

The Upper English River watershed is situated in the northwest portion of the RSA (Figure 6.2-2), noting that the mainstem channel and associated tributary streams in the Upper English River watershed primarily drain east to northwest through the English River (and associated tributaries) into Minnitaki Lake and Abram Lake. The Upper English River watershed continues to flow through the English River towards Lac Seul in the Lac Seul – Central English River watershed. The watershed ultimately drains to Hudson’s Bay after flows are conveyed through the Winnipeg River and Nelson River. The Project crosses a total of six watercourses and one lake/pond in this watershed, of which four were found to have permanent flow (Table 6.2-5).

The Upper English River watershed includes a total catchment area of approximately 14,143 km^2. There are two significant river systems larger than 1000 km^2 in the watershed: the English River (with a catchment of approximately 7,283 km^2 and main channel length of 271 km) and the Sturgeon River (with a catchment of approximately 4,595 km^2 and main Channel length of 179 km) (MNR 2011, MNRF 2019).

The surficial geology underlying the Upper English River watershed is primarily a mix of Precambrian bedrock and Pleistocene till with scattered Glaciofluvial and Glaciolacustrine deposits (MNDM 2006). The watershed consists largely of swamp, bog, and treed land cover (accounting for more than 52% of the catchment area) (MNRF 2019). The Upper English River watershed continues to flow through the English River towards Lac Seul in the Lac Seul – Central English River watershed.

The length of the mainstem channel of the English River from approximately 1.3 km northeast of Little Trewartha Lake to 1 km east of Southeast Bay, Minnitaki Lake is approximately 271 km.

The shape factor for the catchment is 10.5, suggesting a relatively wider catchment (i.e., shorter distance from headwaters to outlet). Topographic relief in the Upper English River watershed varies from approximately 352 m to 574 m, while the mean slope of the catchment is roughly 3.8% (MNRF 2019).

05QD – Wabigoon River Tertiary Watershed

The Wabigoon River watershed is situated in the northwest corner of the RSA (Figure 6.2-2) noting that the mainstem channel and associated tributary streams of the Wabigoon River drain to the northwest. The Wabigoon River represents a tributary of the English River, meaning that watercourse ultimately drains to Hudson’s Bay after flows are conveyed through the Winnipeg River and Nelson River. The Project crosses a total of 100 watercourses and 10 lakes/ponds in this watershed, of which 94 were found to have permanent flow (Table 6.2-5).

The Wabigoon River watershed includes a total catchment area of approximately 8,752 km^2. There are two other significant river systems in the overall watershed with a catchment size larger than 1000 km^2: the Eagle River (with a catchment area of approximately 2,510 km^2 and mainstem channel length of 135 km) and the Long Lake River (with a catchment area of approximately 1,236 km^2 and mainstem channel length of 108 km) (MNR 2011, MNRF 2019).

The surficial geology in the Wabigoon River watershed is primarily a mix of Precambrian bedrock and Pleistocene till with scattered silt and till Glaciolacustrine deposits (MNDM 2006). Land cover in the watershed consists largely of swamp, fen, bog, and forested areas (accounting for more than 67% of the catchment area) (MNRF 2019). In addition, the watershed includes the City of Dryden, noting that approximately 2.8 % of the watershed consists of community, infrastructure, and agricultural land.

The length of the mainstem channel of the Wabigoon River from Raleigh Lake to Ball Lake is approximately 319 km. The shape factor for the watershed is 11.7, suggesting a slightly elongated catchment (i.e., longer distance from headwaters to outlet), while topographic relief in the watershed varies from approximately 315 m to 526 m with a mean slope of roughly 0.6% (MNRF 2019).

Water Crossings by Tertiary Watershed

A summary of the total number of water crossing locations by tertiary watershed are presented in Table 6.2-5, noting that the desktop-generated, baseline results for each of the water crossings are provided in Appendix 6.2-B.

Table 6.2-5: Summary of Water Crossings by Tertiary Watershed

Tertiary Watershed	Number of Water Crossings at Watercourses	Number of Water Crossings at Lakes or Ponds	Water Crossings with Intermittent Flow Regime	Water Crossings with Permanent Flow Regime[a]	Crossings Investigated with No Defined Channel[b]	Number of Unmapped Water Crossings	Total Number of Crossing Locations[c]
021B – North Lake Superior Shoreline	15	2	-	14	5	5	27
02AB – Kaministiquia River	100	20	3	107	18	77	216
05PAB – Rainy Headwaters	71	51	17	99	15	28	165
05PBB – Rainy Lake	52	15	1	64	21	28	116
05PBA – Big Turtle River	60	17	9	67	10	31	118
05QA – Upper English River	6	1	3	4	2	4	13
05QD – Wabigoon River	100	10	16	94	16	49	175
Total	**404**	**116**	**49**	**449**	**87**	**222**	**830**

a) Flow regime for waterbodies were assumed to be permanent if a watercourse, lake or pond was not visited as part of the ground-based surveys or if there was no flow regime information available as a result of the desktop data analysis, then the watercourse was assumed to be permanent.

b) Crossing locations that had been initially inferred to include waterbodies, but were subsequently confirmed to be water features with no defined bed or banks (i.e., swales, runoff pathways, or low-lying areas of seasonal ponding) were described as "Crossings with No Defined Channel".

c) Total number of crossing locations includes water crossings at watercourses, lakes, ponds, and drainage features with no defined channel (i.e., the surface water features were shown to be swales, runoff pathways, or low-lying areas of seasonal ponding with no defined bed or banks).

6.2.5.2.2 Surface Water Use

Active Permits to Take Water

The MECP's PTTW data catalogue (MECP 2022) was accessed on November 11, 2022, to identify active permits to take surface water, and surface water and groundwater, within the surface water LSA, and are listed in Table 6.2-6. The PTTWs in the surface water LSA were issued for various purposes, including:

- Municipal water supply from the Atikokan River that was issued to the Township of Atikokan;
- Industrial water supply from a pond source for aggregate washing issued that was issued to Lempiala Sand & Gravel Limited; and
- Commercial water supplies from the Atikokan River for aquaculture that was issued to the Atikokan Sportsmen's Conservation Club.

These active PTTWs are summarized in Table 6.2-6. Detailed PTTW information is provided in Table 3.1-2 of Appendix 6.2-A, and PTTW locations are shown in Appendix 6.2-A – Figure 3.1-1.

Table 6.2-6: Active Permits to Take Water (Surface Water, and Surface Water and Groundwater) in the Surface Water Local Study Area

Tertiary Watershed	Total Number of Active PTTWs	Number of Active PTTWs
2AB-Kaministiquia River	1	1 – Aggregate Washing
5PBB-Rainy Lake	2	1 – Municipal water supply 1 – Industrial
Totals	**3**	**3**

PTTW = Permit to Take Water.

Hydroelectric Generation

Based on a review of hydroelectric generation mapping, including Waterpower Generating Station mapping (MNRF 2022d), WSC Hydrometric datasets (ECCC 2022a), Capstone Infrastructure (2022), H2O Power (2020), North Vista (2022), and Ontario Power Generation reports (OPG 2022a, b), a total of 11 hydroelectric generating stations were shown to be located in the surface water RSA and include a combined capacity of approximately 106 MW. These stations are listed in Table 6.2-7 and presented in Appendix 6.2-A – Figure 3.1-1.

The hydroelectric generation facilities that are located upstream of the Project (this includes Silver Falls Generating Station and Valerie Falls Generating Station) will have a regulating/controlling effect on streamflows (at locations downstream of the generating stations). The exception being the Portage Prairie Park, which functions as a micro-hydroelectric facility (rather than a reservoir storage and cascade system – consistent with the other locations). The remaining eight identified hydroelectric generating stations are located within or downstream of the surface water LSA. This includes the hydroelectric generation facilities at Blue Lantern Lodge, Boulevard Lake Dam, Kakabeka, Calm Lake, Wainwright, McKenzie Falls, Sturgeon Lake, and Eagle River Dam.

Table 6.2-7: Hydroelectric Generating Stations in the Surface Water Regional Study Area

Tertiary Watershed	Generating Station	Site ID	Waterbody	Latitude (°N)	Longitude (°W)	Operator	In-Service Year	Capacity (MW)	Head (m)
05PAB-Rainy Headwaters	Prairie Portage Park Power Generation	5PA02	Basswood River	48.04988	-91.43769	Quetico Provincial Park	2000	0.02	3
02AB-Kaministiquia River	Kakabeka Generating Station	2AB01	Kaministiquia River	48.41502	-89.62936	Ontario Power Generation	1906	25	59.1
02AB-Kaministiquia River	Boulevard Lake Dam	2AB15	Current River	48.45626	-89.18913	City of Thunder Bay	1987	0.5	24.4
02AB-Kaministiquia River	Silver Falls Generating Station	2AB02	Kaministiquia River / Dog Lake	48.71080	-89.62483	Ontario Power Generation	1959	48	109.5
05PBB-Rainy Lake	Valerie Falls Generating Station	5PB01	Seine River	48.79181	-91.70495	Great Lakes Power Inc. (Brookfield Renewable Energy Group), Valerie Falls General Partner Limited	1994	10	20
05PBB-Rainy Lake	Calm Lake	5PB40	Seine River	48.79344	-92.15363	H2O Power	1928	9.7	24.4

Tertiary Watershed	Generating Station	Site ID	Waterbody	Latitude (°N)	Longitude (°W)	Operator	In-Service Year	Capacity (MW)	Head (m)
05QD-Wabigoon River	Eagle River Generating Station Dam	5QD02	Eagle River	49.79077	-93.19619	Capstone Infrastructure - CPOT Title Corp. (on behalf of MPT Hydro LP)	1928	1.76	9.5
05QD-Wabigoon River	McKenzie Falls Generating Station Dam	5QD14	Eagle River	49.80470	-93.18924	Capstone Infrastructure - CPOT Title Corp. (on behalf of MPT Hydro LP)	1938	1.12	8
05QD-Wabigoon River	Wainwright Generating Station	5QD03	Wabigoon River	49.82151	-92.87617	Capstone Infrastructure - CPOT Title Corp. (on behalf of MPT Hydro LP)	1928	1.1	9.1
05QA-Upper English River	Sturgeon Lake Power Dam	5PB41	Seine River	50.08875	-90.82555	H2O Power	1927	8.8	20
05PBA-Big Turtle River	Blue Lantern Lodge	5PB45	Marion Creek	48.914	-92.914	Blue Lantern Lodge Ltd.	2010	0.05	8

° = Degrees; MW = Megawatt; m = metres.

6.2.5.2.3 Surface Water Quantity

Climatic and hydrological conditions were estimated for the Project based on a desktop review of publicly available, long-term monitoring records from Environment Canada (EC) and Water Survey of Canada (WSC). This considers that WSC, operates, or has operated, 29 hydrometric monitoring stations within the limits of the RSA, noting that streamflow records are available at 20 of the stations, while lake levels are available at the other nine stations. A full summary of the WSC hydrometric monitoring stations is available in Section 3.1.3 of Appendix 6.2-A - Surface Water Baseline Report.

The desktop review of the environmental monitoring records included the derivation of several climate and flow statistics. These analyses are described below:

- Flow records from the identified WSC hydrometric stations were reviewed to assess (1) the mean annual surface water yield and average seasonal mean flows at stations where streamflow is gauged, and (2) the monthly fluctuation in lake levels at stations where water levels are gauged; and
- Mean annual precipitation was estimated using the OWIT tool. The results of this analysis are summarized for each of the relevant tertiary watersheds.

A review of the results showed that:

- Mean annual precipitation in the tertiary watersheds varies from 699 to 723 mm; and
- Mean annual surface water yields varied from 240 to 372 mm at stations with natural (not regulated) flows, and from 195 to 334 mm at stations with regulated flows, recognizing that the range of observed values is generally consistent with the associated results from OWIT.

With reference to Appendix 6.2-A – Figure 3.1-1, Figure 6.2-3, and Appendix 6.2-A – Table 3.1-6, review of the monthly streamflow and lake level results demonstrated that mean flows/water levels are highest during the spring (due to the spring freshet - snowmelt) and lowest in the winter. Average seasonal yields in the region ranged from 18 mm in the fall (Station 05QD016) to 46 mm in the spring (Stations 04GD001 and 04JF001). The following trends were observed:

- The flow hydrographs at stations with natural flows (Figure 6.2-3) were shown to generally exhibit a primary peak in April or May and a secondary peak in October;
- The flow hydrographs at stations with regulated flows (Figure 6.2-3) were generally shown to display a primary peak in either May or June and a secondary peak in October, with the exception of station 05PB009 where the secondary peak occurred in November;

- Surface water yields for all stations were generally lowest in either February or March when runoff is at a minimum for the year (i.e., most precipitation occurs, and is stored, as snow);
- The surface water yield between May and June at stations with natural flows (Figure 6.2-3 and Appendix 6.2-A – Table 3.1-6) was shown to account for 30% (station 05PB018) to 43% (station 02AB024) of the annual total, while the associated results between April and June was observed to represent 36% (station 05QA004) to 72% (station 02AB023) of the annual total;
- The surface water yield between April and June at stations with regulated flows (Figure 6.2-4 and Appendix 6.2-A – Table 3.1-6) was shown to represent 32% (station 05PB009) to 60% (station 02AB020) of the annual total;
- The mean monthly lake levels at lake-based stations with natural flows (Figure 6.2-5), varied from -0.6 to 0.8 m relative to the average annual level, noting that the reported lake levels on Figure 6.2-5 would be expected to follow a seasonal distribution consistent with the surface water yields recorded at WSC stream gauging stations with natural flows (i.e., periods of relatively higher flows and lake levels in the spring and fall, compared to periods of relatively lower flows and lake levels in the winter and summer); and
- The mean monthly lake levels at lake-based stations with regulated flows (Figure 6.2-6), were shown to vary from -0.7 to 1.6 m relative to the average annual level.

Figure 6.2-3: Mean Monthly Surface Water Yields at Water Survey of Canada Stream Gauging Stations with Natural Flows

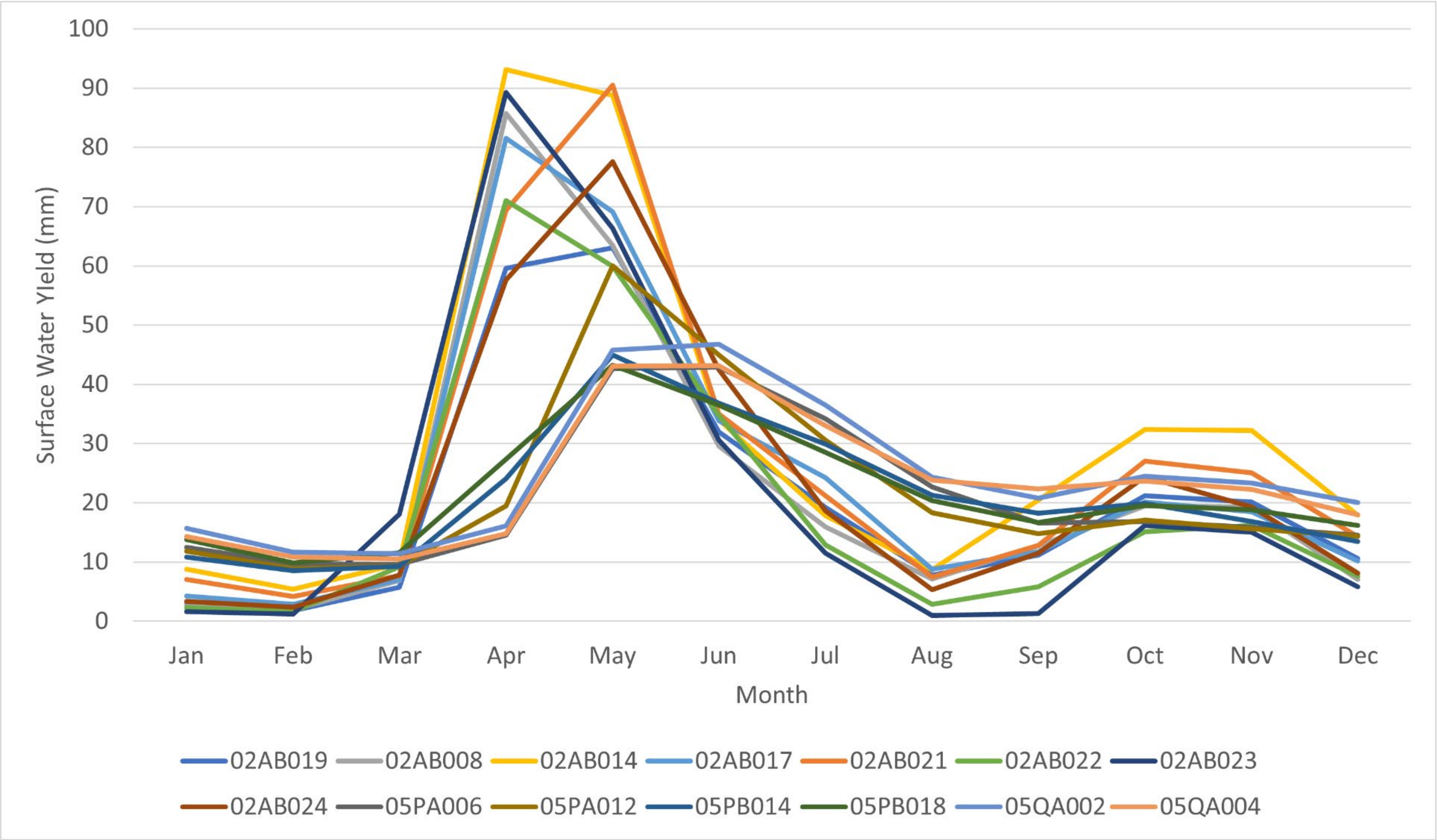


Figure 6.2-4: Mean Monthly Surface Water Yields at Water Survey of Canada Stream Gauging Stations with Regulated Flows

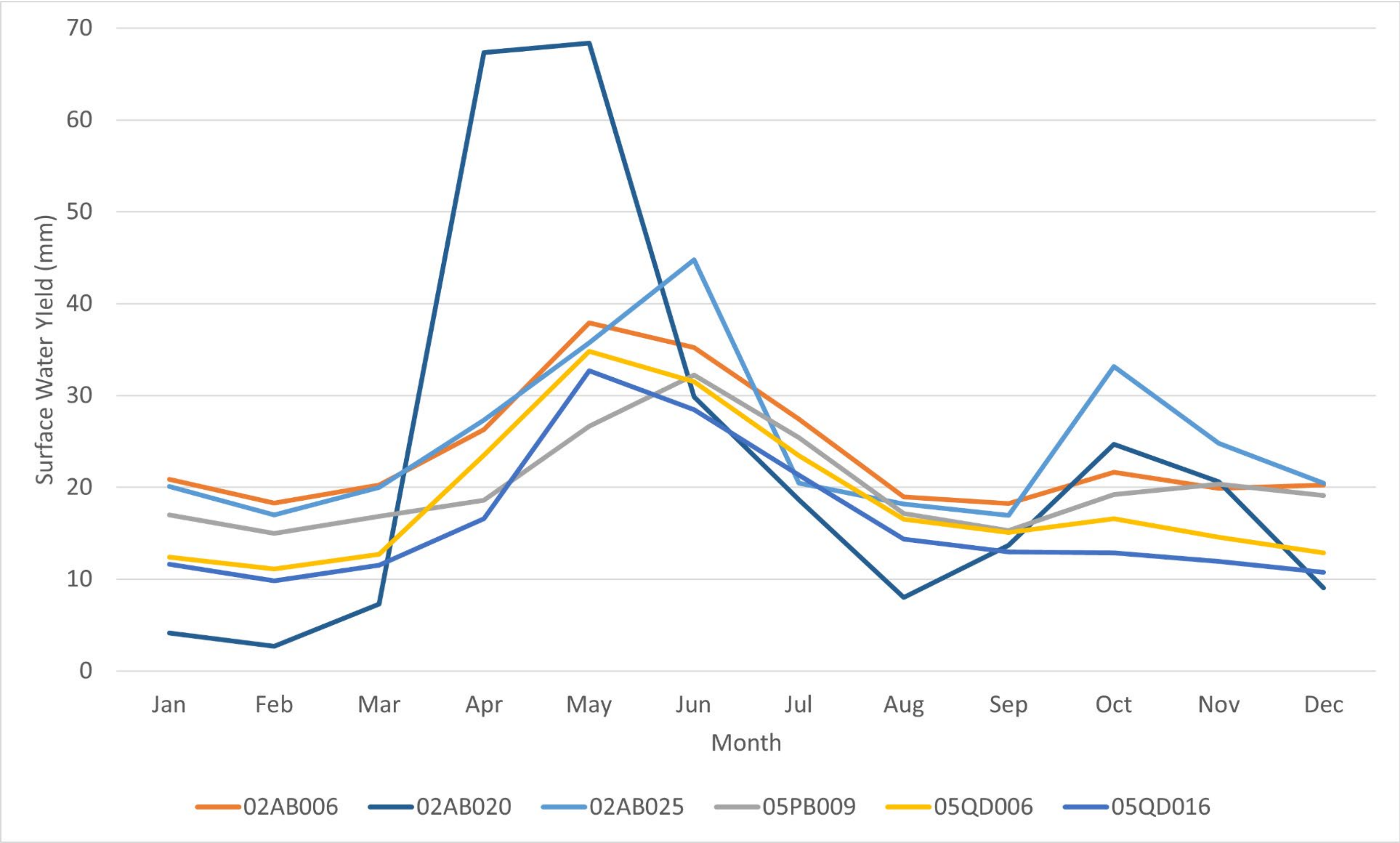


Figure 6.2-5: Mean Monthly Lake Levels at Water Survey of Canada Water Level Gauging Stations with Natural Flows

