



Stantec

NIAGARA REGION WIND FARM
WATER ASSESSMENT AND WATER
BODY REPORT

File No. 160950269

April 2013

Prepared for:

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NIAGARA REGION WIND FARM
WATER ASSESSMENT AND WATER BODY REPORT

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1.0 Introduction

Niagara Region Wind Corporation (NRWC) is a renewable energy development company based in Oakville, Ontario and is dedicated to providing renewable energy for Ontario. Further information can be found on their website at www.nrwc.ca.

Niagara Region Wind Corporation (NRWC) is proposing to develop, construct, and operate the 230 Megawatt (MW) Niagara Region Wind Farm (the Project) within the Townships of West Lincoln and Wainfleet and the Town of Lincoln within the Niagara Region and within Haldimand County in Southern Ontario, in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province. The Project Study Area is shown in Appendix A.

1.1 PROJECT OVERVIEW

The basic components of the Project include 77 wind turbine generators (80 potential locations identified) each with a rated capacity ranging from approximately 2.3 MW to 3.0 MW for a maximum installed nameplate capacity of 230 MW. An overhead and/or underground collection system connects each turbine to one of two transformer substations along a series of 34.5 kilovolt (kV) lines. Turbines are grouped into nine collector circuits that bring power (and data via fibre optic lines) to one of the transformer substations. Voltage is stepped up from 34.5kV to 115kV at each transformer substation by means of a 100 MVA base rated transformer with two stages of cooling (via fans). A 115kV transmission line transports power from each of the two transformer substations north to the tap-in location where the Project is connected to the Hydro One Networks Inc. (HONI) owned transmission line, south of the Queen Elizabeth Way (QEW) in the Town of Lincoln. Power generated from this Project will be conveyed along the existing HONI transmission line to the Beach Transformer Station in Hamilton.

Alternate transmission and collector lines routes have been identified and assessed to provide options during detailed design, the final selection of which route to follow will be confirmed following the consultation process with local distribution companies, agency review and detailed design.

Other Project components include access roads, junction boxes (or pad-mounted disconnect switches) and associated culverts at swales and water body crossings. Temporary components during construction may include temporary laydown areas (for storage and staging areas at each turbine location), crane pads or mats, staging areas along access roads, delivery truck turnaround areas, central construction laydown areas and crane paths. All project components are illustrated on Figure 3 (Appendix A).

According to subsection 6(3) of O. Reg. 359/09, the Project is classified as a Class 4 Wind Facility.

1.2 STUDY AREA AND PROJECT LOCATION

In accordance with O. Reg. 359/09, the "Project Location" includes all land and buildings/structures associated with the Project and any air space in which the Project will occupy. This includes structures such as turbines, access roads and power lines as well as any temporary work areas (the 'constructible area' for the Project) which are required to be utilized during the construction of the Project. The Project Location is within the Townships of West Lincoln and Wainfleet and the Town of Lincoln within the Niagara Region and within Haldimand County in Southern Ontario. Project infrastructure such as collector lines and transmission lines will be sited along the boundaries of the Township of Pelham and Town of Grimsby, but will be sited outside of these municipalities on the opposite side of the road.

The "Project Study Area" was established to scope the siting of the proposed wind turbines, collector lines, access roads and temporary work areas. Similarly, the "Interconnector Study Area" was established to scope the location of the proposed 115kV transmission line, transformer substations and tap-in location. These two terms are intended to assist with background data collection and consultation, however have no formal definition or application under O.Reg. 359/09. Appendix A identifies both Study Areas, which include portions of the Townships of West Lincoln and Wainfleet and the Towns of Grimsby and Lincoln within the Niagara Region and within Haldimand County in Southern Ontario.

For the purposes of the REA reports, the "Zone of Investigation" includes all land, air and water within 120 metres of the "Project Location" where site investigations are required and were completed in accordance with O.Reg. 359/09. The Project will be located on privately owned land and within municipal rights-of-way (ROWs) in the Niagara Region and within Haldimand County.

This Water Assessment and Water Body Report is intended to satisfy the requirements outlined within Ontario Regulation 359/09 and is to be submitted as one component of the Renewable Energy Approval (REA) application for the Project. The Project boundary is not located within the Oak Ridges Moraine Conservation Plan Area, but is located within the Protected Countryside of the Greenbelt Plan, and some components are located within the Niagara Escarpment Plan.

This report identifies water bodies that are within the 120 m Zone of Investigation and assesses potential negative environmental effects that may result from construction activities. Mitigation measures are also identified to alleviate potential negative environmental effects.

Once the Project layout and locations of water bodies were confirmed, a water records review was conducted according to Section 30(1) of O. Reg. 359/09. Additionally, fish communities were characterized at water bodies within the 120 m Zone of Investigation and a general aquatic habitat assessment was conducted. A combination of background data and results of Stantec's 2012 surveys were used to determine the presence or absence of water bodies and fish habitat

within the 120 m Zone of Investigation. Photographs of all water features were taken during field surveys and are included in **Appendix B**.

Locations where water bodies are present within 120 m of a proposed Project Location are presented in Figures 3.1 to 3.56 and summarized in **Table 3.1**. All water bodies within the Zone of Investigation and identified in this report are located farther than 30 m from any turbine blade tip. The designation of features as water bodies was agreed upon by field staff using field conditions at the time of the survey and the definition of water body provided in O. Reg. 359/09.

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”, and the MNR’s Approval and Permitting Requirements Document (APRD).

1.3 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). 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, use, operation, maintenance, changing or retiring of the renewable energy generation facility. Therefore, for the purposes of measuring the distance from the Project Location to a water body, a Project Location is considered to be the outer limit where site preparation and construction activities will occur and where infrastructure will be located (e.g. temporary structures, laydown areas, storage facilities, generation equipment, access roads, transmission lines less than 50 kilometres in length, etc.).

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

Table 1.1: 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, 4.0
2. A site investigation conducted in accordance with section 31, including:		
31(4)(1). A summary of any corrections to the report.	✓	Section 3, Table 3.1, Figures 3.1 to 3.56
31(4)(2). Information relating to each water body.	✓	4.1 and 4.2
31(4)(3). A map showing boundaries, location/type and distances.	✓	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	✓	2.4

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Table 1.1: Water Assessment Report and Water Body Report Requirements: O. Reg. 359/09

Requirements (Water Assessment)	Completed	Section Reference
investigation.		
31(4)(6)(i). The dates and times of the beginning and completion of the site investigation.	✓	3.0, Appendix C
If an investigation was conducted by visiting the site:		
31(4)(6)(ii). The duration of the site investigation.	✓	3.0, Appendix C
31(4)(6)(iii).The weather conditions during the site investigation	✓	3.0, Appendix C
31(4)(6)(iv). Field notes kept by the person conducting the site investigation.	✓	Appendix C
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.	✓	4.3, 5.0
5. Report identifies mitigation measures in respect of any negative environmental effects.	✓	6.0
6. Report describes how the environmental effects monitoring plan addresses any negative environmental effects.	✓	7.0
7. Report describes how the construction plan report addresses any negative environmental effects.	✓	6.0, 7.1

2.0 Methods

2.1 DEFINITION OF A WATER BODY

The presence or absence of water bodies within the Project's 120 m Zone of Investigation 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. Data was gathered through agency requests and/or accessing online databases as follows:

- Ontario Ministry of Natural Resources
 - Land Information Ontario (LIO) mapping database
 - Natural Heritage Information Centre (NHIC) online database
 - Background fisheries data acquired from the Vineland Area office
- Niagara Peninsula Conservation Authority (NPCA)
- Grand River Conservation Authority (GRCA)
- Township of Wainfleet
- Township of West Lincoln
- Town of Lincoln
- Town of Grimsby

Copies of all correspondence related to the Records Review will be provided in the Record of Consultation which will be submitted as part of the complete REA application to the MOE. Information obtained as a result of the information requests/records review are presented in Section 4 of this report.

Figures depicting the watercourses and waterbodies identified by LIO mapping (MNR, 2009) are included in Figures 3.1 through 3.56, Appendix A, where "watercourses" and "waterbodies" are water features (including lakes, rivers, streams, etc.), as mapped by the 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 Zone of Investigation. Further information on these potential water bodies was obtained during the site investigations (as described in Section 2.3).

The MNR and NPCA provided background data regarding fish communities at a number of locations in the Zone of Investigation. Fisheries and Oceans Canada's (DFO) Drain Classification mapping was obtained from the Conservation Ontario website (CO, 2011).

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 as presented in Table 4.1. Records of field investigations are included in **Appendix C**.

The purpose of the site investigations was to:

- Ground truth 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 meet the definition of a water body if they are part of a permanent or intermittent channel or seepage area. All other wetland types identified within the Zone of Investigation 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 NHA/EIS.

Once locations of water bodies were confirmed, a general aquatic habitat assessment was conducted within the 120 m Zone of Investigation. A combination of background data and results of Stantec's 2012 surveys were used to determine the presence or absence of fish habitat within the 120 m Zone of Investigation.

As a result of the collection of background data and field data, an assessment was made with respect to the presence or absence of fish habitat at each surveyed reach. 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 intermittently flowing channel 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 as per background data.

2.4 QUALIFICATIONS

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

- Mark Pomeroy, B.Sc. – Fisheries Biologist
- Kelly Mason B.Sc. Env., ERGC – Aquatic Ecologist
- Nancy Harttrup, B.Sc. – Senior Fisheries Biologist
- Marc Faiella, Tech. Dipl., CEPIT – Ecologist
- Katie Easterling, Tech. Dipl., B.Sc. (Hons.) – Biologist
- Trevor Chandler, M.Sc. – Fluvial Systems Specialist
- Joe Keene, M.Sc. – Aquatic Ecologist
- Mitch Ellah, Tech. Dipl., B.Sc. (Hons.) – Aquatic Ecologist

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

3.0 Water Bodies and Fish Habitat within the 120 m Zone of Investigation

As indicated in Section 2.2, the presence or absence of water bodies within the Zone of Investigation 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 **Table 3.1** and illustrated in **Figures 3.1 to 3.56 (Appendix A)**. One-hundred forty-six water bodies were identified within the 120 m Zone of Investigation. Some of the surface water features identified on MNR mapping (e.g. watercourses) did not exist in the field or consisted of surficial drainage; therefore, these features were not classified as water bodies during Stantec's 2012 field investigations (**Table 3.1**). A summary of water bodies and associated project components is presented in **Table 3.2**. Distances from turbine blade tip to each water body are presented in **Table 3.3**. During the field investigations, there were no additional water bodies, lakes or seepage areas identified within 120 m of the Project Location other than those described in Sections 4.1 and 4.2. Photographs and field notes of these investigations are provided in **Appendices B and C** respectively.

An application was submitted to the MNR for a Licence to Collect Fish for Scientific Purposes on June 14, 2012, but was not received; therefore fish sampling was not completed. Fish communities were characterized using a combination of DFO Drain Classification mapping and background data received from the MNR. The presence of fish habitat within the 120 m Zone of the Investigation was determined through a combination background data review and field observations. Fish habitat is illustrated in **Figures 4.1 to 4.56 (Appendix A)**.

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.

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WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

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Table 3.1: Water Body Assessment Summary

Subwatershed/Watercourse	Water Body Station(s)	Non-Water Body Station(s)	Report Figure #	Water Body	Not a Water Body Criteria								Comments
					No Surface Feature Present	Grassed Waterway/ Swale+	Temporary Channel for Surface Drainage*	Roadside Ditch*	Temporarily Poned Area Normally Farmed*	Dugout Pond*	Rock Chute*	Other	
NIAGARA PENINSULA CONSERVATION AUTHORITY													
Lincoln (Municipality) (LIN)													
Thirty Mile Creek	5-1, 5-2, 1-1,1-3,	6-1	2a	√		√							
Lake Ontario 24	2-2	1-2	2a	√		√							
Beamsville Creek	4-1, 3-3, 3-2, 3-1, 2-3	3-1, 3-2, 4-1	2a	√									
Twenty Mile Creek (TWEN)													
Spring Creek	9-1, 8-1, WR2, WR1, FR1, FR4, FR3, SGR3-3, SGR3-2, Younge-1, SGR3-1	FR2	2a, 2c	√		√							
Twenty Mile Creek	11-2	12-1, 11-1	2a, 2b, 2c	√		√							
North Creek	13-1, 13-3, ,T088-1a, T088-1b, 16-3	13-1, 13-2, 15-1, 15-2, 18-1, T088-2, T088-1a, T088-1b, T083-1,2,3 , T085-1	2a, 2b	√		√							18-1 is a REA Water Body on the east side of Port Davidson Road only.
Fifteen, Sixteen, Eighteen Mile Creeks (FSEM)													
Sixteen Mile Creek	51-1, 52-1, 61-1, T028, T079-2A, T079-2C, T079-1, T018-1, T004-1 to T004-4, T004-6, T058-1, T059-2, T059-3, T059-4	56-3, T079-2B, T018-3, T018-2, T004-5, T059-2	2b, 2c	√		√							54-1 is a REA Water Body on the north side of road only.
Fifteen Mile Creek	18-1, 54-1, 55-1, 56-4, 57-2, 57-3, 58-2, 58-1, 60-1	54-1, 56-2, 56-1, 57-1, 58-2, 58-3, 58-1, 59-1, 59-2, 62-1, T027, T057, T056,	2b, 2c	√		√							58-2 is a REA Water Body on the south side of road only. 58-1 is a REA Water Body on the east side of road only.
Upper Welland River (UWR)													
Welland River	28-1, 29-1, 30-1, 31-2, 32-1, 35-3	31-1, 29-1, 30-1	2c, 2d	√									
Unnamed Tributary to UWR	T091, T041-2, T0-72-1, 6-2, 6-3	T041-1, 6-2	2d	√		√							
Tributary to Welland River		T095	2d			√							
Central Welland River (CWR)													
Beaver Creek	23-2, 23-1, 26-1, 27-1, 34-1, T008-3a, T008-3B, T008-1b, 3-4, 5-3	23-2, 34-2, T052-2, T052-4, T052-3, T052-1, T052-6, T052-5, T008-3a	2b, 2c	√	√	√							23-2 is a REA Water Body on the south side of road only.

