BOW LAKE WIND FARM
WATER ASSESSMENT AND WATER BODY REPORT

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Prepared for:

Nodin Kitagan Limited Partnership
and
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Executive Summary

Nodin Kitagan Limited Partnership and Nodin Kitagan 2 Limited Partnership, by their General Partners Shongwish Nodin Kitagan GP Corp. and Shongwish Nodin Kitagan 2 GP Corp., respectively (the "Proponent"), are proposing to develop Phase 1 and Phase 2 of the Bow Lake Wind Farm on predominantly Provincial Crown Land within the unorganized Townships of Smilsky and Peever, in the District of Algoma, Ontario (the "Project"). The Project is located approximately 80 km north of Sault Ste. Marie and roughly six kilometres east of Montreal River Harbour. The Project has three Feed-in Tariff ("FiT") Contracts with the Ontario Power Authority ("OPA") for the sale of electricity generated by the Project.

As part of the Project's design, construction, and operational activities, and understanding the Project falls within the territory of the Batchewana First Nation of Ojibways ("BFN"), the Proponent has engaged directly with the BFN. As a result of these efforts, the BFN:

- Has entered the Project as partner;
- Has entered into various business and relationship agreements with the Proponent to guide Project activities; and
- Has issued a Development and Power Generation Permit, which provides the BFN's approval to construct, operate, repower, and decommission the Project.

The English name of the Project is the *Bow Lake Wind Farm*, however, the BFN know and refer to the Project as *Chinodin Chigumi Nodin Kitagan*.

As proposed, the Project will include 36 wind turbines for a total maximum installed nameplate capacity of up to 58.32 MW. In addition, the Project will require 34.5 kV above and below ground electrical collector and communication lines, pad-mounted transformers, crane pads, two permanent meteorological towers, access roads, an operations and maintenance building, welfare buildings, a transformer station, construction compounds, and other ancillary facilities. The Project will connect to the provincial power grid via existing 115 kV transmission lines located adjacent to the Project's transformer station. A full description of Project infrastructure is provided in the **Project Description Report**. The Project site plan is provided in **Appendix A**.

Once the Project layout was confirmed, a records review and site investigations were conducted to determine the presence or absence of water bodies, in accordance with Section 30(1) of O.Reg. 359/09. Site investigations consisted of habitat assessment and fish community sampling (where appropriate) at water bodies within the 120 m of the Project Location. Locations where water bodies are present within 120 m of the proposed Project Location are presented in Figures 2.1 to 2.9 (**Appendix A**) and summarized in **Table 3.2**.

All water bodies within the 120 m of the Project Location and identified in this report are located farther than 30 m from any turbine blade tip. The designation of features as water bodies was in

accordance with the definition of water body provided in O. Reg. 359/09 and based on observations completed by field staff during field conditions at the time the survey was completed.

Work Permits, pursuant to the *Public Lands Act*, are required from MNR for all water body crossings that will occur in areas not previously evaluated under the existing FMP regulatory process. It is anticipated that these Work Permits will include conditions that must be implemented to ensure that potential impacts to the aquatic environments are minimized. Additionally, authorizations under the *Lakes and Rivers Improvement Act* may be required from MNR for some water body crossings, depending on the watercourse characteristics (flow regime), catchment area and the proposed works. As is the case with the Work Permits, these authorizations will contain conditions that must be fulfilled in order to protect the aquatic habitat and fisheries resources.

Based on the current Project layout and assuming proper implementation of the proposed environmental mitigation and monitoring measures, it is anticipated that Project activities (including all construction activities) will be in compliance with the *Fisheries Act*, and will not result in harmful effects to any water body, fish or fish habitat. Once culvert size and construction methods are finalized, consultation with DFO will take place regarding the twelve culvert crossing locations presented in Section 3.2. DFO will be notified of the crossing details and construction methods.

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1.0 Introduction

Nodin Kitagan Limited Partnership and Nodin Kitagan 2 Limited Partnership, by their General Partners Shongwish Nodin Kitagan GP Corp. and Shongwish Nodin Kitagan 2 GP Corp., respectively (the "Proponent"), are proposing to develop Phase 1 and Phase 2 of the Bow Lake Wind Farm on predominantly Provincial Crown Land within the unorganized Townships of Smilsky and Peever, in the District of Algoma, Ontario (the "Project"). The Project is located approximately 80 km north of Sault Ste. Marie and roughly six kilometres east of Montreal River Harbour. The Project has three Feed-in Tariff ("FiT") Contracts with the Ontario Power Authority ("OPA") for the sale of electricity generated by the Project.

As part of the Project's design, construction, and operational activities, and understanding the Project falls within the territory of the Batchewana First Nation of Ojibways ("BFN"), the Proponent has engaged directly with the BFN. As a result of these efforts, the BFN:

- Has entered the Project as partner;
- Has entered into various business and relationship agreements with the Proponent to guide Project activities; and
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The English name of the Project is the *Bow Lake Wind Farm*, however, the BFN know and refer to the Project as *Chinodin Chigumi Nodin Kitagan*.

As proposed, the Project will include 36 wind turbines for a total maximum installed nameplate capacity of up to 58.32 MW. In addition, the Project will require 34.5 kV above and below ground electrical collector and communication lines, pad-mounted transformers, crane pads, two permanent meteorological towers, access roads, operations and maintenance building, welfare buildings, a transformer station, construction compounds, and other ancillary facilities. The Project will connect to the provincial power grid via existing 115 kV transmission lines located adjacent to the Project's transformer station. A full description of Project infrastructure is provided in the **Project Description Report**. The Project site plan is provided in **Appendix A**.

The selected model of wind turbine for the Project is the General Electric ("GE") 1.6-100; details of this wind turbine are outlined in **Table 1.1**. Further information is provided in the **Wind Turbine Specifications Report**. According to subsection 6.(3) of O. Reg. 359/09, the Project is classified as a Class 4 Wind Facility.

Table 1.1: Wind Turbine Specifications

Operating Data	Specification
General	
Make	General Electric
Model	GE 1.6-100
Name plate capacity (MW)	1.62
Maximum Sound Power Level (dBA)	105
Rotor	
Rotor diameter (m)	100
Blade length (m)	48.7
Blade swept area (m^2)	7,854
Rotation Speed (RPM)	9.75-15.33
Tower	
Hub height above grade (m)	96
Tip height (m)	146

The Project Location is defined in O. Reg. 359/09 to include all land and buildings/structures in, on or over which the Proponent proposes to engage in the Project and any air space which the Proponent will engage in the Project, including certain lands used on a temporary basis during construction ("temporary construction areas"). The following are excluded from the Project Location:

- Existing, modified, and new public multi-use Forest Management Plan ("FMP") roads have been evaluated under the existing FMP regulatory process for the area.

Existing public multi-use roads that do not require upgrades. Two Category 9 Aggregate pits (Permits # 625249, 625250), one Category 3 Class A licenced pit (Permit #625256) and one Category 11 quarry (Permit # 625248) have been evaluated and licenced/permitted under the *Aggregate Resources Act*.The Project is not located in any areas protected under provincial plans and policies described in O. Reg. 359/09.

The siting of wind turbines and associated infrastructure is an iterative process, and the Project layout has been developed to avoid important natural features as a result of field investigations. A map of the Project Location, including the proposed Project layout is provided in **Appendix A**. A 120 m "Zone of Investigation" ("ZOI") has been established, where potential negative environmental effects that may result from construction, operational and decommissioning activities have been assessed. The "ZOI" has been identified based upon the requirements of Ontario Regulation 359/09 ("O. Reg. 359/09" "), the Ontario Ministry of the Environment's ("MOE") *Technical Guide to Renewable Energy Approvals* (MOE, 2009b) and the Ontario Ministry of Natural Resources' ("MNR") *Approval and Permitting Requirements Document for Renewable Energy Projects*, September 2009 ("APRD"). The ZOI encompasses the Project Location plus an additional 120 m surrounding the outer edges of the Project Location. This Report identifies water bodies that are within the ZOI and assesses potential negative environmental effects that may result from the Project. To the extent practical, identified water

bodies are avoided, however where appropriate mitigation measures are also identified to alleviate potential negative environmental effects to a level of insignificance.

Once the Project layout and locations of water bodies were confirmed, a records review of information relevant to the aquatic environments of these water bodies was conducted in accordance with Section 30(1) of O.Reg. 359/09. Additionally, fish communities were sampled at selected water bodies within the 120 m ZOI and a general aquatic habitat assessment was conducted. Water bodies were selected for sampling based on historic data and field investigations that indicated or suggested the presence of fish. A combination of background data and results of Stantec's 2012 field surveys were used to determine the presence or absence of water bodies and fish habitat within the 120 m ZOI. Photographs of all water features were taken during field surveys and are included in **Appendix C**.

Locations where water bodies are present within 120 m of a proposed Project Location are presented in Figures 2.1 to 2.9 and summarized in **Table 3.2**. All water bodies within the ZOI and identified in this report are located farther than 30 m from any turbine blade tip. The designation of features as water bodies was in accordance with the definition of water body provided in O. Reg. 359/09. and based on observations completed by field staff during field conditions at the time the survey was completed. This Water Assessment and Water Body Report has been prepared in accordance with O. Reg. 359/09 (s. 39 and 40), the MOE document "Technical Guide to Renewable Energy Approvals" (MOE, 2009b), and the MNR's Approval and Permitting Requirements Document (APRD) (MNR, 2009c).

1.1 REPORT REQUIREMENTS

A Water Assessment includes a records review and site investigation to determine the presence and boundaries of water bodies as defined in O. Reg. 359/09 within 120 m of the Project Location (assuming that no Lake Trout lakes that are at or above development capacity are identified within 300 m of the Project Location). If water bodies are identified within 120 m of the Project Location, a Water Body Report must be prepared.

A renewable energy project includes all activities associated with the construction, installation, operation, maintenance, and decomissioning of the renewable energy generation facility. Therefore, for the purposes of measuring the distance from the Project Location to a water body, the boundary of the Project Location, as defined above, is considered to be the outer limit where site preparation and construction activities will occur and where infrastructure will be located.

Table 1.1 summarizes the documentation requirements of the Water Assessment and Water Body Reports as specified under O. Reg. 359/09.

Table 1.2: Water Assessment Report and Water Body Report Requirements: O. Reg. 359/09

Requirements (Water Assessment)	Completed	Section Reference
A person who proposes to engage in a renewable energy project shall conduct a water assessment, consisting of the following:		
1. A records review conducted in accordance with section 30.	✓	2.2, 3.1
2. A site investigation conducted in accordance with section 31, including:		
31(4)(1). A summary of any corrections to the records review and the determinations made as a result of conducting the site investigation.	✓	2.3, Figures 2.1 to 2.9, Appendix A
31(4)(2). Information relating to each water body.	✓	3.1
31(4)(3). A map showing boundaries, location/type and distances.	✓	Figures 2.1 to 2.9, Appendix A
31(4)(4). A summary of methods used to make observations for the purposes of the site investigation.	✓	2.3
31(4)(5). The name and qualifications of any person conducting the site investigation.	✓	2.4
31(4)(6)(i). The dates and times of the beginning and completion of the site investigation.	✓	3.0
If an investigation was conducted by visiting the site:		
31(4)(6)(ii). The duration of the site investigation.	✓	3.0
31(4)(6)(iii).The weather conditions during the site investigation	✓	3.0
31(4)(6)(iv). Field notes kept by the person conducting the site investigation.	✓	Appendices B, C, and D
If an alternative investigation of the site was conducted:		
31(4)(7)(i). The dates of the generation of the data used in the site investigation.		N/A
31(4)(7)(ii). An explanation of why the person who conducted the alternative investigation determined that it was not reasonable to conduct the site investigation by visiting the site.		N/A
Requirements (Water Body)		
4. Report identifies and assesses any negative environmental effects of the project on a water body and on land within 30 metres of the water body.	✓	3.1, 3.2
5. Report identifies mitigation measures in respect of any negative environmental effects.	✓	3.1, 5.0
6. Report describes how the environmental effects monitoring plan addresses any negative environmental effects.	✓	6.2
7. Report describes how the construction plan report addresses any negative environmental effects.	✓	6.1

2.0 Methods

2.1 DEFINITION OF A WATER BODY

The presence or absence of water bodies within the Project's 120 m ZOI was assessed using the definition of a water body provided in O. Reg. 359/09, which is as follows:

"…a lake, a permanent stream, an intermittent stream and a seepage area but does not include, a) grassed waterways, b) temporary channels for surface drainage, such as furrows or shallow channels that can be tilled and driven through, c) rock chutes or spillways, d) roadside ditches that do not contain a permanent or intermittent stream, e) temporarily ponded areas that are normally farmed, f) dugout ponds, or g) artificial bodies of water intended for the storage, treatment or recirculation of runoff from farm animal yards, manure storage facilities and sites and outdoor confinement areas".