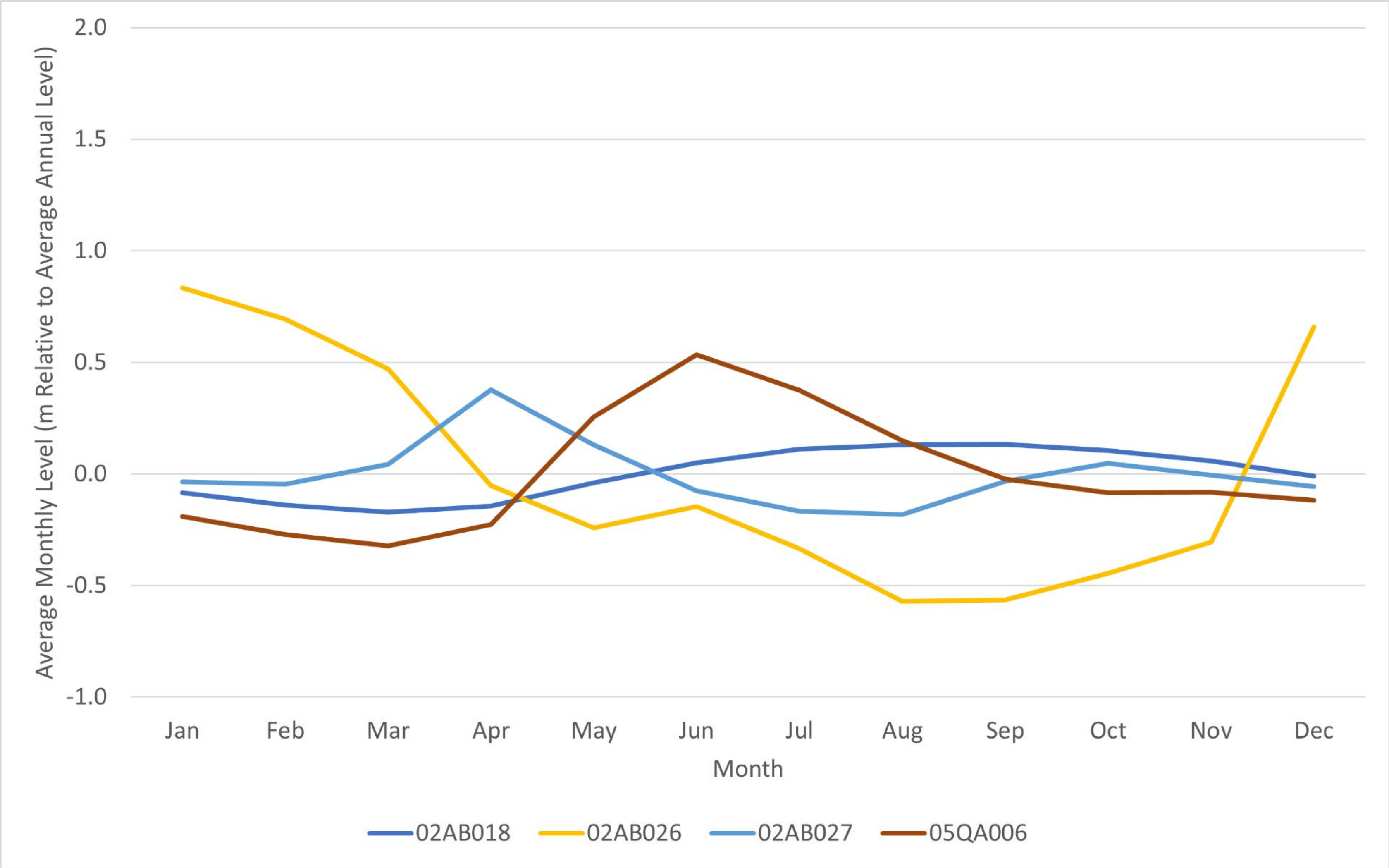
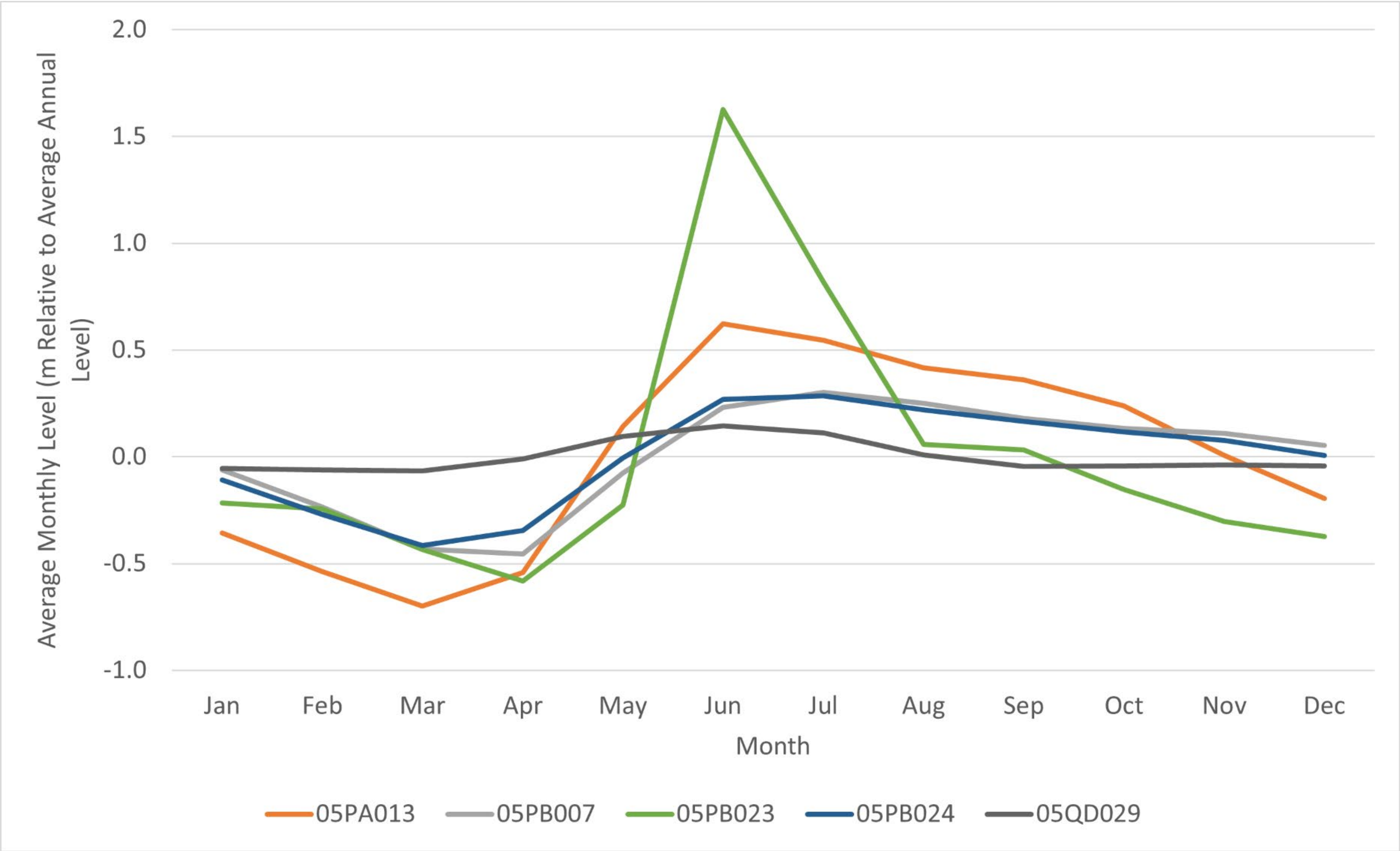


Figure 6.2-6: Mean Monthly Lake Levels at Water Survey of Canada Water Level Gauging Stations with Regulated Flows



6.2.5.2.4 Surface Water Quality

The MECP's PWQMN data catalogue (MECP 2021) was accessed on November 11, 2022 to identify available, long-term surface water records for stations within the seven identified tertiary watersheds of the RSA. This review showed that long-term surface water quality data was available for four of the tertiary watersheds within the RSA, specifically 02AB-Kaministiquia River, 021B-North Lake Superior Shoreline, 05PAB-Rainy Headwaters, and 05QD-Wabigoon River and, as shown in Appendix 6.2-A – Table 3.1-6, included records from 23 monitoring stations (seven of which represent active monitoring stations and 16 which are inactive).

Details for each of the selected PWQMN station are presented in Section 3.1.4 and Attachment 6.2-A-1 of Appendix 6.2-A - Surface Water Baseline Report. Parameters collected at the stations have been compared to standards and guidelines from the Ontario Ministry of Environment and Energy - Provincial Water Quality Objectives (PWQO) (MOEE 1999), Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE 2006), and the Canadian Water Quality Guideline, Water Quality (Freshwater) for the Protection of Aquatic Life (CCME 1999).

A summary of long-term surface water quality trends for tertiary watersheds in the RSA containing PWQMN stations is presented below.

North Lake Superior Shoreline Tertiary Watershed

The available water quality results at the two PWQMN stations within the North Lake Superior Shoreline tertiary watershed includes analytical data from approximately 330 water quality sampling events. Key results were as follows:

- pH values ranged from neutral to alkaline, with values varying between approximately 2.3 to 8.9, with a median value of 7.8;
- Alkalinity ranged from 31 to 188 mg/L (as calcium carbonate [CaCO3]), with a median of 93 mg/L;
- Hardness ranged from 36 to 253 mg/L, with a median of 119 mg/L;
- Dissolved oxygen levels varied between 0.0 and 83.9 mg/L, with a median of 10.2 mg/L;
- Turbidity ranged from 0.7 to 150 NTU, with a median of 5.2 NTU, noting that, in comparison, suspended solids concentrations varied from 0.2 to 2600 mg/L, with a median of 6.0 mg/L;
- Phosphorous concentrations were greater than the Interim PWQO criterion of 20 µg/L for 50% of the sampling events, with a median of 21 µg/L;
- Total cadmium concentrations were greater than the Interim PWQO criteria of 0.1 to 0.5 µg/L (dependent on the associated hardness concentration) for 84% of the sampling events, with a median value of 1.0 µg/L;

- Total copper concentrations were greater than the Interim PWQO criteria of 1 to 5 μg/L (dependent on the hardness concentrations of the sample) for 4% of the sampling events, with a median value of 2.6 μg/L;
- Total iron concentrations were greater than the PWQO criterion of 300 μg/L in 90% of the sampling vents, with a median of 700 μg/L; and
- Total lead concentrations were greater than the Interim PWQO criteria of 1 and 5 μg/L (dependent on the associated hardness concentration) for 32% of the sampling events, with a median value of 3.0 μg/L.

Kaministiquia River Tertiary Watershed

The available water quality results at the 16 PWQMN stations within the Kaministiquia River tertiary watershed includes analytical data from approximately 4,700 water quality sampling events. Key results were as follows:

- pH values ranged from neutral to alkaline, with values varying between approximately 5.7 to 8.9, with a median value of 7.4;
- Alkalinity ranged from 8 to 194 mg/L (as CaCO3), with a median of 42.7 mg/L;
- Hardness ranged from 4.4 to 1640 mg/L, with a median of 50 mg/L;
- Dissolved oxygen levels varied between 0.0 mg/L and 138 mg/L, with a median of 9.8 mg/L;
- Turbidity ranged from 0.1 to 300 NTU, with a median of 4.5 NTU, noting that, in comparison, suspended solids concentrations varied from 0.5 to 1191 mg/L, with a median of 6.0 mg/L;
- Phosphorous concentrations were greater than the Interim PWQO criterion of 20 micrograms per litre (μg/L) for 66% of the sampling events, with a median of 34 μg/L;
- Total cadmium concentrations were greater than the Interim PWQO criteria of 0.1 to 0.5 μg/L (dependent on the associated hardness concentration) for 88% of the sampling events, with a median value of 0.48 μg/L;
- Total copper concentrations were greater than the Interim PWQO criteria of 1 to 5 μg/L (dependent on the hardness concentrations of the sample) for 6% of the sampling events, with a median value of 2.8 μg/L;
- Total iron concentrations were greater than the PWQO criterion of 300 μg/L in 78% of the sampling vents, with a median of 500 μg/L; and

- Total lead concentrations were greater than the Interim PWQO criteria of 1 and 5 µg/L (dependent on the associated hardness concentration) for 9% of the sampling events, with a median value of 2.0 µg/L.

Rainy Headwaters Tertiary Watershed

The available water quality results at the one PWQMN station within the Rainy Headwaters tertiary watershed includes analytical data from approximately seven water quality sampling events. Key results were as follows:

- pH was analyzed for one sampled event. The pH result was 7.4;
- Dissolved oxygen levels varied between 0.0 and 12 mg/L, with a median of 10 mg/L;
- Turbidity was analyzed for one sampled event. The turbidity result was 0.5 NTU;
- Phosphorous concentrations were within the Interim PWQO criterion of 20 µg/L for all seven sampling events, with a median of 10.5 µg/L;
- Copper was analyzed for one sampled event. The copper concentration was greater than the Interim PWQO criteria of 1 to 5 µg/L (dependent on the hardness concentrations of the sample), with a recorded value of 30 µg/L;
- Total iron was analyzed for two sampled events. Total iron concentrations were greater than the PWQO criterion of 300 µg/L for one of the two samples, with concentrations ranging from 100 to 400 µg/L; and
- Total lead was analyzed for one sampled event. The total lead concentration was greater than the Interim PWQO criteria of 1 to 5 µg/L (dependent on the hardness concentrations of the sample), with a recorded value of 50 µg/L.

Wabigoon River Tertiary Watershed

The available water quality results at the four PWQMN stations within the Wabigoon River tertiary watershed includes analytical data from approximately 790 water quality sampling events. Key results were as follows:

- pH values ranged from neutral to alkaline, with values varying between approximately 4.1 to 9.1, with a median value of 7.5;
- Alkalinity ranged from 0.0 to 123 mg/L (CaCO3), with a median of 52 mg/L;
- Hardness ranged from 24 to 204 mg/L, with a median of 58 mg/L;
- Dissolved oxygen levels varied between 0.0 and 19 mg/L, with a median of 9.5 mg/L;
- Turbidity ranged from 0.5 to 110 NTU, with a median of 15 NTU, noting that, in comparison, suspended solids concentrations varied from 1.0 to 160 mg/L, with a median of 9.0 mg/L;

- Phosphorous concentrations were greater than the Interim PWQO criterion of 20 µg/L for 96% of the sampling events, with a median of 54 µg/L;
- Total cadmium concentrations were greater than the Interim PWQO criteria of 0.1 to 0.5 µg/L (dependent on the associated hardness concentration) for 71% of the sampling events, with a median value of 0.75 µg/L;
- Total copper concentrations were greater than the Interim PWQO criteria of 1 to 5 µg/L (dependent on the hardness concentrations of the sample) for 11% of the sampling events, with a median value of 3.0 µg/L;
- Total iron concentrations were greater than the PWQO criterion of 300 µg/L in 25% of the sampling vents, with a median of 750 µg/L; and
- Total lead concentrations were greater than the Interim PWQO criteria of 1 and 5 µg/L (dependent on the associated hardness concentration) for 9% of the sampling events, with a median value of 2.3 µg/L.

Summary of Baseline Conditions

The key findings of the desktop analysis of baseline surface water conditions are as follows:

- **Watershed and river system characteristics** – The Project crosses seven tertiary watersheds (02AB – Kaministiquia River, 021B – North Lake Superior Shoreline, 05PAB – Rainy Headwaters, 05PBA – Big Turtle River, 05PBB – Rainy Lake, 05QA – Upper English River, and 05QD – Wabigoon River) that include a total 1,484 individual waterbody locations. These waterbodies range from catchment areas of approximately <1 km² to 16,390 km² and generally drain to the east (towards Lake Superior) or west (ultimately discharging to Lake Winnipeg). The surficial geology of the watersheds is dominated by organic deposits with occurrences of glaciolacustrine deposits, glaciofluvial deposits, till, and bedrock, while land cover in the catchments is characterized by mostly treed cover and moderate relief (ranging on average from 320 to 450 m).
- **Surface water use** – A total of three PTTWs are active within and in close proximity to the surface water LSA along the ROW (based on MECP records). In addition, a total of 11 hydroelectric generating stations are located within the surface water RSA, eight of which are located within or downstream of the surface water LSA.
- **Surface water yield and seasonal distribution** – Surface water flows and water levels within/slightly outside of the RSA are largely controlled by snowmelt- and rainfall-generated runoff patterns. The spring and fall hydrographs are typically characterized by high flows in response to the annual snowmelt event in April-May and fall rains in October-November, while hydrographs during the summer and winter months are marked by mostly low to moderate flows (due to comparatively dry or frozen conditions,

respectively). Mean annual surface water yields were shown to vary from 195 to 372 mm based on data from OWIT and WSC.

- **Surface water quality** – Based on available data from MECP, surface water quality within and slightly outside of the RSA is generally within relevant guideline values, noting exceedances of some metals (i.e., cadmium, iron, and instances of lead) at certain locations. Observed turbidity from the available water quality records ranged on average from 0.1 to 300 NTU.

6.2.5.3 Field Investigation Summary

A summary of the field results at the subset of water crossing locations (i.e., a total of 210 water crossing locations were targeted for site-specific field surveys along the ROW) is provided below, noting that this summary includes details of hydrological, hydraulic, and geomorphological characteristics.

Photographs of each of the watercourse crossings with additional field data are provided in Appendix 6.2-A, Attachment 6.2-B. The completed Rapid Geomorphic Assessment forms for each of the proposed crossing locations are presented in Appendix 6.2-A, Attachment 6.2-A, Table 3.2-1.

6.2.5.3.1 Surface Water Hydrology

A summary of hydrological, hydraulic, and geomorphological characteristics at the 210 potential water crossings that were field surveyed are presented below, noting that the information is based on the site-specific observations and measurements that were obtained in the field.

North Lake Superior Shoreline Tertiary Watershed

- Field surveys were completed at 10 crossing locations within the North Lake Superior Shoreline tertiary watershed. Key results were as follows:
  - Of the 10 crossing locations, four were deemed as watercourses, one as a lake/pond, and five as drainage features with no defined channel, noting that all four watercourses and the one lake/pond fall into the category of a small-sized watershed (less than 10 km^2).
  - Of the three watercourse crossing locations that were assessed for bankfull geometry, bankfull widths ranged between 2.7 m and 28 m, while bankfull depths varied between 0.2 m and 0.8 m.
- Of the three watercourses and one lake/pond that were analyzed for a Rapid Geomorphic Assessment, three crossing locations displayed stable to mostly stable conditions and one crossing location demonstrated transitional or stressed conditions (with evidence of aggradation and widening).