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WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

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Table 3.1: Water Body Assessment Summary

Subwatershed/Watercourse	Water Body Station(s)	Non-Water Body Station(s)	Report Figure #	Water Body	Not a Water Body Criteria								Comments
					No Surface Feature Present	Grassed Waterway/Swale+	Temporary Channel for Surface Drainage*	Roadside Ditch*	Temporarily Poned Area Normally Farmed*	Dugout Pond*	Rock Chute*	Other	
		T008-1a, T008-2, T039, T008-4											
Black Ash Creek	T081-A, T097-2, 19-3, 19-4, 19-5, 22-1, 36-3, 4-2	T081A, T019-1, 19-2, 24-1, T097-3, T097-1, T039-1, T007, T097-2	2b	√		√							
Parker Creek	20-1, 20-2, 36-1, T094-1, T093-2, T093-1B, T036-1, 4-3	4-4, T094-2, T093-1A, CR4-1, CR4-2, CR4-3	2b	√		√							
Unnamed Creek (Tributary to CWR)	47-1, 47-2, 47-3, 48-1, 43-1, 44-1, 44-2, 36-2, 37-1, 38-1, 38-2, 35-1, 35-2, T001-1, T031-5 - 6, 8, T031-11, T055-1, T032, CR4-11, CR4-5, CR4-8, CR4-12	50-1, 50-2, 45-1, 45-2, 44-2, 37-2, 35-1, T038-1, T038-2, 38-2, T006, T054, T076, , T031-10, , CR4-7, CR4-9, CR4-10, CR4-13, CR4-4, CR4-6,	2b, 2c	√		√							35-1 is a REA Water Body on the east side of road only.
Sucker Creek	55-2, 49-1, 46-1, 40-1, T002-3, T033-1, T035H	T002-1, T002-2, T034, T035M	2c	√		√							
Welland River	39-1, 42-1, T078-1, T029-1, T029-3	T003, T078-2	2c	√		√							
Little Forks Creek	63-2, 8-2, 8-3	63-1	2c			√							
Big Forks Creek (BFC)													
Wolf Creek Drain West	65-3, 10-1, 9-2	65-3	2d	√	√	√							
Wolf Creek Drain East		T010 and T037	2c	√		√							
North Forks Drain	65-4, 68-1, T012-1, T013-2, T019-1, T082, T082-2	T013-1, 67-2, 67-1	2d			√							
Ellsworth Drain	72-1, 71-1, T065-1, 12-2.		2d, 2e	√									
Big Forks Creek	69-2, 69-1, 70-1, 66-2, 66-1, 65-2, 65-1, T013-3, 11-3, 13-4 to 13-7	66-1, W65-1, T013-4, 11-3, 69-2, 13-6	2d	√		√							66-1 is a REA Water Body on the east side of road only.
East Kelly Drain	13-6, 13-5, 74-1, 73-1, T089-1, T084-1, T089-3, T089-2	75-2, 75-1, 73-2, T084-2	2d, 2e			√							
Mill Race Creek	T024-1, 13-8, 14-1, 15-3, 15-4, 15-5, 15-6.	15-4, T024-1	2d, 2e	√		√							
Welland Feeder Canal (WFC)													
Feeder Canal	79-1	79-1	2d, 2e	√		√							

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Table 3.1: Water Body Assessment Summary

Subwatershed/Watercourse	Water Body Station(s)	Non-Water Body Station(s)	Report Figure #	Water Body	Not a Water Body Criteria								Comments
					No Surface Feature Present	Grassed Waterway/Swale+	Temporary Channel for Surface Drainage*	Roadside Ditch*	Temporarily Poned Area Normally Farmed*	Dugout Pond*	Rock Chute*	Other	
Lake Erie North Shore (LENS)													
Hoover Drain	T049-1		2e	√									
Low Banks Drain	83-1, 83-2, T016-1, T044, T061-1	T016-1	2d	√		√							
GRAND RIVER CONSERVATION AUTHORITY													
Lower Grand River													
Dent Drain	T042-2 T098-1, T098-3	T042-3, T042-1, T098-2,	2d	√		√							
West Kelly Drain	T099-1		2d	√									
Tweed Drain	T099-2, T020-1, 77-1, T062-1, T062-2, T096-1		2d	√									
Broad Creek Drain	81-1, 80-1, T005-3, T005-1, T045-2, T017, T045-1, T045-3, 78-1	T005-2	2d	√		√							

*as per REA Definition O. Reg. 359/09

+low lying feature with no defined channel and not dominated by aquatic vegetation

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Water Bodies and Fish Habitat within the 120 m Zone of Investigation

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Table 3.2: Water Body Project Component Summary

Watershed/Water Body	Station(s)	Crossing Type*			w/in 120 m			
		Access Road**	Collector Line	Transmission Line	Turbine	Access Road**	Collector Line	Transmission Line
NIAGARA PENINSULA CONSERVATION AUTHORITY								
Lincoln (Municipality)								
Thirty Mile Creek 1	1-1							√
Thirty Mile Creek 3	1-3			1				
Lake Ontario 24	2-2							√
Tributary to Beamsville Creek 1	4-1			1				
Tributary to Beamsville Creek 2	3-3			1				
Tributary to Beamsville Creek 3	3-2			1				
Tributary to Beamsville Creek 4	3-1			1				
Tributary to Beamsville Creek 5	2-3							√
Twenty Mile Creek								
Tributary to Spring Creek 3	8-1			1				√
Tributary to Spring Creek 4	9-1			1				
Tributary to Spring Creek 5	WR-2			1				
Tributary to Spring Creek 6	WR-1			1				
Tributary to Spring Creek 7	FR-1			1				
Tributary to Spring Creek 8	FR-4			1				
Tributary to Spring Creek 9	FR-3			1				
Tributary to Spring Creek 10	SGR3-3			1				
Tributary to Spring Creek 11	SGR3-2			1				
Tributary to Spring Creek 12	SGR3-1			1				
Tributary to Spring Creek 13	Younge-1			1				
Twenty Mile Creek	11-2			1				
Tributary to North Creek 1	13-1		1	2				√
Tributary to North Creek 2	13-3		1					

NIAGARA REGION WIND FARM

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Water Bodies and Fish Habitat within the 120 m Zone of Investigation

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Table 3.2: Water Body Project Component Summary

Watershed/Water Body	Station(s)	Crossing Type*			w/in 120 m			
		Access Road**	Collector Line	Transmission Line	Turbine	Access Road**	Collector Line	Transmission Line
Tributary to North Creek 3	16-3							
Tributary to North Creek 4	T088-1b					√	√	
Tributary to North Creek 5	T088-1a					√	√	
Fifteen, Sixteen, Eighteen Mile Creeks								
Tributary to Sixteen Mile Creek 1	51-1		1					
Tributary to Sixteen Mile Creek 2	52-1		2					
Tributary to Sixteen Mile Creek 3	54-1		1					
Tributary to Sixteen Mile Creek 4	61-1		1					
Tributary to Sixteen Mile Creek 5	T028				√	√	√	
Tributary to Sixteen Mile Creek 6	T079-2A, T079-2C				√	√	√	
Tributary to Sixteen Mile Creek 7	T079-1				√	√		
Tributary to Sixteen Mile Creek 8	T018-1	1						
Tributary to Sixteen Mile Creek 9	T004-2		1			√		
Tributary to Sixteen Mile Creek 10	T004-1					√	√	
Tributary to Sixteen Mile Creek 11	T004-6					√	√	
Tributary to Sixteen Mile Creek 12	T004-3				√	√	√	
Tributary to Sixteen Mile Creek 13	T004-4				√	√	√	
Tributary to Sixteen Mile Creek 14	T058-1				√	√	√	
Tributary to Sixteen Mile Creek 15	T059-2	1	1		√			
Tributary to Fifteen Mile Creek 1	55-1						√	
Tributary to Fifteen Mile Creek 2	56-4		1			√		
Tributary to Fifteen Mile Creek 3	57-3, T059-4		1			√		
Tributary to Fifteen Mile Creek 4	57-2		1					
Tributary to Fifteen Mile Creek 5	58-2		1					

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WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

April 2013

Table 3.2: Water Body Project Component Summary

Watershed/Water Body	Station(s)	Crossing Type*			w/in 120 m			
		Access Road**	Collector Line	Transmission Line	Turbine	Access Road**	Collector Line	Transmission Line
Tributary to Fifteen Mile Creek 6	58-1						√	
Tributary to Fifteen Mile Creek 7	60-1		1					
Tributary to Fifteen Mile Creek 9	18-1	1						
Upper Welland River								
Tributary to Welland River 1	28-1			1				
Tributary to Welland River 2	29-1			1				
Tributary to Welland River 3	30-1		1	1				
Tributary to Welland River 4	31-2		1	1				
Tributary to Welland River 5	32-1			1				
Welland River	35-3							√
Unnamed Tributary to UWR 1	T091					√		
Unnamed Tributary to UWR 2	T041-2				√	√		
Unnamed Tributary to UWR 3	T072-1	1			√		√	
Unnamed Tributary to UWR 4	6-2		1					
Unnamed Tributary to UWR 5	6-3		3					
Central Welland River								
Tributary to Beaver Creek 1	23-2		1					
Tributary to Beaver Creek 2	23-1		1					
Tributary to Beaver Creek 3	26-1, 27-1		1	1				
Tributary to Beaver Creek 4	34-1		1					
Tributary to Beaver Creek 5	T008-3a				√	√	√	
Tributary to Beaver Creek 6	T008-3b							
Tributary to Beaver Creek 7	T008-1b				√		√	
Beaver Creek 1	3-4		1					

NIAGARA REGION WIND FARM

WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

April 2013

Table 3.2: Water Body Project Component Summary

Watershed/Water Body	Station(s)	Crossing Type*			w/in 120 m			
		Access Road**	Collector Line	Transmission Line	Turbine	Access Road**	Collector Line	Transmission Line
Beaver Creek 2	5-3		1					
Tributary to Black Ash Creek 1	T081-A, 19-4		1					
Tributary to Black Ash Creek 2	T097-2, 22-1		1	1				
Tributary to Black Ash Creek 3	19-3		1					
Tributary to Black Ash Creek 4	19-5		2	1				
Black Ash Creek 1	36-3		1					
Black Ash Creek 2	4-2		1					
Tributary to Parkers Creek 1	20-1	1	1	1				
Tributary to Parkers Creek 2	20-2						√	
Parkers Creek 1	36-1, T036-1	1	3		√			
Parkers Creek 2	4-3		1					
Tributary to Parkers Creek 3	T094-1	1	2					
Tributary to Parkers Creek 4	T093-2					√	√	
Tributary to Parker Creek 5	T093-1b	1	1					
Tributary to Unnamed Creek of CWR 1	47-1		1					
Tributary to Unnamed Creek of CWR 2	47-2		1					
Tributary to Unnamed Creek of CWR 3	47-3		1			√		
Tributary to Unnamed Creek of CWR 4	48-1, T001-1, T055-1		2		√	√		
Tributary to Unnamed Creek of CWR 5	43-1, 36-2		2					
Tributary to Unnamed Creek of CWR 6	44-1		1					
Tributary to Unnamed Creek of CWR 7	44-2		1					
Tributary to Unnamed Creek of CWR 8	37-1		1					
Tributary to Unnamed Creek of CWR 9	38-1		1					
Tributary to Unnamed Creek of CWR 10	38-2		1					

NIAGARA REGION WIND FARM

WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

April 2013

Table 3.2: Water Body Project Component Summary

Watershed/Water Body	Station(s)	Crossing Type*			w/in 120 m			
		Access Road**	Collector Line	Transmission Line	Turbine	Access Road**	Collector Line	Transmission Line
Tributary to Unnamed Creek of CWR 11	35-1		1					
Tributary to Unnamed Creek of CWR 12	35-2		1					
Tributary to Unnamed Creek of CWR 13	T031-8				√	√	√	
Tributary to Unnamed Creek of CWR 14	T032, T031-11	1	1		√			
Tributary to Unnamed Creek of CWR 15	CR4-11							
Tributary to Unnamed Creek of CWR 17	CR4-5		1					
Tributary to Unnamed Creek of CWR 19	CR4-8		1					
Tributary to Unnamed Creek of CWR 20	CR4-12		1					
Tributary to Sucker Creek 1	55-2		1					
Sucker Creek 1	49-1		1					
Sucker Creek 2	T033-1				√	√	√	
Sucker Creek 3	46-1, 40-1, T035H		3					
Tributary to Sucker Creek 2	T002-3				√		√	
Tributary to Welland River 1	39-1		1					
Tributary to Welland River 2	42-1, T029-3	1			√			
Tributary to Welland River 4	T078-1				√	√	√	
Tributary to Welland River 5	T029-1					√	√	
Little Forks Creek 1	63-2						√	
Little Forks Creek 2	8-2, 8-3		3					
Big Forks Creek								
Wolf Creek Drain West	65-3, 10-1		1	2				
North Forks Drain	65-4		1	1				
Mill Race Creek 1	68-1, T019-1, T082-1, T082-2, T013-2	2	3		√			
Unnamed Tributary to Mill Race Creek 1	T012-1				√	√	√	

NIAGARA REGION WIND FARM

WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

April 2013

Table 3.2: Water Body Project Component Summary

Watershed/Water Body	Station(s)	Crossing Type*			w/in 120 m			
		Access Road**	Collector Line	Transmission Line	Turbine	Access Road**	Collector Line	Transmission Line
Ellsworth Drain	72-1, 71-1, T065-1		2	1	√	√		
Unnamed Tributary to Ellsworth Drain	12-2						√	
Unnamed Tributary to South Forks Drain 1	69-2						√	
South Forks Drain 1	69-1, 70-1, T013-3		3	1	√			
South Forks Drain 2	11-3			1				
Unnamed Tributary to Big Forks Creek 1	66-2			1				
Tributary to Big Forks Creek 2	66-1		1					
Wolf Creek Drain	65-2			1				
Unnamed Tributary to Wolf Creek Drain 1	65-1		1					
Unnamed Tributary to Wolf Creek Drain 2	9-2							√
East Kelly Drain	74-1			1			√	
Unnamed Tributary to Kelly Drain 1	13-6, T084-1, T089-1		1					
Unnamed Tributary to Kelly Drain 2	13-5						√	
Kelly Drain 1	73-1		1					
Unnamed Tributary to Kelly Drain 3	T089-3					√	√	
Unnamed Tributary to Kelly Drain 4	T089-2					√	√	
Unnamed Tributary to Kelly Drain 5	13-4			1				
Unnamed Tributary to Kelly Drain 6	13-7		1					
Mill Race Creek	T024-1	1	1					
Unnamed Tributary to Mill Race Creek 1	13-8						√	
Unnamed Tributary to Mill Race Creek 2	14-1						√	
Unnamed Tributary to Mill Race Creek 3	15-3, 15-6						√	
Unnamed Tributary to Mill Race Creek 4	15-4						√	
Unnamed Tributary to Mill Race Creek 5	15-5						√	

