

July 2011



NORTHLAND POWER

McLean's Mountain Wind Farm

Water Assessment Site Investigation Report



Submitted by:



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1. Introduction

Northland Power Inc. (Northland Power) and Mnídoo Mníising Power (MMP) propose to develop a wind facility with a maximum name plate capacity of 60 megawatts (MW) located south of Little Current in the Municipality of Northeastern Manitoulin and the Islands, Ontario (Figure 1). The renewable energy facility will be known as the McLean's Mountain Wind Farm and will be rated as a Class 4 wind facility. Northland Power and MMP have received a contract from the Ontario Power Authority (OPA) for the purchase of electricity generated by wind turbines from this renewable facility through the Province's Feed-in-Tariff (FIT) program and enabled by the Green Energy and Green Economy Act. The project will require approval under *Ontario Regulation 359/09 – Renewable Energy Approval (REA or Ontario Regulation 359/09)* under Section V.0.1 of the *Ontario Environmental Protection Act*.

Ontario Regulation 359/09 requires that all renewable energy projects conduct a site investigation for all water bodies that fall within the project location or the prescribed setback area (REA Section 31). This Water Assessment Site Investigation Report was completed to address the regulatory requirements for the REA process and is the second report in a series that fulfills the requirements of the water body assessment. The reports will be submitted to the Ontario Ministry of the Environment (MOE) for review and comment as required in Ontario Regulation 359/09.



Figure 1: General Location of McLean's Mountain Wind Farm in Ontario

2. The Proponent

Northland Power, founded in 1987, is an experienced developer, owner and operator of renewable power generation in Canada and abroad. Company activities include developing, managing, financing and owning renewable energy facilities. In the course of developing renewable energy projects, Northland Power and MMP strive to satisfy the various environmental approval requirements that vary depending on the jurisdiction, project capacity and site location. In addition, Northland Power and MMP build long-term relationships with the communities that host its' projects. Northland Power is committed to the health and welfare of the community of Little Current and the Municipality of Northeastern Manitoulin and the Islands.

Contact information for the Proponent is as follows:

Full Name of Company:	<u>Northland Power Incorporated</u>
Address:	<u>30 St. Clair Avenue West, 17th Floor</u>
Telephone:	<u>(705) 271-5358, (705) 368-0303</u>
Prime Contact:	<u>Rick Martin - Project Manager</u>
Email:	<u>rickmartin@northlandpower.ca</u>

Dillon Consulting Limited is the prime contractor for the preparation of this Site Investigation Report. The contact at Dillon is:

Full Name of Company:	<u>Dillon Consulting Limited</u>
Address:	<u>235 Yorkland Blvd, Suite 800</u> <u>Toronto, Ontario, M2J 4Y8</u>
Telephone:	<u>(416) 229-4646 ext 2355</u>
Fax:	<u>(416) 229-4692</u>
Prime Contact:	<u>Don McKinnon, REA Project Manager</u>
Email:	<u>DPMckinnon@dillon.ca</u>

3. Project Location

The proposed Class 4 wind facility is located in the Municipality of Northeastern Manitoulin and the Islands in northeastern Ontario, and covers approximately 8,200 ha of land south of the Town of Little Current. Figure 1 shows the general location of the project. Figure 2 shows the project location, as defined in Ontario Regulation 359/09 as the location encompassing all projects components, and includes a 120 m setback for adjacent water bodies. All project components, including wind turbines, access roads, and electrical facilities such as transmission lines, inverters, transformers, substations and electrical feeder lines, will be located on private land or municipal rights-of-way. Figure 2 also displays the results of the determinations made during the water assessment records review. The planned wind facility will occur primarily within lands currently zoned as rural, with small areas used for agriculture (Municipality of Northeastern Manitoulin and the Islands Official Plan 2002; see Appendix A).



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McLean's Mountain Wind Farm Figure 2: Water Assessment Records Review

Legend

- Watercourse Crossing
- Local Roads
- Highway
- Watercourse
- 120 m Project Component Setback
- 300 m Project Component Setback
- Quaternary Watershed Boundary
- Lots/Concessions
- Water Body
- Woodland
- Wetland

Project Components

- 24 Wind Turbine Locations
- Five Extra Permitted Sites
- Substation
- Operations Building
- Horizontal Directional Drilling Access/Exit Pit
- Access Road
- Feeder Lines
- Transmission Line
- Construction Staging Area

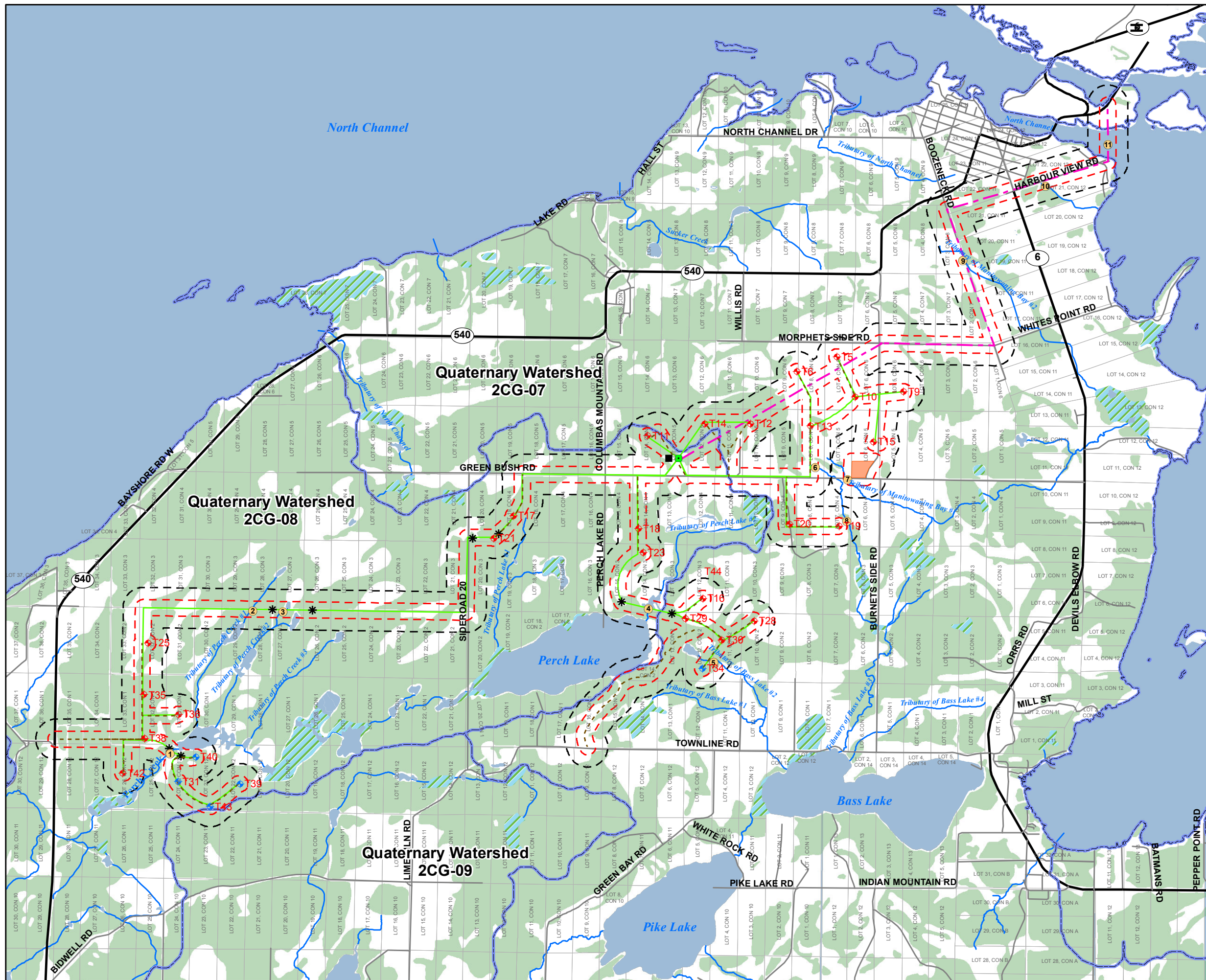


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4. Summary of Records Review

As shown on Figure 2, a records review was completed according to Section 30 of Ontario Regulation 359/09. A summary of the determinations made is outlined in Table 1.

Table 1: Summary of the Water Assessment Records Review

Station ¹	Water Body	Source of Information	Approximate Distance from Project Location to Water Body (m)	Project Components within 120 m
Lakes				
11	North Channel of Lake Huron	MNR Land Information Ontario Mapping	Overlaps	Transmission Line
Lake Trout Lakes				
Not applicable to project location				
Permanent and/or Intermittent Streams¹				
1	Perch Creek	MNR Land Information Ontario Mapping	Overlaps	Feeder Line
			30-120	HDD* access/exit pit
			30-120	Turbine 40
2	Tributary To Perch Creek #1	MNR Land Information Ontario Mapping	Overlaps	Feeder Line
3	Tributary To Perch Creek #2	MNR Land Information Ontario Mapping	Overlaps	Feeder Line
			30-120	HDD* access/exit pit
4	Tributary to Perch Lake #2	MNR Land Information Ontario Mapping	Overlaps	Feeder Line
5	Tributary To Bass Lake #2	MNR Land Information Ontario Mapping	Overlaps	Feeder Line
			Overlaps	Access Road
			30-120	Turbine 34
6	Tributary to Bass Lake #3	MNR Land Information Ontario Mapping	Overlaps	Feeder Line
			Overlaps	Access Road
7	Tributary to Manitowaning Bay #1	MNR Land Information Ontario Mapping	Within 120 m	Construction Staging Area

Station ¹	Water Body	Source of Information	Approximate Distance from Project Location to Water Body (m)	Project Components within 120 m
8	Tributary to Bass Lake #3	MNR Land Information Ontario Mapping	30-120	Turbine 19
9	Tributary to Manitowaning Bay #2	MNR Land Information Ontario Mapping	Overlaps	Transmission Line
10	Unnamed Tributary	MNR Land Information Ontario Mapping	Overlaps	Transmission Line
Seepage Areas				
None located within project location				
Provincial Plan Areas				
None located within project location				

5. Site Investigation Purpose

This site investigation report was completed to analyze the accuracy of the determinations made in the records review. It is consistent with Section 31 of Ontario Regulation 359/09, which states that a person who proposes to engage in a renewable energy project shall ensure that a physical investigation of the land and water within 120 m of the project location is conducted for the purpose of determining:

- whether the results of the analysis summarized in the [Records Review] report are correct or require correction, and identifying any required corrections;
- whether any additional water bodies exist, other than those identified in the records review;
- the boundaries, located within 120 m of the project location, of any water body that was identified in the records review or the site investigation; and,
- the distance from the project location to the boundaries of the water body.

Under Ontario Regulation 359/09, the definition of a water body includes all lakes, permanent and intermittent streams and seepage areas, 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 and spillways;
- d) Roadside ditches that do not contain a permanent or intermittent stream;
- e) Temporary 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 site and outdoor confinement areas.

6. Site Investigation Methodology

Based on the determinations made during the Records Review, all water bodies that met the definition under Ontario Regulation 359/09 and found within 120 m of the project location were the subject of a site investigation of the project location. However, as this project is a transitional project, some of the site investigations were scoped in accordance with the requirements of the Environmental Assessment process. Effort was made to understand the water bodies within the general area of the project location in anticipation of changes to the project location as natural heritage assessment work was undertaken. Based on this, both site-specific investigations and a systems approach were utilized to meet the requirements under Ontario Regulation 359/09.