- For two of the watercourses that were targeted for spot flow measurements at the time of the surveys, instantaneous flow rates were 9.0 L/s (on July 19, 2022) and 2.5 L/s (on September 5, 2022).

Kaministiquia River Tertiary Watershed

Field surveys were completed at 48 crossing locations within the Kaministiquia River tertiary watershed. Key results were as follows:

- Of the 48 crossing locations, 21 were deemed as watercourses, nine as lakes/ponds, and 18 as drainage features with no defined channel, noting that, of the 21 watercourses and nine lakes/ponds, 27 fall into the category of a small-sized watershed (less than 10 km^2) and three (located on the same watercourse) fall into the category of a medium-sized watershed (between 10 km^2 and 1000 km^2).
  - For the 21 watercourse crossing locations that were assessed for bankfull geometry:
  - The 18 crossing locations with small-sized watersheds included bankfull widths that ranged between 0.5 m and 33.7 m and bankfull depths that ranged between 0.15 m and 2.0 m.
  - The three crossing locations with medium-sized watersheds had a bankfull width between 5.2 m and 5.5 m and a bankfull depth between 0.4 m and 2.0.
- For the 18 watercourses and nine lakes/ponds that were analyzed for a Rapid Geomorphic Assessment:
  - The 25 crossing locations with small-sized watersheds included 19 crossing locations that displayed stable to mostly stable conditions and 6 crossing locations that showed transitional or stressed conditions (with evidence of aggradation, widening, and planimetric form adjustment).
  - The two crossing locations with medium-sized watersheds each displayed stable to mostly stable conditions.
- For 12 of the 17 watercourses that were targeted for spot flow measurements at the time of the surveys, instantaneous flow rates ranged from 0.07 L/s to 4.0 L/s (where the flow estimates were obtained between June 20 and September 4, 2022).

Rainy Headwaters Tertiary Watershed

- Field surveys were completed at 56 crossing locations within the Rainy Headwaters tertiary watershed. Key results were as follows:
- Of the 56 crossing locations, 17 were deemed as watercourses, 24 as lakes/ponds, and 15 had no defined channel, noting that of the 17 watercourse and 24 lake/pond crossing locations, 40 fall into the category of small-sized watersheds (less than 10 km^2) and one falls into the category of a medium watershed (between 10 km^2 and 1,000 km^2).

  - Of the 17 crossing locations that fall into the category of a small-sized watershed, bankfull widths ranged between 1.0 m and 25.0 m and bankfull depths ranged between 0.2 m and 2.0 m.

- Of the 15 watercourse and 9 lake/pond crossing locations analyzed for a Rapid Geomorphic Assessment, 24 crossing locations displayed stable to mostly stable conditions and three crossing locations displayed transitional or stressed conditions, generally showing signs of aggradation, and evidence of widening and planimetric form adjustment.

  - Of the 26 crossing locations that fall into the category of a small-sized watershed, 23 crossing locations displayed stable to mostly stable conditions and three crossing locations displayed transitional or stressed conditions, generally showing signs of aggradation, and evidence of widening and planimetric form adjustment.

  - Of the one crossing location that falls into the category of a medium-sized watershed, it displayed stable to mostly stable conditions.

- Instantaneous flows were collected at nine watercourses and seven lake/pond outlets between June 21, 2022 and September 21, 2022, with flows ranging between 0.2 L/s and 77 L/s.

  - Of the eight watercourses and seven lake/pond outlets that fall into the category of a small-sized watershed, flows ranging between 0.2 L/s and 52 L/s were observed.

  - Of the one crossing location that falls into the category of a medium-sized watershed, the recorded flow was 77 L/s.

Rainy Lake Tertiary Watershed

Field surveys were completed at 35 crossing locations within the Rainy Lake tertiary watershed. Key results were as follows:

- Of the 35 crossing locations, seven were deemed as watercourses, seven as lakes/ponds, and 21 had no defined channel, noting that of the 7 watercourse and 7 lake/pond crossing locations, 13 fall into the category of small-sized watersheds (less than 10 km2) and one falls into the category of a medium watershed (between 10 km^2 and 1000 km^2).

  - Of the seven watercourse crossing locations, bankfull widths ranged between 0.8 m and 10 m and bankfull depths ranged between 0.1 m and 1.3 m.

  - Of the six crossing locations that fall into the category of a small-sized watershed, bankfull widths ranged between 1.0 m and 11.6 m and bankfull depths ranged between 0.4 m and 1.5 m.

  - Of the one crossing location that falls into the category of a medium-sized watershed, the bankfull width was 15.2 m and the bankfull depth was 2.0 m.

- Of the eight watercourses and 13 lakes/ponds crossing locations analyzed for a Rapid Geomorphic Assessment, 15 crossing locations displayed stable to mostly stable conditions and one crossing locations displayed transitional or stressed conditions, generally showing signs of aggradation, and evidence of widening and planimetric form adjustment.
  - Of the 14 crossing locations that fall into the category of a small-sized watershed, all 14 crossing locations displayed stable to mostly stable conditions.
  - Of the one crossing location that falls into the category of a medium-sized watershed, it displayed stable to mostly stable conditions.
- Instantaneous flows were collected at four watercourses between July 10, 2022 and September 17, 2022 with flows ranging between 1.5 L/s and 412 L/s observed.
  - Of the three watercourses that fall into the category of a small-sized watershed, flows ranging between 1.5 L/s and 217 L/s were observed.
  - Of the one crossing locations that falls into the category of a medium-sized watershed, the recorded flow was 412 L/s.

Big Turtle River Tertiary Watershed

Field surveys were completed at 24 crossing locations within the Big Turtle River tertiary watershed. Key results were as follows:

- Of the 24 crossing locations, six were deemed as watercourses, eight as lakes/ponds, and 10 had no defined channel, noting that all six watercourse and eight lake/pond crossing locations fall into the category of small-sized watersheds (less than 10 km^2).
- Of the six watercourse crossing locations, bankfull widths ranged between 0.6 m and 3.0 m and bankfull depths ranged between 0.3 m and 0.6 m.
- Of the six watercourse and seven lake/pond crossing locations analyzed for a Rapid Geomorphic Assessment, all 13 displayed stable to mostly stable conditions.
- Instantaneous flows were collected at three watercourses between August 1, 2022 and September 24, 2022 with flows ranging between 0.4 L/s and 17 L/s observed.

Upper English River Tertiary Watershed

Watercourse and/or waterbody characteristics were collected at four crossing locations within the Upper English River tertiary watershed. Key results were as follows:

- Of the four crossing locations, one was deemed a watercourse, one deemed a lake, and two had no defined channels, noting that both watercourse and lake crossing locations fall into the category of small-sized watersheds (less than 10 km^2).

- The crossing location that falls into the category of a small-sized watershed, the bankfull width was 1.0 m and the bankfull depths was 0.4 m.
- Of the one watercourse and one lake/pond crossing locations analyzed for a Rapid Geomorphic Assessment, the lake displayed stable to mostly stable conditions and the watercourse crossing location displayed transitional or stressed conditions, showing signs of aggradation, and evidence of widening and planimetric form adjustment.
- Instantaneous flows were collected at one watercourse on September 16, 2022 with a flow rate of 58 L/s.

Wabigoon River Tertiary Watershed

Watercourse and/or waterbody characteristics were collected at 33 crossing locations within the Wabigoon River tertiary watershed. Key results were as follows:

- Of the 33 crossing locations, 13 were deemed as watercourses, four as lakes/ponds, and 16 had no defined channel, noting that of the 13 watercourse and four lake/pond crossing locations, 10 fall into the category of small sized watersheds (less than 10 km^2) and seven fall into the category of medium sized watersheds (between 10 km^2 and 1000 km^2).
  - Of the six watercourse crossing locations that fall into the category of a small-sized watershed, bankfull widths ranged between 0.8 m and 19.9 m and bankfull depths ranged between 0.3 m and 2.0 m.
  - Of the seven watercourse crossing locations that fall into the category of a medium-sized watershed, bankfull widths ranged between 4.1 m and 15 m and bankfull depths ranged between 1.3 m and 2.0 m.
- Of the 20 watercourses/lakes/ponds/wetlands analyzed for a Rapid Geomorphic Assessment, 18 displayed stable to mostly stable conditions while two crossings displayed transitional or stressed conditions, showing signs of aggradation, and evidence of widening and planimetric form adjustment.
- Instantaneous flows were collected at nine watercourses between July 30, 2022 and September 28, 2022 with flows ranging from less than 0.04 L/s to 336 L/s.
  - Of the six watercourses that fall into the category of a small-sized watershed, flows ranging between 0.04 L/s and 19 L/s were observed.
  - Of the three crossing locations that falls into the category of a medium-sized watershed, flows ranging between 170 L/s and 336 L/s were observed.

Summary of Field Investigations – Surface Water Quantity

The key observations for the surface water quantity aspects of the field investigations are summarized as follows:

- Of the 210 crossing locations surveyed along the preferred route, 69 were deemed as watercourses, 54 as lakes/ponds, and 87 had no defined channel.
- Of the 69 watercourse crossing locations that were assessed for bankfull geometry, bankfull widths ranged between 0.5 m and 33.7 m and bankfull depths varied between 0.1 m and 2.0 m.
- Of the 57 watercourse and 35 lake/pond crossing locations that were analyzed for a Rapid Geomorphic Assessment, 79 displayed stable to mostly stable conditions and 13 crossing locations showed transitional or stressed conditions.
- Of the 40 watercourses that were targeted for spot flow measurements, instantaneous flows ranged from 0.04 L/s to 412 L/s (where the flow estimates were obtained between June 2022 and September 28, 2022).

6.2.5.3.2 Surface Water Quality

A summary of surface water quality characteristics at the 210 potential water crossings that were field surveyed are presented below.

North Lake Superior Shoreline Tertiary Watershed

Water quality results were collected at seven crossing locations within the North Lake Superior Shoreline tertiary watershed. Key results were as follows:

- pH values were neutral, with values varying between 6.76 to 7.65, with a mean and median value of 7.30 and 7.35, respectively.
- Specific conductivity values ranged from a minimum of 135 microSiemens per centimetre (µS/cm) to a maximum of 339 µS/cm in the surface water samples, with a mean and median value of 193 µS/cm and 163 µS/cm, respectively.
- Dissolved oxygen levels varied between 1.21 mg/L and 11.53 mg/L, with a mean and median value of 6.95 mg/L and 7.79 mg/L.
- Turbidity ranged from less than 0.01 NTU to 2.4 NTU, with a mean and median value of 1.36 NTU and 2.12 NTU, respectively.

Kaministiquia River Tertiary Watershed

Water quality results were collected at 32 crossing locations within the Kaministiquia River tertiary watershed. Key results were as follows:

- pH values ranged from acidic to alkaline, with values varying between approximately 2.44 to 8.51, with a mean and median value of 6.80 and 6.78, respectively.
- Specific conductivity values ranged from a minimum of 18 µS/cm to a maximum of 743.4 µS/cm in the surface water samples, with a mean and median value of 163.8 µS/cm and 131.3 µS/cm, respectively.

- Dissolved oxygen levels varied between 0.45 mg/L and 13.29 mg/L, with a mean and median value of 6.13 mg/L and 6.38 mg/L, respectively.
- Turbidity ranged from 0.49 to 145.10 NTU, with a mean and median value of 17.49 NTU and 4.13 NTU, respectively.

Rainy Headwaters Tertiary Watershed

Water quality results were collected at 44 crossing locations within the Rainy Headwaters tertiary watershed. Key results were as follows:

- pH values ranged from acidic to near neutral, with values varying between approximately 3.54 to 7.54, with a mean and median value of 5.98 and 6.06, respectively.
- Specific conductivity values ranged from a minimum of 14 μS/cm to a maximum of 1,793 μS/cm in the surface water samples, with a mean and median value of 296.7 μS/cm and 184.1 μS/cm, respectively.
- Dissolved oxygen levels varied between 1.19 mg/L and 9.76 mg/L, with a mean and median value of 5.66 mg/L and 5.99 mg/L, respectively.
- Turbidity concentrations ranged from 0.13 to 37.39 NTU, with a mean and median value of 5.73 NTU and 5.99 NTU, respectively.

Rainy Lake Tertiary Watershed

Water quality results were collected at 32 crossing locations within the Rainy Lake tertiary watershed. Key results were as follows:

- pH values ranged from acidic to near neutral, with values varying between approximately 3.46 to 7.76, with a mean and median value of 6.02 and 6.08, respectively.
- Specific conductivity values ranged from a minimum of 11.1 μS/cm to a maximum of 257.7 μS/cm in the surface water samples, with a mean and median value of 57.6 μS/cm and 27.1 μS/cm, respectively.
- Dissolved oxygen levels varied between 0.33 mg/L and 8.8 mg/L, with a mean and median value of 5.19 mg/L and 5.40 mg/L, respectively.
- Turbidity ranged from 0.32 to 24.83 NTU, with a mean and median value of 4.81 NTU and 2.56 NTU, respectively.

Big Turtle River – Tertiary Watershed

Water quality results were collected at 24 crossing locations within the Big Turtle River tertiary watershed. Key results were as follows:

- pH values ranged from acidic to near neutral, with values varying between approximately 4.65 to 7.55, with a mean and median value of 5.55 and 5.40, respectively.

- Specific conductivity values ranged from a minimum of 8.47 µS/cm to a maximum of 38.6 µS/cm in the surface water samples, with a mean and median value of 18.0 µS/cm and 17.4 µS/cm, respectively.

- Dissolved oxygen levels varied between 0.71 mg/L and 10.75 mg/L, with a mean and median value of 5.63 mg/L and 6.32 mg/L, respectively.

- Turbidity ranged from 0.46 to 64.05 NTU, with a mean and median value of 7.95 NTU and 3.36 NTU, respectively.

Upper English River Tertiary Watershed

Water quality results were collected at four crossing locations within the Upper English River tertiary watershed. Key results were as follows:

- pH values were acidic, with values varying between approximately 4.65 to 5.16, with a mean and median value of 4.88 and 4.86, respectively.

- Specific conductivity values ranged from a minimum of 19.2 µS/cm to a maximum of 29.1 µS/cm in the surface water samples, with a mean and median value of 21.8 µS/cm and 19.5 µS/cm, respectively.

- Dissolved oxygen levels varied between 5.85 mg/L and 7.83 mg/L, with a mean and median value of 6.90 mg/L and 6.95 mg/L, respectively.

- Turbidity ranged from 1.57 to 3.52 NTU, with a mean and median value of 2.43 NTU and 2.31 NTU, respectively.

Wabigoon River Tertiary Watershed

Water quality results were collected at 33 crossing locations within the Wabigoon River tertiary watershed. Key results were as follows:

- pH values ranged from acidic to near neutral, with values varying between approximately 2.1 to 7.56, with a mean and median value of 5.99 and 6.28, respectively.

- Specific conductivity values ranged from a minimum of 16.4 µS/cm to a maximum of 157.0 µS/cm in the surface water samples, with a mean and median value of 53.5 µS/cm and 30.6 µS/cm, respectively.

- Dissolved oxygen levels varied between 0.70 mg/L and 10.53 mg/L, with a mean and median value of 6.96 mg/L and 7.24 mg/L, respectively.

- Turbidity ranged from less than 0.01 to 60.17 NTU, with a mean and median value of 10.08 NTU and 7.67 NTU, respectively.

Summary of Field Investigations – Surface Water Quality

The key observations for the surface water quality aspects of the field investigations are summarized as follows:

- Measured field pH values at the crossing locations ranged from acidic to near neutral in surface water samples. Overall, 41 of the 146 recorded sample locations had pH in the 2.10 to 6.46 range, below the CCME, Ontario Drinking Water Standards (ODWS) and typical PWQO criteria range (i.e., pH less than 6.5 lower range criteria). Generally, samples from proposed crossing locations were predominantly acidic with a mean, median, and maximum values of 6.12, 6.27 and 8.51, respectively.

- Measured specific conductivity values ranged from a minimum of 8.5 µS/cm to a maximum of 1,793 µS/cm in the surface water samples. Generally, samples from proposed crossing locations displayed mean and median values of 148.5 µS/cm and 64.3 µS/cm, respectively.

- Dissolved oxygen concentrations measured in the field were below the lower CCME and PWQO criteria ranges (e.g., 4 mg/L) in 41 of the 146 recorded samples. Samples from proposed crossing locations had mean, median, and maximum values of 5.97 mg/L, 6.12 mg/L and 13.29 mg/L, respectively.

- Turbidity concentrations measured in the field did not exceed the ODWS aesthetic objective (e.g., 5 NTU) in 91 of 146 recorded samples, with calculated minimum, mean, median, and maximum values of <0.01 NTU, 8.47 NTU, 3.17 NTU, and 145.1 NTU, respectively.

6.2.6 Potential Project-Environment Interactions

The potential Project-environment interactions were identified through a review of the Project Description in combination with the results of the existing conditions assessment. These Project-environment interactions are summarized in Table 6.2-8.

Table 6.2-8: Project-Environment Interactions for Surface Water

Criteria	Indicator	Project Stage Construction[(a)]	Project Stage Operation	Project Stage Retirement	Description of Potential Project-Environment Interaction
Surface Water	• Surface water quantity; and • Surface water quality.	✓	–	✓	• Changes to surface water quantity and surface water quality from short-term water discharges.
Surface Water	• Surface water quality.	✓	✓	✓	• Changes to surface water quality from the transport and delivery of airborne particulate matter to nearby waterbodies.
Surface Water	• Surface water quality.	✓	–	✓	• Changes to surface water quality from the wash-off of trash and leachate at waste handling and storage facilities to nearby waterbodies.
Surface Water	• Surface water quality.	–	✓	–	• Changes to surface water quality from the wash-off of organic debris from vegetation maintenance activities to adjacent waterbodies.
Surface Water	• Surface water quality.	✓	✓	✓	• Changes to surface water quality from the wash-off of accidental spills and leaks to nearby waterbodies.
Surface Water	• Surface water quality.	✓	–	–	• Changes to surface water quality from the wash-off of explosives spills and residues from blasting activities to nearby waterbodies.
Surface Water	• Surface water quantity.	✓	–	–	• Changes to surface water quantity from short-term water taking.

Criteria	Indicator	Project Stage Construction[(a)]	Project Stage Operation	Project Stage Retirement	Description of Potential Project-Environment Interaction
Surface Water	• Surface water quality.	✓	–	✓	• Changes to surface water quality from the wash-off of organic debris from work sites to nearby waterbodies, and/or increased rates of erosion in disturbed and exposed areas with sediment transport and delivery to adjacent waterbodies.
Surface Water	• Surface water quantity; and • Surface water quality.	✓	✓	✓	• Changes to surface water quantity and surface water quality due to changes in land cover.
Surface Water	• Surface water quantity; and • Surface water quality.	✓	–	✓	• Changes to surface water quantity and surface water quality during short-term water diversions at water crossings.
Surface Water	• Surface water quantity; and • Surface water quality.	✓	✓	✓	• Changes to surface water quantity and surface water quality due to changes in channel hydraulics at water crossings.

✓ = A potential Project-environment interaction could result in an environmental or socio-economic effect; – = No plausible interaction was identified.

a) As described in Section 6.2.4.1, the construction scenario assessed as part of the EA is considered bounding and potential effects and mitigation measures for retirement are not identified separately in this EA.

6.2.7 Potential Effects, Mitigation Measures, and Net Effects

This section presents the potential effects, appropriate mitigation measures, and predicted net Project effects for surface water. A summary of the potential effects, mitigation measures, and net effects are presented in Table 6.2-10.

6.2.7.1 Changes to Surface Water Quantity and Surface Water Quality from Short-term Water Discharges

Potential Effects

Discharges of water from Project activities during the construction stage could result in changes to surface water quantity and quality if not mitigated. Discharges could result in increases to streamflow and/or water levels in receiving waterbodies, as well as increases to the concentrations of suspended solids and chemical constituents in these same receivers. Sources of water during Project construction may include:

- Construction water from dewatering activities during excavations for tower foundations;
- Water from concrete batch plants, if required;
- Wash water from cleaning concrete mixing equipment and concrete delivery systems on work sites;
- Wash water from vehicle and equipment wash facilities on work sites and at temporary construction camps, temporary laydown areas; and
- Domestic water from temporary construction camps and construction offices.