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WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

April 2013

Table 3.2: Water Body Project Component Summary

Watershed/Water Body	Station(s)	Crossing Type*			w/in 120 m			
		Access Road**	Collector Line	Transmission Line	Turbine	Access Road**	Collector Line	Transmission Line
Welland Feeder Canal								
Feeder Canal	79-1						√	
Lake Erie North Shore								
Hoover Drain 1	T049-1		1					
Tributary to Little Marsh Drain 1	83-1		1					
Tributary to Little Marsh Drain 2	83-2	1	1					
Tributary to Little Marsh Drain 3	T016-1		1		√			
Tributary to Little Marsh Drain 4	T044-1	2	2		√			
Tributary to Little Marsh Drain 5	T061-1				√	√	√	
GRAND RIVER CONSERVATION AUTHORITY								
Lower Grand River								
Tributary to Dent Drain 1	T042-2	1	1		√			
Tributary to Dent Drain 2	T098-1	1	1					
Tributary to Dent Drain 3	T098-3				√	√	√	
West Kelly Drain	T099-1				√	√	√	
Tributary to Tweed Drain 1	T062-1	1	1		√			
Tributary to Tweed Drain 2	T062-2	1	1					
Tributary to Tweed Drain 3	T096-1	1	1					
Tributary to Tweed Drain 4	77-1						√	
Tributary to Broad Creek Drain 1	78-1		1					
Tweed Drain 1	T099-2		1			√		√
Tweed Drain 3	T020-1	1					√	
Tributary to Broad Creek Drain 2	T045-3					√	√	
Tributary to Broad Creek Drain 3	T045-1				√	√	√	

NIAGARA REGION WIND FARM

WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

April 2013

Table 3.2: Water Body Project Component Summary

Watershed/Water Body	Station(s)	Crossing Type*			w/in 120 m			
		Access Road**	Collector Line	Transmission Line	Turbine	Access Road**	Collector Line	Transmission Line
Tributary to Broad Creek Drain 4	T045-2				√	√	√	
Tributary to Broad Creek Drain 5	81-1, T005-3		1					
Tributary to Broad Creek Drain 6	80-1		2					
Tributary to Broad Creek Drain 7	T005-1	1	1		√			
Tributary to Broad Creek Drain 8	T017	1	1					

*Numbers displayed in cell represent the number of times the particular project component crosses that water body

** includes crane path and underground collector line

NIAGARA REGION WIND FARM

WATER ASSESSMENT AND WATER BODY REPORT

Water Bodies and Fish Habitat within the 120 m Zone of Investigation

April 2013

Table 3.3: Turbine Location and Distance To Nearest Water Body

Turbine Number	Distance to Nearest Water Body (m)
T01	259.25
T02	78.06
T03	710.32
T04	34.38
T05	39.99
T06	452.23
T07	169.66
T08	33.49
T09	1044.31
T10	863.81
T11	129.45
T12	325.20
T13	36.26
T14	55.91
T16	35.26
T18	400.74
T19	102.49
T20	352.52
T21	320.05
T22	46.72
T23	550.42
T24	392.43
T27	393.52
T28	149.01
T29	92.65
T31	32.42
T32	36.85
T33	45.02
T34	349.23
T35	238.50
T36	118.45
T37	756.38
T38	1188.43
T39	666.26

Turbine Number	Distance to Nearest Water Body (m)
T41	60.41
T42	100.79
T43	254.18
T44	45.29
T45	60.49
T46	223.12
T47	71.15
T48	81.63
T49	32.19
T51	893.36
T52	1297.06
T53	1080.14
T54	882.30
T55	40.04
T56	517.06
T57	1172.61
T58	54.18
T59	113.53
T60	356.79
T61	58.07
T62	38.38
T63	421.12
T65	51.85
T66	857.31
T72	39.02
T74	422.68
T75	197.62
T76	251.22
T78	35.25
T79	34.00
T80	390.18
T81	578.94
T82	35.35
T83	322.43

Turbine Number	Distance to Nearest Water Body (m)
T84	820.66
T85	1209.86
T88	97.75
T89	211.95
T91	345.35
T93	71.43
T94	698.70
T95	410.64
T96	480.65
T97	471.09
T98	53.44
T99	104.49

4.0 Existing Conditions and Predicted Impacts

In the following sub-sections, available background data are provided for each subwatershed, 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 fish habitat is present. In some cases, DFO Operational Statements may be applicable for construction activities in or near water (e.g. crossing watercourses with overhead lines, underground cables, etc.). When an Operational Statement is used, mitigation measures provided in the Operational Statement will protect fish habitat and no further review or approvals are required.

Although specific Operational Statements are referenced in this report, consultation with the NPCA, GRCA, and/or DFO may result in site-specific construction methods and mitigation measures for some locations.

Information in Sections 4.1 and 4.2 is presented on a subwatershed basis. Listed generally north to south, the Project Location has been described according to two conservation authority jurisdictions, and has been subdivided into nine subwatersheds as follows:

Niagara Peninsula Conservation Authority

- Lincoln (Municipality)
- Twenty Mile Creek
- Fifteen Sixteen Eighteen Mile Creek
- Upper Welland River
- Central Welland River
- Big Forks Creek
- Welland Feeder Canal
- Lake Erie North Shore

Grand River Conservation Authority

- Lower Grand River

Mapped features that were not deemed to be water bodies are listed in **Table 3.1** with exclusion criteria indicated. Additional information is provided in **Appendix A (Figures 3.1 to 3.56)** and in **Appendix B** and **Appendix C**. Within each subwatershed, only those water features occurring within 120 m of the Project Location, and that were deemed to be water bodies, are summarized in Sections 4.1 and 4.2 and in **Table 4.2** through **4.10**. Each subwatershed is discussed in further detail below in Sections 4.1 and 4.2.

Weather conditions during field investigations are presented in Table 4.1.

Table 4.1: Site Investigations Information

Dates	Daily Duration of Site Visit	Air Temperature (Range) °C	Precipitation in 24 hours prior to Survey
April 4 -5, 2012	9:30 am – 3:15 pm	10-12	None
April 19, 2012	8:15 am – 4:30 pm	10-15	None
June 6 – 8, 2012	8:30 am – 6:30 pm	20-30	None
June 11-13, 2012	9:00 am – 5:45 pm	20-30	None
June 18-22, 2012	8:45 am – 4:45 pm	25-32	Light rain on the 18th
September 19, 2012	2:20 pm -7:30 pm	15-17	yes

4.1 NIAGARA PENINSULA CONSERVATION AUTHORITY

4.1.1 Lincoln (municipality) Subwatershed

Within the Project Location, the Lincoln subwatershed is characterized by relatively short, permanently flowing watercourses that originate on the Niagara Escarpment and flow north to Lake Ontario. There are three subcatchments in this subwatershed including Beamsville Creek, Thirty Mile Creek, and Lake Ontario. The subwatershed is a mix of rural and urban land use, and contains agricultural land, forested areas, portions of the Town of Grimsby, and portions of the community of Beamsville (part of the Town of Lincoln).

Habitat information at the locations identified in **Figures 4.1** through **4.56** is provided in **Table 4.2** along with references to general impacts, mitigation measures and predicted net effects of specific project components.

Table 4.2: Summary of Fish Habitat within the 120 m Zone of Investigation – Lincoln Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
1-1	Site observations made at roadside due to no property access. Intermittent flow. Approximately 2 m wide (bankfull) channel dominated by <i>Typha</i> sp.	Transmission line to be located within 120 m of a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
1-3	Permanent flow dominated by riffle morphology. Riparian area dominated by mature trees and a variety of shrubs. In-water vegetation dominated by <i>Typha</i> sp. and reed canary grass. Bankfull width = 2.5 m Wetted width = 1 m Water depth = 15 cm Substrate = Cobble, silt, boulder, and gravel.	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for Overhead Line Construction may apply (Appendix D).	None expected
2-2	Permanent flow dominated by riffle morphology. Riparian area consists of jewelweed, walnut, and sugar maple. In-water vegetation dominated by <i>Typha</i> sp. Bankfull width = 2.5 m Wetted width = 1 m Water depth = 15 cm Substrate = Cobble, silt, boulder, and gravel.	Transmission line to be located within 120 m of a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
2-3	Intermittent flow which was dry during field investigations. Sumac and maples predominate in riparian area. Bankfull width = 2 m Substrate = Cobble, silt, and boulder.	Transmission line to be located within 120 m of a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
3-1	Intermittent flow which was dry during field investigations. <i>Typha</i> sp. and <i>Phragmites</i> sp. dominate channel. Bankfull width = 4 m Substrate = soil	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for Overhead Line Construction may apply (Appendix D).	None expected
3-2	Intermittent flow which was dry during field investigations. Riparian area dominated by sumac, maple. Perched culvert at Mountain view Road. Bankfull width = 2 m Substrate = Silt, sand, detritus, and clay.	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
3-3	Intermittent flow which was dry during field investigations. <i>Typha</i> sp. and <i>Phragmites</i> sp. dominate in-channel vegetation. Bankfull width = 4 m Substrate = Silt, clay, gravel, and sand.	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
4-1	Intermittent flow with water present only on west side of Mountainview Road. In-channel vegetation dominated by <i>Typha</i> sp. Bankfull width = 2 m Wetted width (west side of road) = 1.5 m Substrate = Silt and detritus (west side)	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

^a see Appendix A

^b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.1.2 Twenty Mile Creek Subwatershed

Twenty Mile Creek is the second largest subwatershed within the NPCA jurisdiction (NPCA, 2006). Within the Project Location, the Twenty Mile Creek subwatershed contains four major watercourses: North Creek, Twenty Mile Creek, Spring Creek, and Gavora Ditch. North Creek converges with Spring Creek near the west edge of the Project Location and is characterized by a meandering channel surrounded by agricultural fields. Twenty Mile Creek and Spring Creek are relatively wide, broadly meandering watercourses that flow generally east through forested areas within the Project Location. Gavora Ditch is a straightened, trapezoidal channel with sporadic patches of forested riparian areas. Background data suggests that all watercourses in the Twenty Mile Creek subwatershed within the Project Location possess intermittent flow regimes (NPCA 2008a). According to NPCA's Twenty Mile Creek Watershed Plan (NPCA 2006), the majority of watercourses that fall within the Project Location are considered "Type 2" or "important" fish habitat as defined in the MNR document entitled "*Niagara Regional Municipality Fish Habitat Types with Management Rationale.*" (MNR, 2000)

Habitat information at the locations identified in **Figures 4.1 to 4.56** is provided in **Table 4.3** along with references to general impacts, mitigation measures and net effects of specific project components.

Table 4.3: Summary of Fish Habitat within the 120 m Zone of Investigation – Twenty Mile Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
8-1	Intermittent flow with in-channel vegetation consisting of <i>Typha</i> sp. and reed canary grass. Bankfull width = 1.5 m Substrate = Clay, silt, and gravel	Transmission line to be located within 120 m of a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
9-1	Intermittent flow with in-channel vegetation consisting of <i>Typha</i> sp. and reed canary grass. Bankfull width = 5 m – 7 m	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
11-2	Permanent flow dominated by run morphology. In-water vegetation consists of <i>Nuphar</i> sp. and duckweed. Bankfull Width = 15 m Wetted Width = 10 m Water Depth = 80-100 cm Substrate = silt and clay	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
13-1	Intermittent flow with in-channel vegetation consisting of reed canary grass and marsh marigold. Bankfull width = 5 m Substrate = soil	Water body to be crossed by transmission line (2 crossings) and collector line (1 crossing).	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
13-3	Permanent flow dominated by run morphology. In-channel vegetation consists of <i>Typha</i> sp., duckweed, and reed canary grass. Bankfull width = 12 m Wetted width = 3 m Water depth = 30 cm Substrate = Clay, silt, and sand	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
16-3	Intermittent flow. Dry during field investigations. In-channel and riparian vegetation consists of reed canary grass. Bankfull width = 3 m Substrate = Clay, silt, and sand	Transmission line to be located within 120 m of a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
18-1	Intermittent flow and dry during field investigations. Water body present on west side of Port Davidson Road only. In-channel vegetation dominated by <i>Typha</i> sp. Bankfull width = 2 m Substrate = Silt, clay, and sand	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction (Appendix D).	None expected
T088-1a	Intermittent flow. Dry during field investigations. Undercut banks observed in-channel. Bankfull width = 2 m Substrate = Sand, gravel, clay, boulder, and cobble.	Collector line and access road to Turbine 88 to be located within 120 m of a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T088-1b	Intermittent flow and dry during field investigations. Narrow defined channel through reed canary grass	Collector line and access road to Turbine 88 to be located within 120 m of a water body.	Construction activities associated with installing the collector line may affect the reach outside the	Ensure implementation of appropriate mitigation measures. See Section 6.1.	Installation of new access road culvert. Can likely be mitigated –

Table 4.3: Summary of Fish Habitat within the 120 m Zone of Investigation – Twenty Mile Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
	on east side of Woods Road only. Bankfull Width = 0.50 m Substrate = silt		constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).		unlikely that DFO authorization would be required.
WR-2	Intermittent flow and dry during field investigations. Riparian area predominantly consists of grasses. Bankfull Width = 3 m Substrate = silt	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
WR-1	Permanent flow and dry during field investigations. Riparian area is predominantly grasses. Bankfull width = 3 m Wetted width = 1 m Substrate = silt	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
FR-1	Intermittent flow in a trapezoidal channel. Dry during field investigations. Riparian area consists predominantly of grasses. Bankfull Width = 3-4 m Substrate = silt	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
FR-4	Permanent flow and is dominated by pool morphology. Riparian area predominately consists of trees and grasses. In-water cover is comprised of deep pools, aquatic vegetation, and woody debris Bankfull width = 6 m Wetted width = 3 Water depth = 0.10 m Substrate = silt and clay	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
FR-3	Intermittent flow and dry during field investigations. Riparian area is dominated by grasses. Bankfull width = 3 m Substrate = silt	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
SGR3-3	Permanent flow with 100% pool morphology. Riparian area consists predominantly of grasses. In-water cover includes deep pool, aquatic vegetation, and woody debris. Bankfull width = 6 m Wetted width = 3 m Water depth = 0.05 m Substrate = silt	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
SGR3-2	Intermittent flow with poorly defined channel in grassy field which was dry during field investigations. Riparian area has sparse grass cover. Substrate = silt	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.3: Summary of Fish Habitat within the 120 m Zone of Investigation – Twenty Mile Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
SGR3-1	Intermittent flow and dry during field investigations. Riparian area consists predominantly of grasses. Substrate = silt	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
Younge-1	Permanent flow and dominated by pool morphology. Riparian area consists predominantly of grasses. In-water cover includes aquatic vegetation, such as <i>Typha</i> sp. Bankfull width = 3 m Wetted width = 1-1.5 m Water depth = 0.10 m Substrate = silt, sand, clay and detritus	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

a see Appendix A

b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.1.3 Fifteen, Sixteen, and Eighteen Mile Creeks Subwatershed

The Fifteen, Sixteen and Eighteen Mile Creeks subwatershed arises above the Niagara Escarpment as a series of straightened agricultural drains with sparsely vegetated riparian areas. The watercourses flow in a generally northeasterly direction before falling over the Niagara Escarpment and converging with Lake Ontario.