2.2 RECORDS REVIEW

A water records review was conducted according to Section 30(1) of O.Reg. 359/09. The available water body records maintained by the agencies listed in Section 30(2) were searched, as applicable, with most data gathered through agency requests and/or accessing online databases as follows:

- Ontario Ministry of Natural Resources
  - Background fisheries data acquired from the Sault Ste. Marie District office
  - Land Information Ontario ("LIO") mapping database
  - Natural Heritage Information Centre online database

Copies of all correspondence related to the records review will be provided in the Consultation Report which will be submitted as part of the complete Renewable Energy Approval ("REA") application to the Ministry of Environment ("MOE"). Information obtained as a result of the information requests/records review are presented in Section 3.0 of this report.

Figures depicting the watercourses and waterbodies identified by LIO mapping (MNR, 2009a) are included in Figures 2.1 through 2.9, Appendix A, where "watercourses" and "waterbodies" are water features (including lakes, rivers, streams, etc.), as mapped by MNR. These water features may or may not meet the definition of a water body as described in Section 2.1. Potential waterbodies were also identified through a review of aerial photographs of the ZOI. Further information on these potential water bodies was obtained during the site investigations (as described in Section 2.3).

The MNR provided background data regarding fish communities at a number of locations in the ZOI. These data are presented in Section 3.1.

2.3 SITE INVESTIGATIONS

Site investigations were carried out according to Section 31 of O.Reg. 359/09. The investigations were conducted on several dates between April 30, 2012 and August 30 2012 as presented in **Table 3.1**. Records of field investigations are included in **Appendices B,C,** and **D**.

The purpose of the site investigations was to:

- Field confirm the results of the records review to identify any required corrections;
- Determine whether any additional water bodies exist, other than those identified during the records review; and
- Identify the boundaries of any water body located within 120 m of the Project Location.

While on site, the field crews used visual inspections to verify the presence or absence of water bodies within 120 m of the Project Location.

In some cases, marshes or portions of other on-line wetland features within the Project Location and the ZOI meet the definition of a water body if they are part of a channel containing permanent or intermittent flow, or a seepage area. All other wetland types identified within the Project Location and the ZOI do not contain channels and therefore do not meet the definition of a water body under O.Reg. 359/09 and are addressed in the draft Natural Heritage Assessment/Environmental Impact Study ("NHA/EIS"). (Stantec, 2013a)

Once the Project layout and locations of water bodies were confirmed, a general aquatic habitat assessment was conducted within the 120 m ZOI. Fish communities were sampled at representative locations between July 5-17, 2012 and were undertaken using either a Model 12 or Smith Root Model 24 backpack electrofisher or minnow traps. In cases where one water body traversed several Project components, one or two representative locations were fished/sampled to determine the general species assemblage for the watercourse. Specific locations where fish sampling was completed are identified in **Appendix D**. A combination of background data and results of Stantec's 2012 surveys were used to determine the presence or absence of fish habitat in water bodies identified within the Project Location and the 120 m ZOI.

The following criteria were used for the designation of fish habitat:

- **Fish Habitat** – permanently flowing watercourse with available fish community data (background and/or Stantec surveys) or watercourses with an intermittent flow regime contributing indirectly (e.g., allochthonous inputs, flow) to downstream reaches supporting fish.
- **Not Fish Habitat** – not directly connected to a downstream water feature that supports fish or where Stantec surveys captured fish.

2.4 QUALIFICATIONS

The following Stantec personnel were responsible for the site investigation, identification of water bodies and for determining any implications associated with fish and fish habitat:

- Mark Pomeroy, B.Sc. – Fisheries Biologist
- Nancy Harttrup, B.Sc. – Senior Fisheries Biologist
- Joe Keene, M.Sc – Ecologist
- Marc Faiella, Tech. Dipl., CEPIT – Ecologist
- Mitch Ellah, Tech. Dipl., B.Sc. (Hons.) – Aquatic Ecologist
- Mike Johns, Tech. Dipl. – Ecologist
- Katie Easterling, Tech. Dipl., B.Sc. (Hons.) – Biologist
- Nathan Burnett, Tech. Dipl., B.Sc. (Hons.) – Aquatic Ecologist

Curricula vitae are provided in **Appendix F**.

3.0 Results

Weather conditions during field investigations are presented in **Table 3.1**.

Table 3.1: Stantec 2012 Site Investigation information

Dates	Daily Duration of Site Visit	Air Temperature (Range) ^{o}C *	General Weather Observations
April 30	8:30-17:00	0-8	Overcast, scattered showers.
May 1	8:30-16:00	-1-19	Overcast, scattered showers.
May 2	8:30-12:30	6-11	Overcast, scattered showers.
July 5	10:00-17:30	17-31	Sunny, humid. No precipitation.
July 6	9:30-17:30	13-28	Clear, humid.
July 7	9:30-17:00	16-23	Mix of sun and cloud. Scattered showers
July 8	10:00-17:30	11-24	No precipitation, partly cloudy, humid.
July 9	9:00-17:00	10-23	Mostly sunny, humid, scattered showers.
July 11	9:00-17:00	8-28	Mostly clear, no precipitation.
July 12	8:00-16:00	12-30	No precipitation in previous 24 hrs. Partly cloudy. Light winds.
July 13	9:00-16:00	12-31	No precipitation in previous 24 hrs. Clear.
July 14	9:00-16:30	19-28	Mostly clear with scattered showers.
July 15	9:00-16:30	19-26	Morning showers, clearing by afternoon.
July 16	9:00-16:30	17-26	Morning fog, scattered showers in afternoon.
August 9	9:00-16:00	13-24	Clear, no precipitation.
August 27	8:30-18:00	17-24	Morning fog, scattered showers.
August 28	8:30-18:00	9-21	Sunny with morning fog.
August 29	8:30-18:00	7-25	Clear, no precipitation
August 30	9:00-12:00	12-28	Clear, no precipitation

**Temperature ranges from Sault Ste. Marie weather station, Environment Canada, 2012.*

As indicated in Section 2.1, the presence or absence of water bodies within the Project Location and the ZOI was assessed using the definition of a water body provided in O. Reg. 359/09. Based on the results of field investigations and the records review, water features within 120 m of the Project Location are summarized in Sections 3.1.1 and 3.1.2, and are illustrated in Figures 2.1 to 2.9 (**Appendix A**). A total of one-hundred and seven (107) water bodies were identified within the Project Location and 120 m ZOI. The one-hundred and seven water bodies include all but one of the water features identified on MNR mapping (MNR, 2009a). One of the surface water features (reach 9A-2) identified on MNR mapping consisted of unchannelized surficial drainage and was therefore not classified as a water body during Stantec's 2012 field investigations (Figure 2.4).

Section 39(1) of O. Reg. 359/09 prohibits the construction, installation or expansion of a renewable energy generation facility in a project location that is within 30 m of the average annual high water mark of a lake, intermittent stream, permanent stream or seepage area.

However, this prohibition does not apply if, in addition to the preparation of a Water Body Report, certain components of the renewable energy facility remain outside of the 30 m setback. For Class 3 or 4 wind facilities, turbines and transformer substations must be located outside of the lake, stream or seepage area and cannot be located within 30 m of them.

Careful siting of the wind turbines at the Bow Lake Wind Farm ensures that all 36 turbines are located greater than 30 m from any lake, stream or seepage area as shown on Figures 2.1-2.9 and Figures 3.1-3.9 (**Appendix A**). As depicted on Figures 2.4 and 3.4, water body 7-5 is located 26 m from the northeast corner of the area identified for the construction compound, transformer station and the operations and maintenance building. In accordance with the 30 m setback distance required for the transformer station from this water body, the transformer station will not be constructed within 30 m of waterbody 7-5.

During field investigations, there were several water bodies and seepage areas identified within 120 m of the Project Location, in addition to those identified on MNR mapping. Locations of all water bodies are presented in **Appendix A**. Water bodies and the corresponding Project components located within 120 m are presented in Table 3.2. Photographs and field notes recorded during field investigations are provided in **Appendices B** and **C** respectively.

Table 3.2: Water Body and Project Components Summary

Station Number	Crossing Type		w/in 120 m of Specified Project Component			
	Access Road (N/U)*	Collector Line	Turbine/Met Tower (M)	Access Road*	Collector Line	Other Project Component(e.g. Laydown area)
Agawa Tertiary Watershed						
0-3	√ (U)					
0-2	√ (U)					
9B-1	√ (U)					
9B-2				√ (U)		
9B-3				√ (U		
9B-4				√ (U)		
9B-5	√ (U)					
9B-8	√ (U)					
9B-9				√ (U)		
9B-10	√ (U)					
9B-11				√ (U)		
9A-1						√
10-31						√
10-22				√ (U)		
10-14				√ (U)		
10-27		√			√	
10-29					√	
10-28		√				
10-25		√				
10-26					√	

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Station Number	Crossing Type		w/in 120 m of Specified Project Component			
	Access Road (N/U)*	Collector Line	Turbine/Met Tower (M)	Access Road*	Collector Line	Other Project Component(e.g. Laydown area)
10-13		√				
10-16		√				
10-17		√				
10-18			√		√	
10-19					√	
10-20			√	√ (N)	√	
10-8					√	
10-12			√	√ (N)	√	
10-11			√	√ (N)	√	
10-10				√ (N)	√	
10-6			√		√	
10-5					√	
10-7		√	√			
10-3					√	
10-34				√ (N)	√	
10-33				√ (N)	√	
7-20					√	√
7-19					√	
7-17						√
7-16		√				√
7-15					√	√
7-14					√	√
7-13					√	√
7-12					√	√
7-11					√	√
7-10					√	√
7-9					√	√
7-18					√	√
7-5					√	√
7-8					√	
7-1					√	
1-1					√	
1-5					√	
1-12					√	
1-14					√	
1-10		√				
1-11					√	
2-3				√ (N)	√	
2-4					√	
3-4					√	
3-5			√ (M)		√	

Table 3.2: Water Body and Project Components Summary

Station Number	Crossing Type		w/in 120 m of Specified Project Component			
	Access Road (N/U)*	Collector Line	Turbine/Met Tower (M)	Access Road*	Collector Line	Other Project Component(e.g. Laydown area)
3-1					√	
Goulais Tertiary Watershed						
9C-2						√
10-2		√	√			
10-1		√	√			
10-21		√	√	√ (N)	√	
11-4		√				
12-1		√				
11-3		√			√	
11-1					√	
11-2					√	
1-3					√	
1-4					√	
1-9		√				
1-8		√				
1-7		√				
1-6		√				
2-2					√	
3-3					√	
3-6					√	
3-7		√				
3-8		√				
4-1			√		√	
4-2		√			√	
4-4			√	√ (N)	√	
4-5			√			
0-9		√				
0-7					√	
0-4		√				
0-10		√				
0-11		√				
0-12		√				
0-13		√				
5-2	√ (N)	√	√		√	
5-3	√ (N)	√	√			
6-1				√ (N/U)		
9F-10				√ (U)		
9F-9	√ ((U)					
9F-8				√ (U)		
9F-1				√ (U)		
9F-7				√ (U)		

Table 3.2: Water Body and Project Components Summary

Station Number	Crossing Type		w/in 120 m of Specified Project Component			
	Access Road (N/U)*	Collector Line	Turbine/Met Tower (M)	Access Road*	Collector Line	Other Project Component(e.g. Laydown area)
9F-2				√ (U)		
9F-6				√ (U)		
9F-3	√ (U)					
9F-4				√ (U)		
9F-5				√ (U)		

* includes underground collector line (if not overhead at the crossing location).
N= New road U=Upgrade to existing road
(M) Met Tower

Additional field surveys included fish sampling at selected locations and an assessment of fish habitat. Fish collection records are presented in **Appendix D**. A summary of aquatic habitat characteristics within the 120 m ZOI is presented in **Table 3.3** and **Table 3.4**, and is illustrated in Figure 3.1 to 3.9 (**Appendix A**).

Results of the records review and field investigations are presented on a watershed basis, with the Project Location divided into two watersheds: Agawa and Goulais, as per MNR mapping MNR, 2009a).

Based on a review of the document entitled “Inland Ontario Lakes Designated for Lake Trout Management” (MNR, 2003), there are no Lake Trout lakes that are at or above development capacity identified within 300 m of the Project Location.