Mitigation Measures

All discharges of Project water will be conducted in accordance with O. Reg. 387/04 (Government of Ontario 2021c), as amended by O. Reg. 64/16 (Government of Ontario 2016) under the *Ontario Water Resources Act* or O. Reg. 255/11 (Government of Ontario 2011) under the *Environmental Protection Act*, where applicable, recognizing that these discharge activities will require permitting or approvals through the MECP's Environmental Activity and Sector Registry (EASR), PTTW, or an Environmental Compliance Approval (ECA). As part of the permitting and/or approvals process associated with EASR, PTTW, and ECA, a water taking and discharge plan and supporting technical analysis will be developed for each source of construction water, wastewater and wash water, as required, noting that, by design, the applicable water quantity and quality criteria (e.g., effluent limits) associated with the plan will be protective of the existing surface water, groundwater and natural environment conditions in the local area and, in turn, are expected to result in minimal changes (if any) to streamflows, water levels, and the concentrations of suspended solids and chemical constituents in nearby waterbodies. Water quantity and quality monitoring will be completed, where appropriate, to confirm the effectiveness of the discharge plan and associated mitigation measures, as well as to maintain and demonstrate compliance with regulatory permits/approvals.

The specific requirements for short-term water taking and discharge activities will be determined during the permitting and design stage of the Project. An initial engagement with MECP will be used to establish the preferred method to apply for and secure water taking and discharge related permits and approvals. It is possible that specific water taking and discharge activities may be eligible for EASR (e.g., construction dewatering between 50,000 L/day and 400,000 L/day during excavations for tower foundations), noting that each relevant EASR would be tied to a discrete activity and location along the Project alignment. Other water taking and discharge activities (e.g., direct surface water taking from a lake or river of greater than 50,000 L/day for the purposes of water supply) would require a PTTW. Finally, if daily flow rates are more than 10,000 L/day, it is understood that discharge of water from stormwater management facilities and other sewage works will require an ECA (e.g., wash water from vehicles and equipment, water from concrete batch plants, domestic water and grey water from leaching beds).

Further to the mitigation measures described above:

- Concrete for the Project will be locally sourced and delivered in concrete mixer trucks, to the extent feasible. Concrete may be mixed on-site in batch plants along the ROW and will be fully consumed. Where applicable, treatment and disposal of water from any such concrete batch plants will be in compliance with ECAs issued by the MECP under the *Environmental Protection Act*.
- Wash water from cleaning concrete mixing equipment and delivery systems, as well as from vehicles and equipment, will be collected in designated wash-out sites, located at least 30 m from a water body. The wash-out site will be monitored regularly to verify that runoff from the area does not report to a waterbody. Following the construction phase, all temporary wash-out sites will be capped with local backfill and re-graded prior to construction crews departing the site.
- Domestic water discharge from temporary construction camps and work sites will be disposed of in one of two ways. Water discharge from toilets at temporary construction camps and portable sanitation facilities at work sites will be collected in approved vehicles and hauled to existing municipal wastewater treatment plants (WWTPs) authorized to accept this type of waste. Greywater will be discharged to leaching beds constructed at the temporary construction camps, approved under the Ontario Building Code 2012. The treatment unit (e.g., septic tank system) shall be connected to a leaching bed constructed in accordance with the requirements of Section 8.7 of the Ontario Building Code. In compliance with the Code, leaching beds will be sited a minimum of 15 m away from any waterbody. A sewage ECA may be required for the leaching beds serving the construction camp, depending on the total theoretical flow rate, noting that a sewage ECA would be needed if the theoretical daily flows for domestic water discharge and grey water are more than 10,000 L/day, while a building permit approval would be required instead if the theoretical daily flows are less than 10,000 L/day.

- No tower foundations are anticipated to be placed below the highwater mark (HWM), noting that, with few exceptions, all towers are currently planned at locations that are at least 30 m from mapped waterbodies. If a tower foundation is required within the limits of the HWM (based on specific cases identified in the field), the relevant regulatory approvals will be secured for the proposed works.

Net Effects

Measurable changes (i.e., net effects) to surface water quantity (increase in streamflows and/or water levels at receiving water bodies) and surface water quality (increase to the concentrations of suspended solids and chemical constituents in receiving water bodies) may occur as a result of short-term water discharges during the construction stage of the Project, even with the effective implementation of the mitigation measures outlined above and in Table 6.2-10. Therefore, this Project-environment interaction is carried forward to the net effects characterization (Section 6.2.8.2).

6.2.7.2 Changes to Surface Water Quality from the Transport and Delivery of Airborne Particulate Matter to Nearby Waterbodies

Potential Effects

Air emissions from Project activities during the construction stage could result in changes to surface water quality, if not mitigated. The transport and delivery of airborne particulate matter could result in increased concentrations of chemical constituents and suspended solids in receiving waterbodies. During Project construction and operations, particulate matter may be combustion products and/or fugitive dust generated from:

- Vehicle and equipment exhausts;
- Transportation of personnel, materials, and equipment on access roads;
- Site preparation, earthworks, stockpiling, and demolition activities;
- Blasting activities; and
- On-site concrete mixing.

Mitigation Measures

Mitigation measures planned to reduce the potential effects of airborne particulate matter on the surface water environment include:

- Operating properly functioning vehicles and equipment;
- Regularly servicing and maintaining vehicles and equipment;
- Turning off vehicles and equipment when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition, where reasonable and practicable;

- Using multi-passenger vehicles to transport personnel, where practicable;
- Minimizing dust generating activities, as practicable and where required, during periods of high wind to limit dust emissions and spread;
- Wetting or covering soil and aggregate materials during transportation, as appropriate;
- Reducing vehicle speeds at work sites and on access roads, as appropriate;
- Employing dust suppression at concrete batch plants, work sites, and on access roads, as appropriate; and
- Vegetating stockpiles, where appropriate.

Net Effects

The results of a screening level assessment of air emissions during the construction stage indicated that, with the implementation of the above mitigation measures (also summarized in Table 6.2-10), there would be no net effects on existing ambient concentrations of particulate matter. To that end, no net effects to surface water quality are expected as a result of the transport and delivery of airborne particulate matter.

Based on the above, this effect (i.e., increase to the concentrations of chemical constituents and suspended solids in receiving water bodies from the transport and delivery of airborne particulate matter) is not carried forward to the net effects characterization (Section 6.2.8.2).

6.2.7.3 Changes to Surface Water Quality from the Wash-off of Trash and Leachate at Waste Handling and Storage Facilities to Nearby Waterbodies

Potential Effects

Hydro One with their contractor(s) will establish and operate temporary waste handling and storage facilities at various locations during the construction stage of the Project. The wash-off of trash (i.e., rainwater that has direct contact with the trash and may mobilize solids to downstream receivers) and leachate at these facilities to nearby waterbodies could result in changes to surface water quality relative to the Baseline Characterization. Changes may include increases in concentrations of suspended solids (including floating debris) and chemical constituents in the receiving water.

Mitigation Measures

Portable, secure, solid waste receptacles will be provided on work sites, and at temporary laydown areas for the collection and temporary storage of domestic waste (e.g., food scraps, paper, cardboard, bottles, cans) and non-hazardous construction waste (e.g., wiring, metal, rubble). These receptacles will be located outside a minimum 30 m buffer around waterbodies, to the extent practicable, and the solid waste collected in these receptacles will be hauled periodically to waste handling and storage facilities located at the temporary construction camps.

Waste handling and storage facilities and waste recycling areas will be established at each temporary construction camp. These facilities will be located outside of the minimum 30 m buffer zone around waterbodies to the extent practicable, provided with drainage controls and require personnel to be trained in industry standard waste management practices and procedures. Organic waste, recyclable materials, and non-hazardous solid waste at waste handling and storage facilities will be separated and temporarily stored in appropriate containers before being transported to a waste disposal site designed to accept this type of waste. Hazardous solid and liquid waste at waste handling and storage facilities will be temporarily stored in labelled, closed, compatible containers, with secondary containment if appropriate. Hazardous, solid, and liquid waste will be managed and disposed of in compliance with O. Reg. 347 as amended by O. Reg. 86/16 under the *Environmental Protection Act*. Hazardous waste will be periodically transported by a registered hauler to an approved disposal site. The generation of hazardous waste is expected to be mainly associated with the servicing and maintenance of construction vehicles and equipment, although there may be other sources. Hazardous waste may include used oils, lubricants, and antifreeze, as well as spent lubricating cartridges, oily rags, oily drums, fuel containers, batteries, and fluorescent bulbs.

Net Effects

Based on the effective implementation of the mitigation measures described above (also summarized in Table 6.2-10), coupled with other planning and strategies inherent to the design, no measurable increase to the concentrations of suspended solids and chemical constituents is expected in receiving waterbodies as a result of the wash-off of trash and leachate at waste handling and storage facilities. The volume of trash or leachate-influenced water that collects near a solid waste handling and storage area is expected to be small, meaning that potential loading of suspended solids and chemical constituents to the broader surface water system is anticipated to be relatively inconsequential. In addition, the likelihood that this water is subsequently conveyed to a nearby waterbody is expected to be low, given the plan to maintain a 30 m waterbody buffer and implement/maintain erosion and sediment controls. As such, this potential Project-environment interaction is not carried forward to the net effects characterization (Section 6.2.8.2).

6.2.7.4 Changes to Surface Water Quality from the Wash-off of Organic Debris from Vegetation Maintenance Activities to Adjacent Waterbodies

Potential Effects

During the operation and maintenance stage of the Project, vegetation maintenance activities will be required along the ROW to minimize the potential for vegetation to grow into, or fall onto, the conductors. Activities will generally include mechanical and/or manual methods to manage vegetation to an appropriate height. Mechanical vegetation maintenance activities along the ROW could result in changes to surface water quality, if not mitigated. If not mitigated, potential effects may include the transport of organic debris to nearby waterbodies, with the opportunity for increased concentrations of suspended solids in the receiving water.

Mitigation Measures

To minimize potential impacts to waterbodies, a riparian buffer of 30 m around waterbodies will be maintained for the transmission line ROW, unless required for access to install water crossing structures, in which case a 10 m wide ROW for equipment access will be cleared within the transmission line ROW. The access roads will be cleared and will be 10 m wide.

Vegetation clearing will consist of cutting tree trunks parallel to, and within 15 cm of the ground or lower, as well as the removal of all shrubs, debris, and other such materials. Grubbing may be required along some parts of the ROW. Vegetation will be largely removed by mechanical means, except within 10 m of a watercourse or wetland. In these areas, vegetation will be removed manually, using chain saws and other hand-held equipment, while leaving the undergrowth and duff layer undisturbed to prevent erosion.

The temporary disturbance within the 30 m buffer up to 10 m from a waterbody will have potential for effects to surface water during the construction time period. After the construction time period, the 30 m riparian buffer is expected to be rehabilitated within a two-year timeframe and will be maintained through operations. Removed vegetation will be immediately relocated outside a waterbody buffer zone (30 m), and above its high-water mark.

Chemical vegetation maintenance, including the use of herbicides, will not be used during construction of the Project or for future maintenance of this transmission line.

Net Effects

Based on the effective implementation of the mitigation measures described above (also summarized in Table 6.2-10), coupled with other planning and strategies inherent to the design, no measurable changes to the concentrations of suspended solids are expected at receiving waterbodies as a result of wash-off of organic debris from mechanical vegetation maintenance activities. The volume of water that could be potentially affected by clearing activities is expected to be small, meaning that potential loading of suspended solids to the broader surface water system is anticipated to be relatively inconsequential. Further to this, the likelihood that this water is subsequently conveyed to a nearby waterbody is expected to be low, given the plans to maintain buffer zones of 30 m around waterbodies, and limit clearing of riparian vegetation to the extent practicable and to the requirement of the access road and alignment clearing width only. Clearing at water crossings along the 46-m-wide transmission line ROW will generally be limited to a 10-m-wide ROW for equipment access to water crossing structures (e.g., temporary bridges). Clearing or disturbed areas within the 30 m buffer will be provided with maintained erosion and sediment controls. As such, this potential Project-environment interaction is not carried forward to the net effects characterization (Section 6.2.8).

6.2.7.5 Changes to Surface Water Quality from the Wash-off of Accidental Spills and Leaks to Nearby Waterbodies

Potential Effects

Accidental spills and leaks from the transportation, storage, and handling of hazardous materials during the construction stage, and the operation of vehicles and equipment during the construction and operation and maintenance stages, have the potential to change surface water quality. Spills and leaks could be washed off into nearby waterbodies during a runoff event or when using winter roads and, if occurring in high enough volumes, could change the chemical constituents in receiving waters.

Hazardous materials that may be handled and stored during Project construction include:

- Fuels and batteries for vehicle and equipment operation;
- Oils, grease, and liquid chemicals for vehicle and equipment maintenance; and
- Explosives for blasting activities.

Mitigation Measures

The transportation, storage, and handling of fuels during construction will be in compliance with the *Technical Standards and Safety Act, 2000* (Government of Ontario 2020b) and Canada's *Transportation of Dangerous Goods Act, 1992* (Government of Canada 2019b). Fuels will be transported to temporary construction camps and temporary laydown areas in tanker trucks, drums, or other approved containers, and stored in aboveground storage tanks featuring secondary containment. Drums and containers will be transported off-site and disposed at a waste disposal site designed to accept this type of waste. Vehicles used for transportation will be licensed and maintained according to safety requirements. The aboveground storage tanks will meet the requirements of the Canadian Council of Ministers of the Environment (CCME 2003). Transportation of fuel on winter roads will only take place in safe ice conditions (e.g., open roads where ice thickness has been measured).

Refueling, service, and maintenance of vehicles and equipment will generally be carried out in designated areas at temporary construction camps and temporary laydown areas located a minimum of 120 from waterbodies to the extent possible. These areas will be designed and constructed to collect and contain minor leaks and spills. For example, containment measures may consist of low permeability liners, sloped appropriately, and buried in the ground, portable berms (e.g., insta-berms) or concrete pads with perimeter drainage control. Drainage will be passed through an oil-water separator to remove hydrocarbons prior to its release to a vegetated area. If refueling within 120 of a waterbody cannot be avoided, enhanced spill containment measures will be used. In the event that refuelling, servicing and maintenance is required in the field, 120 m buffer will be respected to the extent possible. There may be locations where this is not possible due to the prevalence of wetlands; however, in these locations enhanced spill containment measures will be used.

Hydro One with their contractor(s) will prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred. Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in on-site work areas, and/or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents.

It is noted that a sewage ECA may be required for the management of storm water drainage from the spill containment areas of substations. In the event of a spill, it is anticipated that the water will be collected and transported in trucks to a treatment facility for disposal (similar to the management of wash water for vehicle and equipment).

Net Effects

The wash-off of fluids from accidental spills and leaks may result in an increase to the concentrations of chemical constituents in receiving water bodies. However, leaks, or spills are considered avoidable with good planning, adequate design, and proper emergency response. Further to this, the frequency, spatial extent and severity of accidental spills or leaks during the construction and the operation and maintenance stages of the Project are anticipated to be minimized with the effective implementation of the mitigation measures identified above (also summarized in Table 6.2-10). However, it is recognized that, even with the best planning and the implementation of mitigation measures, the potential exists for accidents and malfunctions. As such, measurable changes (i.e., net effects) to surface water quality in the form of increases to the concentrations of chemical constituents in receiving waterbodies could occur in the event of the wash-off from accidental spills or leaks to nearby waterbodies. Based on the above, this Project-environment interaction is carried forward to the net effects characterization (Section 6.2.8.3).

6.2.7.6 Changes to Surface Water Quality from the Wash-off of Explosives Spills and Residues from Blasting Activities to Nearby Waterbodies

Potential Effects

Blasting may be required for the construction of tower foundations and new permanent access roads where other options are not feasible. The blasting agents employed can be accidentally released during storage, transfer or loading. These blasting activities may result in changes to surface water quality, recognizing that explosives spills and residues could be washed off into nearby waterbodies during a runoff event and, if occurring in high enough volumes, may result in changes to the concentrations of chemical constituents in receiving waters. A waterbody may be influenced by these potential effects only if there is need to employ blasting in close proximity to the feature. Therefore, it is anticipated that only a limited number of waterbodies may be potentially affected.

Mitigation Measures

The transportation and storage of explosives will be in compliance with the *Explosives Act* and the *Transportation of Dangerous Goods Act, 1992*, where applicable, recognizing that explosives will be transported in vehicles with valid Natural Resources Canada (NRC) permits, and stored in properly sited and secured magazines licensed by NRC.

Ammonium nitrate and fuel oil will not be used. Explosives will be in emulsion form, to mitigate potential dissolution and poor explosive performance in the presence of water, noting that emulsion type explosives are highly water resistant.

Hydro One will employ only qualified persons, with appropriate training and experience, to carry out the transportation and handling of explosives. Good housekeeping practices will be observed during loading of explosives with a plan to immediately clean up spills and undetonated explosives. Proper loading techniques will be implemented to minimize the use of excess explosives and the potential for spillage. Waste rock (from the construction of tower foundations) and aggregates (from quarrying activities) are expected to be free of blasting residues. The Environmental Inspector will monitor blasting operations for adherence to the Blasting and Communication Management Plan.

Blasting wastes may include discarded explosives and packaging containing chemical residues (classified as hazardous wastes), as well as waste rock. Discarded explosives will either be detonated on-site as part of the blast with explosives packaging on a day-to-day basis, or temporarily stored in the explosives magazine and returned to the explosives distributor.

Net Effects

Measurable changes to surface water quality (i.e., net effects) at nearby waterbodies may occur due to the wash-off of explosives spills and residues from blasting activities, even with the effective implementation of the mitigation measures identified above (also summarized in Table 6.2-10). Therefore, this Project-environment interaction is carried forward to the net effects characterization (Section 6.2.8.4).

6.2.7.7 Changes to Surface Water Quantity from Short-term Water Taking

Potential Effects

During the construction stage, short-term water takings may be required from surface water or surface water and groundwater sources for the purposes of construction and water supply. These short-term water takings could result in changes to surface water quantity in the form of reductions in streamflows and/or water levels at nearby waterbodies. The specific locations for short-term water takings, as well as the anticipated water taking duration and volumes, will be determined during the permitting and design stage of the Project. These water takings may include:

- Dewatering of excavations for tower foundations, and of any new borrow pits, if required;

- Water diversion to create and maintain a dry work area for the construction of water crossings;
- Water for drilling as part of geotechnical investigations;
- Water for on-site concrete mixing and earthworks (compaction);
- Water for dust suppression at work sites and along access roads;
- Water for construction of winter roads (i.e., snow fills, ice bridges and maintenance);
- Water for washing concrete mixing equipment and delivery systems, as well as vehicles and equipment, on work sites, temporary construction camps, temporary laydown areas; and
- Water for drinking and sanitation at construction offices, temporary construction camps, temporary laydown areas and other work areas.

Mitigation Measures

All short-term water takings from surface water and/or groundwater sources for construction purposes will be carried out in accordance with O. Reg. 387/04, as amended by O. Reg. 64/16 under the *Ontario Water Resources Act*, and industry best standards, recognizing that designated water taking activities will require registration on the EASR or a PTTW from the MECP. As part of the permitting and/or approvals process through EASR and PTTW, a water taking and discharge plan will be developed for each source of water taking, as required, noting that, by design, the daily and instantaneous rates of water taking associated with the plan will be protective of the existing surface water, groundwater and natural environment conditions in the local area and, in turn, are expected to result in minimal changes (if any) to streamflows and/or water levels at nearby waterbodies. Water quantity and quality monitoring will be completed, where appropriate, to confirm the effectiveness of the water taking and discharge plan and associated mitigation measures, as well as to maintain compliance with regulatory permits/approvals.