Mapping presented in the Fifteen, Sixteen, and Eighteen Mile Creeks Subwatershed Plan (NPCA, 2008) indicates that the majority of Fifteen and Sixteen Mile Creeks and their tributaries are considered “Type 1” or “critical” fish habitat, and that the majority of Eighteen Mile Creek and its tributaries are considered “Type 2” or “important” fish habitat as defined by MNR (2000). The report also indicates that the following thirty fish species are known to occur within the subwatershed:

- White Sucker
- White Crappie
- Common Carp
- Pumpkin Seed
- Green Sunfish
- Yellow Perch
- Brown Bullhead
- Freshwater Drum
- Gizzard Shad
- White Perch
- Largemouth Bass
- Bluegill
- Emerald Shiner
- Channel Catfish
- Golden Shiner
- Rainbow Smelt
- Round Goby
- Brassy Minnow
- Finescale Dace
- Bluntnose Minnow
- Fathead Minnow
- Blacknose Dace
- Longnose Dace
- Creek Chub
- Northern Hog Sucker
- Central Mudminnow
- Brook Stickleback
- Rock Bass
- Black Crappie
- Johnny Darter

Habitat information at the surveyed locations identified in **Figures 4.1 to 4.56** is provided in **Table 4.4** along with references to general impacts, mitigation measures and net effects of specific project components.

Table 4.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Fifteen, Sixteen, and Eighteen Mile Creeks Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
51-1	Intermittent flow in moderately defined channel through <i>Typha</i> sp. Dry during field investigations. Riparian area predominately consists of <i>Typha</i> sp. Channel is dominated by aquatic vegetation such as <i>Typha</i> sp. and reed canary grass. Bankfull Width = 4 m	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
52-1	Permanent flow dominated by run morphology. In-stream vegetation consists of iris, <i>Typha</i> sp., water plantain and duckweed. Bankfull Width= 5 m Wetted Width = 2.5 m Water depth = 10 cm Substrate = gravel, sand and cobble	Collector line to cross a water body (2 crossings).	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
54-1	Permanent flow dominated by pool morphology. Riparian area consists of reed canary grass. Bankfull Width = 1 m Wetted Width = 0.6 m Water Depth = 10 cm Substrate = sand, gravel and silt	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
61-1	Intermittent flow and dry during field investigations, standing water within culvert. Shallow channel definition. Riparian area dominated by reed canary grass. Bankfull Width = 20 m Watercourse Width = 2.5 Substrate = Sand, gravel and muck	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T028	Permanent flow dominated by run morphology. Bankfull Width = 1.2 m Wetted Width = 1 m Water Depth = 2 cm Substrate = Gravel and sand	Collector line and, access road and Turbine 28 to be located within 120 m of a water body.	Construction activities associated with installing the collector line, access road and turbine may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T079-2A	Intermittent flow dominated by pool morphology. In-water cover consists of aquatic vegetation such as water plantain and algae. Bankfull Width = 2 m Wetted Width = 1 m Water Depth = 2 cm Substrate = Sand, cobble, gravel, boulder and bedrock	Collector line, access of road, and Turbine 79 to be located within 120 m of a water body.	Construction activities associated with installing the turbine may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Section 5.1).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T079-2C	Permanent flow dominated by flat morphology. In-water cover consists of undercut banks, deep pools, woody debris and aquatic vegetation (water plantain). Bankfull Width = 2.5 m Wetted Width = 1 m Water Depth = 2 cm Substrate = Sand, coble and gravel	Turbine 79 to be located within 120 m of a water body.	Construction activities associated with installing the turbine may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected

Table 4.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Fifteen, Sixteen, and Eighteen Mile Creeks Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T079-1	Permanent flow dominated by pool morphology. In-water cover consists of undercut banks, deep pools, and boulders. Riparian area consists of grasses with few trees. Bankfull Width = 8 m Wetted Width = 4 m Water Depth = 50 cm Substrate = Boulder, cobble, clay, silt, sand and gravel	Turbine 79 to be located within 120 m of a water body providing fish habitat. Turbine 79 access road to be located within 120 m of a water body.	Construction activities associated with installing the turbine may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Section 5.1).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T018-1	Intermittent flowing, straightened channel with well-defined bed and banks. Riparian area consists of grasses and shrubs. Bankfull Width = 2 m Wetted Width = dry Water Depth = n/a Substrate = Sand	Turbine 18 access road to cross a water body.	Construction activities associated with installing the turbine may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Section 5.1).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T004-2	Intermittent flow and dominated by aquatic vegetation. Dry during field investigations. Bankfull Width = 1.5 m Substrate = Clay, gravel, sand	Collector line to cross a water body. Access road to Turbine 4 to be located within 120 m of a water body.	Construction activities associated with installing the collector line and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T004-1	Intermittent flowing trapezoidal channel dominated by aquatic vegetation (water plantain, <i>Juncus</i> sp., and reed canary grass), dry during field investigations. Bankfull Width = 4.5 m Substrate = Clay, sand	Collector line and access road to Turbine 4 to be located within 120 m of a water body.	Construction activities associated with installing the collector line and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T004-6	Intermittent flow and dry during field investigations. Low-lying swale with channel definition in some areas. Bankfull Width = 1 m Substrate = Clay, sand	Collector line and access road to Turbine 4 to be located within 120 m of a water body.	Construction activities associated with installing the collector line and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T004-3	Intermittent flow and dry during field investigations. In-water cover consists of water plantain, reed canary grass and <i>Typha</i> sp. Bankfull Width = 2 m Substrate = Clay, sand	Collector line, access road and Turbine 4 to be located within 120 m of a water body.	Construction activities associated with installing the collector line and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T004-4	Low-lying wet area dominated by aquatic vegetation. Riparian area consists of <i>Typha</i> sp., willows and shrubs and has about a 40% cover.	Collector line, access road and Turbine 4 to be located within 120 m of a water body.	Construction activities associated with installing the collector line and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T058-1	Intermittent flowing, shallow channel dominated by grasses sp. and <i>Juncus</i> sp. Dry during field investigations. Bankfull Width = 1 m Wetted Width = 0.5	Collector line, access road and Turbine 58 to be located within 120 m of a water body.	Construction activities associated with installing the collector line and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected

Table 4.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Fifteen, Sixteen, and Eighteen Mile Creeks Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
	Water Depth = n/a Substrate = Clay, sand		5.4).		
T059-2	Intermittent flow and dry during field investigations. Water body located within a forested area. Bankfull Width = ~2 m Substrate = n/a	Collector line, access road to Turbine 59 to cross a water body. Turbine 59 to be located within 120 m of a water body.	Construction activities associated with installing the collector line, turbine and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
55-1	Intermittent flow and dry during field investigations. Riparian area dominated by trees and shrubs. Bankfull Width = 3 m Substrate = Clay, silt, muck	Collector line to be within 120m of a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
56-4	Intermittent flow with undercut banks observed during field investigations. Dry during field investigations. Bankfull Width = 2 m Water Depth = dry Substrate = Silt, muck, gravel	Collector line to cross a water body. Access road to Turbine 56 to be within 120 m of a water body.	Construction activities associated with installing the collector line and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
57-3	Intermittent flow with standing water observed in culvert during field investigations. Bankfull Width = 4 m Water Depth = 4 cm Substrate = Silt, clay, muck	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T059-4	Intermittent flow dominated by pool morphology. Riparian area consists of grasses. Bankfull Width = 2.5 m Wetted Width = 1.5 m Water Depth = 5 cm Substrate = Silt, clay, sand	Collector line to cross a water body. Access road to Turbine 57 to be within 120 m of a water body.	Construction activities associated with installing the collector line and access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
57-2	Intermittent flow dominated by pool morphology. Riparian area consists of grasses with sparse mature trees. Bankfull Width = 6 m Wetted Width = 3.5 m Water Depth = 10 cm Substrate = Silt, muck, clay	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
58-2	Intermittent flowing channel which was dry during field investigations. Reed canary grass observed in riparian area, but not in-channel. In-water cover consists of undercut banks. Bankfull Width = 1 m Wetted Width = 0.3 m Substrate = Silt, muck, clay, sand and gravel	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
58-1	Intermittent flow and dry during field investigations. Bankfull Width = 1 m Substrate = Silt, muck, clay, gravel, sand, marl	Collector line to be within 120 m of a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in	. Ensure implementation of appropriate mitigation	None expected

Table 4.4: Summary of Fish Habitat Within the 120 m Zone of Investigation – Fifteen, Sixteen, and Eighteen Mile Creeks Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
			surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	measures. See Section 6.1.	
60-1	Permanent flow dominated by flat morphology. Riparian area consists of sparse shrubs with occasional trees. In-water cover provided by deep pools, undercut banks, and aquatic vegetation. Bankfull Width = 9 m Wetted Width = 8 m Water Depth = >100 cm Substrate = channel too deep to observe substrate	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

a see Appendix A

b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.1.4 Upper Welland River Subwatershed

Within the Project Location, the Upper Welland River is a broadly meandering watercourse with a sparse, narrow riparian area. Welland River Subwatershed tributaries within the Project Location consist primarily of Class C (i.e., permanent flow, warmwater, no sensitive species/communities present) and Class F (i.e., intermittent flow) municipal drains (OMAFRA, 2011). The NPCA (2011) indicates that within the Project Location, Upper Welland River tributaries, including the main channel of the river and tributaries located to the north, contain a mix of “Type 1” or “critical” and “Type 2” or “important” fish habitat as defined by MNR (2000). MNR (2008) indicates that the following thirty-three fish species are present in Upper Welland River subwatershed and its tributaries within the Project Location:

- Shorthead Redhorse
- Northern Pike
- Grass Pickerel
- White Sucker
- Walleye
- White Crappie
- Common Carp
- Pumpkinseed
- Rock Bass
- Green Sunfish
- Yellow Perch
- Black Bullhead
- Yellow Bullhead
- Brown Bullhead
- Freshwater Drum
- White Perch
- Largemouth Bass
- Bluegill
- Channel Catfish
- Tadpole Madtom
- Blackside Darter
- Logperch
- Golden Shiner
- Common Shiner
- Mimic Shiner
- Brassy Minnow
- Bluntnose Minnow
- Fathead Minnow
- Creek Chub
- Central Mudminnow
- Brook Stickleback
- Johnny Darter
- Black Crappie

Tributaries south of the Welland River have not been classified by the MNR with respect to habitat type, but have been subject to assessment under DFO’s Drain Classification protocol. The majority of drains south of the Welland River have been designated Class F Municipal Drains (i.e., intermittent flow).

Habitat information at the locations identified in **Figures 4.1** to **4.56** is provided in **Table 4.5** along with references to general impacts, mitigation measures and net effects of specific project components.