3.1 EXISTING CONDITIONS AND PREDICTED IMPACTS

In the following sub-sections available background data are provided for each water body reach surveyed, followed by site-specific information regarding physical habitat and fish communities as determined by Stantec in 2012. Potential impacts to fish habitat and general mitigation measures are provided for each site where direct and indirect fish habitat is present. In some cases, Fisheries and Oceans Canada (“DFO”) Operational Statements (“OS”) may be used for construction activities occuring in or near water bodies (e.g. crossing watercourses with overhead collector lines, underground collector cables, etc.). Where use of an OS is feasible, reference is made in the summary table to the relevant OS. When an OS is used, proper implementation of the mitigation measures provided in the OS will protect fish habitat and no further review or approvals are required under the *Fisheries Act*.

Although specific OS’s are referenced in this report, consultation with the MNR, and/or DFO may result in site-specific construction methods and mitigation measures for some locations where aquatic habitat is considered sensitive.

Located within the Agawa and Goulais Tertiary Watersheds, the Project Location is characterized by moderately to strongly rolling terrain, dominated by previously logged deciduous forest, with areas of thin soils and shallow bedrock.

Water bodies within the Project Location consist of a channels possessing a mix of intermittent and permanent flow regimes, originating on strongly sloping terrain that contribute flow to larger, permanently flowing streams located in lower gradient or well defined valley features. Many of the larger channels drain through small lakes or ponds prior to converging with the Montreal River to the north (Agawa tertiary watershed) or to the Little Batchawana River/Big Pike Creek to the south (Goulais tertiary watershed). Water bodies within the Project Location have either warmwater or coldwater thermal regimes and associated fish populations, depending on the amount of groundwater input they receive.

Within the Project Location, generally low fish species diversity was observed. However, despite the low diversity, more than 100 fish were captured at several sites (see **Appendix D**). MNR records (MNR, 2012) and Stantec's 2012 field investigations indicate that the following fish species are present in water bodies within the Project Location or ZOI:

- Lake Trout (ZOI -Montreal River only)
- White Sucker
- Finescale Dace
- Brook Trout
- Blacknose Dace
- Golden Shiner
- Central Mudminnow
- Fathead Minnow
- Northern Redbelly Dace
- Brook Stickleback
- Yellow Perch
- Mottled Sculpin

3.1.1 Agawa Tertiary Watershed

Habitat information at the locations identified in Figures 2.1 to 2.4, and Figure 2.6 is provided in **Table 3.3** along with references to general impacts, mitigation measures and predicted net effects.

Information for the one LIO mapped feature that was not deemed to be a water body is provided in Figure 2.4, and in **Appendices B** and **C**.

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
0-3	Intermittent flow. Dry during field investigations. Steep gradient. Riparian area dominated by sugar maple and birch. Bankfull width = 1.2 m Substrate = Sand, detritus, cobble, and boulder	Upgrades to access road crossing a water body (**Figure 2.1**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected
0-2	Intermittent flow. Channel dry during field investigations. Steep gradient. Riparian area dominated by sugar maple andbirch. Bankfull width = 0.6 m Substrate = Sand, silt, gravel	Upgrades to access road crossing a water body (**Figure 2.1**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected
9B-1	Permanent flow dominated by riffle and run morphology. Occasional undercut banks. Riparian area dominated by sugar maple and ferns. Bankfull width = 2.5 m Wetted width = 1.2 m Water depth = 20 cm Substrate = Cobble, gravel, sand, boulder and detritus. Fish observed and collected during 2012 field investigations (Appendix D).	Upgrades to access road crossing a water body (**Figure 2.3**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
9B-2	Intermittent flow. Isolated pools observed during field investigations. Pools contained floating pondweed. Riparian area dominated by yellow birch. Bankfull width = 0.3 m Wetted width = 0.3 m Water depth = 5 cm Substrate = Sand, gravel, and silt	Upgrades to access road crossing a water body (**Figure 2.3**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected
9B-3	Intermittent flow. Dry during field investigations. Riparian area dominated by eastern white cedar, yellow birch. Bankfull width = 0.6 m Substrate = Sand, gravel, silt, and cobble	Upgrades to access road crossing a water body (**Figure 2.3**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected
9B-4 (Montreal River)	Permanent flow dominated by run morphology. Side bay of Montreal River. Riparian area dominated by steep slopes and mature trees. Bankfull width = 235 m Wetted width = 235 m Water depth = too deep to sample (> 2 m) Substrate (at shore) = Cobble, sand, boulder, muck, and detritus MNR data indicates the presence of Lake Trout (Appendix D)	Upgrades to access road within 120 m of a water body (**Figure 2.3**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
9B-5	Permanent flow along east side ofHogg Dam Road. Very shallow. Flow and channel definition disappears approximately 5 m downstream (west) of Hogg Dam Road. Hogg Dam Road culvert perched by approximately 30 cm. Riparian area dominated by mountain maple and mountain ash. Bankfull width = 0.7 m Wetted width = 0.6 m Water depth = 10 cm Substrate = Gravel, sand, cobble, detritus, and boulder	Upgrades to access road crossing a water body (**Figure 2.3**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected
9B-8	Permanent flow dominated by pool morphology. Riparian area dominated by black spruce and white birch. Upstream of Hogg Dam Road, watercourse is ponded and deep (>1 m). Downstream of Hogg Dam Road, watercourse is narrow and very shallow. Bankfull width (U/S) = 10 m Bankfull width (D/S) = 1 m Wetted width (U/S) = 10 m Wetted width (D/S) = 0.5 m Water depth = 5 cm Substrate = Cobble, gravel (U/S); Silt, detritus, muck, and sand (D/S)	Upgrades to access road crossing a water body (**Figure 2.3**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected
9B-9 (Montreal River)	Permanent flow dominated by pool morphology. Side bay of Montreal River. Riparian area dominated by steep slopes, and mature trees. School of Cyprinids observed in shallows.	Upgrades to access road within 120 m of a water body (**Figures 2.2 and 2.3**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	Bankfull width = 235 m Wetted width = 235 m Water depth = > 1.5 m Substrate (at shore) = Gravel, cobble, sand and boulder. Fish observed during 2012 field investigations. MNR data indicates the presence of Lake Trout. (**Appendix D**)		surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)		
9B-10	Permanent flow dominated by riffle morphology. Upstream (east of Hogg Dam Road) riparian area dominated by white birch, sugar maple, eastern white cedar. Steep slopes and sparse vegetation downstream (west) of Hogg Dam Road. Perched culvert at Hogg Dam Road. Bankfull width = 2.5 m Wetted width = 1.2 m Water depth = 8 cm Substrate (u/s and d/s of road) = Sand, cobble, gravel, and detritus Great Lakes Environmental Services (GLES, 2012) observed Brook Trout and Mottled Sculpin downstream of Hogg Dam Road. Stantec did not observe or capture any fish during field investigations. Possible changes in morphological and flow characteristics (due to erosion or slumping) may contribute to the discrepancy between the two reports.	Upgrades to access road crossing a water body (**Figure 2.2**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected
9B-11	Permanent flow dominated by riffle morphology. Water body located within hydro corridor. Riparian area consists of small sugar maples and herbaceous plant species. Steep gradient downstream of Hogg Dam Road. Bankfull width = 2 m	Upgrades to access road within 120 m of a water body (**Figure 2.2**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction,	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	Wetted width = 0.65 m Water depth = 5 cm Substrate = Cobble, sand, gravel, muck, and detritus		loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)		
9A-1 (Montreal River)	Permanent flow. Gartshore Dam headpond approximately 100 m east of dam. Steep slope on downstream (north) side of McKay Road. Riparian area dominated by sugar maple, poplar , large woody debris Bankfull width = 220 m Wetted width = 200 m Water depth = >5 m Substrate = Bedrock, boulder and cobble Fish collected during 2012 field investigations. MNR data indicates the presence of Lake Trout. (**Appendix D**)	Water extraction location (**Figure 2.3**).	Water taking activities may have localized effects (e.g. temporary impacts to aquatic habitat and organisms at water extraction point. See Section 4.1)	Ensure implementation of appropriate mitigation measures (See Section 5.1) including implementing end of intake requirements as set out in DFO's Freshwater Intake End-of-Pipe Intake Guidelines (1995). If applicable, follow volume limits set out in MOE permit to take water.	None expected
10-31 (Montreal River)	Permanent flow. Bay on Gartshore Dam headpond approximately 300 m east of dam. Steep slope on downstream (north) side of McKay Road. Riparian area dominated by sugar maple, poplar , large woody debris including logs and stumps. Bankfull width = 220 m Wetted width = 200 m Water depth = >5 m Substrate = Bedrock, cobble, and gravel Fish collected during 2012 field investigations. MNR data indicates the presence of Lake Trout. (**Appendix D**)	Construction compound & welfare building to be located within 120 m of a water body. (**Figure 2.2**).	Construction activities associated with the Consruction Compound may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability See Sections 4.1 and 4.5)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
10-22	Permanent pond located on north side of McKay Road, west of reach 10-14. Dimensions approximately 30 m by 15 m. Mean depth is 30 cm. Riparian area dominated by herbaceous plants and shrubs.	Upgrades to access road within 120 m of a water body (**Figures 2.3** and **2.4**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-14	Permanent pond located on north side of McKay Road, within road allowance. Site is east of reach 10-22. Dimensions approximately 10 m by 15 m. Mean depth is 1.5 m. Predominantly soft substrate. *Potamogeton* sp. observed. Bedrock ridge creates dam impeding or preventing fish passage from downstream channel and Montreal River. Riparian area dominated by herbaceous plants and shrubs. Iron staining observed, suggesting possible groundwater discharge.	Upgrades to access road within 120 m of a water body (**Figure 2.4**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-27	Permanent flow dominated by run morphology. Culvert perched by approximately 40 cm at McKay Road. Riparian area dominated by sugar maple and yellow birch. Bankfull width = 2 m Wetted width = 0.7 m Water depth = 8 cm Substrate = Cobble, sand, gravel, and detritus	Collector line to cross a water body (**Figure 2.4**).	Construction activities associated with installing the collector lines may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
10-29	Intermittent flow. Channel morphology dominated by pools. Riparian area dominated by sugar maple and ferns. Bankfull width = 1.5 m Wetted width = 0.4 m Water depth = 2 cm Substrate = Gravel, detritus, cobble, and sand	Collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector lines may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-28	Seep originating from side of steep slope. Permanent flow is generally unchannelized and disappears underground before crossing McKay Road.	Collector line to cross a water body (**Figure 2.4**).	Construction activities associated with installing the collector lines may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
10-25	Permanent flow dominated by riffle and run morphology. Undercut banks observed during field investigations. Culvert at McKay Road perched by approximately 30 cm. Riparian area dominated by mountain maple, yellow birch, and sugar maple. Bankfull width = 4.5 m Wetted width = 2.5 m Substrate = Cobble, gravel, sand, and boulder Fish collected during 2012 field	Collector line to cross a water body (**Figure 2.4**).	Construction activities associated with installing the collector lines may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	investigations (**Appendix D**).				
10-26	Intermittent flow. Dry during field investigations. Riparian area dominated by sugar maple, yellow birch, and ferns. Bankfull width = 3 m Substrate = Sand, cobble, gravel, and boulder	Collector line to be located within 120 m of a water body. (**Figure 2.4**).	Construction activities associated with installing the collector lines may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-13	Permanent flow dominated by pool morphology. Riparian area dominated by sugar maple and ferns. Several locations with undercut banks. Bankfull width = 3 m Wetted width = 0.6 m Water depth = 4 cm Substrate = Cobble, gravel, sand, boulder, and detritus	Collector line to cross a water body. (**Figure 2.4**).	Construction activities associated with installing the collector lines may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
10-16	Permanent flow dominated by run morphology. Riparian area dominated by maple and ferns. Low gradient area with jewelweed and grasses adjacent to, and on edge of poorly defined channel. Bankfull width = 1.5 m Wetted width = 0.7 m Water depth = 10 cm Substrate = Silt and detritus	Collector line to cross a water body. (**Figure 2.4**).	Construction activities associated with installing the collector lines may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
10-17	Permanent flow originating from seep,	Collector line to cross a	Construction activities	See Sections 5.1, 5.3,	None