The project location was visited by site investigators in order to document the water bodies within the project location. Documentation included a record of qualitative and quantitative observations including type of water body, average annual high water mark, habitat types, surrounding riparian composition and representative photographs. Efforts were co-ordinated with the team of site investigators conducting the natural heritage assessment of the project location to locate any potential seepage areas not identified during the records review. All results are discussed according to the quaternary watershed boundaries for tertiary watershed 2CG (Manitoulin Islands Watershed).

6.1 Average Annual High Water Mark Determination

Average annual high water mark determination was approximated from the bank full width due to the relatively flat topography or deep cut channels at most water crossings.

6.2 Name and Qualifications of Site Investigators

The names and qualifications of all site investigators are outlined in Table 2 below. Curriculum vitae's (CVs) for each site investigator has been included in Appendix B. Some of the site investigators listed below have been involved with the McLean's Mountain Wind Farm project since 2004 and are involved in numerous renewable energy projects that are seeking approval under Ontario Regulation 359/09.

Table 2: Names and Qualifications of Site Investigators at the Time of Their Specific Project Involvement.

Name	Degrees and Professional Designations	Years of Experience	McLean's Mountain Wind Farm Project Role	Certifications
Mark Brobbel	• M.Sc. (Biology) • B.Sc. (Honours, Biology) • Registered Professional Biologist, College of Applied Biology of B.C.	18	• Fisheries Habitat Assessment	• Class 2 Electrofishing Crew Leader Certification Course • OMNR Stream Habitat Assessment Training Course, Fish Community Sampling Module
Daniel Knee	• B.Sc. (Honours Biology) • Diploma (Integrated Resource Management Technology)	11	• Fisheries Habitat Assessment	• Class 1 Electrofishing Recertification • MTO/DFO/OMNR Protocol Training for Fisheries Specialists
Lindsay Knezevich	• B.Sc. (Biology) • Ecosystem Survey-Field Skills Certificate	2	• Fisheries Habitat and Community Assessment	• Ontario Stream Assessment Protocol • Class 2 Electrofishing Crew Leader Certification Course
Ben Gottfried	• Fish and Wildlife Technician Diploma	3	• Fisheries Habitat and Community Assessment	• Class 1 Electrofishing Certification Course

6.3 Site Investigation Dates, Times, Duration and Weather Conditions

As outlined in Table 3, multiple site investigations were undertaken over a period of 6 years in the project location. The details of each site investigation, in accordance with REA Section 31, are provided in Table 3 and should be read concurrently with Table 2.

6.4 Access to Adjacent Lands

As outlined in O. Reg. 359/09, all lands within 120 m of a project component must be assessed for water bodies. Often, this can present a dilemma for proponents when the 120 m setback area falls outside of lands leased for the renewable facility. During site investigations access was permitted through landowner and client contact to each watercourse crossing within 120 m of the wind farm layout at the time of investigations.

Table 3: Site Investigation Dates, Times, Duration and Weather Conditions

Date	Survey Type	Site Investigator	Time	Duration (hours)	Weather Conditions	
					EC Weather Station*	Field Conditions
October 26-27, 2004	Fisheries Habitat Screening	Mark Brobbel	Not available	Not available	<i>Temperature:</i> 4.8 – 6.1°C 4.3 – 8.8°C <i>Cloud Conditions:</i> - Cloudy, Mostly Cloudy - Mostly Cloudy, Mainly Clear	Not available
October 1, 2008	Fisheries Habitat Screening	Daniel Knee	Not available	10	<i>Temperature:</i> 4.5 – 6.5°C <i>Cloud Conditions:</i> Cloudy, Drizzle, Rain Showers	Mix of sun and cloud with light wind.
May 4, 5, 6 and 7, 2010	Fisheries Habitat and Community Assessment	Ben Gottfried, Lindsay Knezevich	10:30-19:30	40.5	<i>Temperature:</i> 10 – 14°C 10 – 16°C 5.5 – 10°C 1.4 - 9°C <i>Cloud Conditions:</i> - Mostly Cloudy, Rain Showers, Moderate Rain Showers, Hail - Rain Showers, Mostly Cloudy - Mostly Cloudy - Cloudy	<i>Temperature:</i> 10-18°C <i>Cloud conditions:</i> sunny-cloudy; Occasional light precipitation; Occasional wind

*The nearest Environment Canada (EC) weather station is located in Sudbury

7. Site Investigation Results

Based on the site investigation, the occurrence of water bodies within or within 120 m of the project location are documented below. In addition to assessing the accuracy of the records review, information relating to each water body within the project location and surrounding 120 m was collected, including the type, plant and animal composition and the ecosystem of the land and water. Ecological Land Classification, undertaken as part of the Natural Heritage Assessment (NHA), has been employed to describe the lands within 30 m of a water body. A detailed explanation of the methodology and results can be found in the NHA Site Investigation Report for this project. As discussed in Section 6.0, some efforts were made to re-package site investigations conducted to fulfill the requirements of the Environmental Assessment process. Therefore, in some cases, results will be discussed in the context of the entire project location.

The project location falls within Ecodistrict 6E-17 (Gore Bay) and the Manitoulin Islands Tertiary Watershed 2CG, which lies between the north end of Georgian Bay and Lake Huron and drains into Lake Huron (Henson and Brodribb 2005; Phair *et al.*, 2005). This watershed consists of Manitoulin Island and many smaller islands surrounding it. Characteristics of this watershed include coastal areas, stream systems, lakes and wetlands. A significant portion of the watershed is alvar, with mixed forests, sparse deciduous and coniferous forest and dense deciduous forest found throughout the remainder of the watershed. Approximately 9% of the watershed is made up of stream systems; less than 8% is comprised of lake systems (Phair *et al.*, 2005).

The project location is split between two quaternary watersheds (2CG-08 and 2CG-07; see Figure 3). Watercourse stations 1 – 4 fall within the western quaternary watershed of 2CG-08 with eastern watercourse stations 5 – 11 falling within quaternary watershed 2CG-07. In general, the majority of watercourses within the project location flow towards either Perch Lake or Strawberry Channel (Lake Huron).



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McLean's Mountain Wind Farm Figure 3: Water Assessment Site Investigation

Legend

- Watercourse Crossing
- Local Roads
- Highway
- Watercourse
- 120 m Project Component Setback
- 300 m Project Component Setback
- 30 m Water Features Setback
- 120 m Water Feature Setback
- Quaternary Watershed Boundary
- Lots/Concessions
- Water Body
- Woodland
- Wetland

Project Components

- 24 Wind Turbine Locations
- Five Extra Permitted Sites
- Substation
- Operations Building
- Horizontal Directional Drilling Access/Exit Pit
- Access Road
- Feeder Lines
- Transmission Line
- Construction Staging Area

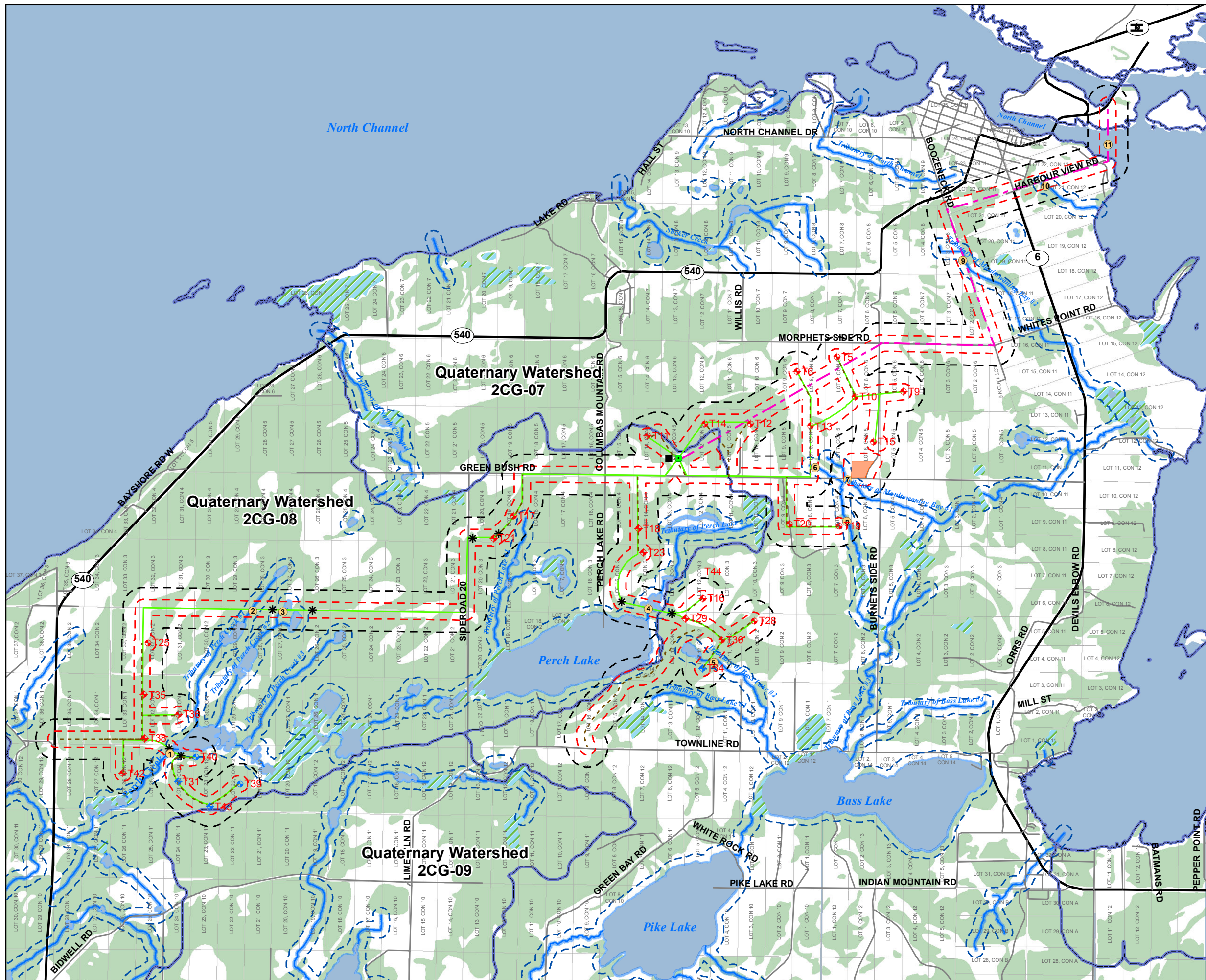


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7.1 The North Channel (*Station 11*)

According to Chart 2207-4 of the Canadian Hydrographic Service, the channel east of the bridge crossing the North Channel has a maximum depth of approximately 6 m. Further east, the depth of the channel approaches 10 m. On the south side of the channel, a rocky beach ranging in width from approximately 6-10 m is present (Photo 1, Appendix C). The slope on the south side of the beach is vegetated with a mix of tree, shrub and herbaceous vegetation. Near shore bottom substrates of the channel were noted to be primarily sand, with some cobble present. The channel width at the swing bridge is approximately 250 m (Photo 2, Appendix C). On the north side of the channel, east of the swing bridge, a low-lying floodplain area is present (Photo 3 and 4, Appendix C). The floodplain is comprised of sand and gravel with grass and sedge hummocks growing throughout. Sporadic willow shrubs were also present. Along the north shoreline, angular cobble is present with some emergent vegetation growth (i.e., sedges, softstem bulrush, etc.). Two submarine cables were noted extending from the water on both sides of the North Channel. The habitat within the North Channel consists of a shallow bedrock channel with no vegetation according to geotechnical analysis. The vegetation community on the southern bank where the transmission line meets Manitoulin Island consists of OAGM4: Open Pasture (Figure 4). The northern bank vegetation community consists of RBSA1-1: Common Juniper Shrub Alvar.