The specific requirements for short-term water taking and discharge activities will be determined during the permitting and design stage of the Project. An initial engagement with MECP will be used to establish the preferred method to apply for and secure water taking and discharge related permits and approvals. It is possible that specific water taking and discharge activities may be eligible for EASR (e.g., construction dewatering between 50,000 L/day and 400,000 L/day during excavations for tower foundations), noting that each relevant EASR would be tied to a discrete activity and location along the Project alignment. Other water taking and discharge activities will require a PTTW (e.g., direct surface water taking from a lake or river of greater than 50,000 L/day for the purposes of water supply), recognizing that multiple sources of surface water takings or surface water and groundwater takings could be potentially captured under a single PTTW. Finally, it is understood that discharge of wastewater from stormwater management facilities and other sewage works will require an ECA (e.g., wash water from vehicles and equipment, wastewater from concrete batch plants, domestic wastewater, and grey water from leaching beds [if daily flow rates are more than 10,000 L/day]).

Water takings for other construction purposes (e.g., to supply concrete batch plants, for earthworks and for washing vehicles and equipment) will be in compliance with the approval conditions of the PTTW (if the water taking is greater than 50,000 L/d) and/or carried out in a manner that avoids unacceptable negative environmental effects or interference with other water users. Construction water sources and volume of water for concrete production is not known at this stage of Project planning, but will be conducted in accordance with applicable regulatory requirements. Water used for dust suppression will be brought to the site by tanker truck. Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland.

Potable water for work sites, temporary construction camps and temporary laydown areas will be obtained from local supplies via water tank trucks, via existing surface water and/or ground water sources with appropriate treatment as needed, and/or from bottled sources for drinking and sanitation, and for small scale concrete mixing using bagged concrete. No new water taking from surface water sources will be required for these domestic purposes. Wells may be drilled at the temporary construction camps if this option is more feasible.

Overall, water taking for construction purposes will be in compliance with the applicable legislation and regulations and good industry practice.

Net Effects

Measurable changes to surface water quantity (i.e., net effects) may occur as a result of water taking activities, even with the effective implementation of the mitigation measures identified above (also summarized in Table 6.2-10). The measurable changes would potentially involve reduction in streamflows and/or water levels at water bodies (specific to or adjacent to the source of the water taking). Therefore, this Project environment interaction is carried forward to the net effects characterization (Section 6.2.8.5).

6.2.7.8 Changes to Surface Water Quality from the Wash-off of Organic Debris from Work Sites to Nearby Waterbodies, and/or Increased Rates of Erosion in Disturbed and Exposed Areas with Sediment Transport and Delivery to Adjacent Waterbodies

Potential Effects

Site preparation, earthworks, and stockpiling activities during the construction stage could result in changes to surface water quality, recognizing that activities involving vegetation clearing and/or ground disturbance or exposure may result in increased rates of erosion, transport and delivery of organic debris and sediments to nearby water bodies. This in turn may result in an increase to the concentrations of suspended solids in receiving water bodies.

Details of site preparation, earthworks, and stockpiling activities are described below:

- The preparation of sites for the transmission structures will include vegetation removal, grubbing, stripping of topsoil, removal of unsuitable subsoil, and rough grading;
- The transmission line ROW preparation will be carried out over a typical 46 m wide area. There may be additional ROW easement required at major water crossings and major deflections. Vegetation, including timber and shrubs, will be removed along the transmission line ROW. In addition, diseased or damaged trees located at the edge of the transmission line ROW will be removed;
- Access roads and temporary workspaces will also be cleared of vegetation, grubbed, stripped of topsoil and unsuitable subsoil (where required), and roughly graded;
- Earthworks will include excavation, fill, backfill, and final grading activities. Excavations for tower foundations along the 46 m wide transmission line ROW may include blasting, drilling and shallow digs. Excavation and fill for access road upgrades and construction will be required along the ROW to provide appropriate grades, widths, and travel surfaces (road subbase and base courses) for the safe transportation of personnel, materials and equipment. Fording of watercourses at crossing locations with clearing and crossing installation equipment may be necessary to facilitate installation of crossing structures. Earthworks for the installation of waterbody crossings will be required to provide the structural stability for bridges and culverts, and to provide adequate widths and travel surfaces for vehicular traffic. Earthworks at waterbody crossings will include removal of unsuitable subsoil, excavation and placement of bedding and/or backfill materials for bridge foundations and culverts, and fill to construct road embankments and travel surfaces; and
- Stockpiling will consist of the short-term storage of topsoil and unsuitable subsoil removed during site preparation, as well as excavated materials (rock, soil) and required aggregates (sand, gravel, crushed rock) for the construction of tower foundations, access road upgrades and construction, and the installation of waterbody crossings.

Mitigation Measures

The preparation of work sites will include vegetation removal, grubbing, stripping of topsoil and removal of unsuitable subsoil, as well as rough grading. The 46 m wide transmission line ROW preparation will be carried out in accordance with standard utility practices and procedures and will involve the removal of all incompatible vegetation. Removal will consist of cutting trees within 15 centimetres (cm) of the root collar or lower, as well as the removal of all shrubs, debris, and other such materials. Diseased or damaged trees located outside of the ROW that have potential to fall onto the overhead line conductors or structures will also be removed.

Clearing of the transmission line ROW will take into consideration:

- Widths of watercourses;
- Location of wetlands;

- Locations of known archaeological and heritage sites;
- Areas of timber storage and the method of cutting and storing timber; and
- Required buffer zones (e.g., for watercourses).

Vegetation removal will take into consideration 30 m buffer zones around waterbodies and clearing of riparian vegetation will be restricted to the extent feasible. Vegetation removal at water crossings along the transmission line ROW will generally be limited to a 10 m wide ROW for equipment access to water crossing structures (e.g., temporary bridges). Cleared vegetation will be immediately removed outside a waterbody buffer zone, and above its high-water mark where this is identified to extend beyond the buffer zone.

Small trees and branches will be burned or chipped on-site; the chips may be spread over the ROW. Salvaged merchantable timber will be de-limbed, and decked along the edge of the ROW for short-term storage according to clearing contract requirements. Hydro One with their contractor(s) will work with applicable Forest Resource Licence or Sustainable Forest Licence holders and Indigenous communities to manage merchantable timber cleared by the Project. Timber, chips and other organic debris will be stored outside the buffer zone and above the high-water mark of any nearby waterbody. Slash and debris will be chipped or burned on-site with other organic debris in compliance with O. Reg. 207/96 under the *Forest Fires Prevention Act.*

Earthworks will include excavation, fill, backfill, and final grading activities. Excavations for tower foundations along the ROW may include blasting, drilling and shallow digs. Excavation and fill for access road upgrades and construction will be required to provide appropriate grades, widths, and travel surfaces (road subbase and base courses) for the safe transportation of personnel, materials, and equipment. Earthworks for the installation of water crossings will be required to provide the structural stability for bridges and culverts, and to provide adequate widths and travel surfaces for vehicular traffic. Earthworks at water crossings will include removal of unsuitable subsoil, excavation and placement of bedding and/or backfill materials for bridge foundations and culverts and fill to construct road embankments and travel surfaces. Earthworks for access road upgrades and construction, and the installation of water crossings, will be accomplished using heavy construction equipment where possible, with light equipment being used in sensitive areas.

Some excavations will be internally draining, and eroded material from disturbed and exposed surfaces will be contained within the excavation. Such excavations will be subject to temporary dewatering activities, as described above, when discussing short-term discharges during construction. Where disturbed and exposed areas are externally draining, multiple stages of drainage, erosion and sediment controls will be employed, as appropriate, consistent with good industry practice. Controls may include seeding, surface roughening (scarification), lockdown netting, straw bales, straw and/or wood fibre logs, rock check dams, silt fences, sediment traps/basins, diversion swales/dykes and collection ditching. Similar to the clearing of vegetation, earthworks will take into consideration buffer zones around waterbodies to the extent practicable. Revegetation of work areas will be initiated at the first opportunity, where appropriate, to stabilize disturbed and exposed ground. All aggregate pits will be located a minimum of 120 m away from the ordinary high-water mark of a waterbody, where possible. The aggregate pits will follow the guidelines and associated conditions/requirements of the approved permits, including development of a rehabilitation plan, outlined in the Aggregate Permits on Crown Lands for Pits and Quarries above Water (MNRF 2014) and the Forest Management Planning Manual (OMNRF 2017).

Stockpiling will consist of the short-term storage of topsoil and unsuitable subsoil removed during site preparation, as well as excavated materials (rock, subsoil) and required aggregates (sand, gravel, crushed rock) for the construction of tower foundations, access road upgrades and construction, and the installation of water crossings. Stockpiling will be accomplished using heavy or light construction equipment, as appropriate.

Sedimentation in the receiving environment will be controlled by directing sediment laden water to various temporary storage and settlement features (i.e., sumps, settling ponds or catch basins) prior to discharge. Alternately, where appropriate, the sediment laden water will be directed to drain/filter through low gradient, well-vegetated areas away from watercourses (i.e., using pumps, hoses, etc.).

Sediment control measures will be incorporated prior to construction activities or immediately after disturbance on site-specific cases throughout the Project to avoid introduction of sediment to the environment, and, as part of this, to stabilize drifting soils or loss of topsoil, as practicable. Sediment control measures may include silt fences, filter bags, straw bale fences, berms, ponds and gravel or vegetative filters, check dams, erosion control blankets, and other features.

To limit the disturbance caused by new construction, Hydro One with their contractor(s) will use the existing ROW, roads, and trails for access, to the extent practicable. In addition, temporary laydown areas will be constructed on existing disturbed areas with appropriate land use designations, where possible. Additional contingency measures will be implemented as appropriate in the event of excessive rain, wet weather or flood-like conditions (when the planned activity could cause significant damage to soils, such as rutting by traffic through the topsoil, soil structure damage during soil handling, or compaction and associated pulverization of topsoil structure damage due to heavy traffic):

- Re-schedule work or reduce/detour traffic in areas where soils are considered to be excessively wet.
- Restrict construction traffic, where feasible, to equipment with low-ground pressure tires or wide pad tracks.
- During excessively wet conditions, work only in non-problem areas, such as well-drained soil or well-sodded lands, until conditions improve.

- Limit vehicle access through soft/wet areas to periods when frozen conditions occur (i.e., early morning/evening) and have crews park in a stable area and walk to on-site equipment if feasible.
- Install access or rig matting in problem areas to protect soils.
- If necessary, work will be suspended until soils dry out or appropriate site-specific mitigation can be used to prevent soil disturbance.

Access roads and water crossings will be constructed in accordance with MNRF's Environmental Guidelines for Access Roads and Water Crossings (1990), to the extent practicable. The MNRF provides comprehensive guidance with respect to sound design and construction practices to mitigate potential environmental effects. Where applicable, water crossings will also be constructed in compliance with MNRF approvals issued under O. Reg. 454/96 and the *Lakes and Rivers Improvement Act.* In accordance with these approvals, Hydro One with their contractor(s) will be required to complete construction along waterbody shorelines as well as in-water works in a manner that minimizes adverse environmental effects such as increased flooding, waterbody and shoreline erosion, and sediment loads.

Net Effects

Even with the effective implementation of the mitigation measures identified above (also summarized in Table 6.2-10), measurable changes to surface water quality (i.e., net effects) may occur due to the wash off of organic debris, and/or increased rates of sediment erosion/transport, to nearby waterbodies as part of site preparation, earthworks, stockpiling activities, and construction of access roads and water crossings during the construction stage of the Project. Therefore, this Project-environment interaction is carried forward to the net effects characterization (Section 6.2.8.6).

6.2.7.9 Changes to Surface Water Quantity and Surface Water Quality due to Changes in Land Cover

Potential Effects

Construction, operation, and maintenance of the transmission line ROW, as well as the construction of tower foundations, new access roads, temporary construction camps, turn-around areas, temporary laydown areas, and modifications at existing transformer stations could result in changes to surface water quantity. Construction of these Project components will result in changes in land cover from treed to bare ground or low-growing grasses and shrubs (ROW and temporary construction easements), and from treed to gravel, paved or roofed surfaces (access roads, temporary construction camps, turn-around areas and temporary laydown areas). Operation and maintenance of the ROW represents a change in land cover from the undisturbed treed cover to one of low-growing grasses and shrubs. The potential effect to surface water quantity as a result of the identified changes in land cover may include a local increase in runoff rates and runoff volumes from the various Project components and, in turn, an increase in streamflows, water levels, and erosion/sedimentation processes at nearby water bodies (i.e., downstream receivers). By extension, the identified increase in streamflows- with the potential for higher rates of sediment erosion/transport (all of which are tied to surface water quantity) may result in an associated increase to the concentrations of suspended solids (surface water quality) in these water bodies. In addition to the above, recreational Off-Road Vehicle (ORV) use may increase as a result of new access routes and clearing of existing roads and trails along Project areas. While recreational access is currently unauthorized within the transmission line corridor, the potential for heightened unauthorized use of ORVs within the ROW could further exacerbate the identified effects above (e.g., changes/disturbance to land cover with the potential for increased rates of runoff and associated erosion-sedimentation processes). It could also result in effects at a channel scale in the event of unsanctioned ORV crossings (via fording) at waterbodies (e.g., disturbance and/or alterations to channel form/hydraulics with potential implications on flow conveyance, fish and fish habitat, and erosion-sedimentation processes) (Carrot River Valley Watershed Association nd, Guldin 2004, DFO nd).

The likely magnitude of changes to surface water quantity and surface water quality as a result of alterations in land cover were assessed in several of the watercourses and waterbodies crossed by the Project. This assessment was completed by estimating the proportion of disturbed land area relative to the overall catchment area at selected Assessment Points (APs), recognizing that the approach considers drainage area as a proxy or analog for streamflow and, to a lesser extent, the potential for sediment erosion and transport (with implications on surface water quality). The selection process for “Assessment Points” or “APs” was based primarily on a scaled approach, with the objective of selecting a representative number of waterbodies crossed by the Project under different categories of watershed size: 1) Medium- to Large-sized Watersheds (greater than 50 km^2), 2) Small- to Medium-sized Watersheds (between 2 and 50 km^2), and 3) Very Small Watersheds (less than 2 km^2). In general, an AP was assigned to the most downstream crossing of any waterbody bisected by the Project footprint, noting that this approach considers the total cumulative effect of Project activities/components on each relevant catchment area. Furthermore, in instances where the same waterbody was crossed at multiple locations, the catchment area of the most upstream crossing was in some cases also evaluated, given that the proportion of disturbed area relative to the total catchment area at this location would be inherently larger (compared to downstream crossing locations) and, in turn, would allow an assessment of the potentially “worst case” scenario. Catchments within the Project boundaries, but without a waterbody crossing, were not assessed.

A total of four APs were selected and assessed for each of the watershed categories/sizes. The results of the assessment were as follows:

- **Medium to Large Watersheds – Greater than 50 km^2:** The Project footprint as a percentage of the catchment draining to the selected APs ranged from 0.01% to 0.59% and had a median value of 0.2%.

- **Small to Medium Watersheds – Between 2 and 50 km^2:** The Project footprint as a percentage of the catchment draining to the selected APs ranged from 0.52% to 1.32% and had a median value of 0.91%.

- **Very Small Watersheds – Less thank 2 km^2:** The Project footprint as a percentage of the catchment draining to the selected APs ranged from 3.12% to 7.24% and had a median value of 3.78%.

The likely magnitude of changes to surface water quantity and surface water quality resulting from changes in land cover is expected to be negligible where the disturbed land area represents 5% or less of the overall catchment area of the AP, noting that the value of ±5% is within the typical error of a streamflow measurement and output from a hydrologic/hydraulic model (Fulford et al. 1994, James 2005). The likely magnitude of changes to surface water quantity and surface water quality as a result of alterations in land cover is expected to be measurable, albeit ‘low’, where the disturbed land area lies between 5% and 15% of the overall catchment area of the AP. The upper limit of 15% is a conservative estimate of the amount of land disturbance that would result in noticeable changes in streamflow, water levels, and waterbody stability, recognizing that observations and inferences from the literature (Bosch and Hewlett 1982, Hibbert 1967, Swanson et al. 1986, Stednick 1996, British Columbia Ministry of Forests 1999, and Schnorbus et al. 2004) show that marked changes in streamflow and channel stability as a result of land disturbance (i.e., clear-cut practices) are typically not expected if less than approximately 20% of the contributing catchment is disturbed.

For the locations where the proportion of disturbed area to total catchment area will be higher than 5% (specific to the APs with the Very Small Watershed category/size), it is important to point out the following:

- Most of the identified watercourses crossed by the Project are headwater streams, meaning that they inherently support intermittent or ephemeral flow conditions;

- The catchment areas are comparatively small in size (as detailed above);

- Any noticeable increase in runoff that occurs during construction at the identified watercourses (with associated changes to downstream flows and water levels) will be in response to large precipitation events (of comparatively lower frequency) and will decrease once the reclamation process progresses and vegetation is re-established at the disturbed areas; and

- Any increase in downstream flows and water levels at the identified watercourses (mainly restricted to the construction stage only) will be limited in spatial extent, given that the anticipated effects will be largely indiscernible a short distance downstream of the crossing (as the headwater feature joins the broader surface water system and/or drains a progressively larger catchment area).

Mitigation Measures

Hydro One will carefully manage runoff from disturbed areas to minimize or avoid potential changes in surface water quantity in receiving waterbodies. Mitigation measures include:

- Progressive re-vegetation of the ROW including natural revegetation, as appropriate;
- Use of existing roads and trails for access, to the extent practicable, to minimize new disturbance;
- Upgrading and constructing new access roads in accordance with MNRF's Environmental Guidelines for Access Roads and Water Crossing (1990), which provides comprehensive guidance with respect to design and construction practices to mitigate environmental effects;
- Construction of temporary laydown areas on existing disturbed land, where possible, to minimize new disturbance;
- Locating temporary construction camp facilities, temporary laydown areas and other Project activities a minimum of 30 m from the ordinary high-water mark of a waterbody;
- Restoring access roads and trails, temporary construction camps, temporary laydown areas, turn-around areas and construction easements at the end of construction to pre-existing compatible condition;
- Limiting use of ORVs by Hydro One and associated contractors during construction and operation, noting that:
- ORV use will follow DFO's Code of Practice for Fording (DFO 2022f), DFO's All Terrain Vehicle Guidance (DFO nd) and O. Reg 316/03;
- Inspecting and cleaning ORVs before and after each use to prevent the spread of invasive species and to identify any fuel leaks or equipment damage; and
- Avoidance of sensitive features and water crossings to the extent practicable.
- Provision of multistage drainage and sediment controls to collect and treat stormwater runoff from Project components, as appropriate, recognizing that controls may include diversion swales/dykes, collection ditches, silt fences, rock check dams, sediment traps/basins, level spreaders and riparian buffer strips.

Net Effects

Even with the effective implementation of the mitigation identified above, changes to land cover may result in a measurable increase in streamflows, water levels, and erosion sedimentation processes at receiving water bodies (due to associated increases in runoff rates and runoff volumes from the surrounding area). Changes to land cover may also result in an increase to the concentrations of suspended solids in receiving water bodies (due to corresponding increase to streamflow and sediment erosion/transport processes). As described above and detailed further in Section 6.2.8.7, the results of the assessment demonstrated that the magnitude of the effect is expected to be negligible at most of the assessment points, given that the percentage of disturbed area relative to the overall catchment is expected to be 5% or less at the majority of locations. For the locations where the proportion of disturbed area to total catchment area will be higher than 5%, it was shown that the water bodies are generally headwater streams with comparatively small catchment sizes, meaning that they inherently support intermittent or ephemeral flow conditions. Further to this, any increase in downstream flows and water levels at these water bodies (mainly restricted to the construction stage only) will be limited in spatial extent, recognizing that the anticipated effects will be largely indiscernible a short distance downstream of the crossing (as the headwater feature joins the broader surface water system and/or drains a progressively larger catchment area). Based on this, the Project-environment interaction is carried forward to the net effects characterization (Section 6.2.8.7).