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	dominated by flat morphology. Riparian area dominated by sugar maple, yellow birch, white spruce, and balsam fir. Bankfull width = 5 m Wetted width = 0.2 m Water depth = 1 cm Substrate = Silt and detritus	water body. (**Figure 2.4**).	associated with installing the collector lines may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	expected
10-18	Permanent flow dominated by riffle morphology. Riparian area dominated by sugar maple and yellow birch with a dense understorey of ferns, jewelweed, seedlings and saplings. Bankfull width = 0.6 m Wetted width = 0.3 m Water depth = 5 cm Substrate = Gravel, cobble, sand, detritus, and boulder	Collector line and Turbine 12 to be located within 120 m of a water body. (**Figure 2.4**).	Construction activities associated with installing the collector lines and Turbine 12 may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-19	Permanent flow originating from a seep, high gradient with predominantly step-pool morphology. Riparian vegetation dominated by sugar maple and yellow birch. Bankfull width = 1.1 m Wetted width = 0.4 m Water depth = 4 cm Substrate = Sand, boulder, clay, cobble and detritus	Collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with the installation of the overhead collector line and the underground collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
10-20	Intermittent flow, high gradient, dominated by step-pool morphology. Riparian vegetation dominated by sugar maple. Bankfull width = 1.2 m Wetted width = 0.4 m Water depth = 5 cm Substrate = Cobble, detritus, gravel and sand	Access Road upgrades, collector line and Turbine 10 to be located within 120 m of a water body (**Figure 2.2**).	Construction activities within the work area of Turbine 10, the access road and collector lines may affect the reach despite being outside of the turbine work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1.)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-8	Permanent lake. Dimensions approximately 800 m by 80 m. Mean depth is approximately 2 m. Riparian area dominated by mixed forest. Beaver dam observed during field investigations. Fish collected during 2012 field investigations (**Appendix D**).	Collector line to be located within 120 m of a water body. (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-12	Permanent flow originating from a seep. Located on steep slope. Riparian area dominated by sugar maple and white birch. Bankfull width = 1 m Wetted width = 0.3 m	Access road, collector line and Turbine 1 to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the access road, collector line, and Turbine 1 may affect the reach outside the work area	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	Water depth = 4 cm Substrate = Cobble, sand, boulder, and detritus		(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)		
10-11	Permanent flow originating from seep. Channel dominated by run morphology on steep slope. Riparian area dominated by sugar maple and ferns. Bankfull width = 1 m Wetted width = 0.6 m Water depth = 2 cm Substrate = Gravel, sand, cobble, boulder, and detritus	Access road, collector line and Turbine 1 to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the access road, the collector line, and Turbine 1 may affect the reach outside the area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-10	The water body originates from two seeps (one of which is outside the Project Location). The channels converge within 60 of their origins. Within the Project Location, the channel is located predominantly on a steep slope. It is dominated by run morphology. Riparian area dominated by mature deciduous forest. Bankfull width = 1.2 m Wetted width = 0.8 m Water depth = 2 cm Substrate = Gravel, sand, cobble, boulder, and detritus	Access road and collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the access road and the collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-6	Permanent flow originating from a seep on a steep slope. Channel dominated by pool and	Collector line and Turbine 3 to be located within 120 m	Construction activities associated with installing the	Ensure implementation of appropriate mitigation	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	run morphology. Riparian area dominated by sugar maple, white birch, jewelweed. Bankfull width = 1 m Wetted width = 0.4 m Water depth = 5 cm Substrate = Gravel, cobble, detritus, bedrock, boulder, and muck	of a water body (**Figure 2.4**).	collector line and Turbine 3 may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	measures. See Section 5.1.	
10-5	Permanent flow originating from three seeps on a steep slope. Channel dominated by riffle morphology. Riparian area dominated by sugar maple, yellow birch, ferns, and jewelweed. Bankfull width = 1 m Wetted width = 0.4 m Water depth = 5 cm Substrate = Cobble, gravel, detritus, and boulder	Collector line be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-7	Permanent flow originating from a seep. Channel dominated by pool morphology. Riparian area dominated by sugar maple, white birch, and jewelweed. Bankfull width = 0.6 m Wetted width = 0.4 m Water depth = 5 cm Substrate = Detritus, sand, gravel, cobble, and muck	Collector line to cross a water body. Turbine 3 to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector line and Turbine 3 may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.4.	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
10-3	Permanent flow originating from seep.	Collector line to be located	Construction activities	Ensure implementation	None

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	Channel dominated by pool and run morphology. Riparian area dominated by sugar maple, white spruce, white birch, jewelweed, and ferns. Bankfull width = 1.5 m Wetted width = 0.6 m Water depth = 5 cm Substrate = Detritus, muck, silt, sand, and cobble	within 120 m of a water body (**Figure 2.5**).	associated with installing the collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	of appropriate mitigation measures. See Section 5.1.	expected
10-34	Intermittent flow. High gradient. Channel morphology dominated by riffles. Riparian area dominated by maple and yellow birch. Bankfull width = 2.0 m Wetted width = 0.5 m Water depth = 15 cm Substrate = Detritus, boulder, sand, silt, cobble, and gravel	Access road and collector line to be located within 120 m of a water body (**Figure 2.3**).	Construction activities associated with installing the access road and collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
10-33	Intermittent flow. High gradient. Channel was dry in many locations during field investigations. Riparian area dominated by yellow birch, balsam fir, and maple. Bankfull width = 0.5 m Wetted width = 0.3 m (isolated areas) Water depth = 10 cm (isolated areas) Substrate = Detritus, silt, sand, boulder, and gravel	Access road and collector line to be located within 120 m of a water body (**Figure 2.3**).	Construction activities associated with installing the access road and collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-20	Isolated seep, 10 m x 5 m. Riparian	Collector line to be located	Construction activities	Ensure implementation	None

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	vegetation consisting of mature mixed forest. Not Fish Habitat	within 120 m of a water body. (**Figure 2.4**).	associated with installing the collector line may affect the water body (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1)	of appropriate mitigation measures. See Section 5.1.	expected
7-19	Isolated seep, 10 m x 10 m. Riparian vegetation consisting of mature mixed forest. Not Fish Habitat	Collector line to be located within 120 m of a water body. (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-17	Permanent flow, moderate to high gradient dominated by riffle morphology. Riparian vegetation consisting of mature mixed forest. Bankfull width = 6.0 m Wetted width = 2.5 m Water depth = 10 cm Substrate = Cobble, boulder, gravel, sand and silt Fish observed during 2012 field investigations. (**Appendix D**)	Construction compound & welfare building area to be located within 120 m of a water body. (**Figure 2.4**).	Construction activities associated with installing the construction compound & welfare building may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-16	Permanent flow originating from upstream	Collector line to cross a	Construction activities	Ensure implementation	None

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	seep. Channel dominated by riffle morphology with sections of sub-surface flow. Riparian vegetation consisting of mature mixed forest. Bankfull width = 3.0 m Wetted width = 1.2 m Water depth = 5 cm Substrate = Sand, silt and detritus	water body and construction laydown & transformer station to be located within 120 m of a water body (**Figure 2.4**).	associated with installing the collector line and the construction compound & welfare building may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1, 4.3 and4.5)	of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	expected
7-15	Permanent flow originating from an upstream seep. Channel dominated by riffle morphology with sections of sub-surface flow. Riparian vegetation consisting of mature mixed forest. Bankfull width = 4.0 m Wetted width = 0.3 m Water depth = 10 cm Substrate = Sand, silt and detritus	The following project components are within 120 m of this water body (**Figure 2.4**): • Collector line • Construction compound & welfare building • Construction laydown & transformer station	Construction activities associated with installing the collector line, the construction compound & welfare building and the construction laydown & transformer station may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.5)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-14	Intermittent flow originating from an upstream seep, high gradient. Channel dominated by riffle morphology with isolated pools. Large sections of channel are dry due to sub-surface flow. Riparian vegetation consisting of mature mixed forest. Bankfull width = 4.0 m Wetted width = 0.2 m Water depth = 5 cm	The following project components are within 120 m of this water body (**Figure 2.4**): • Collector line • Construction compound & welfare building • Construction laydown & transformer station	Construction activities associated with installing the collector line, the construction compound & welfare building and the construction laydown & transformer station may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	Substrate = Sand, silt and detritus		construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.5)		
7-13	Permanent flow originating from two seeps along the side of a rocky ridge, high gradient, dominated by riffle morphology and sections of sub-surface flow. Riparian vegetation comprised of mature mixed forest. Bankfull width = 2.5 m Wetted width = 1.0 m Water depth = 5 cm Substrate = Silt, sand and detritus	The following project components are within 120 m of this water body (**Figure 2.4**): • Collector line • Construction compound & welfare building • Construction laydown & transformer station	Construction activities associated with installing the collector line, the construction compound & welfare building and the construction laydown & transformer station may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.5)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-12	Permanent flow originating from a seep at the end of a rocky ridge, high gradient, dominated by riffle morphology with subsurface flow in sections. Riparian vegetation comprised of mature mixed forest. Bankfull width = 1.5 m Wetted width = 1.0 m Water depth = 10 cm Substrate = Sand, silt and detritus	The following project components are within 120 m of this water body (**Figure 2.4**): • Collector line • Construction compound & welfare building • Construction laydown & transformer station	Construction activities associated with installing the collector line, the construction compound & welfare building and the construction laydown & transformer station may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability.	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
			See Sections 4.1 and 4.5)		
7-11	Intermittent flow, high gradient, dry at the time of field investigations. Riparian vegetation comprised of mature mixed forest. Channel joins with reach 7-10 and reach 7-9 downstream. Bankfull width = 2.5 m Substrate = Silt, detritus and sand	The following project components are within 120 m of this water body (**Figure 2.4**): • Collector line • Construction compound & welfare building • Construction laydown & transformer station	Construction activities associated with installing the collector line, the construction compound & welfare building and the construction laydown & transformer station may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.5)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-10	Intermittent flow, high gradient, dry at the time of field investigations. Riparian vegetation comprised of mature mixed forest. Channel joins with reach 7-11 and reach 7-9 downstream. Bankfull width = 2.5 m Substrate = Silt and detritus	The following project components are within 120 m of this water body (**Figure 2.4**): • Collector line • Construction compound & welfare building • Construction laydown & transformer station	Construction activities associated with installing the collector line, the construction compound & welfare building and the construction laydown & transformer station may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.5)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-9	Intermittent flow, high gradient and dry at the time of field investigations. Riparian vegetation comprised of mature mixed forest. Channel joins with reach 7-10 and reach 7-	The following project components are within 120 m of this water body (**Figure 2.4**):	Construction activities associated with installing the	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	11 downstream. Bankfull width = 2.5 m Substrate = Silt and detritus	• Collector line • Construction compound & welfare building • Construction laydown & transformer station	collector line, the construction compound & welfare building and the construction laydown & transformer station may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.5)		
7-18	Intermittent flow, high gradient, seep at upstream end. Channel dominated by riffle morphology. Riparian vegetation consisting of mature mixed forest. Bankfull width = 1.5 m Wetted width = 0.2 m Water depth = < 5 cm Substrate = Sand, silt and detritus	The following project components are within 120 m of this water body (**Figure 2.4**): • Collector line • Construction laydown & transformer station	Construction activities associated with installing the collector line and the construction laydown & transformer station may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.5.)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-5	Permanent flow dominated by run morphology. Riparian vegetation dominated by sugar maple, yellow birch and fern. Bankfull width = 2.0 m Wetted width = 0.7 m Water depth = 10 cm Substrate = Gravel, sand, cobble, boulder and detritus Fish collected during 2012 field	The following project components are within 120 m of this water body (**Figure 2.4**): • Collector line • Construction laydown, transformer station and Operations and Maintenance Building	Construction activities associated with installing the construction laydown, transformer station, collector line, and Operations and Maintenance Building may affect the reach outside the work area(e.g. Temporary increase in surface water	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	investigations. (**Appendix D**)		turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.5.)		
7-8	Intermittent flow, dry at the time of field investigations. Riparian vegetation dominated by sugar maple and fern. Bankfull width = 0.8 m Substrate = Detritus, sand, silt and muck	Collector line to be located within 120 m of a water body. (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
7-1	Intermittent flow, primarily dry with isolated pools at the time of field investigations. Riparian vegetation comprised of mixed forest. Bankfull width = 0.75 m Wetted width = 0.5 m Water depth (isolated pool) = 15 cm Substrate = Boulder, cobble, gravel and detritus	Collector line to be located within 120 m of a water body. (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
1-1	Permanent lake, 250 m x 250 m. Riparian cover along shoreline comprised of mixed forest. Water depth = > 1 m Substrate = Detritus, silt and muck with scattered boulder	Collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the area outside the work area(e.g. Temporary increase in surface water turbidity due	Ensure implementation of appropriate mitigation measures. See Sections 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
			to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Section 4.1)		
1-5	Intermittent flow, high gradient. Dominated by isolated standing pools at the time of field sampling. Riparian vegetation was dominated by fern, sugar maple and touch-me-not. Bankfull width = 0.65 m Wetted width = 0.4 Water depth = 2 cm Substrate = Boulder, cobble, detritus and sand.	Collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
1-12	Intermittent flow, high gradient. Low water levels and channel dominated by pools at the time of field investigations. Riparian vegetation dominated by fern and sugar maple. Bankfull width = 1.0 m Wetted width = 0.6 m Water depth = 2 cm Substrate = Boulder, cobble and detritus	Collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
1-14	Permanent flow dominated by pool morphology. Riparian vegetation dominated by yellow birch and sugar maple. Bankfull width = 1.0 m Wetted width = 0.75 m Water depth = 20 cm	Collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction,	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	Substrate = Cobble, boulder, detritus and sand		loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)		
1-10	Intermittent flow. Primarily dry with isolated, shallow pools at time of field investigations. Riparian vegetation dominated by immature sugar maple and eastern white cedar. Bankfull width = 0.6 m Substrate = Clay, boulder, silt and muck	Collector line to cross a water body (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
1-11	Permanent lake, 275 m x 100 m. Riparian vegetation along shoreline includes eastern white cedar and balsam fir. Water depth = > 1 m Substrate = Silt, detritus, muck and boulder	Collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
2-3	Intermittent flow. Dry during field investigations. Riparian area dominated by ferns and sugar maple. Bankfull width = 1.6 m Wetted width = 1.4 m (isolated pools) Water depth = 7 cm – 15 cm (isolated pools)	Acces road and collector line to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the access road and the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	Substrate = Boulder, cobble, gravel, sand, and detritus		runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)		
2-4	Permanent lake, 300 m x 100 m. Riparian vegetation around shoreline comprised of buffalo berry, eastern white cedar, sugar maple and balsam fir. Water depth = > 1 m Substrate = Detritus, muck, boulder, gravel, and silt	Collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the lake outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
3-4	Intermittent flow, water restricted to isolated pools at the time of field investigations. Riparian vegetation dominated by mature maples. Bankfull width = 1.0 m Wetted width = 0.3 m Water depth = 2 cm Substrate = Detritus, muck, boulder, gravel, cobble and sand	Collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
3-5	Intermittent flow, high gradient and generally low water levels in pools and flats at the time of field investigations. Riparian vegetation dominated by mature maples and yellow birch. Bankfull width = 1.0 m	Met tower and collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the met tower and the collector line may affect the reach outside the work area(e.g. Temporary increase in	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.3: Summary of Fish Habitat Within the 120 m Zone of Investigation – Agawa Watershed