7.2 Lakes

A search and analysis of the records and resources outlined in the records review did not identify any lakes in the project location or within the surrounding 120 m. The results of the site investigation verified this determination.

7.3 Permanent and/or Intermittent Streams in Quaternary Watershed 2CG-07

Station #1

This new crossing location falls along a section of Perch Creek which flows southwest through a wetland area (Photo 5, Appendix C) and over a waterfall as it moves to its discharge point at Lake Huron. This waterfall is a barrier to fish migration to this section of the creek. Flow at the time of field investigations was fairly low with moderate velocity. Aquatic conditions are best characterized by dominant run habitat with some riffle and flats downstream of the crossing and riffle habitat dominating upstream of

the crossing with some runs and a few pools. Stream width ranged from 2.5 m to 20.0 m. In-stream cover within the downstream section of Perch Creek consists of cobble (60%), in-stream woody debris (5%), overhanging woody debris (5%), in-stream vascular macrophytes (10%) and overhanging vascular macrophytes (5%). In-stream cover within the upstream section of Perch Creek consists of boulders (5%), cobble (60%), overhanging woody debris (5%), in-stream vascular macrophytes (5%) and overhanging vascular macrophytes (10%) (Photo 6, Appendix C). Some areas of Perch Creek did not have any in-stream cover available.

Fish habitat is formed by bedrock, cobble, gravel, and detritus substrate. Abundant fish species were observed including bluntnose minnow, creek chub, brook stickleback, northern redbelly dace and central mudminnow. The surrounding vegetation community consists of FOMM10: Fresh-Moist Spruce-Fir Hardwood Mixed Forest, SWDM4-5: Poplar Deciduous Swamp, WODM5-1: Fresh-Moist Poplar Deciduous Woodland and MASM1-1: Cattail Mineral Shallow Marsh (Figure 4). Significant wildlife habitat associated with this crossing includes a Waterfowl Nesting Area (WNA 1; Figure 5), Turtle Overwintering Area (TOA 1; Figure 6) and a Woodland Amphibian Breeding Area (WABH 1; Figure 7). This crossing is also located downstream of a beaver dam. According to the landowner (Bruce Wood - May 7, 2010) this section of Perch Creek is intermittent and recedes into adjacent wetland areas for part of the year.

Station #2

This crossing conveys flow from a small watercourse through two culverts to a standing wetland area which drains into Perch Creek. A small stream flows through a coniferous stand into a wetted ditch (Photo 7, Appendix C). Flow at the time of field investigations was minimal, but the grass channel indicates high flow periods. This watercourse likely provides intermittent habitat and contributes to fish habitat. Abundant woody debris may be responsible for the standing pool on the downstream end with high amounts of algae (Photo 8, Appendix C). Poor water clarity prevented an accurate description of substrate but it is assumed to be muck and detritus based on similar sites. No fish were observed during field investigations. The surrounding vegetation community consists of FOMM10: Fresh-Moist Spruce-Fir-Hardwood Mixed Forest (Figure 4). Significant wildlife habitat associated with this crossing includes Sites Supporting Area-sensitive Species: Forest Birds (FB 2; Figure 8).



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McLean's Mountain Wind Farm Figure 4: Ecological Land Classification Map

Legend

- Local Roads
- Highway
- Watercourse
- 120m Project Component Setback
- Lots/Concessions
- Water Body
- Woodland

Ecological Land Classification (Based on Community Code)

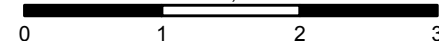
- 1) BO: Bog
- 2) CVC_2: Light Industrial
- 3) CVL_3: Sewage and Water Treatment
- 4) CVR_1: Low Density Residential
- 5) FOD: Deciduous forest
- 6) FODM1: Dry-Fresh Oak Deciduous Forest
- 7) FODM5-1: Dry-Fresh Sugar Maple Deciduous Forest
- 8) FODM8-1: Fresh-Moist Poplar Deciduous Forest
- 9) FOMM10: Fresh-Moist Spruce Fir – Hardwood Mixed Forest
- 10) FOMM4: Dry-Fresh White Cedar Mixed Forest
- 11) MAMM1: Graminoid Mineral Meadow Marsh
- 12) MAMM3: Mixed Mineral Meadow Marsh
- 13) MASM1: Graminoid Mineral Shallow Marsh
- 14) MASM1-1: Cattail Mineral Shallow Marsh
- 15) MASM1-14: Reed Canary Grass Mineral Shallow Marsh
- 16) ME: Meadow
- 17) OAGM4: Open Pasture
- 18) OAO: Open Water
- 19) RBSA1-1: Common Juniper Shrub Alvar
- 20) SWCM1-2: White Cedar-Conifer Coniferous Swamp
- 21) SWDM2: Ash Mineral Deciduous Swamp
- 22) SWDM2-1: Black Ash Deciduous Swamp
- 23) SWDM2-2: Green Ash Deciduous Swamp
- 24) SWDM3: Maple Mineral Deciduous Swamp
- 25) SWDM4-5: Poplar Deciduous Swamp
- 26) SWMM1-1: White Cedar-Hardwood Mixed Swamp
- 27) SWMM3-2: Poplar-Conifer Mixed Swamp
- 28) SWMM4: Ash Mixed Swamp
- 29) SWTM2-5: Red-Osier Dogwood Mineral Deciduous Swamp
- 30) SWTM3: Willow Mineral Deciduous Thicket Swamp
- 31) TAGM4: Treed Pasture
- 32) WODM5-1: Fresh-Moist Poplar Deciduous Woodland

Project Components

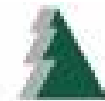
- 24 Wind Turbine Locations
- Five Extra Permitted Sites
- Substation
- Operations Building
- Horizontal Directional Drilling Access/Exit Pit
- Transmission Line
- Access Road
- Feeder Lines
- Construction Staging Area



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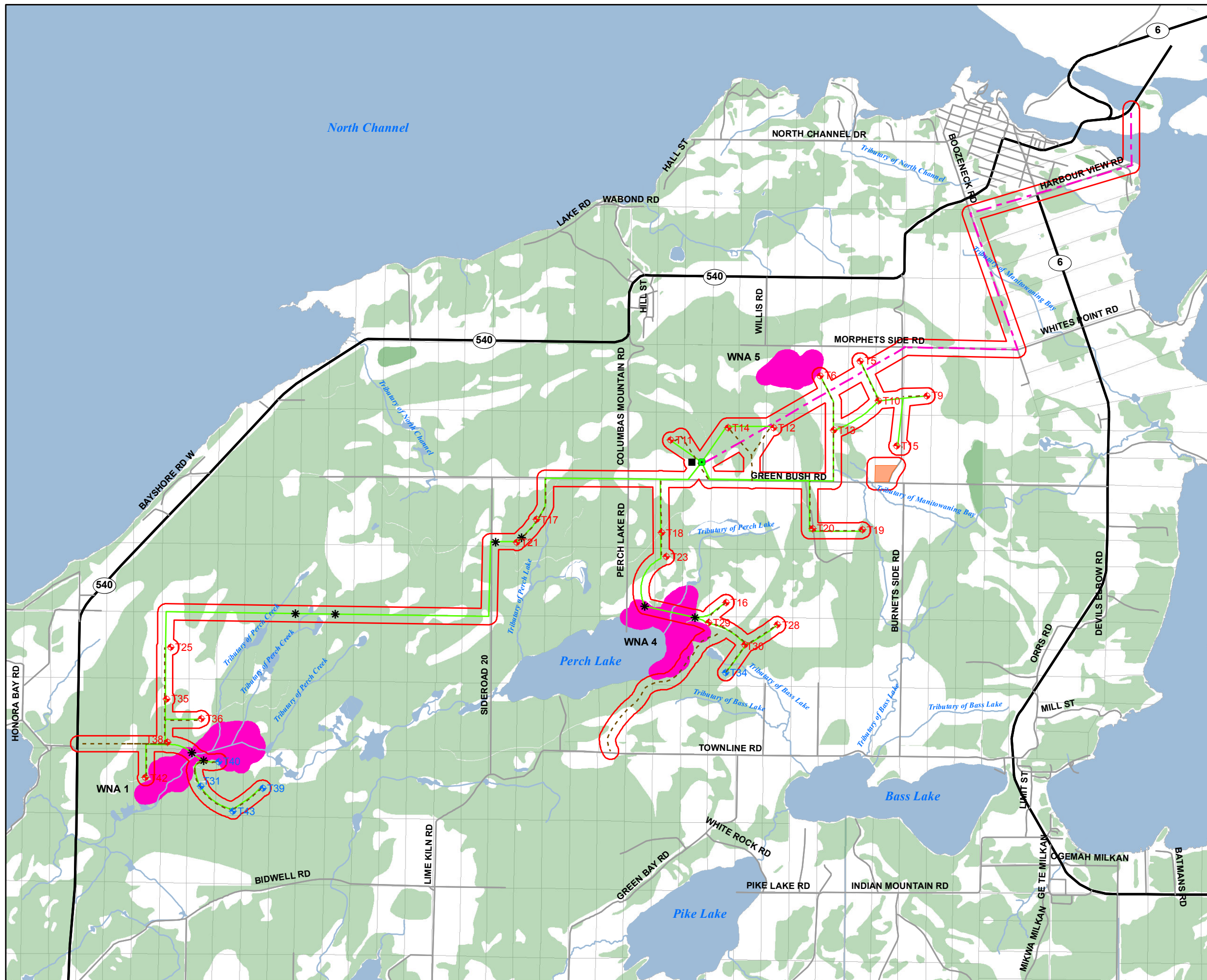
McLean's Mountain Wind Farm Figure 5: Significant Waterfowl Nesting Areas

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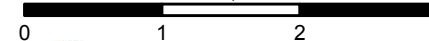
- Local Roads
- Highway
- Watercourse
- 120 m Project Location Setback
- Lots/Concessions
- Water Body
- Unclassified Woodland Community
- Waterfowl Nesting Areas
(Including: MAMM1, MAMM3, MASM1, MASM1-1, MASM1-14, ME, SWDM2, SWDM2-1, SWDM2-2, SWDM3, SWDM4-5, SWTM2-5, SWTM3)