Table 4.5: Summary of Fish Habitat within the 120 m Zone of Investigation – Upper Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
28-1	Intermittent flow dominated by pool morphology. Bankfull Width = 2.5 m Wetted Width = 2 m Water Depth = 7 cm Substrate = Silt, muck, sand and clay.	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
29-1	Intermittent flow and dry during field investigation. Occasional undercut banks. Bankfull Width = 1.5 m Substrate = Muck, silt and clay	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
30-1	Permanent flow dominated by pool morphology. In-water cover provided by undercut banks and aquatic vegetation. Riparian area consists of sparse mature and immature trees and reed canary grass. Bankfull Width = 6 m Wetted Width = 3 m Water Depth = 20 cm Substrate = Muck, silt, clay and cobble	Transmission line and collector line to cross a water body.	Construction activities associated with installing the transmission line and collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
31-2	Intermittent flow and dry during field investigations. Bankfull width = 2 m Substrate = Muck, silt, clay and cobble	Transmission line and collector line to be within 120 m of a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
32-1	Permanent flow dominated by pool morphology. Riparian area dominated by trees and shrubs. Bankfull Width = 2.5 m Wetted Width = 1.2 m Water Depth = 2 cm Substrate = Muck, silt, clay and sand	Transmission line to cross a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
35-3	Permanent flow dominated by pool morphology. Riparian area consists predominantly of herbaceous plants, with sparse willow. In-water cover consists of reed canary grass, aquatic vegetation and deep pools. Bankfull Width = 40 m (Flood plain) Wetted Width = 30 m Water Depth = >100 cm Substrate = Muck, silt, clay and sand	Transmission line and collector line to cross a water body.	Construction activities associated with installing the transmission line and collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T091	Intermittent flow in trapezoidal channel. Standing water observed during field investigation. Bankfull Width = 3 m Wetted Width = 1.5 m Water Depth = 30 cm Substrate = Muck, silt, clay and detritus	Access road to Turbine 91 to be within 120 m of a water body.	Construction activities associated with installing the access road may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1 and 5.2,).	Ensure implementation of appropriate mitigation measures. See Sections 6.1.	None expected

Table 4.5: Summary of Fish Habitat within the 120 m Zone of Investigation – Upper Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T041-2	Intermittent flow dominated by pool morphology. Standing water observed within channel during field investigations. In-water cover provided by deep pools. Bankfull Width = 5 m Wetted Width = 0.4 m Water Depth = 20 cm Substrate = Silt, clay and muck	Access road and Turbine 41 to be within 120 m of a water body.	Construction activities associated with installing the access road and turbine may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1 and 5.2,).	Ensure implementation of appropriate mitigation measures. See Sections 6.1.	None expected
T072-1	Intermittent flow dominated by run morphology. Standing water observed within channel during field investigations. Riparian area contains sparse grasses. Bankfull Width = 4 m Wetted Width = 1.5 m Water Depth = 15 cm Substrate = Silt and muck	Access road to Turbine 72 to cross a water body. Turbine 72 and collector line to be within 120 m of a water body.	Construction activities associated with installing the turbine and collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
6-2	Intermittent flowing trapezoidal channel which was dry during site investigation. Riparian area contains grasses. Bankfull Width = 1.5 m Substrate = Soil and grasses	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
6-3	Intermittent flow dominated by 100% pool morphology. Riparian area contains grasses. Channel is dominated by aquatic vegetation such as reed canary grass and Typha. Bankfull Width = 8 m Wetted Width = 1.5 m Water Depth = 20 cm Substrate = Silt, clay and muck.	Collector line (3 crossings) to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

a see Appendix A

b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.1.5 Central Welland River Subwatershed

Within the Project Area, the Central Welland River Subwatershed contains seven subcatchments, including Beaver Creek, Parker Creek, Unnamed Creek, Sucker Creek, and Little Forks Creek (NPCA, 2011). Watercourses in the subwatershed are generally bordered by agricultural lands and flow southeast prior to converging with the central reach of the Welland River. Topography is generally flat or gently sloping towards the Welland River (NPCA, 2011). The majority of watercourses within the subcatchments have been designated “Type 1” or “critical” fish habitat as defined by the MNR (2009). MNR (2008) indicates that the following thirty-two fish species are known to occur in the Central Welland River:

- Bowfin
- Gizzard Shad
- White Sucker
- Bigmouth Buffalo
- Shorthead Redhorse
- Black Bullhead
- Yellow Bullhead
- Brown Bullhead
- Channel Catfish
- Tadpole Madtom
- Johnny Darter
- Logperch
- Brook Silverside
- Freshwater Drum
- White Perch
- Golden Shiner
- Emerald Shiner
- Common Shiner
- Bluntnose Minnow
- Fathead Minnow
- Rock Bass
- Green Sunfish
- Pumpkinseed
- Bluegill
- Northern Pike
- Grass Pickerel
- Largemouth Bass
- White Crappie
- Black Crappie
- Yellow Perch
- Walleye
- Goldfish
- Common Carp

Habitat information at the location identified in **Figures 4.1 to 4.56** is provided in **Table 4.6** along with references to general impacts, mitigation measures and net effects of specific project components.

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
23-2	Intermittent flow dominated by run morphology. In-water cover consists of algae. Riparian area dominated by reed canary grass. Bankfull Width = 1.5 m Wetted Width = 0.5 m Water Depth = 10 cm Substrate = Clay, silt and sand.	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
23-1	Intermittent flow and dry during field investigations. Riparian area consists of reed canary grass. Bankfull = 5 m	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
26-1	Permanent flow dominated by pool morphology. In-water cover provided by deep pools and aquatic vegetation. Bankfull Width = ~25 m Wetted Width = 1.5 m Water Depth = 30 cm Substrate = Muck, silt, and clay	Transmission line and collector line to cross a water body.	Construction activities associated with installing the transmission line and collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
27-1	Natural watercourse dominated by aquatic vegetation. Riparian area consists of sparse ash and shrub species. No property access.	Transmission line to be located within 120 m of a water body.	Construction activities associated with installing the transmission line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Sections 6.1.	None expected
34-1	Intermittent flowing channel which was mostly dry during field investigations. Isolated pool observed at bridge. In-water cover consists of aquatic vegetation and a single deep pool. Bankfull width = 3.5 m Wetted width = 2 m Water Depth = 1.5 m Substrate = Muck and silt	Collector line to cross a water body.	Construction activities associated with installing the collector line may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T008-3a	Isolated open water (80 m x 100m). Riparian area dominated by aquatic vegetation (<i>Typha</i> sp., <i>Sagittaria</i> sp., bulrushes, sedges). Substrate = Muck	Access Road to Turbine 8 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1 and 5.2).	Ensure implementation of appropriate mitigation measures. See Sections 6.1.	None expected
T008-1b	Intermittent flow in straightened, trapezoidal channel. In-water cover consists of isolated deep pools, and aquatic vegetation. Riparian area dominated by grasses trees. Bankfull Width = 3 m Wetted Width = 2 m Water Depth = 5 cm Substrate = Muck	Turbine 8 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the turbine and collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T081-A	Intermittent flowing, trapezoidal channel. Dry during field investigations. Riparian vegetation consists of <i>Typha</i> sp. and grasses. Bankfull = 2 m Substrate = Silt, sand and muck	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
19-4	Intermittent flowing channel which was dry during field investigations. Riparian vegetation consists of <i>Typha</i> sp. and grasses. In-water vegetation is <i>Typha</i> sp. and reed canary grass Bankfull = 2 m	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T097-2	Natural watercourse with intermittent flow dominated by run morphology. In-water cover consists of boulder (rip-rap), and deep pools. Bankfull Width = 1.5 m Wetted Width = 1 m Substrate = Silt, sand, clay, gravel, cobble and boulder.	Collector line and transmission line to cross a water body.	Construction activities within the constructible area of the collector line and transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
22-1	Permanent flow dominated by run morphology. In-water cover consists of woody debris and aquatic vegetation. Bankfull Width = 8 m Wetted Width = 4 m Water Depth = 10 cm Substrate = Silt, clay and sand	Collector line and transmission line to cross a water body.	Construction activities within the constructible area of the collector line and transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
19-3	Intermittent flowing channel which was dry during field investigations. Riparian area consists predominately of <i>Typha</i> sp. and grasses. Bankfull Width = 2.5 - 3 m Substrate = Clay, silt and sand	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
19-5	Intermittent flowing channel which was mostly dry during field investigations, water in culvert. Riparian area consists predominately of mature trees. Substrate = Clay, silt and sand.	Collector line (2 crossings) and transmission line (1 crossing) to cross water body.	Construction activities within the constructible area of the collector line and transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
36-3	Permanent flow dominated by pool morphology. Natural watercourse dominated by aquatic vegetation. Bankfull Width = 10 m (Flood plain) Wetted Width = 1 m Maximum Water Depth = 70 cm Substrate = Muck, Silt and clay	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
20-1	Intermittent flowing defined channel on east side, surficial drainage on the west side. Dry during field investigations. Substrate = Clay, silt and sand	Collector line and transmission line to cross water body.	Construction activities within the constructible area of the collector line and transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
20-2	Intermittent flowing channel which was dry during field investigations. Bankfull Width = 2 m	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
36-1	Permanent flow dominated by pool morphology. In-water cover consists of undercut banks and aquatic vegetation. Bankfull Width = 5.5 m Wetted Width = 4 m Water Depth = ~ 50 cm Substrate = Silt, muck and clay	Collector line to cross water body (2 crossings). Access road to be located within 120 m of water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T036-1	Permanent flow dominated by run morphology. In-water cover consists of undercut banks, and woody debris. Bankfull Width = 7 m Wetted Width = 5 m Water Depth = ~ 40 cm Substrate = Muck, silt and clay	Access Road and collector line to cross water body (3 crossings). Turbine 36 to be located within 120 m of water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T094-1	Intermittent flowing channel which was dry during field investigations. Riparian area consists predominately of grasses. Bankfull Width = 2 m	Collector line (2 crossings) and access road (1 crossing) to cross water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T093-2	Intermittent flow dominated by aquatic vegetation. Riparian area consists predominately of sedges and shrubs. Wetted Width = 4 m Substrate = Muck	Turbine 93H and collector line to be within 120 m of water body.	Construction activities within the constructible area of the collector line and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T093-1b	Permanent flow dominated by pool morphology. In-water cover consists of algae. Bankfull Width = n/a Wetted Width = 15 m Water Depth = ~ 20 cm Substrate = Silt and clay	Collector line (1 crossing) and access road (1 crossing) to cross water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
47-1	Intermittent flow dominated by aquatic vegetation. Dry during field investigations. Riparian area consists of 100% <i>Typha</i> sp.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
47-2	Intermittent flowing channel which was dry during field investigations. Dominated by aquatic vegetation.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
47-3	Intermittent flowing channel which was dry during field investigations. Riparian area consists of 100% <i>Typha</i> sp.	Collector line to cross water body. Access road to be within 120 m of water body	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
48-1	Intermittent flowing channel which was dry during field investigation. Channel is dominated by aquatic vegetation such as <i>Typha</i> sp. and reed canary grass. Bankfull Width = 2 m Substrate = Clay, muck, silt, sand and gravel.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T001-1	Permanent flow dominated by pool morphology. Bankfull Width = 3 m Wetted Width = 1 m Water Depth = ~5 cm Substrate = Clay and sand	Collector line to cross water body. Access road to be within 120 m of water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T055-1	Permanent flow dominated by run morphology. In-water cover consists of undercut banks and aquatic vegetation. Bankfull Width = 2 Wetted Width = 0.6 m Water Depth = 15 cm Substrate = Clay and silt	Access road and Turbine 55 to be within 120 m of water body.	Construction activities within the constructible area of the access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
43-1	Natural watercourse with permanent flow dominated by run morphology. Bankfull Width = 5 Wetted Width = 1-3 m Water Depth = 15 cm Substrate = Clay, silt and sand	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
36-2	Natural watercourse with intermittent flow, dry during field investigation. Bankfull Width = 3 m Substrate = Muck and silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
44-1	Trapezoidal channel with Intermittent flow, dry during field investigation. Riparian area consists predominately of grasses. Bankfull Width = 2.5 m Substrate = Clay, sand and silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
44-2	Natural watercourse with intermittent flow, dry during field investigation. Riparian area consists predominately of grasses. Bankfull Width = 1-2 m Substrate = Clay, sand and silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
37-1	Permanent flow dominated by flat morphology. Natural watercourse dominated by aquatic vegetation. Bankfull Width = 3 m Wetted Width = 1 m Water Depth = 30 cm Substrate = Muck, silt and clay	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
38-1	Natural watercourse with permanent flow dominated by pool morphology. In-water cover consists of undercut banks and aquatic vegetation. Bankfull Width = 3 m Wetted Width = 1 m Water Depth = 10 cm Substrate = Muck, silt and clay	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
38-2	Natural watercourse with permanent flow dominated by pool morphology. Dominated by aquatic vegetation. Bankfull Width = 2 m Wetted Width = 1 m Water Depth = 15 cm Substrate = Muck, silt, clay and sand	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
35-1	Permanent flow dominated by pool morphology. In-water cover consists of deep pool, and aquatic vegetation. Bankfull Width = 4 m Wetted Width = 3 m Water Depth = 15 cm Substrate = Muck and silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
35-2	Permanent flow dominated by pool morphology. In-water cover consists of deep pools and aquatic vegetation. Bankfull Width = 4 m Wetted Width = 3 m Water Depth = ~50 cm Substrate = Silt, muck, clay and cobble	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T031-8	Intermittent flow dominated by pool morphology. Mostly dry during field investigations. Bankfull Width = 3.5 m Substrate = Clay	Turbine 31, access road to Turbine 31 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T032	Permanent flow dominated by flat morphology. Natural watercourse dominated by aquatic vegetation. Bankfull Width = 3 m Wetted Width = 2 m Water Depth = 15 cm Substrate = Muck, silt and clay	Collector line and access road (1 crossing) to cross water body. Turbine 32 to be within 120 m of water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T031-11	Permanent flow dominated by pool morphology. Bankfull Width = 1.5 m Wetted Width = 0.5 m Water Depth = 5 cm Substrate = Clay and silt	Collector line (2 crossings) and access road (1 crossing) to cross water body. Turbine 32 to be within 120 m of water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
55-2	Intermittent flow dominated by aquatic vegetation. Riparian area consists predominately of mature trees. Bankfull Width = 1.2 m Wetted Width = 1 m Substrate = Silt, clay and muck.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
55-2	Intermittent flow in trapezoidal channel. Dry during field investigations. Riparian area dominated by mature trees. Bankfull width = 1.2 m Substrate = Silt, clay, and muck.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
49-1	Intermittent flow dominated by pool morphology. Substrate = Silt, muck, and clay	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T033-1	Permanent flow dominated by pool morphology. Riparian area consists predominately of grasses and small trees. Bankfull Width= 4 m Wetted Width = 1.5 m Water Depth = 3-4 cm Substrate = silt, clay, sand, gravel, cobble and boulder	Turbine 33, access road to Turbine 33 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
46-1	Intermittently flowing channel which contained isolated pools during field investigations. Riparian vegetation consists of grasses and in-water vegetation is reed canary grass. Bankfull Width= 3 m Substrate = clay, silt and sand	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
40-1	Permanent flow with 100% pool morphology. Riparian vegetation comprised of reed canary grass and woodlot. Dominated by aquatic vegetation. Bankfull Width= 2.5 m Wetted width = 2.5 m Water depth = 8 cm Substrate = muck, clay and silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T035H	Permanent flowing trapezoidal channel with 100% pool morphology. Banks are covered with reed canary grass. In-water vegetation is dominated by algae. Bankfull Width= 5 m	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
	Wetted Width = 1 m Water depth = 5 cm Substrate = muck, clay and silt		and 5.4).		
T002-3	Intermittent flowing trapezoidal channel with 100% pool morphology. Riparian area consists predominately of shrubs and aquatic vegetation. Channel is dominated by aquatic vegetation Bankfull Width= 4 m Wetted Width = 1 m Water depth = 2 cm Substrate = detritus, silt and muck.	Turbine 2 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
39-1	Permanent flow with a flat dominated morphology. Riparian vegetation has 5% cover with reed canary grass. Bankfull Width= 3 m Wetted Width = 2.5 m Water Depth = 10 cm Substrate = muck, silt and clay.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
42-1	Intermittent flow with a run dominated morphology. Riparian vegetation has a 3% cover of reed canary grass. The channel is dominated by aquatic vegetation and has undercut banks Bankfull Width= 2.5 m Wetted Width = 1.2 m Water Depth = 5 cm Substrate = clay, sand, silt and muck.	Collector line to cross water body.	Construction activities within the constructible area of the access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1 and 5.2).	Ensure implementation of appropriate mitigation measures. See Sections 6.1 and 6.2. (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T029-3	Intermittent flow with a pool dominated morphology. Riparian area consists predominately of mature trees. In-water cover consists of undercut banks and woody debris. Bankfull Width= 6 m Wetted Width = 3 m Water Depth = 5 cm Substrate = sand, gravel, silt and marl.	Access road to cross water body. Turbine 29 to be within 120 m of a water body.	Construction activities within the constructible area of the access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1 and 5.2).	Ensure implementation of appropriate mitigation measures. See Sections 6.1 and 6.2. (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T078-1	Intermittent flowing channel which was dry during field investigation. Riparian vegetation is reed canary grass which overhangs the channel. Bankfull Width= 1.5 m Wetted Width = 1 m Substrate = clay and sand.	Access road to Turbine 78H and Turbine 78H to be within 120 m of a water body.	Construction activities within the constructible area of the access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1 and 5.2).	Ensure implementation of appropriate mitigation measures. See Sections 6.1 and 6.2. (Appendix D).	None expected
T029-1	Intermittent trapezoidal channel which was dry during field investigations. Riparian vegetation consists predominantly of grasses. In-water cover consists of woody debris and aquatic vegetation. Bankfull Width= 2.5 m Substrate = silt, clay, sand and gravel.	Access road to Turbine 29 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
CR4-11	Intermittent flowing channel which was dry during time of investigation. Riparian area consists of trees and grasses. Bankfull Width= 1-2 m Substrate = silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
CR4-5	Intermittent flowing channel which was dry during time of investigation. Riparian vegetation consists predominantly of grasses, however limited to roadside ditch. Substrate = silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
CR4-8	Intermittent flowing channel which was dry during time of investigation. Riparian vegetation consists predominantly of grasses and trees. Bankfull Width= < 1 m Substrate = silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
CR4-12	Intermittent flowing channel which was dry during time of investigation. Riparian area consists of grasses. Substrate = silt	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
63-2	Intermittent flowing trapezoidal channel. The channel is dominated by aquatic vegetation. Bankfull Width = 5 m Wetted Width = 2.5 m Water Depth = 2 cm Substrate = silt, clay, sand and gravel.	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
3-4	Intermittent flowing channel with 100% isolated pool morphology during the site of investigation. Riparian area consists of grasses. The channel is dominated by aquatic vegetation such as Typha, duckweed and reed canary grass. Bankfull Width = 4 m Wetted Width = 2 m Water Depth = 40 cm Substrate = silt, detritus, cobble and muck.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
4-2	Intermittent flowing channel with 100% isolated pool morphology during the site of investigation. The riparian area consists of grasses. The channel is dominated by aquatic vegetation such as sedges, duckweed and reed canary grass. Bankfull Width = 4 m Wetted Width = 2.5 m Water Depth = 45 cm Substrate = silt, clay and muck.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.6: Summary of Fish Habitat within the 120 m Zone of Investigation – Central Welland River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
4-3	Intermittent flowing channel with 100% isolated pool morphology during the site of investigation. The riparian area consists of grasses. The channel is dominated by aquatic vegetation such as duckweed and reed canary grass. Bankfull Width = 4 m Wetted Width = 2.5 m Water Depth = 40 cm Substrate = silt, clay and muck.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
5-3	Permanent flowing channel with 100% isolated pool morphology during the site of investigation. The riparian area consists of grasses. The channel is dominated by aquatic vegetation such as duckweed, Typha and reed canary grass. Bankfull Width = 5 m Wetted Width = 2 m Water Depth = 30 cm Substrate = silt, clay, detritus and muck.	Collector line to cross water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
8-2	Intermittent flowing channel which was dry during the site of investigation. The riparian area consists of grasses. Bankfull Width = 2 m Substrate = muck and grasses.	Collector line and transmission line to cross water body.	Construction activities within the constructible area of the transmission line and collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
8-3	Intermittent flowing channel which was dry during the site of investigation. The riparian area consists of grasses, Typha and sedges. The channel is dominated by aquatic vegetation such as Typha and sedges. Bankfull Width = 2 m Substrate = silt and muck.	Collector line to cross (2 crossings) water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