Reach ID[a]	Site Description[b]	Proposed Works[c]	Potential Impacts	Mitigation	Net Effects[d]
	Wetted width = 0.5 m Water depth = 5 cm Substrate = Detritus, muck, cobble, gravel, sand and boulder		surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)		
3-1	Permanent flow dominated by run morphology. Riparian vegetation comprised of fern, yellow birch, balsam fir and sugar maple. Bankfull width = 0.76 m Wetted width = 0.4 m Water depth = 8 cm Substrate = Boulder, gravel, detritus, sand and muck	Collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

a see **Figures 2.1 through 2.9** (**Appendix A**)
b summary of the surveyed reach. Substrate listed in order of dominance. At locations where no fish community information is reported (i.e. neither MNR or Stantec data), sampling was not conducted due to habitat or morphological limitations.
c "Access road" includes associated underground collector line unless otherwise indicated
d assumes all mitigation measures are properly implemented and successful

3.1.2 Goulais Tertiary Watershed

Table 3.4 provides habitat descriptions of water body reaches with fish habitat within 120 m of the ZOI within the Golais Watershed. A description of the proposed works, potential impacts, general mitigation, and an assessment of anticipated net affects are also included. The location of these reaches are shown on Figures 2.4 to 2.9.

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
9C-2	Permanent lake, 350 m x 200 m. Riparian vegetation along shoreline consisting of mature mixed forest. Eastern shoreline shallow with emergent aquatic vegetation. Water depth = > 1 m Substrate = Gravel, cobble, sand silt and detritus Fish observed during 2012 field investigations. (**Appendix D**)	Water extraction location (**Figure 2.2**).	Water taking activities may have localized effects to the aquatic environment (e.g. temporary impacts to aquatic habitat and organisms at water extraction point. See Section 4.1)	Ensure implementation of appropriate mitigation measures (See Section 5.1) including implementing end of intake requirements as set out in DFO, 1995. If applicable, follow volume limits set out in MOE permit to take water.	None expected
10-2	Intermittent flow, groundwater seepage at origin with steep grade and isolated pools separated by frequent falls. Riparian vegetation consisted of mature mixed forest. Bankfull width = 0.5 m Wetted width = 0.3 m Water depth = 15 cm Substrate = Boulder, cobble and detritus	Ccollector line to cross a water body. Turbine 4 to be located within 120 m of a water body (**Figure 2.5**).	Construction activities associated with installing the collector line and Turbine 4 may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.4.)	Ensure implementation of appropriate mitigation measures. See Sections See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
10-1	Intermittent flow, high gradient, dominated by riffle morphology. Riparian vegetation dominated by raspberry, elderberry and shrubs.	Collector line to cross a water body. Turbine 5 to be located within 120 m of a water body (**Figure**	Construction activities associated with installing the collector line and Turbine 4 may affect the reach (e.g.	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
	Bankfull width = 1.0 m Wetted width = 0.5 m Water depth = 5 cm Substrate = Gravel, cobble, sand, bedrock, boulder, silt and detritus	**2.5**).	Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.4.)	5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	
10-21	Intermittent flow, high gradient, dominated by step-pool morphology. Riparian vegetation dominated by sugar maple. Bankfull width = 1.0 m Wetted width = 0.4 m Water depth = 5 cm Substrate = Cobble, boulder, gravel, sand and detritus	Collector line to cross a water body. Access road, collector line and Turbine 11 to be located within 120 m of a water body (**Figure 2.4**).	Construction activities associated with installing the collector line, the access road, and Turbine 11 may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3.)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
11-4	Permanent flow, low gradient, with a mix of riffle, pool and flat morphologies. Channel passes through a series of open, meadow marshes dominated by grasses and sedges and includes a 4 m waterfall at the southwest edge of the ZOI that is a barrier to fish passage. Bankfull width = 1.8 m Wetted width = 1.2 m Water depth = 15 cm Substrate = Cobble, sand, silt and detritus	Collector line to cross a water body (**Figure 2.5**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.4.)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
12-1	Permanent flow, dominated by pool morphology. Riparian vegetation consisting of mature deciduous forest. Bankfull width = 1.4 m Wetted width = 0.8 m Water depth = 5 cm Substrate = Gravel, silt, sand, boulder and detritus	Collector line to cross a water body (**Figures 2.4** and **2.5**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
11-3	Permanent flow, high gradient, originating from an area of seepage. Dominated by step pool morphology. Riparian vegetation consisting of mixed forest. Bankfull width = 1.4 m Wetted width = 1.2 m Water depth = 3 cm Substrate = Boulder, cobble, gravel, detritus and silt	Collector line to cross a water body. (**Figure 2.5**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
11-1	Intermittent flow, high gradient and dry at the time of field investigations. Riparian vegetation dominated by sugar maple, eastern white cedar and balsam fir. Bankfull width = 1.0 m Substrate = Cobble, muck, detritus, sand and boulder	Collector line to be located within 120 m of a water body (**Figure 2.5**).	Construction activities associated with installing the collector line and may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
11-2	Intermittent flow, dominated by pool morphology. Riparian vegetation dominated by sugar maple and yellow birch. Bankfull width = 1.0 m Wetted width = 0.5 m Water depth = 20 cm Substrate = Sand, detritus, cobble and boulder	Collector line to be located within 120 m of a water body (**Figure 2.5**).	Construction activities associated with installing the access road and the collector line and may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
1-3	Intermittent flow and high gradient. Surface water confined to isolated pools. Riparian vegetation consisting of mixed forest. Bankfull width = 1.2 m Wetted width = 0.7 m Water depth = 5 cm Substrate = Cobble, boulder, gravel and detritus	Collector line to be located within 120 m of a water body (**Figure 2.5**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
1-4	Permanent lake, 250 m x 400 m. Riparian cover along shoreline comprised of balsam fir and eastern white cedar. Water depth = > 1 m Substrate = Cobble, detritus, boulder, muck, sand and silt	Collector line to be located within 120 m of a water body (**Figure 2.5**).	Construction activities associated with installing the collector line may affect the areas outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
1-9	Intermittent flow, high gradient. Channel dominated by pool morphology. Riparian vegetation dominated by fern and sugar maple. Bankfull width = 1.0 m Wetted width = 0.5 m Water depth = 4 cm Substrate = Boulder, cobble, gravel and detritus	Collector line to cross a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
1-8	Permanent flow dominated by pool morphology, downstream reach of 1-7. Riparian vegetation dominated by jewelweed, yellow birch, sugar maple and fern. Bankfull width = 1.0 m Wetted width = 0.5 m Water depth = 7 cm Substrate = Gravel, detritus, boulder and cobble Fish observed during 2012 field investigations. (**Appendix D**)	Collector line to cross a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
1-7	Intermittent flow, high gradient, upstream of reach of 1-8. Surface water confined to a series of isolated pools at the time of field investigations. Riparian vegetation was dominated by fern and sugar maple. Bankfull width = 0.7 m Wetted width = 0.5 m Water depth = 2 cm Substrate = Cobble, boulder, sand and detritus	Collector line to cross a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
				cut Stream Crossing (**Appendix E**).	
1-6	Intermittent flow dominated by run morphology with isolated pools. Riparian vegetation dominated by yellow birch, sugar maple and fern. Bankfull width = 3.5 m Wetted width = 1.4 m Water depth = 15 cm Substrate = Boulder, gravel, detritus, sand and cobble Fish observed during 2012 field investigations. (**Appendix D**)	Collector line to cross a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
2-2	Permanent lake, 775 m x 50 m. Water levels very low at time of field investigations with large areas of exposed and drying lake bottom along shoreline within the ZOI. Substrate = Detritus, muck, boulder, cobble and sand	Collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the areas outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
3-3	Intermittent flow, low gradient and water primarily in isolated pools at the time of field investigation. Riparian vegetation was comprised of mature mixed forest dominated by balsam fir and white spruce. Bankfull width = 0.8 m Wetted width = 0.6 m Water depth = 4 cm Substrate = Detritus, muck, sand, boulder,	Collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
	cobble and gravel		decreased bank stability. See Section 4.1)		
3-6	Intermittent flow, high gradient and little water found primarily in pools at the time of field investigations. Riparian vegetation dominated by mature deciduous forest. Bankfull width = 3.2 m Wetted width = 1.3 m Water depth = 10 cm Substrate = Gravel, sand, cobble, muck, detritus and boulder	Collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
3-7	Intermittent flow, high gradient and little water found primarily in flats and pools at the time of field investigations. Riparian vegetation dominated by mature deciduous forest. Bankfull width = 0.7 m Wetted width = 0.25 m Water depth = 2 cm Substrate = Boulder, cobble, gravel, sand and detritus	Collector line to cross a water body. (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.4.)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
3-8	Intermittent, isolated pools present at the time of field investigations. Riparian vegetation dominated by yellow birch, balsam fir and fern. Bankfull width = 1.0 m Water depth = 1 cm (isolated pools) Substrate = Sand, cobble, gravel and boulder	Collector line to cross a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade,	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
			and decreased bank stability. See Sections 4.1, 4.3, and 4.4.)	Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	
4-1	Intermittent flow, water restricted to pools at the time of field investigations. Riparian vegetation dominated by sugar maple, yellow birch and fern. Bankfull width = 1.5 m Water depth = 10 cm (isolated pools) Substrate = Cobble, boulder, sand, gravel and detritus	Collector line and Turbine 28 to be located within 120 m of a water body (**Figure 2.7**).	Construction activities associated with installing the collector line and Turbine 28 may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
4-2	Intermittent flow, water restricted to isolated pools at the time of field investigations. Riparian vegetation dominated by sugar maple, yellow birch and fern. Bankfull width = 1.3 m Water depth = 5 cm -10 cm (isolated pools) Substrate = Cobble, gravel, sand, detritus and boulder	Collector line to cross a water body (**Figures 2.6** and **2.7**).	Construction activities associated with installing the collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3.)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
4-4	Intermittent flow, dry at the time of field investigations with abundant leaf litter in the channel. Riparian vegetation dominated by sugar maple, yellow birch and fern.	Access road, collector line, and Turbine 26 to be located within 120 m of a water body (**Figure**	Construction activities associated with installing the access road, collector line, and	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
	Bankfull width = 2.0 m Substrate = Gravel, sand, cobble and detritus	**2.6**).	Turbine 26 may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)		
4-5	Intermittent flow, dry at the time of field investigations with abundant leaf litter in the channel. Riparian vegetation dominated by sugar maple, yellow birch and fern. Bankfull width = 1.0 m Substrate = Silt, gravel, sand and detritus	Collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach outside the work area(e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
0-9	Permanent flow with riffle, run and pool areas. Minor undercutting of banks. Riparian area dominated by yellow birch, sugar maple and fern. Bankfull width = 3.0 m Wetted width = 2.0 m Water depth = 10 cm Substrate = Boulder, cobble, gravel and sand. Fish observed during 2012 field investigations. (**Appendix D**)	Collector line to cross a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