Project Components

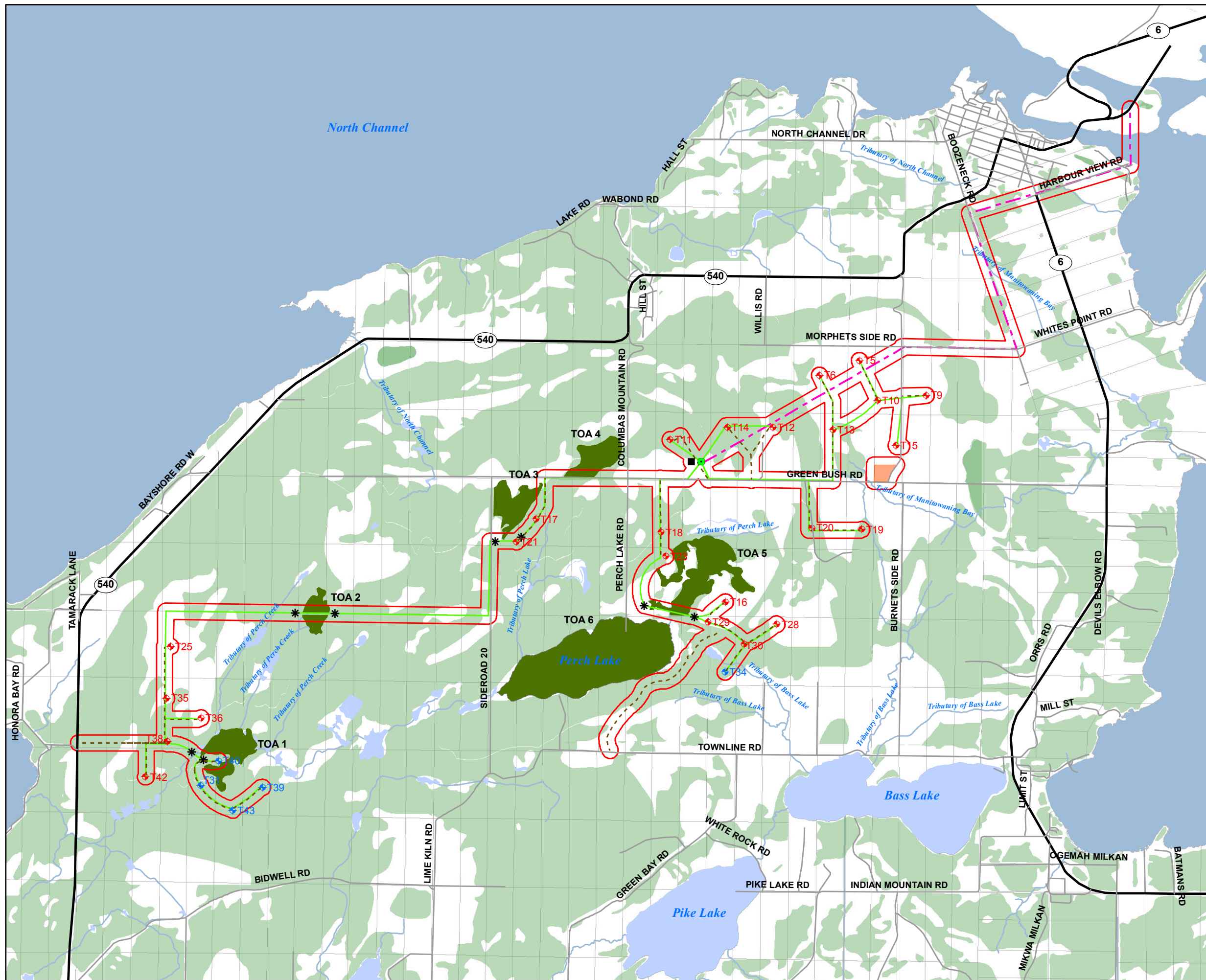
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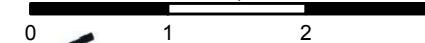
McLean's Mountain Wind Farm Figure 6: Significant Turtle Overwintering Areas

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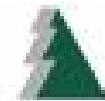
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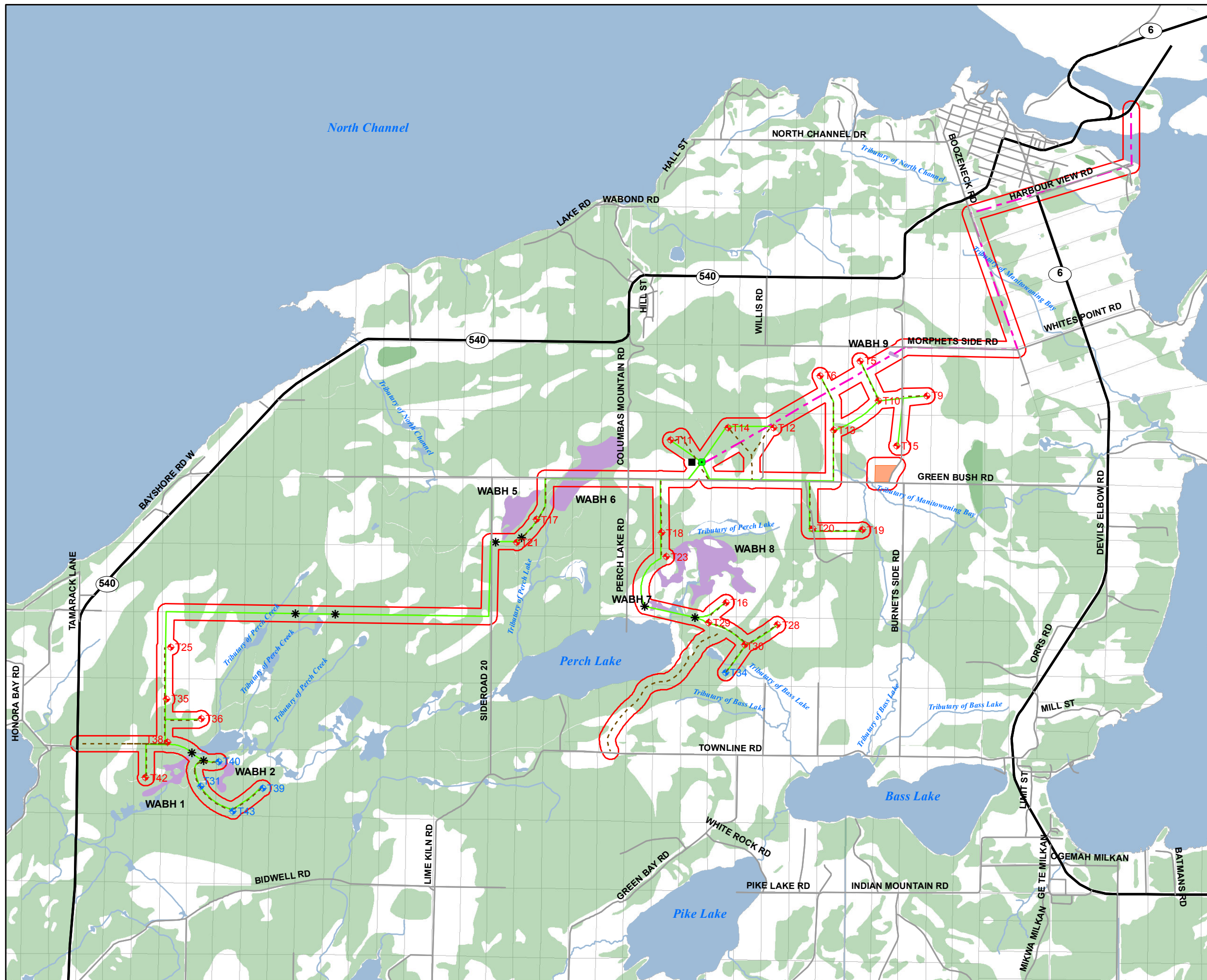
McLean's Mountain Wind Farm Figure 7: Significant Woodland Amphibian Breeding Habitat Areas

Legend

- Local Roads
- Highway
- Watercourse
- 120 m Project Location Setback
- Lots/Concessions
- Water Body
- Unclassified Woodland Community
- Woodland Amphibian Breeding Habitat
(Including: SWDM2, SWDM2-1, SWDM2-2, SWDM3, SWDM4-5, SWMM1-1, SWMM3-2, SWMM4)

Project Components

- 24 Wind Turbine Locations
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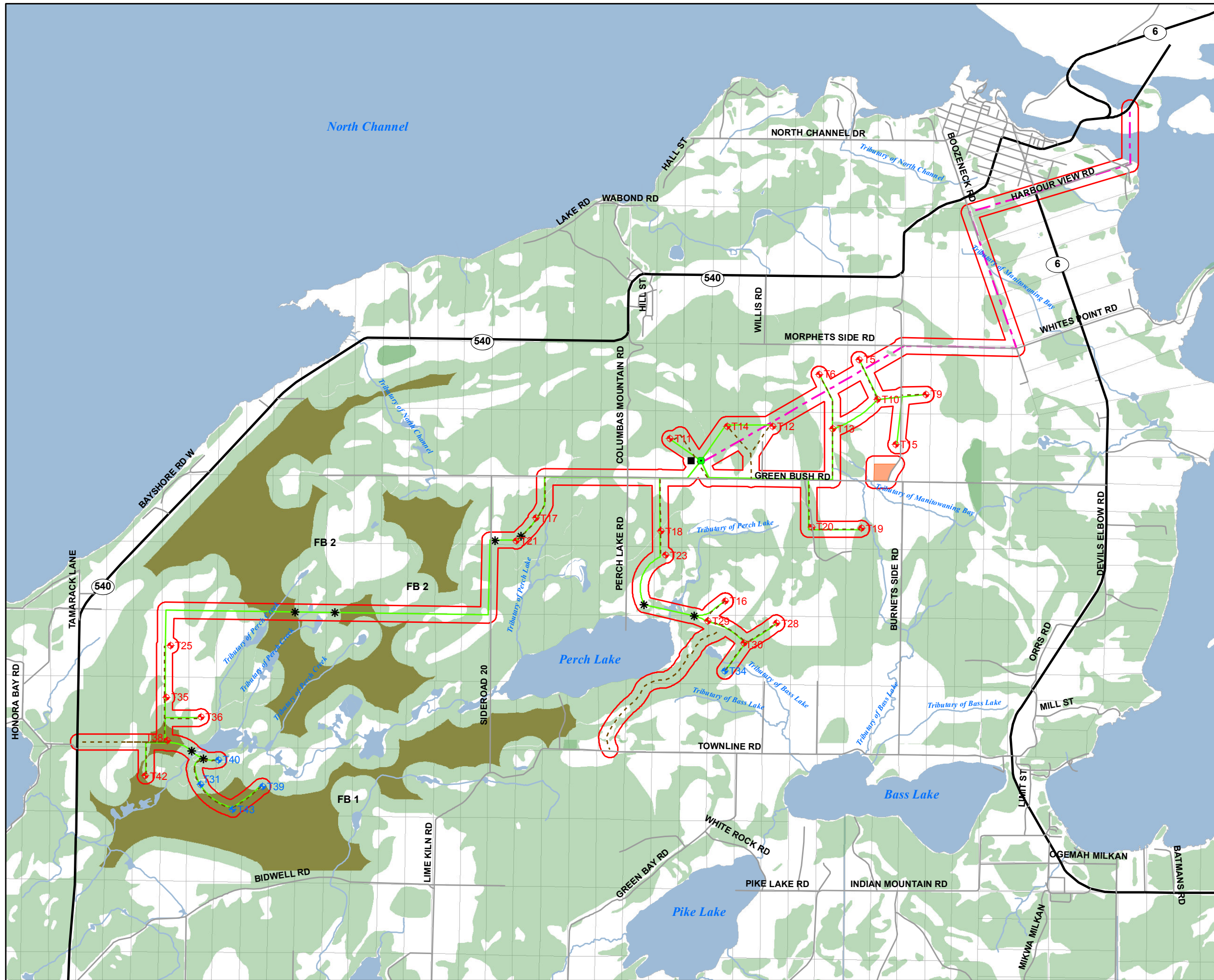


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CONSULTING**

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Date Created: May 27, 2008
Date Modified: July 5, 2011
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PowerMapping\NEM Report 2011\Woodland Amphibian Breeding Habitat.mxd



McLean's Mountain Wind Farm

Figure 8: Significant Sites Supporting Area-Sensitive Species: Forest Birds

Legend

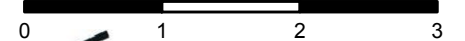
- Local Roads
- Highway
- Watercourse
- 120 m Project Location Setback
- Lots/Concessions
- Water Body
- Unclassified Woodland Community (< 200m from edge)
- Unclassified Woodland Community (Interior > 200 m from edge)
(Including: FOD, FODM1, FODM5-1, FODM8-1, FODM10, FODM4, FODM5-1, SWCM1-2, SWDM2-1, SWDM2-1, SWDM2-2, SWDM2, SWDM3, SWDM4-5, SWMM1-1, SWMM3-2, SWMM4)