a see Appendix A

b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.1.6 Big Forks Creek Subwatershed

Big Forks Creek contains six subcatchments that fall within the Project Location, including Wolf Creek Drain East, Wolf Creek Drain West, North Forks Drain, Ellsworth Drain, East Kelly Drain, and the headwaters of Mill Race Creek. Most water features within the subwatershed consist of straightened agricultural drains with intermittent flows and surrounded by active agricultural fields that possess intermittent flow regimes (OMAFRA, 2011). Background data from the MNR (2008) indicates that main stem of Big Forks Creek extends to approximately 12 km from the confluence with the Welland River. East Kelly Drain is the exception, as it is a municipal drain characterized by permanent flow, a warmwater thermal regime, and the presence of sensitive species/communities (OMAFRA, 2011). Additionally, there are several relatively large forested tracts of land located along Jenny Jump Road that are atypical of land-use within the subwatershed.

MNR (2008) indicates that the following twenty species of fish are present in Big Forks Creek:

- Bowfin
- Central Mudminnow
- Black Bullhead
- Brown Bullhead
- Tadpole Madtom
- White Perch
- Brook Stickleback
- Johnny Darter
- Logperch
- Golden Shiner
- Bluntnose Minnow
- Green Sunfish
- Pumpkinseed
- Bluegill
- Northern Pike
- Largemouth Bass
- White Crappie
- Black Crappie
- Yellow Perch
- Goldfish

Habitat information at the locations identified in **Figures 4.1 to 4.56** is provided in **Table 4.7** along with references to general impacts, mitigation measures and net effects of specific project components.

Table 4.7: Summary of Fish Habitat within the 120 m Zone of Investigation – Big Forks Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
65-3	Intermittent flow with 100% pool morphology. Riparian area has 10% cover of mature trees, shrubs and reed canary grass. Bankfull width = 6 m Wetted width = 2.5m Water depth = 15 cm Substrate = muck, silt, clay and sand.	Transmission line and collector line to cross a water body.	Construction activities within the constructible area of the transmission line and collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
65-4	Permanent flowing trapezoidal channel, with 100% pool morphology. Riparian area consists predominately of ash trees and shrubs. In-water cover consists of dense aquatic vegetation such as duckweed and <i>Typha</i> sp. Bankfull width = 7 m Wetted width = 3 m Water depth = 20 cm Substrate = muck, silt, clay and detritus.	Transmission line and collector line to cross a water body.	Construction activities within the constructible area of the transmission line and collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
68-1	Permanent flowing trapezoidal channel, with 100% pool morphology. Riparian area consists predominately of reed canary grass, mature trees and shrubs. In-water cover consists of aquatic vegetation. Bankfull width = 7 m Wetted width = 3 m Water depth = 15 cm Substrate = muck, silt, clay and sand.	Access road (2 crossings) and collector line (3 crossings) to cross a water body. Turbine 82 and Turbine 19 are within 120 m of a water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T019-1	Permanent flowing trapezoidal channel, with 100% pool morphology. Riparian area consists predominately of elm and ash. In-water cover consists of aquatic vegetation such as <i>Typha</i> sp., and reed canary grass, algae, duckweed, water plantain and sedges. Bankfull width = 7 m Wetted width = 4 m Water depth = 40 cm Substrate = clay and sand.	Access road (2 crossings) and collector line (3 crossings) to cross a water body. Turbine 82 and Turbine 19 are within 120 m of a water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T082-1	Permanent flow with pool morphology (standing water). Riparian area has a 5% cover of shrubs and grasses. Aquatic vegetation observed during field investigations consists of duckweed and pond weed. Bankfull width = 4 m Wetted width = 2 m Water depth = 60 cm Substrate = clay and silt and muck.	Access road and collector line to cross a water body. Turbine 82 is within 120 m of a water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.

Table 4.7: Summary of Fish Habitat within the 120 m Zone of Investigation – Big Forks Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T082-2	Intermittent flowing channel which was dry during field investigations. Riparian area consists predominately of shrubs and grasses. In-water cover consists predominantly of woody debris. Bankfull width = 5 m Wetted width = 1.5 m Substrate = silt and muck.	Turbine 82 is within 120 m of a water body.	Construction activities within the constructible area of the turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Section 5.1).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T013-2	Permanent flow with run morphology. Riparian area consists predominately of algae and grasses. The channel has , duckweed and deep pools for in-water cover Bankfull width = 4 m Wetted width = 1.5 m Water depth = 50 cm Substrate = clay and silt.	Access road (2 crossings) and collector line (3 crossings) to cross a water body. Turbine 13 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T012-1	Intermittent flow with very little water at field investigations. Riparian area consists predominately of Manitoba maple and willow sp. In-water cover consists of aquatic vegetation such as water plantain and <i>Typha</i> sp. Bankfull width = 5 m Wetted width = 2 m Substrate = clay and silt.	Collector line, access road and Turbine 12 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
72-1	Site observations made at roadside due to no property access. Likely intermittent flow. Channel is trapezoidal and riparian area consists of reed canary grass and sparse shrubs. Bankfull Width= 5 m Wetted Width = 2 m	Collector line to cross (3 crossings) a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
71-1	Intermittent flow with no water at field investigations. Riparian area consists of reed canary grass. The channel is dominated by aquatic vegetation. Bankfull width = 5 m Wetted width = 2 m Substrate = silt, muck, clay and sand.	Collector line to cross (3 crossings) a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T065-1	Permanent flow with 100% pool morphology. Riparian area consists of cottonwood, ash, sumac, riverbank grape, <i>Phragmites</i> and dogwood. The channel is dominated by aquatic vegetation such as water plantain, <i>Typha</i> sp., reed canary grass and iris. Bankfull width = 5 m Wetted width = 2.5 m Water depth = 20 cm Substrate = clay and sand.	Collector line to cross (2 crossings) a water body, access road and Turbine 65, transformer station to be located within 120 m of a water body	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.7: Summary of Fish Habitat within the 120 m Zone of Investigation – Big Forks Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
69-2	Intermittent flowing trapezoidal channel with 100% pool morphology. Riparian area consists of mature and immature trees and reed canary grass. In-water cover is provided by aquatic vegetation. Additional cover is provided by overhanging terrestrial vegetation Bankfull width = 4.5 m Wetted width = 2 m Water depth = 5 cm Substrate = sand, muck, sand and clay.	Collector line to be within 120 m from water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
69-1	Permanent flowing trapezoidal channel with 100% pool morphology. Riparian area consists of sparse shrubs and reed canary grass. In-water cover consists of aquatic vegetation and pools. Bankfull width = 7 m Wetted width = 2 m Water depth = 15 cm Substrate = silt, muck, clay and sand.	Collector lines to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
70-1	Permanent flow in a trapezoidal channel with 100% pool morphology. Riparian area has sparse tree and shrub cover. The channel is dominated by aquatic vegetation. Bankfull width = 6 m Wetted width = 3 m Water depth = 30 cm Substrate = silt, muck and clay.	Transmission line and collector line to cross a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T013-3	Permanent flow in a trapezoidal channel with 100% pool morphology. Riparian area vegetation is dominated by silver maple, sumac, willow and reed canary grass. The channel is dominated by aquatic vegetation. In-water cover consists of duckweed. Bankfull width = 7 m Wetted width = 4 m Water depth = 30 cm Substrate = sand and clay.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
66-2	Permanent flow in a trapezoidal channel with 100% pool morphology. The channel is dominated by aquatic vegetation and the banks are well vegetated. Bankfull width = 5 m Wetted width = 3 m Water depth = 15 cm Substrate = silt, muck and clay.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
66-1	Intermittent flow dominated by run morphology. There is no riparian cover. The channel is dominated by aquatic vegetation. Bankfull width = 3.5 m Wetted width = 2.5 m Water depth = 10 cm Substrate = silt, muck and clay.	Transmission line to cross a water body.	Construction activities within the constructible area of the transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.7: Summary of Fish Habitat within the 120 m Zone of Investigation – Big Forks Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
11-3	Intermittent flow. Dry during field investigations. Trapezoidal channel containing reed canary grass. Riparian cover consists of grasses and small shrubs. Bankfull width = 2 m Substrate = Silt.	Transmission line to cross a water body.	Construction activities within the constructible area of the transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
65-2	Permanent flow with 100% pool morphology. Riparian area consists of trees and shrubs. The channel is dominated by aquatic vegetation. In-water cover includes aquatic vegetation, and deep pools. Bankfull width = 10 m Wetted width = 2 m Water depth = 10 cm Substrate = silt, muck, clay, gravel and sand.	Transmission line to cross a water body.	Construction activities within the constructible area of the transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
65-1	Permanent flowing trapezoidal channel with 100% pool morphology. Riparian area consists predominately of trees and shrubs. The channel is dominated by aquatic vegetation. In-water cover is comprised of aquatic vegetation such as water plantain and <i>Typha</i> sp. Bankfull width = 4 m Wetted width = 2.5 m Water depth = 10 cm Substrate = silt, muck, clay and sand.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
74-1	Intermittent flowing trapezoidal channel with 100% pool morphology. Riparian area consists predominately of mature trees, Sumac, reed canary grass and <i>Typha</i> sp. The channel is dominated by aquatic vegetation. In-water cover includes aquatic vegetation and deep pools. Bankfull width = 6 m Wetted width = 3 m Water depth = 5 cm Substrate = silt, muck, clay and sand.	Collector Line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
13-6	Intermittent trapezoidal channel with isolated pools during field investigations. Riparian area contains poplar, willow and a variety of shrub species. In-channel vegetation includes reed canary grass and <i>Typha</i> sp.. Bankfull width = 3 m Wetted width = 1.75 m Water depth = 15 cm Substrate = Silt, detritus, muck and clay.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T084-1	Intermittent flowing channel with 100% run morphology (standing water). There is a 25% riparian cover of grasses and mature trees. Bankfull width = 5 m Wetted width = 1.5 m Water depth = 5-10 cm Substrate = silt and muck.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.7: Summary of Fish Habitat within the 120 m Zone of Investigation – Big Forks Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T089-1	Permanent flowing channel with 100% pool morphology. Riparian vegetation is dominated by elm and ash. In-water cover includes duckweed and overhanging reed canary grass. Bankfull width = 3 m Wetted width = 1.5 m Water depth = 30 cm Substrate = clay and silt.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
73-1	Intermittent flowing trapezoidal channel with 100% pool morphology. Riparian area consists of sumac, reed canary grass, <i>Typha</i> sp. and mature trees. The channel is dominated by aquatic vegetation. In-water cover includes aquatic vegetation, and deep pools. Bankfull width = 6 m Wetted width = 3 m Water depth = 5 cm Substrate = silt, muck, clay and sand.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T089-3	Intermittent flowing channel which was dry during field investigations. The riparian zone includes elm, reed canary grass, maple and ash. Bankfull width = 2 m Wetted width = 1 m Substrate = clay and silt.	Access road to Turbine 89 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1 and 5.2).	Ensure implementation of appropriate mitigation measures. See Sections 6.1 and 6.2.	None expected
T089-2	Permanent flowing trapezoidal channel which was dry during field investigations. Riparian vegetation consists of elm and ash. The channel is dominated by aquatic vegetation such as water plantain, reed canary grass and <i>Typha</i> sp. In-water cover includes aquatic vegetation. Bankfull width = 2 m Wetted width = 1 m Substrate = clay and silt.	Access road to Turbine 89 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T024-1	Permanent flow with 100% run channel morphology and trapezoidal in shape. There is a 45% riparian cover of grasses and small trees. In-water cover includes aquatic vegetation. Bankfull width = 6 m Wetted width = 3 m Substrate = clay, silt and muck.	Collector line and access road to Turbine 24 to cross a water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
9-2	Intermittent flowing trapezoidal channel which was dry during field investigations. The riparian zone includes <i>Typha</i> . Bankfull width = 5 m Substrate = Soil	Transmission line to cross a water body.	Construction activities within the constructible area of the transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.7: Summary of Fish Habitat within the 120 m Zone of Investigation – Big Forks Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
10-1	Intermittent flowing trapezoidal channel which was dry during field investigations. The riparian zone includes small trees. Channel contains reed canary grass. Bankfull width = 2 m Substrate = silt, muck and detritus.	Transmission line to cross a water body.	Construction activities within the constructible area of the transmission line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	
12-2	Permanent flowing trapezoidal channel, parallel to Jenny Jump Road with isolated pools observed during field investigations. The riparian zone contains meadow species and grasses. Channel contains reed canary grass and <i>Typha</i> . Bankfull width = 6 m Wetted width = 2 m Water depth = 20 cm Substrate = silt, clay, muck and detritus.	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
13-5	Intermittent flowing trapezoidal channel which was dry during field investigations. The riparian zone includes meadow species and <i>Phragmites</i> . Bankfull width = 2.5 m Substrate = muck.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
13-6	Intermittent flowing trapezoidal channel with isolated pools observed during site investigations. The riparian zone includes meadow species and poplars. Bankfull width = 2 m Wetted width = 1.5 m Water depth = 10 cm Substrate = silt, detritus and muck.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
13-7	Intermittent flowing trapezoidal channel with 100% isolated pool morphology during the site investigation. The riparian zone includes meadow species and sumac. Channel consists of duckweed and reed canary grass. Bankfull width = 6 m Wetted width = 2 m Water depth = 10 cm Substrate = silt and clay.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
13-8	Permanent flowing trapezoidal channel, parallel to Poth Road with isolated pools observed during the site investigation. The riparian zone includes meadow species and pine. Channel consists of reed canary grass. Bankfull width = 2.5 m Wetted width = 2 m Water depth = 20 cm Substrate = silt, clay and muck.	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
14-1	Permanent flowing trapezoidal channel with 100% isolated pool morphology during the site investigation. The riparian zone includes scrubland	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g.	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream	None expected