0-7	Intermittent flow with permanent ponded area upstream. Loss of channel definition and surface flow. Isolated pools present between upstream and downstream areas. Riparian area dominated by balsam fir, sugar maple and ferns. Bankfull width = 1.2 m Wetted width = 0.5 m Water depth = 5 cm Substrate = Muck, detritus, silt and sand.	Collector line to be located within 120 m of a water body (**Figure 2.6**).	Construction activities associated with installing the collector line may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
0-4	Intermittent flow, low water at the time of field investigations restricted to pools and flats. Riparian vegetation dominated by sugar maple, balsam fir and fern. Bankfull width = 1.5 m Wetted width = 0.7 m Water depth = 5 cm Substrate = Sand, boulder, cobble, detritus and gravel Fish observed during 2012 field investigations. (**Appendix D**)	Collector line to cross a water body (**Figure 2.7**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.3 Apply DFO Operational Statement for Overhead Line Construction (**Appendix E**).	None expected
0-10	Permanent lake and wetland (east arm of Bow Lake and west arm of Negick Lake). Bankfull width = 30 m Wetted width = 25 m Water depth = > 1.2 m Substrate = Gravel, sand, detritus and muck. Fish observed and collected during 2012 field investigations. (**Appendix D**) MNR indicates the presence of Northern Pike in adjacent Bow Lake and Negick Lake.	Collector line to cross a water body (**Figure 2.7**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
				(**Appendix E**).	
0-11	Permanent wetland area dominated by pool morphology. Riparian area dominated by emergent aquatic vegetation and yellow birch. Bankfull width = 20 m Wetted width = 10 m Water depth = 30 cm Substrate = Gravel, sand, silt, muck and detritus. Fish collected during 2012 field investigations. (**Appendix D**)	Collector line to cross a water body (**Figure 2.7**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
0-12	Intermittent flow, high gradient. Dry at the time of field investigations. Riparian area dominated by mature maples. Bankfull width = 2 m Substrate = Boulder, cobble, gravel, sand, muck and detritus	Collector line to cross a water body (**Figure 2.7**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
0-13	Intermittent flow, high gradient. Dominated by step-pool morphology. During field investigations, isolated pools of standing water and undercut banks observed. Riparian area comprised of mixed forest. Bankfull width = 1.4 m Wetted width = 0.3 m Water depth = 5 cm	Collector line to cross a water body (**Figure 2.7**).	Construction activities associated with installing the collector line may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade,	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
	Substrate = Boulder, cobble, gravel, sand and detritus.		and decreased bank stability. See Sections 4.1 and 4.3)	Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	
5-2	Intermittent flow, dry at the time of field investigations. Permanent shallow pond at the downstream end of the channel within 10 m of existing road. Riparian vegetation dominated by mature deciduous forest. Bankfull = 1.4 m Substrate = Gravel, sand, detritus, cobble and boulcer	Access road and collector line to cross a water body. Collector line and Turbine 34 to be located within 120 m of a water body (**Figure 2.9**).	Construction activities associated with installing the access road, collector lines, and Turbine 34 may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1, 4.2, and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.3, and 5.4. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
5-3	Intermittent flow dominated by flat morphology. Riparian vegetation dominated by maple and fern. Bankfull width = 1.3 m Wetted width = 0.5 m Water depth = 4 cm Substrate = Gravel, detritus, muck, cobble and boulder	Collector line to cross a water body. Access road and Turbine 35 to be located within 120 m of a water body (**Figure 2.9**).	Construction activities associated with installing the access road, collector line, and Turbine 35 may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.3)	Ensure implementation of appropriate mitigation measures. See Sections 5.1, 5.2, and 5.3. Apply DFO Operational Statement for Overhead Line Construction, High Pressure Directional Drill, Punch and Bore, or Isolated or Dry Open-cut Stream Crossing (**Appendix E**).	None expected
6-1	Intermittent flow, water restricted to isolated pools at the time of field investigations. Riparian vegetation dominated by maple, eastern white cedar and yellow birch.	Access road and collector line to be located within 120 m of a water body (**Figure 2.9**).	Construction activities associated with installing the access road and collector line may affect the reach outside	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
	Bankfull width = 1.2 m Water depth = 5 cm (isolated pools) Substrate = Detritus, boulder, cobble, gravel, sand and muck		the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)		
9F-10	Permanent lake, 360 m x 140 m. Shoreline riparian vegetation consisting of mixed forest. Water depth = > 2 m Substrate = Gravel, cobble, sand and silt	Upgrades to access road within 120 m of a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the water body outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
9F-9	Intermittent flow, dry at the time of field investigations with a 50 m x 60 m permanent pond mid-way along the channel approximately 60 m southwest (downstream) of the road. Clear signs of erosion and sediment transport throughout channel. Riparian vegetation consisting of mixed forest. Bankfull width = 4 m Pond water depth = up to 1 m Substrate = Cobble, gravel, sand and silt Fish collected from pond during 2012 field investigations. (**Appendix D**)	Upgrades to access road crossing a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
9F-8	Permanent lake, 375 m x 230 m. Shoreline dominated by mature mixed forest.	Upgrades to access road within 120 m of a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the	Ensure implementation of appropriate mitigation measures. See Section	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
	Water depth = 0.5 m to 1 m Substrate = Cobble, gravel, sand, muck and detritus Fish collected during 2012 field investigations. (**Appendix D**)		water body outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	5.1.	
9F-1	Permanent flow, high gradient, dominated by riffle morphology. Riparian vegetation dominated by mature deciduous forest. Bankfull width = 5 m Wetted width = 2 m Water depth = 5 cm Substrate = Cobble, gravel, boulder, sand and detritus Fish collected during 2012 field investigations. (**Appendix D**)	Upgrades to access road within 120 m of a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
9F-7	Permanent flow, dominated by run morphology in open, low wetland area. Riparian vegetation dominated by Joe pye weed and grasses. Bankfull width = 1.5 m Wetted width = 0.5 m Water depth = 0.3 m Substrate = Detritus, clay, silt, sand and boulder Fish collected during 2012 field investigations. (**Appendix D**)	Upgrades to access road within 120 m of a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
9F-2	Permanent flow dominated by flat morphology. Riparian vegetation dominated by wetland grasses, sedges and shrubs.	Upgrades to access road within 120 m of a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the	Ensure implementation of appropriate mitigation measures. See Section	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
	Bankfull width = 2 m Wetted width = 1.7 m Water depth = 10 cm Substrate = Gravel, sand, detritus, cobble and silt Fish collected during 2012 field investigations. (**Appendix D**)		reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	5.1.	
9F-6	Permanent lake, 500 m x 140 m. Shoreline riparian vegetation consisted of mixed forest. Water depth = > 1 m Substrate = Gravel, cobble, sand, muck and detritus Fish collected during 2012 field investigations. (**Appendix D**)	Upgrades to access road within 120 m of a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the water body outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased shoreline stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected
9F-3	Intermittent flow dominated by flat morphology. Riparian vegetation dominated by maple and fern. Bankfull width = 1.6 m Wetted width = 1.2 m Water depth = 10 cm Substrate = Cobble, gravel, sand, boulder and detritus Fish collected during 2012 field investigations. (**Appendix D**)	Upgrades to access road crossing a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the reach (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Sections 4.1 and 4.2)	Ensure implementation of appropriate mitigation measures. See Sections 5.1 and 5.2.	None expected
9F-4	Intermittent flow dominated by flat morphology. Channel relatively wide and shallow due to extensive areas of bedrock. Riparian	Upgrades to access road within 120 m of a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

Table 3.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Goulais Watershed

Reach ID[a]	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
	vegetation dominated by mature maple. Bankfull width = 3.5 m Wetted width = 0.7 m Water depth = 5 cm Substrate = Bedrock, cobble, gravel, boulder, sand and detritus Fish observed during 2012 field investigations. (**Appendix D**)		reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)		
9F-5	Permanent beaver pond, 100 m x 75 m. Water depth = < 1 m Substrate = detritus and silt	Upgrades to access road within 120 m of a water body (**Figure 2.9**).	Construction activities associated with upgrading the access road may affect the reach outside the work area (e.g. Temporary increase in surface water turbidity due to runoff during construction, loss of riparian cover and associated shade, and decreased bank stability. See Section 4.1)	Ensure implementation of appropriate mitigation measures. See Section 5.1.	None expected

a see **Figures 2.4** to **2.9** (**Appendix A**)
b summary of the surveyed reach. Substrate listed in order of dominance. At locations where no fish community information is reported (i.e. neither MNR or Stantec data), sampling was not conducted due to habitat or morphological limitations..
c "Access road" includes associated underground collector line unless otherwise indicated
d assumes all mitigation measures are properly implemented and successful

3.2 SUMMARY OF CULVERT CROSSINGS AT WATER BODIES PROVIDING FISH HABITAT

Based on the current Project layout, it may be necessary to acquire additional approvals from DFO under the federal *Fisheries Act,* due to culvert installations. Approvals may include the need for *Fisheries Act* Authorization depending on DFO's assessment of the potential impacts of the Project to fish habitat. Based on Stantec's assessment of the potential impacts of the Project, and based on Stantec's experience with REA applications submitted for other wind projects that involve water body crossings, it is likely that all potential Project-related impacts to aquatic habitat can be fully mitigated and that DFO will issue a Letter of Advice indicating that proposed mitigation measures when properly implemented, will prevent negative effects to fish and fish habitat. Locations where *Fisheries Act* approval may be necessary include sites where new access roads and/or upgrades (i.e., horizontal and vertical realignments) to existing roads may require culvert works, as well as locations where Project activities require that the size or orientation of existing road culverts be substantially altered. The following is a list of all locations where culvert crossings are proposed at water bodies providing fish habitat:

- Agawa Subwatershed
  - 0-3
  - 0-2
  - 9B-1
  - 9B-2
  - 9B-3
  - 9B-5
  - 9B-8
  - 9B-10
- Goulais Subwatershed
  - 5-2
  - 5-3
  - 9F-3
  - 9F-9

The predictions of net effects presented in **Tables 3.3** and **3.4** assume that, based on the proposed mitigation measures, potential negative effects associated with turbine construction, and overhead and underground collector line installation will be fully mitigated. It may then be possible to use DFO O.S.'s (see **Appendix E**) for the construction of these components. When an O.S. is used, mitigation measures provided in the O.S., will protect fish habitat when properly implemented, and no further review or approvals are required.

Although specific O.S.'s are referenced in this report, further consultation with the DFO during the course of development may result in site-specific construction methods and mitigation measures for some locations. In such cases, the details of construction methods, timing, mitigation measures, etc. will be submitted to DFO for review.

Work Permits, pursuant to the *Public Lands Act*, are required from MNR for all water body crossings that will occur in areas not previously evaluated under the existing FMP regulatory process. It is anticipated that these Work Permits will include conditions that must be implemented to ensure potential impacts to the quatic environments minimized. Additionally, authorizations under the *Lakes and Rivers Improvement Act* may be required from MNR for some water body crossings, depending on the watercourse characteristics (flow regime),catchment area and the proposed works. As is the case with the Work Permits, these authorizations will contain conditions that must be fulfilled in order to protect the aquatic habitat and fisheries resources.