Project Components

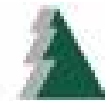
- 24 Wind Turbine Locations
- Five Extra Permitted Sites
- Substation
- Operations Building
- Horizontal Directional Drilling Access/Exit Pit
- Transmission Line
- Access Road
- Feeder Lines
- Construction Staging Area



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POWER**

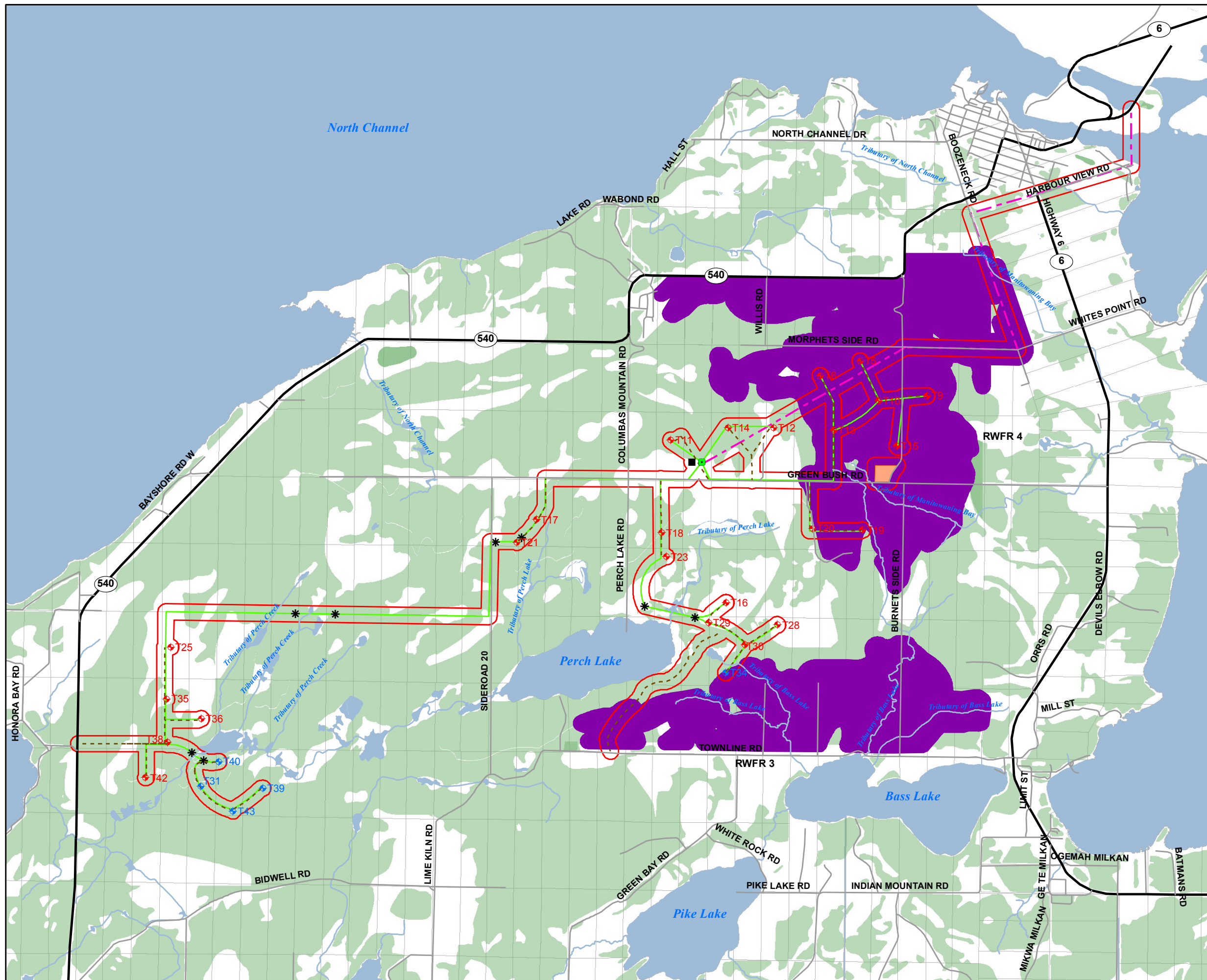
McLean's Mountain Wind Farm Figure 9: Significant Raptor Winter Feeding and Roosting Areas

Legend

- Local Roads
- Highway
- Watercourse
- 120 m Project Location Setback
- Lots/Concessions
- Water Body
- Unclassified Woodland Community
- Raptor Winter Feeding and Roosting Area (120m Buffer)
(Including: OAGM4)

Project Components

- 24 Wind Turbine Locations
- Five Extra Permitted Sites
- Substation
- Operations Building
- Horizontal Directional Drilling Access/Exit Pit
- Transmission Line
- Access Road
- Feeder Lines
- Construction Staging Area

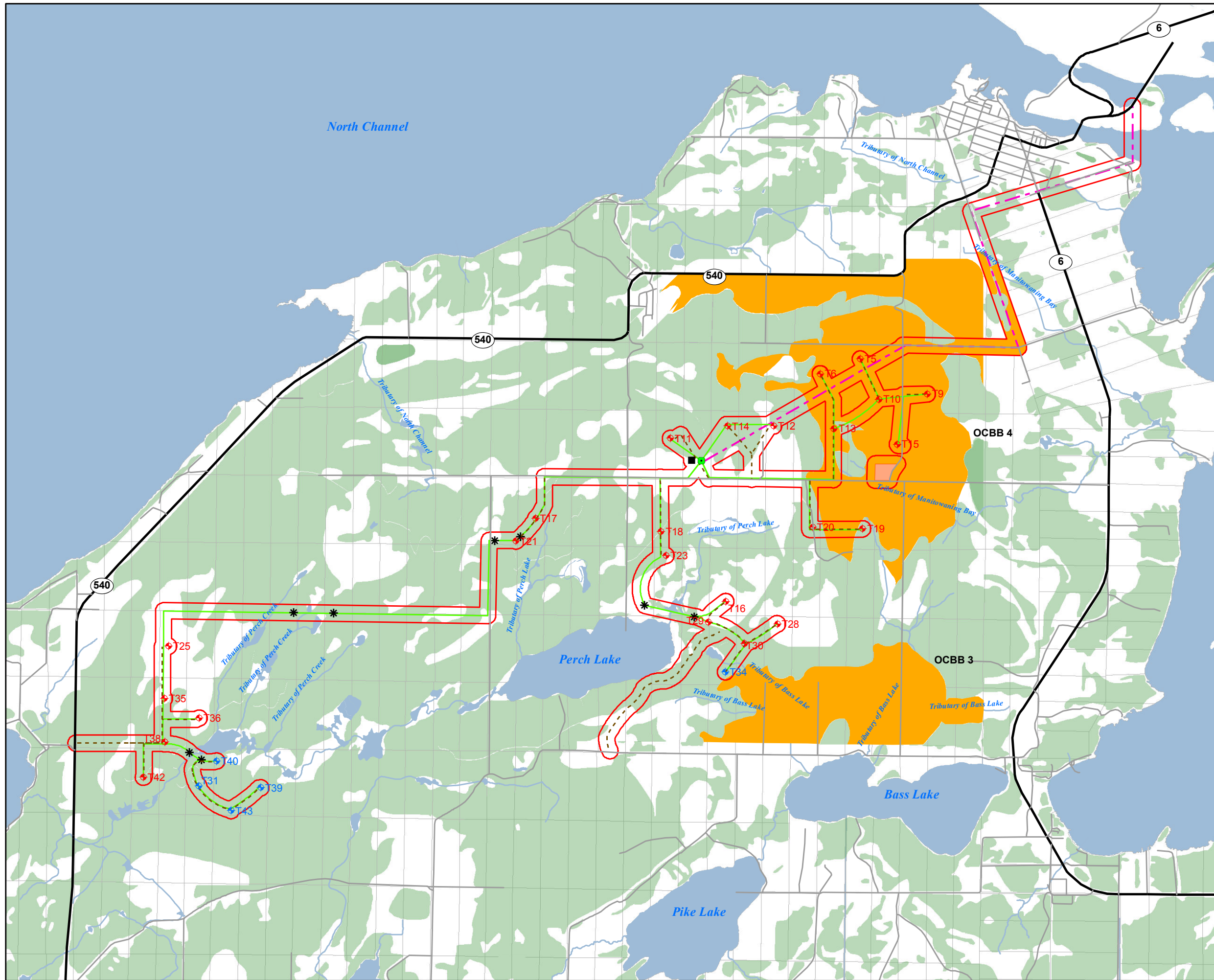


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Date Modified: July 6, 2011
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PowerMapping\NEM Report 2011\Raptor Winter Feeding and Roosting Area.mxd



**NORTHLAND
POWER**

**McLean's Mountain Wind Farm
Figure 10: Significant Sites
Supporting Area-Sensitive Species:
Open Country Breeding Bird Habitat**

Legend

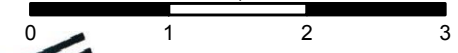
- Local Roads
- Highway
- Watercourse
- 120 m Project Location Setback
- Lots/Concessions
- Water Body
- Unclassified Woodland Community
- Open Country Breeding Bird Habitat > 30 ha
(Including: OAGM4, ME)

Project Components

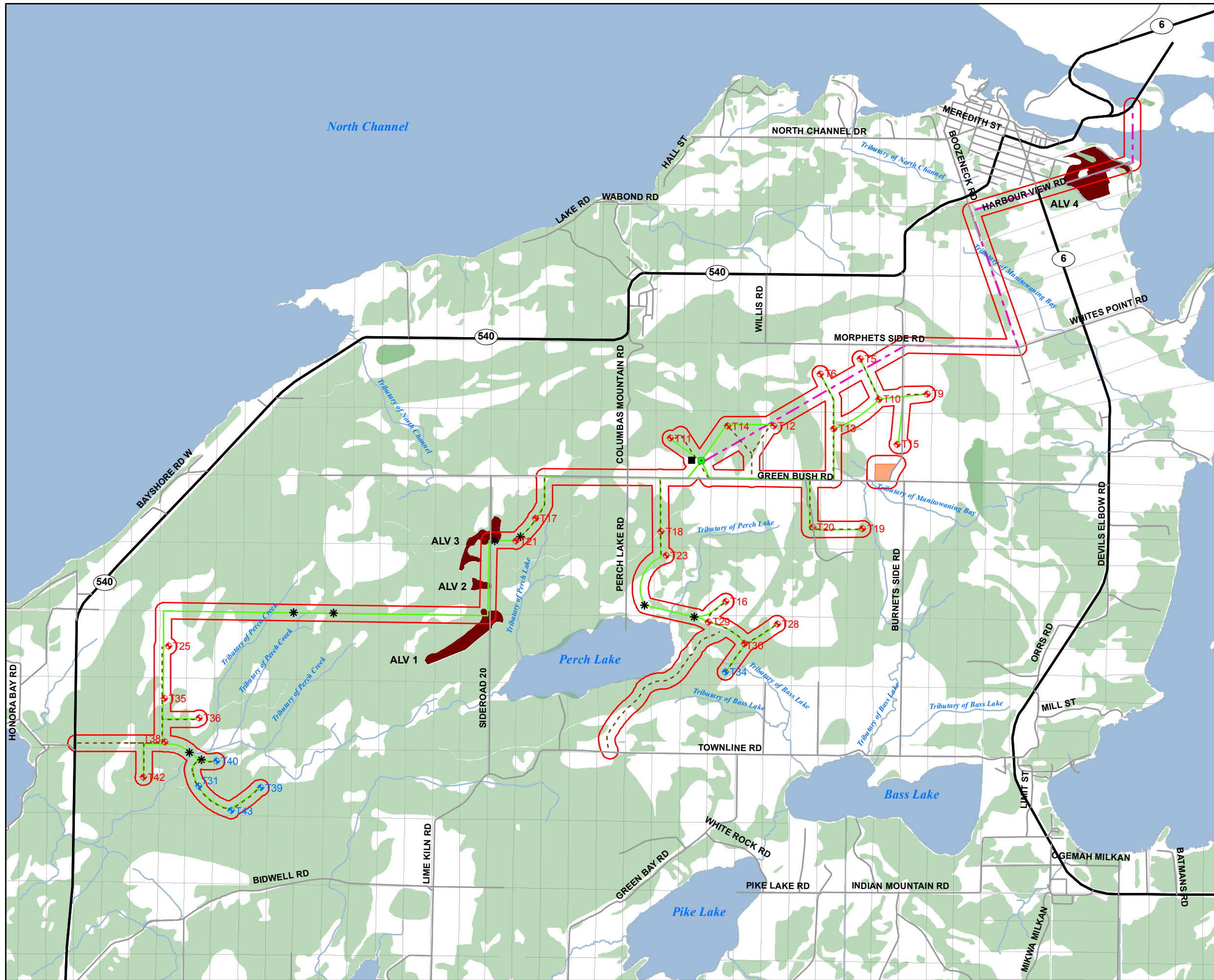
- 24 Wind Turbine Locations
- Five Extra Permitted Sites
- Substation
- Operations Building
- Horizontal Directional Drilling Access/Exit Pit
- Transmission Line
- Access Road
- Feeder Lines
- Construction Staging Area