6.2.7.10 Changes to Surface Water Quantity and Surface Water Quality during Short-term Water Diversions at Water Crossings

Potential Effects

The construction of temporary and permanent waterbody crossings, and removal of temporary crossing structures following the completion of the relevant work, along access roads and the transmission line ROW will, in most cases, require a short-term diversion of water to maintain a dry work site either wholly or partially within the waterbody during the installation of both temporary and permanent crossing structures and the removal of temporary crossing structures. The short-term diversion will involve the use of a temporary dam and pump bypass system (active in-stream diversion) or temporary diversion channels and/or dams (passive in-stream diversion). The implementation of short-term water diversions, in combination with the construction and removal of temporary waterbody crossing structures, may result in changes to surface water quantity. The potential effects on surface water quantity and quality may include:

- Localized changes to streamflows and/or water levels, and erosion-sedimentation processes immediately upstream and downstream of the work area and/or within the work area depending on the dewatering method and dewatering controls (e.g., pumping rates that exceed streamflow conditions could result in a decrease in water levels upstream of the diversion works and, in turn, a slight increase downstream);
    - Increases to the concentrations of suspended solids in water bodies as a result of increased rates of erosion-sedimentation processes during water taking and discharge activities (specific to the points of water taking and discharge in the waterbody), or following the removal of the diversion works and/or installation or removal of temporary waterbody crossing structures due to the disturbance of the bed and banks of the waterbody (specific to the limits of the work area, with the opportunity for sediment to be mobilized and transported downstream); and

- Increases to the concentrations of chemical constituents in water bodies due to equipment leaks.

There will also be the temporary, short-term, and local bypass of flow through the work site (i.e., change in drainage patterns), and the potential for increased rates of erosion-sedimentation following the removal of the diversion works and/or installation or removal of temporary waterbody crossing structures due to the disturbance of the waterbody bed and banks within the work area.

A review of the water crossings lists, presented in Appendix 6.2-B, indicates the following:

- A total of 316 water crossings are planned for the transmission line ROW and a total of 514 water crossings are planned for the access roads;
- As many as 214 (68%) and 235 (46%) of the water crossings along the ROW and access roads, respectively, are on permanent waterbodies (containing water at least nine months of the year);
- There will be 76 water crossings over lakes or ponds along the ROW, and 40 water crossings over lakes or ponds along access roads.
- Based on the surficial geology underlying the water crossings, the following is observed:
  - 513 (62%) of the water crossings are located over bedrock;
  - 182 (22%) of the water crossings are located over glaciolacustrine deposits; and
  - The remaining water crossings are located over organic deposits (3%), glaciofluvial outwash deposits (4%), glaciofluvial ice-contact deposits (2%), till (less than 1%), fluvial deposits (less than 1%), and unknown surficial geology (6%).

The water crossings located over bedrock (exposed or covered by a thin layer of drift) are expected to be relatively stable with a lower likelihood of experiencing increased opportunities for erosion-sedimentation processes.

Mitigation Measures

Short-term water diversions (active or passive) will be carried out in accordance with O. Reg. 387/04 as amended by O. Reg. 63/16 and 64/16 under the *Ontario Water Resources Act*. This includes the implementation of the following conditions under sub-section 3(3) of O. Reg. 64/16, which represent the key mitigation for the diversion works, and allow exemption from PTTW or EASR approvals:

- Diverted water will remain in, or be directed back to, the same waterbody (e.g., pumped water from a waterbody will be returned to that same waterbody at a location immediately downstream of the construction area);

- The diversion works will be installed/operated to maintain water quality and quantity conditions upstream and downstream of the construction area;
- Pumped water will contain no visible contaminants (e.g., petroleum hydrocarbon sheen of film);
- Sediment and erosion control measures will be properly installed and maintained, with a plan to dispose of any trapped/collected materials after diversion activities have been completed; and
- Any refuelling of pumps or construction equipment will occur at least 120 m away from local water bodies. If refueling within 120 of a waterbody cannot be avoided, enhanced spill containment measures will be used.

Hydro One with their contractor(s) will satisfy these conditions and will construct the water crossings in compliance with MNRF approvals, required under O. Reg. 454/96 of the *Lakes and Rivers Improvement Act*, as applicable. The purpose of MNRF approvals is to prevent alteration to fish and wildlife habitat, flooding, erosion, and pollution.

Hydro One with their contractor(s) will manage dewatering activities to minimize potential adverse environmental effects and interference with downstream water users. Planned mitigation measures consist of the following:

- Minimizing the number of water crossings required, to the extent possible, by appropriate alignment of the ROW and access roads;
- Limiting the number of water crossings installed simultaneously on a single waterbody, where more than one crossing structure is required;
- Constructing water crossings in compliance with MECP-specified conditions and MNRF approvals, if required; and
- Constructing water crossings over a relatively short time period, and under low water conditions (during the winter and/or summer seasons) where possible.

Specific measures to be undertaken during water diversion activities to satisfy the conditions above will be determined in the detailed planning stage of the Project.

The implementation of these mitigation measures and best management practices are anticipated to limit the potential for changes to streamflow, water levels and erosion-sedimentation processes at the time of the active or passive diversion works, as well as the potential for increased rates of erosion-sedimentation following the removal of the diversion works and/or installation or removal of temporary waterbody crossing structures due to the disturbance of the bed and banks of the waterbody (within the limits of the work area).

Based on the results of the baseline studies and associated effects assessment for the surface water concentrations, Project activities are not expected to result in measurable increases to metals concentrations in the surface water environment, with the understanding that several design and mitigation measures will be employed during construction to mitigate the potential for unforeseen release of sediment or deleterious substance (that could theoretically result in changes to downstream water quality). Environmental monitoring (including water quality sampling/testing noted in Section 6.2.11) will be conducted during construction to verify the performance and effectiveness of the planned mitigation. Monitoring will occur during installation works, including all in-water activities, and continue during the duration of the Project, including the removal of temporary crossing structures as part of reclamation activities. Contingency plans will be developed in the event of an unexpected change to water quantity or quality (i.e., increase in turbidity in accordance with CCME standards).

Overall, the plan to comply with the conditions and practices identified above is expected to minimize opportunities for increased concentrations of suspended solids and chemical constituents (due to any associated changes to erosion-sedimentation processes). Water quantity and quality monitoring will be completed, where appropriate, to confirm the effectiveness of the diversion works and any associated mitigation measures, as well as to maintain compliance with regulatory permits/approvals.

Net Effects

The installation of temporary and permanent waterbody crossings and removal of temporary waterbody crossing structures following the completion of the relevant work, and the associated use of short-term diversion of water (to create and maintain a dewatered area for the purpose of constructing, upgrading or removing the structures), may result in a measurable increase or reduction in streamflows, water levels, and erosion-sedimentation processes at locations upstream or downstream of the crossing, and an increase to the concentrations of suspended solids and chemical constituents in water bodies, even with the implementation of the mitigation identified above (also summarized in Table 6.2-10). Therefore, this Project-environment interaction is carried forward to the net effects characterization (Section 6.2.8.8).

6.2.7.11 Changes to Surface Water Quantity and Surface Water Quality due to Changes in Channel Hydraulics at Water Crossings

Potential Effects

The installation and maintenance of water crossing structures (temporary and permanent) during the construction and operation phases of the Project may result in changes to channel hydraulics at the affected portion of the waterbody and, in turn, potential changes in surface water quantity due to modifications in channel form and function. More specifically, the installation and maintenance of water crossing structures may result in a localized increase or reduction to flow velocities, shear stresses, water levels and erosion-sedimentation processes at locations upstream or downstream of the crossing. For example, local impedance of streamflow (i.e., backwater with an increase in water levels and opportunities for sedimentation) may occur upstream of a waterbody crossing, with a corresponding reduction in flow velocities and shear stresses. There is also the potential for a localized increase in flow velocities at the inlets and outlets of waterbody crossing structures, which in turn could result in increased rates of erosion at the water bodies.

By extension, an increase to erosion and shear stress processes (both of which are tied to surface water quantity) in the vicinity of the crossing structure may result in an associated increase to downstream concentrations of suspended solids (surface water quality), while an increase to sedimentation upstream of the crossing structure could instead result in a corresponding decrease to downstream concentrations of suspended solids.

A review of the water crossings lists, presented in Appendix 6.2-B, indicates the following:

- A total of 830 water crossings along the transmission line ROW (316), access roads (514) are planned;
- Of these 830 water crossings, 116 will be located on lakes or ponds; and
- Of these 830 water crossings, 569 have identified crossing methods, while 261 water crossings were deemed to be redundant and one crossing needed no improvements. Some water crossings were identified to have a nearby crossing that could be used for both the ROW and access roads, and so crossing each waterbody individually was deemed redundant. Water crossing methods are described in Table 6.2-9.

Table 6.2-9: Identified Methods for Crossing Waterbodies during Construction

Crossing Type	Number of Water Crossings
Clear Span	53
Clear Span Causeway	**1**
Existing Clear Span	4
Culvert	241
Culvert Causeway	6
Existing Culvert	28
Culvert Repair	0
Ice Bridge	15
Ice Bridge/Snow Fill	4
Logfill	59
Logfill/Snowfill	7

Crossing Type	Number of Water Crossings
Snowfill	91
Rig Mat	6
One-time Ford	54

Mitigation Measures

Water crossing structures will be designed and constructed in accordance with permits and approvals through DFO, LRCA and/or MNRF, if applicable, recognizing that all newly installed or upgraded crossing structures at mapped or unmapped waterbodies are expected to require permitting through one or more of O. Reg. 239/13 under the *Public Lands Act* (administered by MNRF for water crossings on Crown land), O. Reg. 454/96 under the *Lakes and Rivers Improvements Act* (administered by MNRF for water crossings on Private or Crown land),O. Reg. 180/06 for the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses under the *Conservation Authorities Act* (administered by LRCA for water crossings in LRCA jurisdiction), and approvals through DFO under the Ministry of Natural Resources and Forestry and Fisheries and Oceans Canada protocol for the review and approval of forestry water crossings protocol (MNRF and DFO 2021).

The specific configuration of water crossing structures, including clear span bridges, ice bridges/snow fills, rig mats and culverts, will be primarily based on hydrologic and hydraulic design flow calculations, which consider, but are not limited to, expected rainfall and peak flow within the geographic area, as well as the relevant catchment area, channel slope, and channel substrate.

Each waterbody crossing will be visited ahead of construction by qualified environmental personnel and fisheries biologists and/or technicians to verify that the crossing location is conducive to the planned crossing structure installation, such that any changes in site conditions can be addressed through necessary design adjustments. If site-specific features prevent the installation of a crossing structure, a different crossing method will be selected and implemented.

Hydro One with their contractor(s) will carefully design and construct water crossings to minimize potential adverse environmental effects resulting from changes to cross section hydraulics. If site-specific changes to crossing structure type are required, engagement with appropriate regulatory authorities (i.e., MNRF, DFO) will occur prior to any instream construction activities, where appropriate (i.e., placement of additional fill, re-grading and/or stabilization of bed or banks). Similar to the discussion above in relation to short-term water diversions, the mitigation measures to reduce the potential effects to cross section hydraulics will involve the following:

- Minimizing the number of water crossings required, to the extent possible, by appropriate alignment of the ROW and access roads, and use of existing roads or trails as much as possible;
- Carrying out construction activities without any permanent in-water works (i.e., permanent water crossings will be installed above the high-water mark) is anticipated;
- Designing the infrastructure at water crossings to pass peak flows and maintain sufficient flow conveyance in such a way that no discernible effects on stream hydraulics occur;
- Maintaining the characteristic channel width, depths, slopes and substrate in the event that a channel realignment is required, noting that:
- Channel realignments and/or infillings will be avoided through Project planning and design to the extent practicable.
- Channel realignments and/or infilling will only be undertaken in locations where specific conditions are met and/or where required for safety and security purposes.
- A realignment would avoid the use of a DFO code of practice (required approval by DFO), with the plan and mitigations requiring reviewed by MNRF through permitting the water crossing.
- Implementing sediment and erosion control measures prior to commencing construction work;
- Returning the watercourse banks to their original profile and stabilizing disturbed areas as necessary, to prevent soil erosion, upon completion of construction work;
- Designing and constructing water crossings in compliance with MNRF's Environmental Guidelines for Access Roads and Water Crossings (1990);
- Constructing water crossings in compliance with MNRF approvals;
- Reclaiming temporary water crossings at the end of construction;
- Monitoring will be conducted at permanent culverts for the life of the project to identify and remove blockages (e.g., ice, woody debris), as needed, that could otherwise lead to scouring and effects to channel morphology and fish habitat, and potentially interfere with fish passage; and
- Monitoring/inspections of new permanent waterbody crossing structures and roadside drainage features (on a twice annual basis for the first two years following post-construction and then annually) for physical function and condition.

Net Effects

Even with the effective implementation of the mitigation measures identified above (also summarized in Table 6.2-10), the installation of water crossings along the ROW and access roads may result in measurable changes (i.e., net effects) to channel hydraulics at some crossing locations, with the potential for changes in surface water quantity (localized increase or reduction to flow velocities, shear stresses, water levels, and erosion/-sedimentation processes at locations upstream or downstream of the crossing) and quality (increase or reduction to the concentrations of suspended solids at locations downstream of the crossings due to the corresponding changes to erosion-sedimentation processes in the vicinity of the crossing). Therefore, this Project-environment interaction is carried forward to the net effects characterization (Section 6.2.8.9).

6.2.7.12 Summary of Potential Effects, Mitigation Measures, and Net Effects

Table 6.2-10 provides a summary of the effects assessment, which is based on the previous assessment and the implementation of mitigation measures identified above, and further supplemented in the table below.

Table 6.2-10: Summary of Effects and Mitigation Measures to Surface Water Quality and Quantity

Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
Project activities during the construction stage: • Discharges of water from construction, vehicle and equipment wash, and domestic activities.	• Changes to surface water quantity and surface water quality from short-term water discharges.	**Construction stage:** • Construction water will be discharged in compliance with O. Reg. 387/04 as amended by O. Reg. 64/16 and/or O. Reg. 63/16, where applicable, and good industry practice. • Wash water from cleaning concrete mixing equipment and delivery systems, as well as from vehicles and equipment, will be collected in designated wash-out sites, located at least 30 m from a water body. The wash-out site will be monitored regularly to verify that runoff from the area does not report to a waterbody. Following the construction phase, all temporary wash-out sites will be capped with local backfill and re-graded prior to construction crews departing the site. • Grey water will be discharged to leaching beds at the temporary construction camps. All required permits and authorizations will be acquired for construction and operation of the leaching beds. Leaching beds will be designed and constructed according to R.R.O 1990, Reg. 358: Sewage Systems design requirements. • Grey water from temporary construction camps will be disposed of in compliance with the Ontario Building Code. • Domestic effluent will be removed from temporary construction camps by approved disposal trucks and disposed of at municipal WWTPs with authorization and capacity to accept this waste.	• Net changes to surface water quantity and surface water quality during construction from short-term water discharges.
Project activities during the construction stage: • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, turn-around areas, temporary laydown areas, and temporary construction camps); • Surface water management and erosion control; • Borrow pits for aggregates; • Concrete mixing on-site or in batch plants; • Operation of vehicles, construction equipment and diesel generators; and • Transportation of personnel, materials, and equipment. **Project activities during the operation and maintenance stage**: • Transportation of personnel, materials, and equipment.	• Changes to surface water quality from the transport and delivery of airborne particulate matter to nearby waterbodies.	**Construction stage:** • For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated. • Vehicles and equipment will be regularly serviced, maintained, and inspected for leaks. • Where reasonable and practicable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. • Multi-passenger vehicles will be used to transport personnel, where practicable. • Soil and aggregate materials will be transported wetted or under cover, as appropriate. • Vehicle speeds at work sites and on access roads will be limited. • Dust control practices (e.g., wetting with water) will be employed at concrete batch plants, work sites and on access roads near residential areas. Calcium chloride may be used along municipal roads near residences to reduce dust and improve safety where there is increased Project traffic interface with public road users. Application of calcium chloride by Hydro One will be completed in consultation with road authorities and will not occur within 120 m of a waterbody or wetland. • Progressive reclamation of disturbed areas will be practiced. Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. If seeding is required, erosion prone areas will be seeded with a native cover crop and certified seed mix approved by the applicable regulatory agency, as soon as feasible after construction. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions. Soil stockpiles will be vegetated, where appropriate (e.g., if soils are prone to wind erosion). • Topsoil handling will be suspended during high wind conditions, where practicable and as required. • Stripped soil will be stored outside waterbody buffers. Stripped soils will not be placed in surface drainage channel or wetland. **Operation and maintenance stage:** • For vehicles and equipment owned/rented by Hydro One, only properly functioning vehicles and equipment will be operated. • Vehicles and equipment will be regularly serviced, maintained, and inspected for leaks.	• No net effect.

Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		• Where reasonable and practicable, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. • Multi-passenger vehicles will be used to transport personnel, where practicable. • Soil and aggregate materials will be transported wetted or under cover. • Vehicle speeds at work sites and on access roads will be limited.	

Project activities during the construction stage:
• Hazardous materials, solid and liquid waste handling.
	• Changes to surface water quality from the wash-off of trash and leachate at waste handling and storage facilities to nearby waterbodies.	**Construction stage:**
		• Hydro One with their contractor(s) will prepare and implement a Spill Prevention and Emergency Response Plan) that describes specific measures that would be implemented if a spill occurred.
		• Hydro One or their contractor(s) will prepare and implement Waste Management Plans that describe the appropriate management of solid, liquid, and hazardous waste, including:
		  • Construction related garbage, debris, and surplus materials;
		  • Hazardous materials such as used oil, filter and grease cartridges, lubrication containers; and
		  • Domestic garbage and camp waste (i.e., food and grey water). Portable, secure, solid waste receptacles will be provided on work sites, temporary laydown areas and temporary construction camps and periodically emptied.
		• Solid waste handling and storage facilities at temporary construction camps will be sited outside a minimum 30 m buffer around waterbodies.
		• Solid waste handling and storage facilities at temporary construction camps will be provided with drainage controls.
		• Solid waste will be managed and disposed in compliance with O. Reg. 347 as amended by O. Reg. 86/16 under the *Environmental Protection Act.*
		• Personnel will be trained in proper solid waste handling and management procedures.
			• No net effect.

Project activities during the operation and maintenance stage: • Vegetation maintenance along ROW at an appropriate height to protect the facility and improve public and worker safety.	• Changes to surface water quality from the wash-off of organic debris and mechanical vegetation maintenance activities to adjacent waterbodies.	**Operation and maintenance stage:** • Vegetation will be managed according to clearance-to-ground levels to allow for increased vegetation height. • Removed vegetation will be immediately transported outside a waterbody buffer zone (30 m), and above its high-water mark. • Herbicides will not be used during construction of the Project or for future maintenance of this transmission line.	• No net effect.

Project activities during the construction stage:
• Hazardous materials, solid and liquid waste handling;
• Refuelling, service and maintenance of vehicles and construction equipment;
• Operation of vehicles, construction equipment and diesel generators; and
• Transportation of personnel, materials, and equipment.
	• Changes to surface water quality and maintenance from the wash-off of accidental spills and leaks to nearby waterbodies.	**Construction stage:**
		• The transportation, storage, and handling of fuels will be in compliance with the *Technical Standards and Safety Act, 2000* (Government of Ontario 2020b) and Canada's *Transportation of Dangerous Goods Act, 1992* (Government of Canada 2019b).
		• Hydro One or their contractor(s) will prepare and implement a Spill Prevention and Emergency Response Plan that describes specific measures that would be implemented if a spill occurred.
		• Hydro One or their contractor(s) will prepare and implement Waste Management Plans that describe the appropriate management of solid, liquid and hazardous waste, including:
		  • Construction related garbage, debris, and surplus materials;
		  • Hazardous materials such as used oil, filter and grease cartridges, lubrication containers; and
		  • Domestic garbage and camp waste (i.e., food and grey water). Portable, secure, solid waste receptacles will be provided on work sites, temporary laydown areas and temporary construction camps and periodically emptied.
		• Fuel and hazardous materials will be transported in approved containers in licensed vehicles. Transportation of fuel on winter roads will only take place in safe ice conditions.
			• Net changes to surface water quality during construction and operation and maintenance from the wash-off of spills and leaks to nearby waterbodies.

Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
Project activities during the operation and maintenance Stage: • Transportation of personnel, materials, and equipment.		• Fuel and hazardous materials will be stored and handled in designated areas with appropriate secondary containment. • Refueling, service, and maintenance of vehicles and equipment will generally be carried out in designated areas at temporary construction camps and temporary laydown areas located a minimum of 120 from waterbodies to the extent possible. These areas will be designed and constructed to collect and contain minor leaks and spills. For example, containment measures may consist of low permeability liners, sloped appropriately, and buried in the ground, portable berms (e.g., insta-berms) or concrete pads with perimeter drainage control. Drainage will be passed through an oil water separator to remove hydrocarbons prior to its release to a vegetated area. If refueling within 120 of a waterbody cannot be avoided, enhanced spill containment measures will be used. • In the event that refuelling, servicing and maintenance is required in the field, 120 m buffer will be respected to the extent possible. There may be locations where this is not possible due to the prevalence of wetlands; however, in these locations enhanced spill containment measures will be used. For vehicles and equipment owned/rented by Hydro One or their contractor, only properly functioning vehicles and equipment will be operated. • Vehicles and equipment will be regularly serviced, maintained and inspected for leaks. • Machinery and equipment will be inspected for leaks routinely throughout the duration of construction. • Machinery and equipment are to arrive on-site in a clean condition and will be inspected and maintained routinely to avoid fluid leaks. • Spill response kits will be provided in fuel and hazardous materials storage and handling facilities at temporary construction camps and temporary laydown areas, in on-site work areas and/or in vehicles and equipment, and personnel will be trained in spill response practices and procedures. Spills and leaks will be contained and cleaned up as soon as possible following incidents. • Personnel will be trained in spill avoidance, clean-up and reporting procedures. **Operation and maintenance stage:** • Hazardous materials will be transported in approved containers in licensed vehicles. • Vehicles and equipment will be regularly serviced, maintained and inspected for leaks. • For vehicles and equipment owned/rented by Hydro One, only properly functioning vehicles and equipment will be operated. • Spill response kits will be provided in vehicles and equipment.	
Project activities during the construction stage: • Use of explosives and blasting to create level areas for transmission structures, roads and for foundation excavations.	• Changes to surface water quality from the wash-off of explosives spills and residues from blasting activities to nearby waterbodies.	**Construction stage:** • Hydro One or their contractor(s) will prepare and implement a Blasting and Communication Management Plan that describes specific measures that would be implemented if blasting is required. Hydro One with their contractor(s) will use explosives if excavation to remove materials for foundation systems and roads is not feasible. The Environmental Inspector will monitor blasting operations for adherence to the Blasting and Communication Management Plan.	• Net changes to surface water quality during construction from the wash-off of explosive spills and residues from blasting activities to nearby waterbodies.
Project activities during the construction stage: • Water taking from surface water sources for the purposes of construction and water supply.	• Changes to surface water quantity from short-term water taking.	**Construction stage:** • Water taking will be in compliance with O. Reg. 387/04 as amended by O. Reg. 64/16 (pertaining to permits, data and reporting, and water transfers), where applicable, and good industry practice. • Potable water for work sites, temporary construction camps, temporary laydown areas will be obtained from local suppliers via water tank trucks.	• Net changes to surface water quantity during construction from short-term water taking.
Project activities during the construction stage: • Clearing, grading, earth moving, grubbing of vegetation, and	• Changes to surface water quality from the wash-off of organic debris from work sites to nearby waterbodies, and/or	**Construction stage:** • During construction, existing access roads or trails will be used as much as possible to limit disturbance resulting from construction of new access roads and trails.	• Net changes to surface water quality during construction from the wash-off of organic debris

Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect

stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, turn-around areas, temporary laydown areas, and temporary construction camps);
• Extraction of aggregates;
• Surface water management and erosion control; and
• Reclamation of decommissioned access roads, turn-around areas, laydown areas, staging areas, and temporary construction camps.
	increased rates of erosion in disturbed and exposed areas with sediment transport and delivery to adjacent waterbodies.	• Temporary laydown areas and temporary construction camps will be constructed on existing disturbed areas and/or at reasonably flat areas with stable soil, where possible.
		• New access roads or trails will be designed and constructed in accordance with the MNRF Environmental Guidelines for Access Roads and Water Crossings (1990).
		• Water crossings will be constructed in compliance with O. Reg. 180/06 as amended by O. Reg. 63/13 and O. Reg. 454/96, as applicable.
		• Buffer zones of 30 m will be maintained around waterbodies and clearing of riparian vegetation will be limited to the extent practicable and to the requirement of the access road and alignment clearing width only. Clearing at water crossings along the transmission line ROW will generally be limited to a 10 m wide ROW for equipment access to water crossing structures (e.g., temporary bridges).
		• Removed vegetation will be immediately transported outside a waterbody buffer zone, and above its high-water mark to minimize disturbance to the bed and banks.
		• Hydro One with their contractor(s) will work with both Indigenous communities and forest management units to manage merchantable timber cleared by the Project.
		• Slash and debris will be chipped and spread over the ROW or will be burned in accordance with provincial *Forest Fires Prevention Act* and in compliance with O. Reg. 207/96.
		• Install, monitor, and manage appropriate erosion and sedimentation control measures to minimize or avoid sediment mobilization to drainages, or waterbodies. Adequate and appropriate erosion and sedimentation control materials shall be on-site and available prior to commencement of construction.
		• Temporary erosion control measures to be:
		  ◦ Properly installed;
		  ◦ Installed before or immediately after initial disturbance; and
		  ◦ Inspected and properly maintained (e.g., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established or reclamation is complete.
		• Disturbed areas will be stabilized (e.g., cover exposed areas with erosion control blankets or tarps to keep the soil in place and prevent erosion) as needed. Such areas will be covered with mulch to prevent erosion.
		• Sedimentation in the receiving environment will be controlled by directing sediment laden water to various temporary storage and settlement features (i.e., sumps, settling ponds or catch basins) prior to discharge. Alternately, where appropriate, the sediment laden water will be directed to drain/filter through low gradient, well-vegetated areas away from watercourses (i.e., using pumps, hoses, etc.).
		• Sediment control measures will be incorporated prior to construction activities or immediately after disturbance on site-specific cases throughout the Project to avoid introduction of sediment to the environment, and, as part of this, to stabilize drifting soils or loss of topsoil, as practicable. Sediment control measures may include silt fences, filter bags, straw bale fences, berms, ponds and gravel or vegetative filters, check dams, erosion control blankets, and other features.
		• Additional contingency measures will be implemented as appropriate in the event of excessive rain, wet weather or flood-like conditions (when the planned activity could cause significant damage to soils, such as rutting by traffic through the topsoil, soil structure damage during soil handling, or compaction and associated pulverization of topsoil structure damage due to heavy traffic):
			from work sites to nearby waterbodies, and/or increased rates of erosion in disturbed and exposed areas with sediment transport and delivery to adjacent waterbodies.

Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		• Re-schedule work or reduce/detour traffic in areas where soils are considered to be excessively wet. • Restrict construction traffic, where feasible, to equipment with low-ground pressure tires or wide pad tracks. • During excessively wet conditions, work only in non-problem areas, such as well-drained soil or well-sodded lands, until conditions improve. • Limit vehicle access through soft/wet areas to periods when frozen conditions occur (i.e., early morning/evening) and have crews park in a stable area and walk to on-site equipment if feasible. • Install access or rig matting in problem areas to protect soils. • If necessary, work will be suspended until soils dry out or appropriate site-specific mitigation can be used to prevent soil disturbance. • Progressive reclamation of disturbed areas will be practiced. Natural recovery is the preferred method over seeding of reclamation on level terrain where erosion is not expected. If seeding is required, erosion prone areas will be seeded with a native cover crop and certified seed mix approved by the applicable regulatory agency, as soon as feasible after construction. Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions. • Imported aggregate will be sourced from local quarries or gravel pits where feasible. If local pits are not available, then borrow pits may be required along the transmission ROW and/or purchased from local suppliers. If required, all borrow pits will be identified, established, and decommissioned in accordance with applicable regulatory requirements. • All aggregate pits will be located a minimum of 120 m away from the ordinary high-water mark of a waterbody, where possible. The aggregate pits will follow the guidelines and associated conditions/requirements of the approved permits, including development of a rehabilitation plan, outlined in the Aggregate Permits on Crown Lands for Pits and Quarries above Water (MNRF 2014) and the Forest Management Planning Manual (MNRF 2017).	
Project activities during the construction stage: • Clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, turn-around areas, temporary laydown areas and temporary construction camps); • Extraction of aggregates; • Surface water management and erosion control; • Recreational Off-Road Vehicle (ORV) use may increase as a result of new access routes and clearing of existing roads and trails along Project areas, recognizing that recreational access is currently unauthorized within the hydro corridor; and • Reclamation of decommissioned access roads, turn-around areas, temporary laydown areas, staging	• Changes to surface water quantity and surface water quality due to changes in land cover.	**Construction stage:** • The transmission line ROW, and existing roads and trails will be used for access, to the extent practicable, to minimize changes in land cover. • Temporary laydown areas and temporary construction camps will be constructed on existing disturbed areas and/or at reasonably flat areas with stable soil, where possible. • New access roads will be constructed in accordance with the MNRF's Environmental Guidelines for Access Roads and Water Crossings (1990). • Temporary construction camps, temporary laydown areas and other Project activities will be located a minimum of 30 m away from the ordinary high-water mark of a waterbody. The distance of the setback from the temporary construction camp, temporary laydown area, or storage area will depend on the slope adjacent to the waterbody and will follow the guidelines outlined in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR 2010). • No tower foundations are anticipated to be placed below the highwater mark (HWM), noting that, with few exceptions, all towers are currently planned at locations that are at least 30 m from mapped waterbodies. If a tower foundation is within the limits of the HWM (based on specific cases in the field), the relevant regulatory approvals will be secured for the proposed works. • Progressive re-vegetation of the ROW will be implemented. • Temporary access roads and trails, temporary construction camps, turn-around areas, waterbody crossings, and temporary laydown areas will be reclaimed at the end of construction. • Seeding will follow as close as possible to final cleanup and topsoil material replacement pending seasonal or weather conditions. • Install, monitor, and manage appropriate erosion and sedimentation control measures to minimize or avoid sediment mobilization to drainages, or waterbodies. Adequate and appropriate erosion and sedimentation control materials shall be on-site and available prior to commencement of construction.	• Net changes to surface water quantity and surface water quality during construction and operation and maintenance due to changes in land cover.

Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect

areas, and temporary construction camps.
 	
Project activities during the operation and maintenance stage:
- Operation and maintenance of new ROW, fencing, transmission line, conductors, tower foundations, transformer stations and permanent access roads.
		- Limiting use of ORVs by Hydro One and associated contractors during construction and operation, noting that:
		  - ORV use will follow DFO's Code of Practice for Fording (DFO 2022f), DFO's All Terrain Vehicle Guidance (DFO nd) and O. Reg 316/03;
		  - Inspections and maintenance activities will include cleaning of ORVs before and after each use to prevent the spread of invasive species and to identify any fuel leaks or equipment damage; and
		  - Avoidance of sensitive features and water crossings to the extent practicable.
		- Temporary erosion control measures to be:
		  - Properly installed;
		  - Installed before or immediately after initial disturbance; and
		  - Inspected and properly maintained (e.g., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established or reclamation is complete.
		
		Operation and maintenance stage:
		- Multi-stage drainage and sediment controls to collect and treat stormwater runoff from Project components will be employed at work sites as appropriate.	

Project activities during the construction stage: - Upgrade of existing water crossings, and construction of new water crossings.	- Changes to surface water quantity and surface water quality during short-term water diversions at water crossings.	**Construction stage:** - The construction (and removal as needed) of temporary and permanent waterbody crossings, and removal of temporary crossing structures following the completion of the relevant work, will be constructed in compliance with MNRF regulatory permits and approvals, as applicable. - Water crossings will be designed and constructed in compliance with O. Reg. 180/06 as amended by O. Reg. 63/13 and O. Reg. 454/96, as applicable. - Water crossings will be constructed in accordance with MNRF's Environmental Guidelines for Access Roads and Water Crossings (1990). - Environmental monitoring (including water quality sampling/testing noted in Section 6.2.11) will be conducted during construction to verify the performance and effectiveness of the planned mitigation. Monitoring will occur during installation works, including all in-water activities, and continue during the duration of the Project, including the removal of temporary crossing structures as part of reclamation activities. Contingency plans will be developed in the event of an unexpected change to water quantity or quality (i.e., increase in turbidity in accordance with CCME standards). - Temporary water crossings will be reclaimed at the end of construction. The reclamation will involve removal of temporary water crossing structures (if constructed), restoration and stabilization of waterbody banks, and other disturbed areas when the crossing is no longer required.	- Net changes to surface water quantity and surface water quality during short-term water diversions at water crossings.
Project activities during the construction stage: - Upgrade of existing water crossings, and construction of new water crossings. **Project activities during the operation and maintenance stage:** - Monitor effectiveness of design features and mitigation measures related to new, permanent waterbody crossings	- Changes to surface water quantity and surface water quality due to changes in channel hydraulics at water crossings.	**Construction stage:** - Water crossings will be designed and constructed in accordance with permits and approvals through DFO, LRCA, and MNRF, as applicable. - Water crossings will be designed and constructed in accordance with the MNRF's Environmental Guidelines for Access Roads and Water Crossings (1990). - Water crossing structures, including clear span bridges, ice bridges/snow fills, rig mats and culverts, will be primarily based on hydrologic and hydraulic design flow calculations, which consider, but are not limited to, expected rainfall and peak flow within the geographic area, as well as the relevant catchment area, channel slope, and channel substrate. - Each water crossing will be visited ahead of construction by qualified environmental personnel and fisheries biologists and/or technicians to verify that the crossing location is conducive to the planned crossing structure installation, such that any changes in site conditions can be addressed through necessary design adjustments.	- Net changes to surface water quantity and surface water quality during construction and operation and maintenance due to changes in channel hydraulics at water crossings.

Project Component or Activity	Potential Effect	Mitigation Measures	Net Effect
		• Water crossing design and construction with maintain the characteristic channel width, depths, slopes and substrate in the event that a channel realignment is required, noting that: ◦ Channel realignments and/or infillings will be avoided through Project planning and design to the extent practicable; ◦ Channel realignments and/or infilling will only be undertaken in locations where specific conditions are met and/or where required for safety and security purposes; and if required, ◦ A realignment would avoid the use of a DFO code of practice (required approval by DFO), with the plan and mitigations requiring reviewed by MNRF through permitting the water crossing. • If site-specific changes to crossing structure type is required, engagement with MNRF, DFO and stakeholders will occur prior to any instream construction activities, where appropriate (i.e., placement of additional fill, re-grading and/or stabilization of bed or banks). • At permanent culverts, monitoring will be conducted for the life of the project to identify and remove blockages (e.g., ice, woody debris), as needed, that could otherwise lead to scouring and effects to channel morphology and fish habitat, and potentially interfere with fish passage. • Monitoring/inspections of new permanent waterbody crossing structures and roadside drainage features (on a twice annual basis for the first two years following post-construction and then annually) for physical function and condition.	

m = metre; MNRF = Ministry of Natural Resources and Forestry; O. Reg. = Government of Ontario Regulation; ROW = right-of-way; WWTP = Waste Water Treatment Plant.

6.2.8 Net Effects Characterization

6.2.8.1 Net Effects Characterization Approach

The effects assessment approach followed the general process described in Section 5.6 (Assessment of Net Effects).

Potential effects with no predicted net effect after implementation of mitigation measures identified in Table 6.2-10 are not carried forward to the net effects assessment.

Net effects are described using the significance factors identified in Table 6.2-12. Effects levels are defined for the magnitude of effects characteristics for surface water in Table 6.2-11.

Table 6.2-11: Magnitude Effect Levels for Surface Water

Indicator / Net Effect	Negligible Magnitude	Low Magnitude	Moderate Magnitude	High Magnitude
• Surface water quantity; and • Surface water quality.	A small measurable change that is expected to be within the range of baseline conditions or guideline values, or within the range of natural variability.	A measurable change (discernable) that is expected to be at or slightly exceed the limits of baseline conditions or guideline values.	A defined change to an indicator that is potentially discernable but manageable – does not represent a management concern.	A discernable change to an indicator that is detrimental and may pose a harmful level of risk and not be manageable and represents a management concern.

A summary of the characterization of net effects of the Project on surface water is provided in Table 6.2-12. Net effects are described after the implementation of effective mitigation measures, and summarized according to direction, magnitude, geographic extent, duration/reversibility, frequency, and probability of the effect occurring (based on the methods described in Section 4.5.4). Overall, the effective implementation of mitigation measures summarized in Table 6.2-10 is expected to reduce the magnitude and duration of potential net effects on surface water.

6.2.8.2 Net Changes to Surface Water Quantity and Surface Water Quality from Short-term Water Discharges

Discharges of construction water, and wash water from Project activities during the construction stage have the potential to result in changes to surface water quantity in the form of an increase in streamflows and/or water levels at receiving waterbodies. It could also result in changes to surface water quality in the form of an increase to the concentrations of suspended solids and chemical constituents in receiving waterbodies. The specific locations for short-term discharges will be determined during the permitting and detailed planning stage of the Project. Where appropriate, construction water, or wash water from Project activities will be discharged to a well-vegetated ground surface at a distance greater than 30 m from a waterbody (and pre-treated in compliance with EASR, PTTW or ECA, if required).

The net effect will be direct because the relevant Project activities are expected to directly affect surface water. The effect was assessed as negative in direction because the relevant Project activities may result in an increase in streamflows and/or water levels, and an increase to the concentrations of suspended solids and chemical constituents at receiving waterbodies. The net effect was assessed as negligible in magnitude because short-term water discharge activities will be carried out in accordance with the conditions and requirements of EASR, a PTTW, or ECA, recognizing that the water taking and discharge plans associated with these permits and approvals are by design protective of the existing surface water, groundwater and natural environment conditions in the local area and, in turn, are expected to result in minimal changes (if any) to streamflows and/or water levels at receiving waterbodies, and minimal changes (if any) to surface water quality at nearby waterbodies. The net effect was characterized as short-term in duration, given that discharge activities will be limited to the anticipated timeline of the construction stage of the Project. The net effect was assessed to be frequent, given that discharge activities were expected to occur on a periodic basis during the construction stage (although likely limited to discrete water discharge events). The net effect is expected to be localized in spatial extent because any increases to streamflows and/or water levels, and any increases to the concentrations of suspended solids and chemical constituents (due to discharges), are expected to be limited to the portion of the waterbody immediately downgradient of the point of water discharge (likely restricted to the Project footprint, noting that the effect could be carried into the LSA a short distance downstream). The likelihood of occurrence of the net effect was assessed as probable (the effect is likely to occur).

6.2.8.3 Net Changes to Surface Water Quality from the Wash-off of Spills and Leaks to Nearby Waterbodies

Accidental spills and leaks from the transportation, storage, and handling of hazardous materials during the construction stage, and the operation of vehicles and equipment during the construction and operation and maintenance stages, could be washed off into nearby waterbodies during a runoff event or when using winter roads and, if occurring in high enough volumes, could change the chemical constituents in receiving waters.

The net effect will be direct because the relevant Project activities are expected to directly affect surface water. The net effect was assessed as negative in direction because accidental spills and leaks may result in an increase to the concentrations of chemical constituents in receiving waterbodies. The net effect was characterized as negligible in magnitude because potential volumes/loads to waterbody receivers are expected to be minor. The net effect is expected to be short-term in duration, given that spills and leaks will be contained and cleaned up as soon as possible following incidents. The net effect was assessed to be infrequent (i.e., limited to upset conditions that are not part of the normal or typical operation of the Project). The net effect is expected to be localized in spatial extent because any increases to the concentrations of chemical constituents are anticipated to be limited to the portion of the waterbody immediately downgradient of the point of wash-off (likely restricted to the Project footprint). The likelihood of occurrence of the effect was assessed as possible (the effect may occur, but is not likely), given that the implementation of the detailed Spill Prevention and Emergency Response Plan, which will be developed with consideration for applicable regulations and guidelines for spill management and clean-up, is expected to minimize opportunities for the wash-off of spills and leaks from relevant Project activities to enter nearby waterbodies.