4.0 General Overview of Potential Impacts

4.1 GENERAL CONSTRUCTION-RELATED IMPACTS

In addition to the specific Project component specific activities listed below, Project construction activities within 120 m of water bodies may result in the following effects:

- Short-term increase in turbidity from runoff and soil erosion during construction;
- Loss of shade and riparian vegetation;
- Increased water temperature (thermal impacts);
- Reduced bank stability;
- Reduced allochthonous inputs;
- Interruption of surface flow (water quantity);
- Alteration of surface drainage patterns adjacent to crossing area;
- Changes to groundwater flow patterns from turbine foundation excavations; and
- Water quality (introduction of contaminents); and
- Disturbance effects to aquatic habitat.

4.2 CULVERTS AND ACCESS ROADS

Potential impacts related to the installation and maintenance of culvert crossings in addition to the general impacts listed above may include:

- Disturbance to aquatic biota and habitat during installation;
- Permanent enclosure of portions of a water body;
- Loss of bed material within the length of the culvert; and
- Changes to riparian vegetation within road allowance.

Culverts must be designed and installed such that there is no:

- Restriction of flows through the culvert resulting in upstream pooling;
- Erosion at the culvert inlets and outlets; and
- Barrier to fish passage to upstream environments.

4.3 OVERHEAD COLLECTOR LINES

Short-term impacts on water bodies may include loss of riparian vegetation which can result in increased sedimentation during construction but also affects fish habitat by removing sources of

shade (thermal impacts), cover and food production. There are no long term impacts associated with the operation and maintenance of overhead collector lines.

4.4 UNDERGROUND COLLECTOR LINES

Potential impacts to fish and fish habitat related to the installation of underground collector lines, which are expected to be of limited duration, are as follows:

- Erosion and sedimentation from site disturbance and dewatering;
- Collapse of the punch or bore (if implemented) hold under the stream;
- Disturbing riparian vegetation can reduce shoreline cover, shade and food production areas, and result in thermal impacts; and
- Machinery fording the stream can disturb bottom and bank substrates, disrupt sensitive fish life stages and introduce deleterious substances (i.e. equipment leakage).

4.5 CONSTRUCTION COMPOUND, CONSTRUCTION LAYDOWN, WELFARE BUILDING, AND TRANSFORMER STATION

The potential for effects on water bodies exists from soil erosion resulting from unavoidable removal of stabilizing vegetative cover during construction activities of the Construction Compound, the Construction Laydown, the Welfare Building, and the Transformer Station. Erosion can cause sediment transport to nearby watercourses and a short-term increase in surface water turbidity, including associated impacts to fish and fish habitat. The magnitude and duration of potential effects to watercourses depend on the specific characteristics of each watercourse (e.g. flow regime, water velocity, bed substrates, bank conditions, local soils and the extent and duration of exposure), and the distance construction activities occur from the water body.

Some materials, such as fuel, lubricating oils and other fluids associated with electrical equipment operation and maintenance have the potential to be released to the environment in the event of accidental spills. An appropriate spill containment system should be installed or kept on-site as necessary.

5.0 Standard Mitigation Measures for Working around Fish Habitat

Standard mitigation measures used for works in and around water are summarized below. Specific details of the mitigation measures to be implemented would be determined through consultations with, DFO, and MNR. The extent of mitigation would be dependent on project details such as technical requirements, construction methods and schedule.

5.1 GENERAL MITIGATION MEASURES

There are many standard and effective mitigation measures to protect fish and fish habitat from potential effects during the construction phase of the Project. All water body crossings must adhere to the "Environmental Guidelines for Access Roads and Watercourse Crossings" (MNR, 1990). Culvert installation will be consistent with "CSP Culvert Installation at water Crossings on Forest Access Roads" (NEST Technical Note TN-013, May 1996). General mitigation measures for construction activities near a water body in the ZOI include:

- All in-water work would be completed within MNR timing windows to protect local fish populations during their spawning and egg incubation periods. A typical construction timing window for coldwater streams containing Brook Trout in the Sault Ste. Marie District is June 15 to September 1. A typical construction window for in-water works on warmwater streams in the Sault Ste. Marie District is June 15 to March 31.
- All materials and equipment used for the purpose of site preparation and Project construction shall be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering the water:
  - Any stockpiled materials should be stored and stabilized away from the water;
  - Refuelling and maintenance of construction equipment should occur a minimum of 30 m from a water body;
  - Spills should be reported immediately to the MOE Spills Action Centre;
  - Any part of equipment entering the water should be free of fluid leaks and externally cleaned/degreased to prevent any deleterious substance from entering the water; and
  - Only clean material, free of fine particulate matter should be placed in the water.
- Sediment and erosion control measures should be implemented prior to construction and maintained during the construction phase to prevent entry of sediment into the water:
  - Silt fencing and/or barriers should be used along all construction areas adjacent to sensitive areas (e.g. water bodies, wetlands);
  - No equipment should be permitted to enter any natural areas beyond the silt fencing during construction;

- All sediment and erosion control measures should be inspected at least weekly and during and immediately following rainfall events to ensure that they are functioning properly and are maintained and/or upgraded as required;
- Topsoil stockpiles should be sufficiently distant from watercourses to preclude sediment inputs due to runoff of stored soil materials;
- If the sediment and erosion control measures are not functioning properly, no further work should occur until the sediment and/or erosion problem is addressed;
- All disturbed areas of the construction site should be stabilized immediately and re-vegetated as soon as conditions allow; and
- Sediment and erosion control measures should be left in place until all areas of the construction site have been stabilized.

5.2 MITIGATION MEASURES FOR NEW CULVERT CROSSINGS AND REPLACEMENT/ENHANCEMENT OF EXISTING CULVERTS

Culverts will be required at water bodies crossed by access roads. Culverts are sized according to hydrologic requirements that are determined during the detailed design / permit application stage. Other technical requirements such as load bearing capacity may influence culvert size and materials.

Where fish habitat is present, culverts must be installed such that fish passage is maintained. Where a watercourse provides indirect fish habitat, the culvert must continue to convey flow to downstream areas. MNR timing restrictions for in-water work must be adhered to. All efforts should be made to cross water bodies with intermittent flow regimes during dry (no flow) conditions.

Specific methods for culvert installation are dependent on culvert type, size and construction seasons. If a temporary access road is required, the DFO O.S. for Temporary Stream Crossings (**Appendix E**) can be used if the specific conditions can be met. This O.S. includes details of mitigation measures. Additionally, all water body crossings must adhere to the “Environmental Guidelines for Access Roads and Watercourse Crossings” (MNR, 1990). Culvert installation will be consistent with “CSP Culvert Installation at Water Crossings on Forest Access Roads” (NEST Technical Note TN-013, May 1996).

Under flowing water conditions, water must be pumped or flumed around the work area in order to install a culvert. The following steps outline how a site can be isolated for culvert construction:

Temporary Isolation

- Coffer dams (e.g., aqua-dams, pea gravel bags, concrete blocks, steel or wood wall, clean rip-rap, sheet pile or other appropriate designs) can be used to separate the in-water work site from flowing water.
- If rip rap or pea gravel bags are used, clean, washed material should be used to build the berm. The berm face should consist of clean, washed granular material that is adequately sized (i.e., moderate sized rip rap and not sand or gravel) to hold the berm in place during construction. Material to build the berms should not be taken from below the high water mark.
- Coffer dams should be designed to accommodate any expected high flows of the watercourse during the construction period.
- Before starting construction, fish should be rescued from behind the coffer dam and returned to an area immediately upstream of the isolated area. Rescue operations would consist of electrofishing and/or seining.
- Accumulated sediment should be removed (ensuring that the original bed of the watercourse is not excavated) from behind the coffer dam before its removal.
- The original channel bottom gradient and substrate should be restored after coffer dam removal.
- Water from dewatered areas should be treated or diverted into a vegetated area or settling basin to remove suspended solids and prevent sediment and other deleterious substances from entering the watercourse.
- Coffer dams should be removed in a downstream to upstream sequence to allow gradual re-introduction of water to the dewatered area and prevent excessive suspension of silt or other bed material.
- Pump intakes should be sized and adequately screened to prevent debris blockage and fish mortality (refer to the DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines, (DFO, 1995)).
- The pumping system should be sized to accommodate any expected high flows of the watercourse during the construction period. Back-up pumps should be kept on site in case of pump failure.
- The pump should be discharged to a grassed area to allow water to reenter the watercourse only after it has been filtered through vegetation to prevent silt deposition. If no suitable areas exist, a filter bag should be placed on the pump outlet to filter the water prior to reentry into the watercourse.
- Work should not be completed during flood stage flows or during times when heavy precipitation is occurring or is expected.

5.3 MITIGATION MEASURES FOR OVERHEAD COLLECTOR LINE CROSSINGS

The DFO has prepared an O.S. for overhead line construction (Ontario Operational Statement Habitat Management Program: Overhead Line Construction – see **Appendix E**). This O. S. provides measures to protect fish and fish habitat when undertaking this type of construction activity.

Although construction of overhead lines would not require any in-water works, as discussed in the O.S. , it is the riparian habitat that is most sensitive to disturbance from overhead line construction. Riparian vegetation occurs adjacent to the watercourse and directly contributes to fish habitat by providing shade, cover, and spawning and food production areas.

According to the DFO O.S. , a proponent may proceed with an overhead line project without DFO review when the following conditions are met:

- Construction and/or placement of any temporary or permanent structures (e.g., islands, poles, crib works, etc.) are not required below the ordinary high water mark; and
- The measures to protect fish and fish habitat when constructing overhead lines outlined below are recommended for incorporation into the Project construction phase (abbreviated from the O.S.) (**Appendix E**):
    - Installing overhead lines under frozen conditions is preferable;
    - Machinery fording the watercourse to bring equipment required for construction to the opposite side of the watercourse should be limited to a one-time event (over and back). If the stream bed and banks are highly erodible (e.g., dominated by organic materials and silts) and significant erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practices are to be used to protect these areas. A *Temporary Stream Crossing* Operational Statement (**Appendix E**) is also available;
    - Adhere to the MNR District in-water timing restriction windows
    - Operate machinery from outside of the water and in a manner that minimizes disturbance to the banks of the watercourse;
    - Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks;
    - Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent deleterious substances from entering the water; and
    - Keep appropriate emergency spill containment and clean-up materials kit on site in case of fluid leaks or spills from machinery.
    - Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and until re-vegetation of disturbed areas is complete, and make all necessary repairs;

- The removal of select trees and shrubs will be necessary to accommodate the overhead line in some locations. This removal should be kept to a minimum and should not be wider than the right-of-way;
- Stabilize any waste materials removed from the work site, above the ordinary high water mark to prevent them from entering any watercourse. Spoil piles could be contained with silt fence, flattened, covered with biodegradable mats or tarps, and/or planted with preferably native species or shrubs;
- Vegetate any disturbed areas by planting and/or seeding preferably native trees, shrubs or grasses and cover such areas with mulch as appropriate to prevent soil erosion and to help seeds germinate. If there is insufficient time in the growing season remaining for the seeds to germinate, stabilize the site (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and then vegetate the following spring; and
- Maintain effective sediment and erosion control measures until adequate re-vegetation of disturbed areas is achieved.

5.4 MITIGATION FOR UNDERGROUND COLLECTOR LINE CROSSINGS

There are several crossing techniques that may be employed for installation of a buried collector line. According to DFO the order of preference for such crossings, in order to protect fish and fish habitat is: 1) punch or bore, 2) high pressure directional drilling, 3) dry open-cut crossing and 4) isolated open-cut crossing. These are described in more detail below. There are DFO O.S.s for all of the above methods and all are included in **Appendix E**. In addition to measures identified in the O.S., appropriate spill containment and clean-up materials Emergency Spill Kit should be available on-site in the event of accidental leaks from machinery.

A summary of mitigation measures for Punch and Bore, High Pressure Directional Drill, Dry Open-Cut crossings and Isolated Open-Cut crossings is provided below:

Punch and Bore

Mitigation measures to employ for punch and bore crossings include (also see DFO O.Ss in Appendix E):

- A punch or bore crossing can be conducted at any time of the year provided there is not a high risk of failure and it does not require in-water activities such as machinery fording.
- Design the punch or bore path for an appropriate depth below the watercourse to prevent the pipeline or cable from becoming exposed due to natural scouring of the stream bed.
- While this O. S. does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site and to excavate the bell holes. This removal is to be kept to a minimum and within the utility right-of-way.

- Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the water body. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
- Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing* Operational Statement (**Appendix E**) is also available.
    - If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
    - Grading of the stream banks for the approaches should not occur.
    - If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
    - Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
    - Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.
- Operate machinery on land above the ordinary high water mark (HWM) (refer to **Appendix E**) and in a manner that minimizes disturbance to the banks of the watercourse.
    - Machinery is to arrive on-site in a clean condition and is to be maintained free of fluid leaks.
    - Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
    - Keep an emergency spill kits on site in case of fluid leaks or spills from machinery.
- Excavate bell holes beyond the HWM, far enough away from any watercourse to allow containment of any sediment or deleterious substances above the HWM.
    - When dewatering bell holes, remove suspended solids by diverting water into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering the watercourse.
    - Stabilize any waste materials removed from the work site (including bell holes) to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
    - After suitably backfilling and packing the bell holes, vegetate any disturbed areas.
- Monitor the watercourse to observe signs of malfunction during all phases of the work.

- For the duration of the work, keep on-site and readily accessible, all material and equipment needed to contain and clean-up releases of sediment-laden water and other deleterious substances.
- Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance. This plan is to include measures to:
    - a) stop work, contain sediment-laden water and other deleterious substances and prevent their further migration into the watercourse;
    - b) notify all applicable authorities in the area, including the closest DFO office;
    - c) promptly clean-up and appropriately dispose of the sediment-laden water and deleterious substances; and d) ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse.
- Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch, as appropriate, to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
    - Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

High Pressure Directional Drill

- Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.
- Design the drill path to an appropriate depth below the watercourse to minimize the risk of frac-out and to a depth to prevent the line from becoming exposed due to natural scouring of the stream bed. The drill entry and exit points are far enough from the banks of the watercourse to have minimal impact on these areas.
- While this O.S. does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the road or utility right-of-way.
- Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing* Operational Statement is also available (**Appendix E**).
    - If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
    - Grading of the stream banks for the approaches should not occur.
    - If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of

equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.

  - Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
  - Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

- Operate machinery on land above the ordinary high water mark (refer to **Appendix E**) and in a manner that minimizes disturbance to the banks of the watercourse.
  - Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
  - Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
  - Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
  - Restore banks to original condition if any disturbance occurs.
- Construct a dugout/settling basin at the drilling exit site to contain drilling mud to prevent sediment and other deleterious substances from entering the watercourse. If this cannot be achieved, use silt fences or other effective sediment and erosion control measures to prevent drilling mud from entering the watercourse. Inspect these measures regularly during the course of construction and make all necessary repairs if any damage occurs.
  - Dispose of excess drilling mud, cuttings and other waste materials at an adequately sized disposal facility located away from the water to prevent it from entering the watercourse.
- Monitor the watercourse to observe signs of surface migration (frac-out) of drilling mud during all phases of construction.
- Emergency Frac-out Response and Contingency Planning
  - Keep all material and equipment needed to contain and clean up drilling mud releases on site and readily accessible in the event of a frac-out.
  - Implement the frac-out response plan that includes measures to stop work, contain the drilling mud and prevent its further migration into the watercourse and notify all applicable authorities, including the closest DFO office in the area). Prioritize clean-up activities relative to the risk of potential harm and dispose of the drilling mud in a manner that prevents re-entry into the watercourse.
  - Ensure clean up measures do not result in greater damage to the banks and watercourse than from leaving the drilling mud in place.
  - Implement the contingency crossing plan including measures to either re-drill at a more appropriate location or to isolate the watercourse to complete the crossing at the current location. See *Isolated or Dry Open-cut Stream Crossings* Operational Statement (**Appendix E**) for carrying out an isolated trenched crossing.

  - Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with preferably native grass or shrubs.

- Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
  - Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Dry Open-Cut

Mitigation measures to employ for dry open-cut crossings (dry watercourses) include (also see DFO O.S. in **Appendix E**):

- Crossings should be undertaken on days when precipitation is not expected;
- The tracked excavator should be working in the dry when excavating a trench;
- Topsoil stockpiles should be reasonably distant from watercourses to preclude sediment inputs due to erosion of stored soil materials;
- Water crossings should be backfilled with substrate material that is consistent with the existing substrate size and texture and should remain in/under the crossing;
- The water crossing bed and bank areas should be rehabilitated to pre-excavation condition; and
- Materials such as sand bags, straw bales, geotextile filters, and/or pumps should be readily available on-site so that the crossing can be completed in the dry in case of unexpected stream flow.

Isolated Open-Cut (Dam and Pump Crossings)

Mitigation measures to employ for at low flow watercourses include (also see **Appendix E** O.S. including conditions of use):

- Where a dry open cut crossing is not possible, in-stream work should be completed in the dry by de-watering the work area and diverting and/or pumping flows around cofferdams placed at the limits of the work area:
  - To the extent practicable, crossings should take place on days when precipitation is not expected;
  - Existing stream flows should be maintained downstream of the de-watered work area without interruption, during all stages of the work;
  - Fish, if present, should be removed from the work area prior to de-watering and released alive immediately upstream;

- Flow dissipaters and/or filter bags, or equivalent, should be placed at water discharge points to prevent erosion and sediment release;
- Sediment laden dewatering discharge can be pumped to a temporary settling basin well away from the watercourse and allowed to settle and/or filter through the riparian vegetation before re-entering the watercourse downstream of the construction area;
- As conditions warrant, the work area should be stabilized against the impacts of high flow events at the end of each workday;
- Work in the channel and floodplain should be suspended and the work area stabilized when there is a high probability of a convective rainfall event and during warm winter periods when there is a high likelihood of significant snowmelt runoff;
- Silt or debris that has accumulated around the temporary cofferdams should be removed prior to their withdrawal; and
- If greater than 50,000 l/d is to be taken from the dewatering area, a Permit to Take Water may be required.

6.0 Monitoring

6.1 CONSTRUCTION (AS OUTLINED IN THE CONSTRUCTION PLAN REPORT AND DESIGN AND OPERATIONS REPORT)

Methodologies/Sampling Protocols

As appropriate, an Environmental Monitor should be on-site during installation of Project components that could potentially affect aquatic habitats to ensure compliance with specifications, site plans and permits/authorizations. In particular, the Construction Contractor would ensure that pre-construction preparation is completed (e.g. erosion and sediment control plans) prior to commencement of in-stream work (if required). The Construction Contractor would ensure that detailed pre-construction profiles of the slopes, banks, and bed are determined prior to installation of the access roads and collector lines. The Environmental Monitor should monitor weather forecasts prior to the installation of access roads and collector lines, particularly prior to work near aquatic habitats.

The Construction Contractor will monitor the implementation of proposed mitigation measures and:

- Perform routine checks of all erosion and sediment control measures and repair as appropriate;
- Regularly monitor all water body crossings regardless of crossing technique;
- Monitor flow conveyance during in-water works where culvert replacements are required;
- Visually inspect access/exit pits and directional drill line for frac-outs (if implemented);
- Regularly inspect drilling equipment and materials for fluid spills/leaks and ensure an appropriate supply of spill containment and clean-up materials are on-hand.

Performance Objectives/Additional Actions

The Environmental Monitor should ensure that bank, bed, and floodplain conditions are restored to pre-construction conditions, as reasonably possible, following completion of the construction activities.

Environmental monitoring following spring run-off the year after construction (first year of operations) should also occur, to review the effectiveness of the bank and slope re-vegetation (if required), to check bank and slope stability, and to ensure surface drainage has been maintained. In the event that adverse effects are noted, appropriate remedial measures should be completed as necessary (i.e. site rehabilitation and re-vegetation) and additional follow-up monitoring conducted as appropriate.

Any necessary authorizations or Letters of Advice from DFO, and Work Permits and/or approvals under the *Lakes and Rivers Improvement Act* from MNR, would likely include

conditions of approval such as construction and post-construction monitoring. All such strategies and/or authorizations/approvals should be obtained prior to construction, and all associated conditions and requirements should be properly implemented as appropriate.

6.2 OPERATION

The Environmental Effects Monitoring Plan for the Project is provided in the Design and Operations Report (Stantec, 2013b). Operational activities that have the potential to affect aquatic habitat includes accidental spills and/or leaks. Proper storage of materials (e.g. maintenance fluids) at off-site storage containers would greatly reduce the potential for accidental spills and/or leaks.

In the event of an accidental spill and/or leak appropriate remedial measures will be completed as necessary and additional follow-up monitoring conducted as appropriate. The level of follow-up monitoring and reporting should be based on the severity of the spill/leak and may be discussed with the MOE and MNR. Appropriate containment facilities will be installed for fuel storage and emergency response materials (e.g., spill kits) will be maintained on-site as required. Refuelling, equipment maintenance, and other potentially contaminating activities will occur only in designated areas.

In the event of an accidental discharge of fluids associated with Project operation, the Operation and Maintenance personnel will immediately stop work, identify the source of discharge and rectify the accidental spill. Once the spill is stopped and contained, the extent of the contamination will be assessed and any contaminated soil will be removed and disposed of it in accordance with the current appropriate provincial legislation, such as Ontario Regulation 347. Areas affected by accidental spills will be restored to a safe and clean condition using native materials and vegetation in accordance with MNR requirements.

In the event of a spill reaching a waterbody, containment booms will be deployed and the contained fluids will be removed from the water surface by vacuum truck or other appropriate method. Any contaminated shoreline soils or sediments will be removed and disposed of in accordance with applicable provincial legislation and as determined in consultation with the MNR and DFO as required.

The Emergency Response Plan (see Section 6 for additional details) will contain procedures for spill contingency and response plans, spill response training, notification procedures, and necessary clean-up materials and equipment. As per s.13, 15 and 92 of the *Environmental Protection Act*, all releases that could potentially have an adverse environmental effect, or are in excess of prescribed regulatory levels will be reported to the MOE's Spills Action Centre.

If *Fisheries Act* approvals are required from DFO, some monitoring may be required, and would be stated in the DFO Authorization. Monitoring typically includes photographic records during construction and for two years after the completion of construction to ensure the success of mitigation measures and the survival of plantings and overall function of the installation. If

significant habitat enhancement or compensation measures are required, monitoring may also include assessments of the fish community and habitat use. Similarly, MNR Work Permits or *Lakes and Rivers Improvement Act* authorizations may also include monitoring conditions that may extend into the operational phase.

7.0 Conclusions

The Bow Lake Wind Farm 'Water Assessment and Water Body Report' has been prepared by Stantec for the Proponent in accordance with Ontario Regulation 359/09. This report is one component of the REA application for the Project.

Locations where water bodies are present in or within 120 m of a proposed Project Location are presented in Figures 2.1 to 2.9 and summarized in **Table 3.2**. Aquatic habitat characteristics at each location is summarize in **Tables 3.3** and **3.4**. The designation of various features as water bodies was agreed upon by field staff based on field conditions at the time of the survey and the definition of water body provided in O. Reg. 359/09.

Section 39(1) of O. Reg. 359/09 prohibits the construction, installation or expansion of a renewable energy generation facility in a project location that is within 30 m of the average annual high water mark of a lake, intermittent stream, permanent stream or seepage area. However, this prohibition does not apply if, in addition to the preparation of a Water Body Report, certain components (i.e., wind turbines and transformer station) of the renewable energy facility remain outside of the 30 m setback.

Careful siting of the wind turbines at the Bow Lake Wind Farm ensures that all 36 turbines are located greater than 30 m from any lake, stream or seepage area. Water body 7-5 (Figures 2.4 and 3.4) is located 26 m from the northeast corner of the area identified for the construction compound, transformer station and the operations and maintenance building. In accordance with the 30 m setback distance required for the transformer station from this water body, the transformer station will not be constructed within 30 m of waterbody 7-5. Based on the current Project layout and assuming proper implementation of the proposed environmental mitigation and monitoring measures, it is anticipated that Project activities (including all construction activities) will be in compliance with the *Fisheries Act*, and will not result in harmful effects to any water body, fish or fish habitat. Once culvert size and construction methods are finalized, consultation with DFO will also take place regarding the twelve culvert crossing locations presented in Section 3.2 to ensure compliance with *Fisheries Act* requirements.

Work Permits, pursuant to the *Public Lands Act*, are required from MNR for all water body crossings that will occur in areas not previously evaluated under the existing FMP regulatory process. It is anticipated that these Work Permits will include conditions that must be implemented to ensure potential impacts to the quatic environments minimized. Additionally, authorizations under the *Lakes and Rivers Improvement Act* may be required from MNR for some water body crossings, depending on the watercourse characteristics (flow regime),catchment area and the proposed works. As is the case with the Work Permits, these authorizations will contain conditions that must be fulfilled in order to protect the aquatic habitat and fisheries resources.

This report has been prepared by Stantec for the sole benefit of the Proponent, and may not be used by any third party without the express written consent of the Proponent. The data presented in this report are in accordance with Stantec's understanding of the Project as it was presented at the time of reporting.

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