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Date Created: May 27, 2008
Date Modified: July 6, 2011
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PowerMapping\NEM Report 2011\Open Country Breeding Birds.mxd



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POWER**

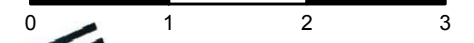
McLean's Mountain Wind Farm Figure 11: Significant Rare Vegetation Areas

Legend

- Local Roads
 - Highway
 - Watercourse
 - 120 m Project Location Setback
 - Lots/Concessions
 - Water Body
 - Unclassified Woodland Community
 - RBSA1-1: Common Juiper Shrub Alvar
- ## Project Components
- 24 Wind Turbine Locations
 - Five Extra Permitted Sites
 - Substation
 - Operations Building
 - Horizontal Directional Drilling Access/Exit Pit
 - Transmission Line
 - Access Road
 - Feeder Lines
 - Construction Staging Area



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Date Created: May 27, 2008
Date Modified: July 7, 2011
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Station #3

This crossing conveys flow between two wetland areas; a large open water marsh with many grass mat islands (Photo 9, Appendix C) to a mixed forest with braided channels (Photo 10, Appendix C). A double culvert is located at this crossing but is blocked by built up woody debris at the upstream end (Photo 11 and 12, Appendix C). A small flow has formed across the road. This crossing represents permanent flow and fish habitat. Substrate near the shore of the open water consists of muck and detritus. No fish were observed during field investigations. The surrounding vegetation community consists of MASM1-14: Reed Canary Grass Mineral Shallow Marsh and SWMM1-1: White Cedar-Hardwood Mixed Swamp (Figure 4). Significant wildlife habitat associated with this crossing includes a Turtle Overwintering Area (TOA 2; Figure 6), Woodland Amphibian Breeding Area (WABH 3 and 4; Figure 7) and Sites Supporting Area-sensitive Species: Forest Birds (FB 2; Figure 8). A beaver dam is also located upstream of this crossing.

Station #4

This crossing conveys flow between two open marsh wetland areas (Photo 13, Appendix C). The southern wetland falls along the northeast tip of Perch Lake. A defined channel exists at the upstream end of the Perch Lake tributary for approximately 6 m, opening into a wet forested area (Photo 14, Appendix C) where an ATV trail crosses. Only standing water was observed at the time of field investigations; therefore, this crossing represents intermittent flow and contributes to fish habitat. Substrate consists solely of mud and detritus. No fish were observed during field investigations. The surrounding vegetation community consists of SWCM1-2: White Cedar-Conifer Coniferous Swamp, SWDM2: Ash Mineral Deciduous Swamp, SWTM3: Willow Mineral Deciduous Thicket Swamp and TAGM4: Treed Pasture (Figure 4). Significant wildlife habitat associated with this crossing includes a Waterfowl Nesting Area (WNA 4; Figure 5), Turtle Overwintering Areas (TOA 5 and 6; Figure 6) and Woodland Amphibian Breeding Habitat (WABH 7 and 8; Figure 7). A beaver dam is also located upstream of this crossing.

7.4 Permanent and/or Intermittent Streams in Quaternary Watershed 2CG-08

Station #5

This crossing is located in proximity to Turbine 34 along the outer southeast edge of the project location (Figure 2). This tributary represents a permanent high gradient pool and riffle system

consisting of multiple waterfalls and drops over the McLean's Mountain escarpment (Photo 15, Appendix C). Flow is conveyed from a cattail marsh (Photo 16, Appendix C) southeast to Bass Lake. Channel width averages from 0.5 – 0.8 m with undercut banks, cobble, woody debris and organic debris as in-stream cover (20%, 30%, 5%, and 5% respectively). Muck, cobble and gravel compose the channel's substrate with minimal submergent vegetation. Flow was moderate at the time of field investigations. No fish were observed and numerous barriers to fish migration are found along the high gradient channel; therefore, limited habitat potential exists. The surrounding vegetation community consists of FODM8-1: Fresh-Moist Poplar Deciduous Forest and OAGM4: Open Pasture (Figure 4). Significant wildlife habitat associated with this crossing includes a Raptor Winter Feeding and Roosting Area (RWFR 3; Figure 9) and Sites Supporting Area-sensitive Species: Open Country Breeding Birds (OCBB 3; Figure 10).

Station #6

This existing crossing location conveys flow from a depressed tire track channel through a culvert to a grass channel in open meadow (Photo 17, Appendix C) which eventually drains into Bass Lake. The upstream channel width averages 3.5 m with in-stream woody debris, in-stream vascular macrophytes and overhanging vascular macrophytes as in-stream cover (5%, 80% and 5% respectively). The downstream channel width averages 2.0 m. In-stream cover consists of in-stream vascular macrophytes (90%). Gravel, sand, detritus and muck compose the channel's substrate. Three fish were observed on the north side of Green Bush Rd; two northern redbelly dace and a central mudminnow. This depressed, grassy channel (Photo 18, Appendix C) showed minimal flow at the time of field investigations which slowed in the open meadow farm fields. As with most of the culverts along Green Bush Rd, flow tends to be intermittent. The surrounding vegetation community consists of FODM1: Dry-Fresh Oak Deciduous Forest and OAGM4: Open Pasture (Figure 4). Significant wildlife habitat associated with this crossing includes a Raptor Winter Feeding and Roosting Area (RWFR 4; Figure 9) and Sites Supporting Area-sensitive Species: Open Country Breeding Birds (OCBB 4; Figure 10).

Station #7

This crossing falls along Green Bush Road, west of Burnets Sideroad where the construction staging area is proposed for the project (Figure 2). This intermittent depressed grass channel flows towards Manitowaning Bay along the eastern side of McLean's Mountain. The upstream channel width averages 3.5 m with in-stream and overhanging vascular macrophytes as in-

stream cover (85% and 5% respectively), as shown in Photo 19, Appendix C. Gravel, sand, muck and detritus compose the upstream channel substrate. The downstream channel width averages 2.0 m with cobble, organic debris, as well as in-stream and overhanging vascular macrophytes for in-stream cover (15%, 10%, 60%, and 10% respectively). Gravel, cobble, sand and detritus compose the downstream channel substrate. Low to no flow was observed during field investigations along this tributary (see Photo 20, Appendix C). The surrounding vegetation community consists of OAGM4: Open Pasture (Figure 4). Significant wildlife habitat associated with this crossing includes a Raptor Winter Feeding and Roosting Area (RWFR 4; Figure 9) and Sites Supporting Area-sensitive Species: Open Country Breeding Birds (OCBB 4; Figure 10).

Station #8

This station is located downstream of *Station #6* along the Tributary of Bass Lake #3. Turbine 19 is located within 120 m of this tributary but is mapped outside of the 30 m setback. The conditions of this intermittent stream were similar to those describe at *Station #6*.

Station #9

This crossing falls along the transmission line pathway in line with Boozeneck Road, flowing southeast towards Manitowaning Bay (Figure 3). Average stream width at this crossing was 2.5 – 3.0 m with a depth of 0.5 – 1.0 m. According to a local resident, the stream accepts flow from the sewage lagoons located upstream resulting in deep green water downstream (see Photo 21 and 22, Appendix C). Topographic mapping indicates that the stream discharges to Strawberry Channel of Lake Huron, south of Thompson Point. This tributary is likely intermittent, and may provide indirect fish habitat to downstream areas. The surrounding vegetation community at the transmission line crossing consists of FOD: Deciduous Forest and OAGM4: Open Pasture (Figure 4). Significant wildlife habitat associated with this crossing includes a Raptor Winter Feeding and Roosting Area (RWFR 4; Figure 9) and Sites Supporting Area-sensitive Species: Open Country Breeding Birds (OCBB 4; Figure 10).

Station #10

This crossing falls along the transmission line pathway along Harbour View Road at the northeast tip of Manitoulin Island (Figure 2). This unnamed intermittent tributary flows east into Lake Huron. Average width at the crossing was 0.5 m with an average depth of 0.05 m; depth at the culvert increased to 0.30 m. The channel is poorly defined through grass substrate

and may provide some intermittent habitat for fish species in Lake Huron. The surrounding vegetation community consists of FODM8-1: Fresh-Moist Poplar Deciduous Forest and RBSA1-1: Common Juniper Shrub Alvar (Figure 4). Significant wildlife habitat associated with this crossing and includes a Rare Vegetation Community identified through surrounding vegetation (ALV 4; Figure 11).

7.5 Seepage Areas

A search and analysis of the records and resources outlined in the records review did not identify any seepage areas in the project location or within the surrounding 120 m. The results of the site investigation verified this determination.

8. Summary of Amendments to the Records Review

Based on the results of the site investigations, no previously unidentified water bodies were identified within 120 m of the project location. Results of the site investigation confirmed the boundaries of all water bodies as indicated on Figure 2.

9. Conclusions

This report is intended to fulfill the requirements for the water assessment site investigation report under Ontario Regulation 359/09. Based on the results of the site investigations, this report identified the accuracy of the records review, confirmed no additional water bodies were present within the project location or within 120 m, verified the boundaries of water bodies located within 120 m of the project location, and the distance of the natural feature from the project location.

This site investigation report is the second report in a series that will fulfill the Water Assessment component of the REA process. All water bodies identified as being within 120 m of a project component will be subject to a subsequent environmental impact study (REA Sections 39 and 40).

Table 4 summarizes the results of this site investigation in the context of the proposed project. All applicable water bodies within the project location and surrounding 120 m are outlined on Figure 3.