Table 4.7: Summary of Fish Habitat within the 120 m Zone of Investigation – Big Forks Creek Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
	species and grasses. Channel consists of reed canary grass and <i>Typha</i> . Bankfull width = 4 m Wetted width = 2 m Water depth = 25 cm Substrate = silt, clay, muck and detritus.		Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Crossing, and Overhead Line Construction may apply (Appendix D).	
15-3	Intermittent flowing trapezoidal channel with 100% isolated pool morphology during the site investigation. The riparian zone includes <i>Typha</i> . Channel consists of <i>Typha</i> . Bankfull width = 3 m Wetted width = 1.5 m Water depth = 15 cm Substrate = clay, silt, muck and detritus.	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
15-4	Intermittent flowing trapezoidal channel with 100% flat morphology. The riparian zone includes <i>Typha</i> and grasses. Channel consists of <i>Typha</i> . Bankfull width = 4.5 m Wetted width = 2 m Water depth = 15 cm Substrate = silt, clay and muck.	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
15-5	Intermittent flowing trapezoidal channel. The riparian zone includes mature forest. The adjacent land-use is an agricultural field. Bankfull width = 4 m	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
15-6	Intermittent flowing trapezoidal channel with 100% isolated pool morphology during the site investigation. The riparian zone includes <i>Typha</i> . Channel consists of <i>Typha</i> . Bankfull width = 3 m Wetted width = 1.5 m Water depth = 15 cm Substrate = clay, silt, muck and detritus.	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

a see Appendix A

b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.1.7 Welland Feeder Canal

Originally established to provide a water source for the Welland Canal, the Feeder Canal is no longer used and is disconnected from any watercourse or watershed. Stagnant water is still present in the channel but the water feature is not considered to provide fish habitat as per the definition under the *Fisheries Act*. Further consultation with the GRCA, NPCA, and DFO may be needed to refine this determination.

Habitat information at the locations identified in **Figures 4.1 to 4.56** is provided in **Table 4.8** along with references to general impacts, mitigation measures and net effects of specific project components.

Table 4.8: Summary of Fish Habitat within the 120 m Zone of Investigation – Welland Feeder Canal

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
79-1	Site observations made at roadside due to no property access. Permanent flow in trapezoidal channel. Riparian area dominated by trees and shrubs. In-water cover includes aquatic vegetation, deep pool, and woody debris. Bankfull Width= 10 m Wetted Width = 8 m Substrate = muck, silt, clay and detritus.	Collector line to be located within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected

a see Appendix A

b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.1.8 Lake Erie North Shore Subwatershed

As the name suggests, all watercourses within the Lake Erie North Shore Subwatershed converge with Lake Erie along its north shore. It is one of the smallest subwatersheds within the Project Location, containing only two subcatchments: Low Banks Drain, and Hoover Drain. NPCA (2010) indicates that these subcatchments have not been evaluated for fish habitat importance. Drain Classification mapping (OMAFRA, 2011) indicates that drains within these two subcatchments are Class D (i.e., permanent flow, cold/coolwater, presence of sensitive species/communities), Class E (i.e., permanent flow, warmwater, presence of sensitive species/communities, greater than 10 years since last clean out), and Class F (i.e., intermittent flow). The Lake Erie North Shore Subwatershed Plan (NPCA, 2010) indicates that the following six species are present in the subwatershed, within the Project Location:

- Banded Killifish
- Emerald Shiner
- Largemouth Bass
- Northern Pike
- Round Goby
- Yellow Perch

Habitat information at the locations identified in **Figures 4.1 to 4.56** is provided in **Table 4.9** along with references to general impacts, mitigation measures and net effects of specific project components.

Table 4.9: Summary of Fish Habitat within the 120 m Zone of Investigation – Lake Erie North Shore Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T049-1	Intermittent flowing channel which was dry during the time of the survey. Riparian area vegetation is dominated by mature trees. In-water cover includes and woody debris. Bankfull width = 6 m Substrate = Silt, muck and detritus.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
83-1	Permanent flow with 100% pool morphology (isolated pools). Riparian area vegetation is dominated by shrubs and trees. In-water cover includes aquatic vegetation. Bankfull width = 8 m Wetted width = 2 m Water depth = 4 cm Substrate = silt, clay and muck.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
83-2	Permanent flow with 100% pool morphology. Riparian area has a 15% cover of Riverbank Grape, trees and shrubs. In-water cover includes deep pools and is dominated by aquatic vegetation. Bankfull width = 10 m Wetted width = 2.5 m Water depth = 30 cm Substrate = muck, clay and silt.	Access road to cross a water body.	Construction activities within the constructible area of the access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2).	See Sections 6.1, 6.2. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T016-1	Permanent flowing trapezoidal channel with unstable banks. Riparian area has a <5% cover of grasses. In-water cover includes, deep pools and such as <i>Typha</i> sp. Bankfull width = 6 m Wetted width = 2 m Substrate = muck, clay and detritus.	Access road to Turbine 16 and collector line to cross a water body. Turbine 16 and Turbine 48 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T044-1	Permanent flows with 100% run channel morphology. Riparian area vegetation is dominated by ash and willow. In-water cover includes woody debris and aquatic vegetation (duckweed, <i>Typha</i> sp.). A huge school of shiners were observed during survey. Bankfull width = 6 m Wetted width = 3 m Substrate = muck, silt, clay and detritus.	Access road to Turbine 44 (2 crossings) and collector line (2 crossings) to cross a water body. Turbine 44 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T061-1	Permanent flow with 90% run and 10% pool channel morphology. Riparian area vegetation is dominated by reed canary grass and other grass species. In-water cover includes deep pools and aquatic vegetation (Pickerelweed). Bankfull width = 3.5 m Wetted width = 2 m Substrate = clay, silt and muck.	Turbine 61, access road to Turbine 61 and collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected

a see Appendix A

b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.2 GRAND RIVER CONSERVATION AUTHORITY

4.2.1 Lower Grand River Subwatershed

Four subcatchments in the Lower Grand River Subwatershed fall within the Project Location, including Dent Drain, West Kelly Drain, Tweed Drain, and Broad Creek Drain. The drains converge with the Grand River within 3 km upstream of its confluence with Lake Erie. Drain Classification mapping (OMAFRA, 2011) indicates that these watercourses are comprised of Class A (i.e., permanent flow, cold/coolwater, no sensitive species/communities present), Class C (i.e., permanent flow, warmwater, no sensitive species/communities present), and Class D (i.e., permanent flow, cold/coolwater, presence of sensitive species/communities) drains.

Habitat information at the locations identified in **Figures 4.1 to 4.56** is provided in **Table 4.10** along with references to general impacts, mitigation measures and net effects of specific project components.

Table 4.10: Summary of Fish Habitat within the 120 m Zone of Investigation – Lower Grand River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T042-2	Permanent flows with 100% run morphology (standing water). Riparian area vegetation is dominated by grass, red osier dogwood and poplars. In-water cover includes and is dominated by aquatic vegetation (Duckweed etc.). Bankfull width = 6 m Wetted width = 2 m Water depth = 40 cm Substrate = silt, clay and muck.	Collector line and access road to cross a water body. Turbine 42 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T098-1	Intermittent flowing trapezoidal channel was dry during field investigations. Riparian area consists of trees and <i>Phragmites</i> . The channel is dominated by aquatic vegetation. In-water cover includes, such as <i>Phragmites</i> . Channel loses definition and becomes a grassy swale. Bankfull width = 3 m Wetted width = 1 m Substrate = clay, sand and detritus.	Access road to Turbine 98 and collector line to cross a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T098-3	Intermittent flowing channel was dry during field investigations. Riparian area vegetation is dominated by elm, cottonwood and riverbank grape. In-water cover includes, and woody debris. Bankfull width = 4 m Wetted width = 1.5 m Substrate = clay, sand and detritus.	Access road to Turbine 98, collector line and T98 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T099-1	Permanent flow with run channel morphology. Riparian area vegetation is dominated by sumac and grasses. In-water cover includes, undercut banks and aquatic vegetation (Arrowhead, Duckweed). Bankfull width = 6 m Wetted width = 2.5 m Water depth = 40 cm Substrate = clay, silt and muck.	Collector line, access road and Turbine 99 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Section 5.1).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T062-1	Intermittent flows with 100% run morphology. Riparian area vegetation is predominately small shrubs and trees. In-water cover includes aquatic vegetation (<i>Typha</i> sp.) and undercut banks. Bankfull width = 5 m Wetted width = 2 m Water depth = 50 cm Substrate = clay, silt and muck.	Collector line and access road to Turbine 62 to cross a water body. Turbine 62 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, turbine and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.