6.2.8.4 Net Changes to Surface Water Quality from the Wash-off of Explosives Spills and Residues from Blasting Activities to Nearby Waterbodies

Blasting activities may result in changes to surface water quality, recognizing that explosives spills and residues could be washed off into nearby waterbodies during a runoff event and, if occurring in high enough volumes, may result in an increase to the concentrations of chemical constituents in receiving waters. A waterbody may be influenced by these potential effects only if there is need to employ blasting in close proximity to the feature. Therefore, it is anticipated that only a limited number of waterbodies may be affected.

The net effect will be direct because the relevant Project activities are expected to directly affect surface water. The net effect was assessed as negative in direction because blasting activities may result in an increase to the concentrations of chemical constituents in receiving waterbodies. The net effect was characterized as negligible in magnitude because potential volumes/loads to waterbody receivers are expected to be minor. The net effect is expected to be short-term in duration, given that blasting activities will be limited to the anticipated timeline of the construction activities. The net effect was assessed to be infrequent (i.e., limited to discrete construction activities). The net effect is expected to be localized in spatial extent because any increases to the concentrations of chemical constituents are anticipated to be limited to the portion of the waterbody immediately downgradient of the point of wash-off (likely restricted to the Project footprint). The likelihood of occurrence of the effect was assessed as possible (the effect may occur, but is not likely), given that the implementation of the detailed Blasting Management Plan, which will be developed with consideration for applicable regulations and guidelines for transportation, handling, storage, and use of explosives, is expected to minimize opportunities for the wash-off of explosives spills and residues from blasting activities to enter nearby waterbodies.

6.2.8.5 Net Changes to Surface Water Quantity during Construction from Short-term Water Taking

The short-term water takings from surface water or surface water and groundwater sources for the purposes of construction and water supply could result in changes to surface water quantity in the form of reductions in streamflows and/or water levels at nearby waterbodies (specific to or adjacent to the source of the water taking). The specific locations for short-term water takings, as well as the anticipated water taking duration and volumes, will be determined during the permitting and design stage of the Project.

The net effect was assessed as direct because the relevant Project activities were expected to directly affect surface water. The net effect was assessed as negative in direction because the relevant Project activities may result in a reduction in streamflows and/or water levels at nearby waterbodies. The net effect was assessed as negligible in magnitude because short-term water taking activities will be carried out in accordance with the conditions and requirements of EASR, a PTTW or an ECA, recognizing that the water taking and discharge plans associated with these permits and approvals are by design protective of the existing surface water, groundwater and natural environment conditions in the local area and, in turn, are expected to result in minimal changes (if any) to streamflows and/or water levels at affected waterbodies. The net effect is expected to be short-term in duration, given that water taking activities will be limited to the anticipated timeline of the construction stage of the Project. The net effect was assessed to be frequent, given that water taking activities were expected to occur on a periodic basis during the construction stage (although likely limited to discrete water taking events). The net effect is anticipated to be localized in spatial extent because any reductions in streamflow and/or water level (due to water taking) will be limited to a small portion of the waterbody near the point of water withdrawal (likely restricted to the Project footprint, noting that the effect could be carried into the LSA a short distance downstream). The likelihood of occurrence of the net effect was assessed as probable (the effect is likely to occur).

6.2.8.6 Net Changes to Surface Water Quality during Construction from the Wash-off of Organic Debris from Work Sites to Nearby Waterbodies, and/or Increased Rates of Erosion in Disturbed and Exposed Areas with Sediment Transport and Delivery to Adjacent Waterbodies

Site preparation, earthworks, and stockpiling activities during the construction stage could result in changes to surface water quality, recognizing that activities involving vegetation clearing and/or ground disturbance or exposure may result in increased rates of erosion, transport and delivery of organic debris and sediments to receiving waterbodies and, in turn, increased concentrations of suspended solids.

The net effect will be direct because the relevant Project activities are expected to directly affect surface water. The net effect was assessed as negative in direction because activities involving vegetation removal and/or ground disturbance or exposure may result in increases to the concentrations of suspended solids in receiving waterbodies. The net effect was assessed as negligible in magnitude because potential volumes/loads to surface water receivers are expected to be minor. The net effect is expected to be short-term in duration, given that the activities are anticipated to be isolated to the period when materials are first cleared and stockpiled during construction. The net effect was assessed to be frequent in occurrence, given that effects will be limited to large rainfall events (occurring on an intermittent basis). The net effect is expected to be localized in spatial extent because any increases to the concentrations of suspended solids are anticipated to be limited to the portion of the waterbody immediately downgradient of the point of wash-off (likely restricted to the Project footprint, noting that the effect could be carried into the LSA a short distance downstream). The likelihood of occurrence of the net effect was assessed as probable (the effect is likely to occur).

6.2.8.7 Net Changes to Surface Water Quantity during Construction and Operation and Maintenance Due to Changes in Land Cover

The potential changes in land cover could result in changes to surface water quantity in the form of local increases in runoff rates and runoff volumes and, in turn, an increase in streamflows and/or water levels, and erosion-sedimentation processes at receiving waterbodies. It could also result in potential changes to surface water quality at waterbodies through increased concentrations in suspended solids.

The net effect will be direct because the relevant Project activities are expected to directly affect surface water. The net effect was assessed as negative in direction because the relevant Project activities may result in an increase in streamflows, water levels and erosion-sedimentation processes, and an increase to the concentrations of suspended solids at receiving waterbodies. The effect was characterized as negligible in magnitude, given that, for most assessment points, the area of disturbed land is expected to represent a small proportion of the total catchment area (i.e., 5% or less). For the locations where the proportion of disturbed area to total catchment area will be higher than 5%, it was shown that the waterbodies are generally headwater streams with comparatively small catchment sizes, meaning that they inherently support intermittent or ephemeral flow conditions. Further to this, any increase in downstream flows and water levels at these waterbodies (mainly restricted to the construction stage only) will be limited in spatial extent, recognizing that the anticipated effects will be largely indiscernible a short distance downstream of the crossing (as the headwater feature joins the broader surface water system and/or drains a progressively larger catchment area). The net effect is expected to be long-term in duration because the effect occurs during construction and operation but is largely mitigated once the reclamation process progresses and vegetation is re-established at the disturbed areas. The net effect was assessed to be frequent, given that any noticeable increase in runoff that occurs during construction at the identified waterbodies (with associated changes to downstream flows, water levels, and sediment erosion/transport processes and, in turn, concentrations of suspended solids) will be in response to large precipitation events (occurring on an intermittent basis). The net effect is expected to be localized in spatial extent because any increases to streamflows, water levels, erosion-sedimentation processes and concentrations of suspended solids are likely limited to the area in the vicinity of the waterbody crossings, and largely indiscernible a short distance downstream. The likelihood of occurrence of the net effect was assessed as probable (the effect is likely to occur).

6.2.8.8 Net Changes to Surface Water Quantity and Surface Water Quality during Short-term Water Diversions at Water Crossings during Construction

The installation and removal of water crossing structures, along with short-term water diversions, could result in the following potential changes to surface water quantity:

- Localized increases or reductions in streamflows, water levels, and erosion-sedimentation processes depending on the specific assessment point relative to the work area (i.e., upstream or downstream of the isolation works, or within the dewatered area) and the diversion method and operations; and
- Localized increases in in-stream erosion-sedimentation processes at the points of the water taking and discharge (to facilitate the diversion).

There will also be the temporary, short-term, and local bypass of flow through the work site (i.e., change in drainage patterns), and the potential for increased rates of erosion-sedimentation following the removal of the diversion works and/or installation or removal of water crossing structures due to the disturbance of the bed and banks of the waterbody (within the limits of the work area).

The installation and removal of water crossing structures, along with short-term water diversions, could result in the following potential changes to surface water quality:

- Localized increase to the concentrations of suspended solids in waterbodies as a result of increased rates of erosion-sedimentation processes during water taking and discharge activities (specific to the points of water taking and discharge in the waterbody to facilitate the diversion), or following the removal of the diversion works and/or installation or removal of waterbody crossing structures due to the disturbance of the bed and banks of the waterbody (specific to the limits of the work area, with the opportunity for sediment to be mobilized and transported downstream); and
- Localized increase to the concentrations of chemical constituents in waterbodies due to equipment leaks.

Of note, no work below the high-water mark (with associated requirements for short-term water diversions) is expected during the installation, maintenance and removal of clear span crossing structures, meaning that the potential effects described above are expected to be limited to waterbody crossings where culverts are used.

The net effect will be direct because the relevant Project activities are expected to directly affect surface water. The net effect was assessed as negative in direction because the relevant Project activities may result in an increase or reduction in streamflows, water levels, and erosion-sedimentation processes at the affected waterbodies depending on the specific assessment point relative to the work area, and the diversion method and operations. It may also result in an increase to the concentrations of suspended solids and chemical constituents in affected waterbodies.

The net effect was characterized as negligible in magnitude, given that short-term water diversions will be carried out in accordance with O. Reg. 387/04 as amended by O. Reg. 63/16 and 64/16 under *Ontario Water Resources Act*, while the installation, maintenance and removal of all waterbody crossing structures and related water diversion works will follow the relevant permitting and approval conditions through LRCA and/or MNRF. As such, the plan to comply with the conditions and practices identified above is expected to minimize opportunities for localized changes to surface water quantity and surface water quality conditions. The net effect is expected to be short-term in duration, given that the installation/removal of waterbody crossing structures and associated use of short-term diversions will be limited to the construction stage of the Project. The net effect was assessed to be infrequent, given that the activities will be restricted to discrete events during the construction stage (i.e., installation and removal of crossing structures). The net effect is expected to be localized in spatial extent because any increase or reduction in streamflows, water levels and erosion-sedimentation processes, and any increase to the concentrations of suspended solids and chemical constituents are likely limited to the area in the immediately vicinity of the waterbody crossings and, where applicable, largely indiscernible a short distance upstream or downstream of the crossing. The likelihood of occurrence of the net effect was assessed as probable (the effect is likely to occur).

6.2.8.9 Net Changes to Surface Water Quantity and Surface Water Quality during Construction and Operation and Maintenance due to Changes in Channel Hydraulics at Water Crossings

The installation and maintenance of water crossing structures may result in changes to channel hydraulics at the affected portion of the waterbody in the form of an increase or reduction in flow velocities, shear stresses, water levels and erosion-sedimentation processes at locations upstream or downstream of the crossing. These changes in channel hydraulics at the water crossings could result in an increase or reduction in the concentrations of suspended solids at locations downstream of the crossings (due to the corresponding changes to erosion-sedimentation processes in the vicinity of the crossing).

The water crossing structure types will potentially include clear span bridges, ice bridges/snow fills, rig mats and culverts, recognizing that, in most instances, culverts would be expected to have a larger influence on channel hydraulics relative to clear span bridges.

The net effect will be direct because the relevant Project activities are expected to directly affect surface water. The net effect was assessed as negative in direction because the relevant Project activities may result in changes to channel hydraulics at water crossings with the potential for a localized increase or reduction in flow velocities, shear stresses, water levels, and erosion-sedimentation processes at locations upstream or downstream of the crossing. The changes to channel hydraulics at water crossings have the potential for a localized increase or reduction in the concentrations of suspended solids at locations downstream of the crossing (e.g., increases to the concentrations of suspended solids where the potential for heightened sediment erosion/transport processes at the outlet of the crossing structure could result in an increase to downstream concentrations of suspended solids, and reductions where the potential for augmented sedimentation processes upstream of the crossing structure could translate to a decrease in downstream concentrations of suspended solids).

The effect was assessed as negligible in magnitude because the crossings will be designed to minimize any effects on channel hydraulics under the majority of streamflow conditions. The net effect is expected to be long-term in duration because, in the case of permanent water crossing structures, the effect persists during operation (noting that the effect can be reversed if the structure is removed). The net effect was assessed to be infrequent, largely limited to infrequent, short-term runoff events (i.e., minor to major floods), rather than typical flow conditions. The net effect is expected to be localized in spatial extent, given that any changes to flow velocities, shear stresses, water levels, erosion-sedimentation processes, and concentrations of suspended solids are expected to be limited to short sections of the channel reach (likely restricted to the Project footprint, noting that the effect could be carried into the LSA a short distance upstream or downstream of the crossing). The likelihood of occurrence of the effect was assessed as possible (the effect may occur but is not likely).

Table 6.2-12: Characterization of Predicted Net Effects for Surface Water

Criteria	Indicators	Net Effect	Direct/ Indirect	Direction	Magnitude	Geographic Extent	Duration/ Irreversibility	Frequency	Likelihood of Occurrence	Significance
Surface Water	• Surface water quantity; and • Surface water quality.	• Net changes to surface water quantity and surface water quality from short-term water discharges.	Direct	Negative	Negligible	Local	Short-term	Frequent	Probable	Not Significant
Surface Water	• Surface water quality.	• Net changes to surface water quality from the wash-off of spills and leaks to nearby waterbodies.	Direct	Negative	Negligible	Local	Short-term	Infrequent	Possible	Not Significant
Surface Water	• Surface water quality.	• Net changes to surface water quality from the wash-off of explosives spills and residues from blasting activities to nearby waterbodies.	Direct	Negative	Negligible	Local	Short-term	Frequent	Probable	Not Significant
Surface Water	• Surface water quantity.	• Net changes to surface water quantity from short-term water taking.	Direct	Negative	Negligible	Local	Short-term	Frequent	Probable	Not Significant
Surface Water	• Surface water quality.	• Net changes to surface water quality from the wash-off of organic debris from work sites to nearby waterbodies, and/or increased rates of erosion in disturbed and exposed areas with sediment transport and delivery to adjacent waterbodies.	Direct	Negative	Negligible	Local	Short-term	Frequent	Probable	Not Significant
Surface Water	• Surface water quantity; and • Surface water quality.	• Net changes to surface water quantity due to changes in land cover.	Direct	Negative	Negligible	Local	Long-term	Frequent	Probable	Not Significant
Surface Water	• Surface water quantity; and • Surface water quality.	• Net changes to surface water quantity and surface water quality during short-term water diversions at water crossings.	Direct	Negative	Negligible	Local	Short-term	Infrequent	Probable	Not Significant
Surface Water	• Surface water quantity; and • Surface water quality.	• Net changes to surface water quantity and surface water quality due to changes in channel hydraulics at water crossings.	Direct	Negative	Negligible	Local	Long-term	Infrequent	Possible	Not Significant

6.2.9 Assessment of Significance

The assessment of significance of net effects of the Project is informed by the interaction between the significance factors, with magnitude, duration, and geographic extent being the most important factors. Consideration is also given to concerns of Indigenous communities, interested agencies, groups and individuals raised during engagement and through review comments on the EA reports. Implementation of proven mitigation measures is expected to avoid or reduce the duration and magnitude of net effects on surface water. The magnitude of the predicted net effects on surface water is negligible (a small measurable change that is expected to be within the range of baseline conditions or guideline values, or within the range of natural variability), direct, and local (confined to the Project footprint or extending a limited distance into the LSA).

Net effects to a criterion would be considered to be significant if the majority of the net effects are assessed as high magnitude, long-term or permanent duration, at any geographic extent and represent a management concern. The predicted net effects on surface water are not anticipated to result in a change to the criterion that will alter the sustainability of the criterion beyond a manageable level, and the net effects are not predicted to result in changes that are not in accordance with provincial and federal guidelines. Therefore, the predicted net effects on surface water are assessed as not significant.

6.2.10 Cumulative Effects Assessment

As identified in Table 6.2-12 Characterization of Predicted Net Effects for Surface Water, the magnitude of the net effects is predicted to be negligible and, in all instances, the net effect is expected to be localized, largely indiscernible a short distance from the point of impact in the waterbody (e.g., crossing location, water intake point, water discharge point). Therefore, they are not carried forward to a cumulative effects assessment.

6.2.11 Monitoring

This section identifies any recommended effects monitoring to verify the prediction of the effects assessment and to verify the effectiveness of the mitigation measures and compliance monitoring to evaluate whether the Project has been constructed, implemented, and operated in accordance with commitments made in the Environmental Study Report. Monitoring will:

- Evaluate the effectiveness of mitigation measures and reclamation, and modify or enhance measures as necessary through adaptive management;
- Identify unanticipated potentially negative effects, including possible accidents and malfunctions; and
- Contribute to continual improvement.

The following monitoring programs will be required following the assessment of, and implementation of mitigation measures for surface water in the LSA:

- Monitoring/inspections of all erosion and sediment management measures, bank stabilization features and cofferdams during construction to verify effectiveness;
- Monitoring of Total Suspended Solids (TSS) and/or turbidity (instrumented measurements and/or visual observations), as well as visual inspections to confirm the presence or absence of oil or sheen, will be coupled with monitoring of streamflow rates and/or water levels, as required to meet regulatory or permitting requirements, at all water crossings targeted for in-stream works during construction to verify effectiveness of construction procedures and mitigation measures including dam and pump/diversion activities associated with the removal and/or installation of temporary or permanent crossing structures;
- Monitoring of one or more surface water quantity and quality parameters at water taking or discharge locations to satisfy the conditions/requirements of water discharge plans related to applicable PTTWs, ECAs or EASR, and to confirm the effectiveness of the discharge plans and associated mitigation measures;
- Monitoring/inspections of all new permanent water crossing structures and roadside drainage features for physical function and condition; and
- Monitoring of water quality and streamflow conditions at waterbodies that include greater sensitivity or implication to change from the standpoint of fish habitat, species at risk, channel stability, drainage pattern, or other environmental considerations. The specific monitoring locations will be determined during the permitting and design stages of the Project; however, it is expected that waterbodies of varying size (small, medium, large) would be captured, recognizing that this would allow the performance/effectiveness of mitigation measures to be evaluated at a range of scales.

6.2.12 Prediction Confidence in the Assessment

The confidence in the effects assessment for surface water is moderate, considering the following:

- Based on the scale of the Project and the substantial number of water crossings, the predicted effects on the surface water environment were assessed from a largely qualitative standpoint, recognizing that this approach was considered appropriate and valid for the scope of the EA.
- The evaluation and the associated confidence in the assessment was based on past experience on similar transmission line projects, with specific attention to the following:
  - The predicted effects of the planned activities on water crossings, along with the application and effectiveness of the proposed best management practices (BMPs)/mitigation, are well known and understood; and

- The effects assessment for the Project considered the characteristic surface water conditions in the LSA/RSA and the design method (including all of the incorporated BMPs/mitigation).

- Where appropriate, the magnitude of the predicted effects was assessed based on the proportion of the catchment area for a given waterbody that will be disturbed or influenced by a specific Project activity, recognizing that this approach considers drainage area as a proxy or analog for streamflow and, to a lesser extent, the potential for sediment erosion and transport.

  - Uncertainty in the assessment has been further reduced by making conservative assumptions, planning implementation of known effective mitigation and monitoring measures, and using available adaptive management measures to address unforeseen circumstances should they arise.

6.2.13 Information Passed on to Other Components

Results of the surface water assessment were reviewed and incorporated into the following components of the EA:

- Groundwater (Section 6.3);
- Vegetation and Wetlands (Section 6.4);
- Wildlife and Wildlife Habitat (Section 6.5);
- Fish and Fish Habitat (Section 6.6);
- Community Well-Being and Infrastructure (Section 7.2);
- Archaeological Resources (Section 7.5);
- Heritage Resources (Section 7.6);
- First Nations rights, interests, and use of land and resources (Section 7.7); and
- Métis rights, interests, and use of land and resources (Section 7.8).

6.2.14 Criteria Summary

Table 6.2-13 presents a summary of the assessment results for surface water by criteria.

Table 6.2-13: Surface Water Assessment Summary

Criteria	Results
Surface Water Quantity	• Net effects are assessed to be not significant with the proper implementation of the mitigation measures and monitoring proposed. • The Project is not predicted to contribute to cumulative effects.
Surface Water Quality	• Net effects are assessed to be not significant with the proper implementation of the mitigation measures and monitoring proposed. • The Project is not predicted to contribute to cumulative effects.

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