Table 4: Summary of the Water Assessment Site Investigation

Station ¹	Water Body	Is the location in the water body?	Distance to nearest project components (metres)	Project Components within 120 m of the water body
Lakes				
11	North Channel of Lake Huron	Yes	Overlaps	Transmission Line
Lake Trout Lakes				
Not applicable to project location				
Permanent and/or Intermittent Streams¹				
1	Perch Creek	Yes	Overlaps	Feeder Line
			72 and 90	HDD* access/exit pit
			55	Turbine 40
2	Tributary To Perch Creek #1	Yes	Overlaps	Feeder Line
3	Tributary To Perch Creek #2	Yes	Overlaps	Feeder Line
			110	HDD* access/exit pit
4	Tributary to Perch Lake #2	Yes	Overlaps	Feeder Line
5	Tributary To Bass Lake #2	Yes	Overlaps	Feeder Line
			Overlaps	Access Road
			98	Turbine 34
6	Tributary to Bass Lake #3	Yes	Overlaps	Feeder Line
			Overlaps	Access Road
7	Tributary to Manitowaning Bay #1	No	40	Construction Staging Area
8	Tributary to Bass Lake #3	No	104	Turbine 19
9	Tributary to Manitowaning Bay #2	Yes	Overlaps	Transmission Line
10	Unnamed Tributary	Yes	Overlaps	Transmission Line

Station ¹	Water Body	Is the location in the water body?	Distance to nearest project components (metres)	Project Components within 120 m of the water body
Seepage Areas				
None located within project location				
Provincial Plan Areas				
None located within project location				

¹ See Figure 2 for station locations in reference to project location; *High-pressure directional drilling

10. References

Henson, B.L., and Brodribb, K.E. 2005. Great Lakes Conservation Blueprint for Terrestrial Biodiversity: Volume 2: Ecodistrict Summaries. 344pp.

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<http://crownlanduseatlas.mnr.gov.on.ca/clupa.html>. Accessed November 2010.

Ontario Ministry of Natural Resources. Land Information Ontario.
<http://www.mnr.gov.on.ca/en/Business/LIO/index.html>. Accessed November 2010.

Ontario Ministry of Natural Resources. March 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248pp.

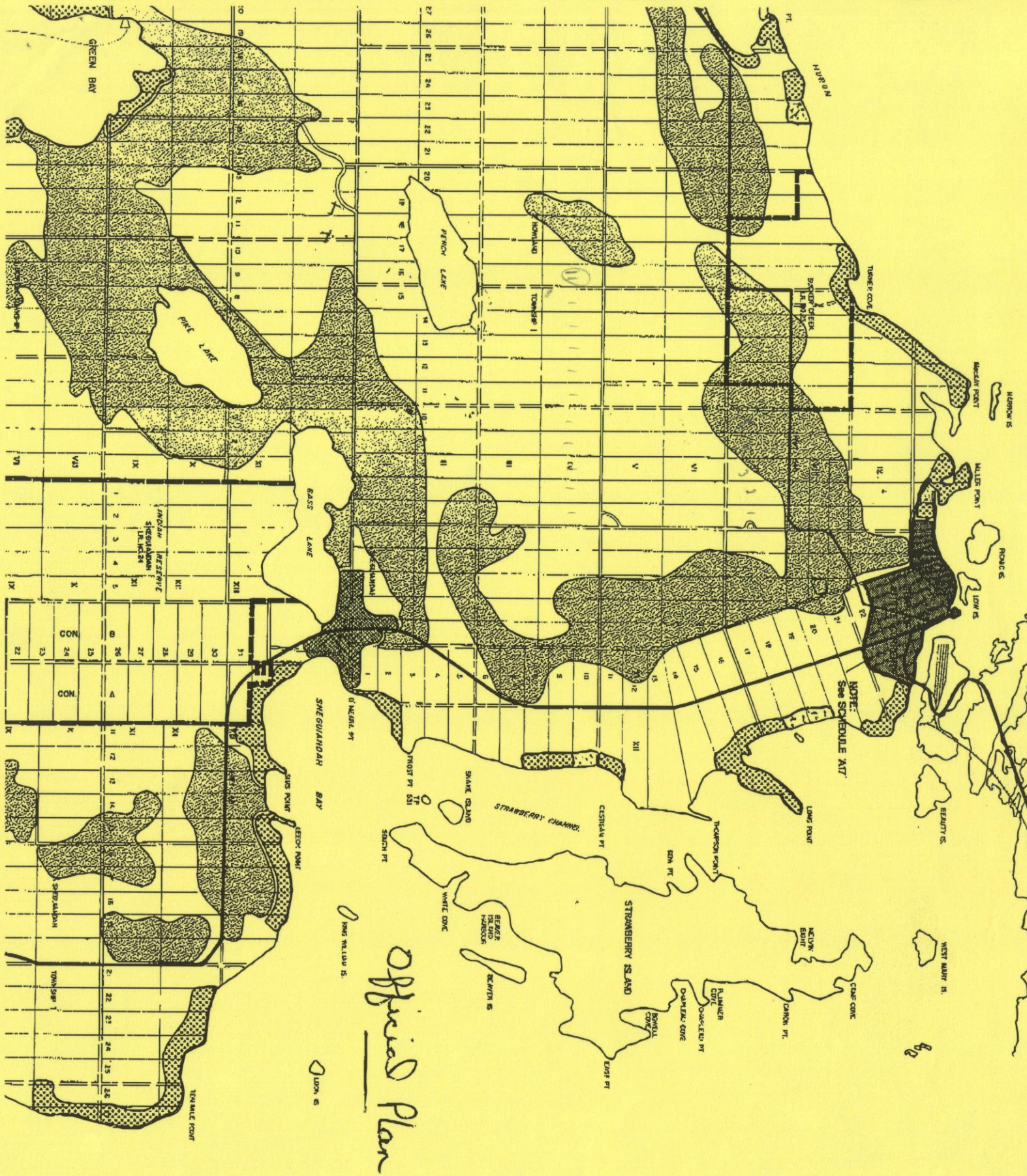
Ontario Ministry of Natural Resources. Natural Heritage Information Centre Database.
<http://nhic.mnr.gov.on.ca/> Accessed November 2010.

Phair, C., Henson, B.L., and Brodribb, K.E. 2005. Great Lakes Conservation Blueprint for Aquatic Biodiversity. Volume 2: Tertiary Watershed Summaries. 454pp.

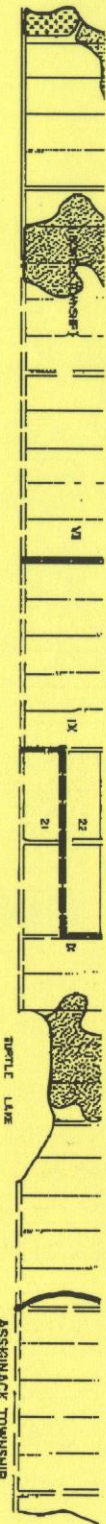
APPENDIX A

Supplementary Information





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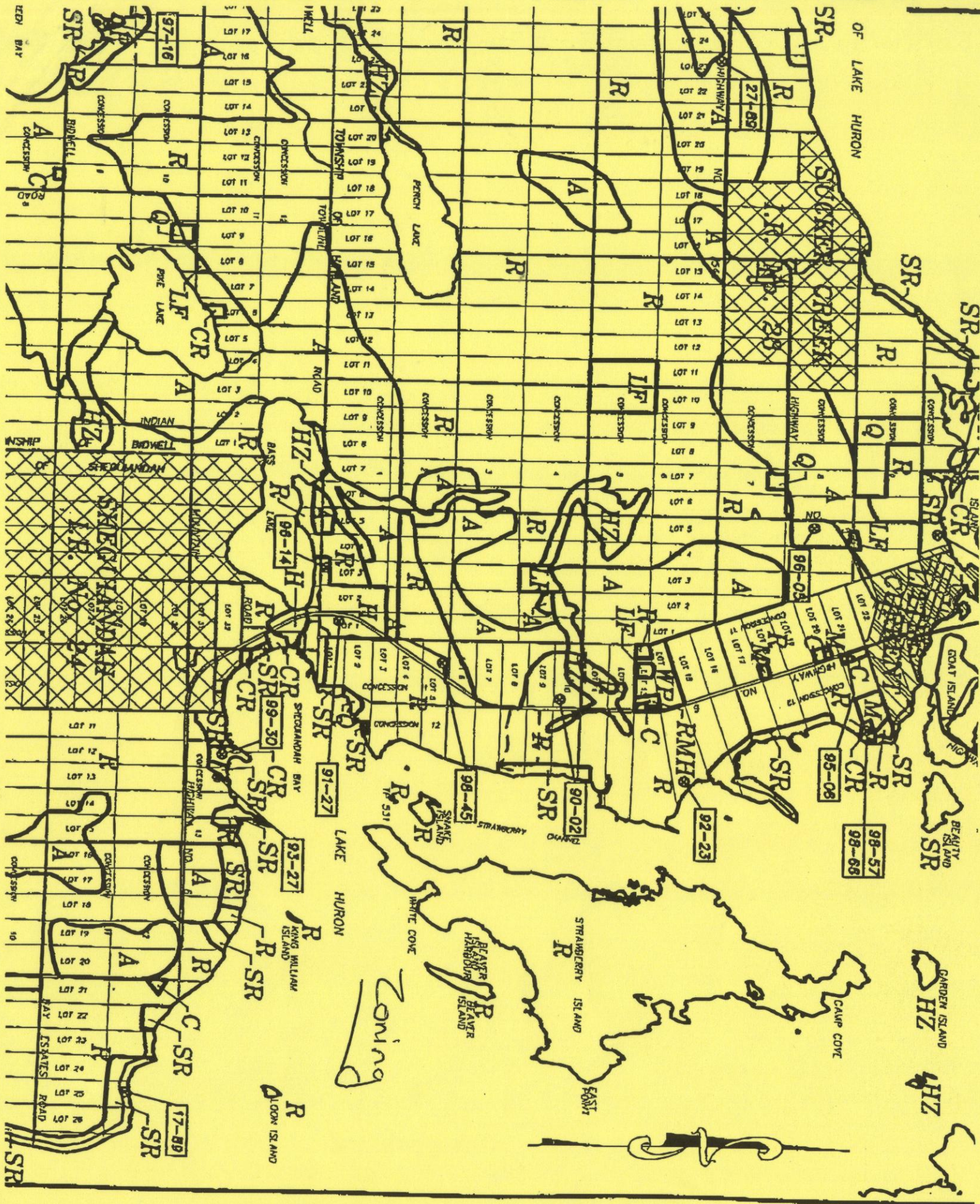
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Mining Area
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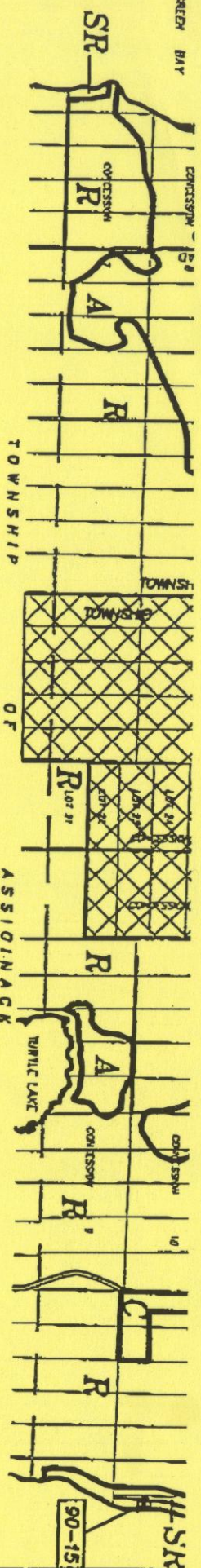
Official Plan

**Future Land Use
Legend:**

-  Rural District
-  Shoreline Development Dist.
-  Agricultural District
-  Hamlet District
-  Urban District
-  Settlement Area

SCHEDULE
A8





ZONES

Zone	Symbol
Agricultural (A)	A
Rural (R)	R
Hamlet (H)	H
Settlement (S)	S
Shoreline Residential (SR)	SR
Mobile Home Park (RMH)	RMH
Restricted Commercial (C)	C
Commercial Recreational (CR)	CR
Restricted Industrial (M)	M
Pit & Quarry (Q)	Q
Recreation (RE)	RE
Hazard (HZ)	HZ
Landfill (LF)	LF
Waste Processing (WP)	WP
Special Provision	

By-Law No. 90-15

NOTE:

No new habitable structure shall be constructed below the 178.3 metre contour adjacent to Lake Huron unless the setback from the shoreline is a minimum of 81 metres and the structure is flood proofed to the 179.8 metre contour.