Table 4.10: Summary of Fish Habitat within the 120 m Zone of Investigation – Lower Grand River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
T062-2	Intermittent flows with 100% run morphology. Riparian area vegetation is predominately small shrubs and trees. In-water cover includes aquatic vegetation (<i>Typha</i> sp.), and undercut banks. Bankfull width = 5 m Wetted width = 2 m Water depth = 50 cm Substrate = clay, silt and muck.	Collector line and access road to Turbine 62 to cross a water body.	Construction activities within the constructible area of the collector line, and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T096-1	Intermittent flowing trapezoidal channel which was dry during field investigations. Riparian area vegetation is predominately mature trees. Substrate = muck	Collector line and access road to Turbine 96 to cross a water body.	Construction activities within the constructible area of the collector line, and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
77-1	Intermittent flowing trapezoidal channel that was dry during the survey. Riparian area vegetation is predominately mature trees and shrubs. In-water cover includes and aquatic vegetation. The channel is dominated by in-water vegetation. Bankfull width = 3 m Wetted width = 1.5 m Substrate = silt, muck and clay.	Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
78-1	Site observations made at roadside due to no property access. Intermittent flow, trapezoidal in shape, 100% pool channel morphology. Riparian area offers no cover to the channel. In-water cover consists of aquatic vegetation. Wetted width = 2.5 m	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T099-2	Permanent flow with run morphology. Riparian area vegetation is predominately grasses and small trees. In-water cover includes, undercut banks, deep pools and aquatic vegetation (Duckweed and <i>Typha</i> sp.). Bankfull width = 6 m Wetted width = 2.5 m Water depth = 40 cm Substrate = clay, silt and muck.	Collector line to cross a water body. Access road to Turbine 99 and Turbine 20 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T020-1	Intermittent flowing trapezoidal channel which was dry during field investigations. Riparian area is predominately mature trees. Channel is dominated by in-water aquatic vegetation (<i>Typha</i> sp.). Bankfull = 2 m Substrate = clay and silt.	Access road to cross a water body. Collector line to be within 120 m of a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Sections 6.1, 6.2.	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.
T045-3	Intermittent flowing trapezoidal channel with 100% run morphology (standing water). Riparian area vegetation is predominately <i>Typha</i> sp. In-water cover includes aquatic vegetation.	Collector line and access road to Turbine 45 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected

Table 4.10: Summary of Fish Habitat within the 120 m Zone of Investigation – Lower Grand River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
	Bankfull width = 2 m Wetted width = 1.5 m Water depth = 15 cm Substrate = silt, muck and detritus.		surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).		
T017	Permanent flow dominated run morphology. In-water vegetation milfoil, cattails, and bulrush. Riparian area dominated by grasses. Bankfull width = 3 m Wetted width = 1.5 m Water depth = 0.5 m Substrate = Silt, clay, and muck.	Collector line and access road to Turbine 47 to cross a water body.	Construction activities within the constructible area of the collector line and access road may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T045-1	Permanent flows with 100% run channel morphology (standing water). Riparian area vegetation is predominately terrestrial shrubs. In-water cover includes aquatic vegetation, and woody debris. Bankfull width = 6 m Wetted width = 1.5 m Water depth = 30 cm Substrate = muck, silt and detritus	Collector line, access road, and Turbine 45 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
T045-2	Intermittent flowing trapezoidal channel with 100% run morphology (standing water). Riparian area vegetation is predominately grass species. In-water cover includes aquatic vegetation such as reed canary grass, <i>Typha</i> sp., algae and <i>Phragmites</i> . Bankfull width = 4 m Wetted width = 2 m Water depth = 15 cm Substrate = muck, detritus and silt.	Collector line, Turbine 45 and access road to Turbine 45 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	Ensure implementation of appropriate mitigation measures. See Section 6.1.	None expected
81-1	Permanent flowing trapezoidal channel with Riparian area vegetation is predominately <i>Typha</i> sp. and meadow species. In-water cover includes aquatic vegetation. Bankfull width = 5 m Wetted width = 3 m Water depth = 2 cm Substrate = silt, muck and clay.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T005-3	Intermittent flows with 100% run channel morphology. Riparian area vegetation is predominately grasses. In-water cover includes aquatic vegetation (<i>Typha</i> sp.). Bankfull width = 6 m Wetted width = 1.5 m Water depth = 40 cm Substrate = clay, muck and silt.	Collector line to cross a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected

Table 4.10: Summary of Fish Habitat within the 120 m Zone of Investigation – Lower Grand River Subwatershed

Reach ID ^a	Site Description*	Proposed Works	Potential Impacts	Mitigation	Net Effects ^b
80-1	Permanent flow with 100% pool channel morphology. The channel was dry during the survey. Riparian area vegetation is predominately tree canopy cover. In-water cover includes aquatic vegetation. Bankfull width = 3 m Wetted width = 0.3 m Water depth = 2 cm Substrate = silt, muck and clay.	Collector line to cross (2 crossings) a water body.	Construction activities within the constructible area of the collector line may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction. (see Sections 5.1, 5.3 and 5.4).	See Sections 6.1, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	None expected
T005-1	Intermittent flows with 100% run channel morphology. Riparian area vegetation is predominately grasses. In-water cover includes aquatic vegetation (<i>Typha</i> sp.). Bankfull width = 3 m Wetted width = 1 m Water depth = 10 cm Substrate = silt and muck.	Collector line and access road to Turbine 5 to cross a water body. Turbine 5 to be within 120 m of a water body.	Construction activities within the constructible area of the collector line, access road and turbine may affect the reach despite being outside of the turbine constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction (see Sections 5.1, 5.2, 5.3 and 5.4).	See Sections 6.1, 6.2, 6.3 and 6.4. DFO Operational Statement for High Pressure Directional Drill, Punch and Bore, Isolated or Dry Open-cut Stream Crossing, and Overhead Line Construction may apply (Appendix D).	Installation of new access road culvert. Can likely be mitigated – unlikely that DFO authorization would be required.

a see Appendix A

b assumes all mitigation measures are implemented and successful

*summary of the surveyed reach

4.3 SUMMARY OF CULVERT CROSSINGS AT WATER BODIES

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 if DFO deems impacts to fish habitat to be substantial. Based on previously submitted REA applications, it is likely that Project-related impacts to aquatic habitat can be mitigated and that DFO can issue a Letter of Advice confirming that proposed mitigation measures will prevent net effects to fish and fish habitat.

Locations where *Fisheries Act* approval may be necessary include sites where new roads and culverts are proposed, as well as locations where Project activities require that the size or orientation of existing road culverts is substantially altered. **Table 4.11** presents a list of the 36 locations where culvert crossings are proposed at water bodies. Culverts installed at non-water body locations (e.g. swales) will be field fit and will not require approval under the *Fisheries Act*. Locations of all proposed culverts are presented in the Site Plan found within the Niagara Region Wind Farm Project Description Report.

Table 4.11: Summary of Culvert Crossings at Water Bodies (as per Tables 4.2 to 4.10)

Subwatershed/Reach ID
Twenty Mile Creek
T088-1b
Fifteen, Sixteen, Eighteen Mile Creek
T004-2
T004-1
T004-3
T059-2
57-2
Upper Welland River
T072-1 (2 crossings)
T091
T041-2
Central Welland River
20-1
36-1
T036-1
T094-1
T093-1b
T032, T031-11

Table 4.11: Summary of Culvert Crossings at Water Bodies (as per Tables 4.2 to 4.10)

Subwatershed/Reach ID
42-1, T029-3
Big Forks Creek
68-1, T019-1, T082-1, T013-2
T082-2
T024-1
T042-2
T098-1
Lake Erie North Shore
T016-1
T044-1 (2 crossings)
Grand River : Lower Grand River
T017
T062-1
T062-2
T096-1
T020-1
T005-1

***1 crossing unless otherwise specified**

The conclusions of no net effects (**Tables 4.2 to 4.10**) assume that negative effects associated with turbine construction, overhead and underground collector line installation can be mitigated. It may then be possible to use DFO Operational Statements (see Appendix D) for the construction of these components. When an Operational Statement is used, mitigation measures provided in the Operational Statement will protect fish habitat and no further review or approvals are required. Although specific Operational Statements are referenced in this report, consultation with the DFO may result in site-specific construction methods and mitigation measures for some locations. In such cases, additional sites may require review by the DFO, and details of construction methods, etc. should be submitted for agency review.

5.0 General Overview of Potential Impacts

5.1 GENERAL CONSTRUCTION-RELATED IMPACTS

Project construction activities include land clearing, soil stripping, grubbing, and grading. Potential impacts to watercourses located within 120 m of the Project Location may include:

- Short-term increase in turbidity from runoff and soil erosion during construction;
- Loss of shade;
- Reduced bank stability;
- Reduced allochthonous inputs; and
- Water quality and habitat disturbance effects to aquatic habitat.

5.2 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 watercourse;
- 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.

5.3 OVERHEAD COLLECTOR LINES

Short-term impacts on watercourses may include loss of riparian vegetation which can result in increased turbidity during construction but also affects fish habitat by removing sources of shade, cover and food production. There are no long term impacts associated with the operation and maintenance of overhead collector lines.

5.4 UNDERGROUND COLLECTOR LINES

Potential impacts to fish and fish habitat related to the installation of underground collector lines are as follows:

- Erosion and sedimentation from site disturbance and dewatering;
- Collapse of the punch or bore hole under the stream;
- Disturbing riparian vegetation can reduce shoreline cover, shade and food production areas; and
- Machinery fording the stream can disturb bottom and bank substrates, disrupt sensitive fish life stages and introduce deleterious substances i.e. equipment is not properly maintained.

5.5 TRANSFORMER SUBSTATIONS

The potential for effects on watercourses exists from soil erosion resulting from unavoidable removal of stabilizing vegetative cover during construction activities. 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. Due to the rural and agricultural land uses within the Project boundary, the watercourses are not highly sensitive to temporary disturbances. However, 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).

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

6.0 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 the local municipality, the NPCA/GRCA, and DFO. The extent of mitigation would be dependent on project details such as technical requirements, construction methods and schedule.

6.1 GENERAL MITIGATION MEASURES

There are many mitigation measures to protect fish and fish habitat from potential effects during the construction phase of a project. General mitigation measures for construction activities near a watercourse in the Zone of Investigation 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 warmwater streams in the Niagara District is July 1 to March 15.
- 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;
 - Refueling and maintenance of construction equipment should occur a minimum of 100 m from a water body;
 - As appropriate, spills should be reported 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 natural areas;
 - 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;

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- Topsoil stockpiles should be sufficiently distant from watercourses to preclude sediment inputs due to erosion 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.

6.2 MITIGATION MEASURES FOR NEW CULVERT CROSSINGS

Culverts would be required at watercourses crossed by access roads. Culverts should be sized according to hydrologic requirements to be determined during the detailed design / permit application stage. Other technical requirements 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 habitat, the culvert must continue to convey flow to downstream areas.

Specific methods for culvert installation would be dependent on culvert type, size and construction seasons. If a temporary access road is required, the DFO Operational Statement for Temporary Stream Crossings can be used if the specific conditions can be met. The Operational Statement includes details of mitigation measures.

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

- Cofferdams (e.g., aqua-dams, sand 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 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.
- Cofferdams should be designed to accommodate any expected high flows of the watercourse during the construction period.

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- 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.
- Cofferdams 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).
- 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 re-enter 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 outlet to filter the water prior to re-entry into the watercourse.
- Work should not be completed during flood stage flows or during times when heavy precipitation is occurring or is expected.

6.3 MITIGATION MEASURES FOR OVERHEAD COLLECTOR LINES

The DFO has prepared an Operational Statement for overhead line construction (Ontario Operational Statement Habitat Management Program: Overhead Line Construction – see **Appendix D**). This Operational Statement provides measures to protect fish and fish habitat when undertaking this type of construction activity. In addition to measures identified in the OS, an Emergency Spill Kit should be available on-site in the event of leaks from machinery.

Although construction of overhead lines (as required) would not require any in-water works, as discussed in the Operational Statement, 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 Operational Statement, a proponent may proceed with an overhead line project without DFO review when the following conditions are met:

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- 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 incorporated into the project (abbreviated from the Operational Statement):
 - 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;
 - Adhere to the MNR District timing windows (typical warmwater timing window for the Niagara is July 1 to March 15),
 - 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 an emergency spill 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 plants may be necessary to accommodate the overhead line. This removal should be kept to a minimum and should not be wider than the RoW;
 - 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 grass or shrubs;
 - Vegetate any disturbed areas by planting and seeding preferably native trees, shrubs or grasses and cover such areas with mulch 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 complete re-vegetation of disturbed areas is achieved.

6.4 MITIGATION FOR UNDERGROUND COLLECTOR LINES

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 Operational Statements for all of the above methods and all are included in **Appendix D**. In addition to measures identified in the OS, an Emergency Spill Kit should be available on-site in the event of leaks from machinery.

A summary of mitigation measures for Punch and Bore, High Pressure Directional Drill, and 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 Operational Statements in Appendix D):

- 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 Operational Statement 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 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.

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- 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) (see definition below) 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.
- 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;

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- 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 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 Operational Statement 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.
 - 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*).

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- 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 (see definition below) 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 (see Ontario DFO office list). 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* for carrying out an isolated trenched crossing.

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- 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 Operational Statements in **Appendix D**):

- 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 D** Operational Statement including conditions of use):

- Where an 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;

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- 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.

7.0 Monitoring

7.1 CONSTRUCTION

7.1.1 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. 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-water 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, crane paths and collector lines. The Environmental Monitor should monitor weather forecasts prior to the installation of access roads, crane paths and collector lines, particularly prior to work near aquatic habitats.

The Environmental Monitor will:

- Perform routine checks of all erosion and sediment control measures
- Monitor flow conveyance during in-water works where culvert replacements are required
- Visually inspect access/exit pits and directional drill line for frac-outs
- Inspect drilling equipment and materials for spills/leaks

7.1.2 Performance Objectives/Additional Actions

The Environmental Monitor should ensure that bank, bed, and floodplain conditions are restored to pre-construction conditions, where 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, under the direction of an environmental advisor.

Compensation strategies and/or permits from Fisheries and Oceans Canada and/or the NPCA, as applicable, may include conditions of approval such as construction and post-construction monitoring. All such strategies and/or permits should be obtained prior to construction, and all such conditions and requirements would be implemented as appropriate.

7.2 OPERATION

The Environmental Effects Monitoring Plan for the Project is provided in the Design and Operations Report. Operation 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.

Appropriate remedial measures may be completed as necessary and additional follow-up monitoring conducted as appropriate in the event of an accidental spill and/or leak. The level of monitoring and reporting should be based on the severity of the spill/leak and may be discussed with the MOE (Spills Action Centre) and MNR.

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 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.

8.0 Conclusions

The Niagara Wind Power Project 'Water Assessment and Water Body Report' has been prepared by Stantec for Niagara Region Wind Corporation 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 within 120 m of a proposed Project Location are presented in **Figures 3.1** to **3.56** and summarized in **Table 3.1**. The designation of various features as water bodies was agreed upon by field staff using field conditions at the time of the survey and the definition of water body provided in O. Reg. 359/09.

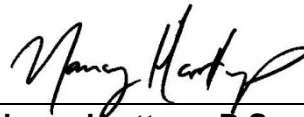
Based on the current Project layout and proposed environmental mitigation measures, in-water work would potentially affect a total of 36 reaches of water bodies containing fish habitat, as presented in **Table 4.11**. Once culvert size and construction methods are finalized, *Fisheries Act* Authorization may be required due to culvert crossings and collector line installation associated with turbine access roads. At the present time, it is expected that all in-water work will result in no permanent impacts to fish or fish habitat and that *Fisheries Act* Authorization can be avoided.

This report has been prepared by Stantec for the sole benefit of Niagara Region Wind Corporation., and may not be used by any third party without the express written consent of Niagara Region Wind Corporation. 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.

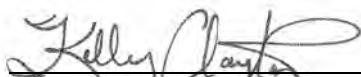
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