This is Schedule A
to By-Law No. 2002-32
Passed this day of 18/12/2002.

Mayor *Samuel H. H. H.*
Clerk *De O. M. A. H.*

APPENDIX B

CVs



**MARK A.
BROBBEL**

BIOLOGIST
ASSOCIATE

Education

M.Sc. (Biology), Queen's University, Kingston, Ontario, 1995

B.Sc. (Honours, Biology), Queen's University, Kingston, Ontario, 1993

Affiliations

Vice-President, Canadian Water Resources Association – Ontario Branch

Registered Professional Biologist, College of Applied Biology of B.C.

LEED® AP

Language

English

Mark is a biologist and project manager with extensive experience across Canada. As a member of the Dillon team, Mark has provided natural sciences services for environmental assessment projects and has managed and coordinated multi-disciplinary teams. Mark has a thorough understanding of mitigation measures for the protection of natural resources, and has provided agency liaison services to obtain regulatory approvals to complete works in and around natural features.

RELEVANT EXPERIENCE

GOVERNMENT SECTOR

Regional Municipality of Halton

Coordinated and managed a surface water monitoring program to investigate potential impacts of increased municipal pumping at the Cedarvale well field in the Town of Halton Hills, Ontario.

Region of Peel

Project manager for a Class Environmental Assessment for Bush Street and Mississauga Road improvements near Belfountain, Ontario. Coordinated disciplines of natural heritage, water resources and archaeology.

Regional Municipality of Niagara

Project manager for a natural heritage impact assessment for Wainfleet Township's water and wastewater servicing in the Region of Niagara. Coordinated a multi-disciplinary team including terrestrial and aquatic biologists, water resources engineers and hydrogeologists in conducting field surveys and impact assessments of proposed servicing.

City of Hamilton

Project manager for a Natural Heritage assessment of lands in the Fruitland Road area in the City of Hamilton. The study involved the identification of natural environment constraints and mitigation considerations for a new road alignment and adjacent land uses (City of Hamilton).

Regional Municipality of Niagara

Coordinated natural heritage work associated with a Class Environmental Assessment for design modifications at the Port Dalhousie Wastewater Treatment Plant.

City of Hamilton

Project manager for multi-disciplinary assignments investigating potential impacts of a proposed light rail transit route on natural heritage, groundwater resources and air/noise within the downtown corridor of the City of Hamilton.

Regional Municipality of Halton

Natural environment coordinator for a trunk sanitary sewer municipal class environmental assessment for the conceptual design from Boyne sewage pumping station to Dundas Street and Third Line.

Municipality of Chatham-Kent

Provided agency liaison services for the proposed replacement of the Snye Road Bridge over the McDonald Tap Drain in the Municipality of Chatham-Kent.

**MARK A.
BROBBEL**

BIOLOGIST
ASSOCIATE

Municipality of Lambton Shores

Provided biological input for Official Plan updates for the Municipality of Lambton Shores; conducted a background review of aquatic information and provided recommendations for Official Plan revisions.

Town of Tecumseh

Provided agency liaison services for fish habitat compensation/mitigation associated with East Townline Drain improvements.

City of London

Reviewed aquatic background information and developed management strategies and restoration targets as input to the Thames Valley Corridor Plan, which was developed to provide a long-range vision for the corridor that is consistent with existing policy and legislation.

JC Fresh Farms

Provided agency liaison services, coordination of biological field work, and development of mitigation measures for a Wallace Fox drain relocation in Kingsville, Ontario.

City of London

Provided advisory services for Cove Road culvert improvements in the City of London; described existing conditions and provided input regarding mitigation measures to protect surrounding aquatic habitat.

Ontario Ministry of Transportation

Coordinated fish and fish habitat impact assessment and the development of mitigation measures related to the re-construction of Highway 11/17 and Highway 61 in Thunder Bay, Ontario.

City of Hamilton

Coordinated a terrestrial and avian investigation in support of a Class Environmental Assessment for proposed modifications to the Ferguson Avenue water pumping station.

Ontario Ministry of Transportation

Coordinated fish and fish habitat impact assessment and the development of mitigation measures related to the re-construction of a portion of Highway 6 in Guelph, Ontario and Highway 7/8 in Kitchener, Ontario.

Ontario Ministry of Transportation

Coordinated fish and fish habitat impact assessment and the development of mitigation and compensation measures related to the re-construction of Highway 401 in the County of Essex (GWP 65-00-00). The study area included Belle River, Duck Creek, and several agricultural drains.

Municipality of Lambton Shores

Coordinated background review of natural features of Parkhill Creek to assist in determining effluent criteria for the Grand Bend Sewage Treatment Facility Expansion and Upgrade Class Environmental Assessment.

County of Essex

Coordinated the development of fish habitat compensation measures and secured approval from Fisheries and Oceans Canada for drain realignment activities associated with Pike Creek bridge reconstruction at County Road 22 in the Town of Lakeshore.

**MARK A.
BROBBEL**

BIOLOGIST
ASSOCIATE

Town of LaSalle

Developed restoration and mitigation measures associated with the Cahill Drain culvert extension at Huron Church Line in the Town of LaSalle.

City of London

Coordinated aquatic field study of the Oatman Drain at the South Thames River in the City of London for the Wellington Road Sanitary and Storm Servicing Class Environmental Assessment.

Regional Municipality of Halton

Coordinated assimilative capacity field study in Black Creek as part of the Acton Wastewater Treatment Plant Class Environmental Assessment.

Regional Municipality of York

Senior biologist providing input into the Class Environmental Assessment of Bathurst Street improvements south of Yonge Street in York Region. Conducted aquatic habitat assessments, consulted with Lake Simcoe Region Conservation Authority, and provided input into mitigation measures for the protection of fish habitat within the Holland River watershed.

Public Works and Government Services Canada

Provided senior input to aquatic management plan and aquatic monitoring program for Canadian Forces Base Gagetown, New Brunswick. Tasks included the review of existing aquatic habitat data, and input into the development of aquatic constraints and enhancement opportunities for on-site resources.

Town of Innisfil

Senior biologist providing input to a fish habitat compensation strategy and compensation plan related to South Innisfil Creek Drain improvements. Conducted background data review and field investigations to investigate potential fish habitat impacts and identified mitigation for proposed works.

County of Essex

Fisheries biologist for preliminary design of County Road 19 (Manning Road) improvements in the County of Essex. Conducted background data review to investigate potential fish habitat impacts and identify mitigation for proposed works.

Regional Municipality of Halton

Provided input regarding mitigation and monitoring for groundwater dewatering associated with construction of the LaSalle Park Sewage Pumping Station adjacent to West Aldershot Creek near the shore of Hamilton Harbour.

City of Hamilton

Conducted bass spawning surveys in Hamilton Harbour to provide input to the West Harbour Waterfront Recreation Master Plan study (City of Hamilton).

Regional Municipality of Halton

Conducted brook trout spawning redd surveys in Black Creek in support of an Acton Wastewater Treatment Plant Class Environmental Assessment for potential modifications to the plant. Provided input to the terms of reference for an assimilative capacity study examining existing conditions and assimilative capacity of Black Creek, a tributary of the Credit River.

**MARK A.
BROBBEL**

BIOLOGIST
ASSOCIATE

Toronto and Region Conservation Authority

Contacted stakeholders to solicit feedback regarding the concept of “net gain” of environmental attributes to offset development activities. Contacted private and public sector stakeholders and compiled comments as input to watershed plans in the Greater Toronto Area.

County of Essex

Fisheries biologist investigating existing conditions of watercourse crossings for County Road 22 improvements in the Township of Lakeshore, County of Essex. Conducted fish community surveys using electrofishing techniques, reviewed existing habitat conditions and provided input regarding regulatory approval requirements and mitigation measures to protect fish habitat of Pike Creek, Puce River and other watercourses and drains that convey flow to Lake St. Clair.

Ontario Ministry of Transportation

Fisheries biologist for Class EA reconstruction of the Putnam Road North and South truck inspection stations along Highway 401. Conducted field surveys on tributaries to Piney Creek and Reynolds Creek and prepared a fisheries impact assessment report.

Manitoba Transportation and Government Services

Provided information package to Fisheries and Oceans Canada (DFO) regarding a proposed bridge at God’s Lake Narrows in Manitoba.

City of Hamilton

Senior biologist providing input into the Class Environmental Assessment for Chedoke Creek bank stabilization in Hamilton. Reviewed site conditions, summarized existing fisheries conditions and provided input into an evaluation matrix of alternatives for bank stabilization.

City of Hamilton

Senior biologist providing input into the Sanatorium Road Class Environmental Assessment for road and stormwater management improvements in Hamilton. Reviewed site conditions and provided input into an evaluation matrix of alternatives.

Ontario Ministry of Transportation

Fisheries biologist for Class EA reconstruction of Highway 401 between Manning Road and Highway 3, near Windsor, Ontario. Conducted field surveys which included electrofishing, prepared a fisheries impact assessment report and developed fish habitat mitigation and compensation measures, in consultation with MNR and DFO.

District Municipality of Muskoka

Coordination of aquatic/fisheries tasks for the evaluation of landfill expansion alternatives in Huntsville, Bracebridge and Gravenhurst. Tasks included assessments of fisheries resources and contribution to an evaluation matrix to assist in determining the preferred option for expansion.

Regional Municipality of Halton

Project manager for the Cedarvale well field impact assessment in Georgetown, Ontario. A pumping test was used to examine the potential impacts on surface water features, including Silver Creek and the Hungry Hollow ESA, from increased pumping at the Cedarvale well field.

**MARK A.
BROBBEL**

BIOLOGIST
ASSOCIATE

Town of Whitby

Coordinated fisheries field work in Lynde Creek tributaries for a background urban planning study to provide guidance for land use in West Whitby. Field work and reporting components included fish community and benthic surveys, water quality measurements and fish habitat mapping.

Regional Municipality of Halton

Project manager for a Schedule B Class Environmental Assessment for increased municipal pumping capacity at the Cedarvale Well Field in Georgetown, Ontario.

Regional Municipality of Halton

Fisheries biologist for an environmental baseline study conducted in Acton, Ontario. Project tasks included surveys of spawning redds and the benthic invertebrate community in Black Creek, in addition to flow and water temperature monitoring. Collected data were used to provide input to the development of a pumping test at the Prospect Park well field.

Municipality of Lambton Shores

Conducted secondary source review of aquatic resources within the Grand Bend Sewage Treatment Facility Master Plan Study Area.

City of London

Conducted background review of aquatic resources within the South Thames River in the City of London, as input into the Vauxhall Pollution Control Plant Class Environmental Assessment process for a combined sewer overflow management project.

Township of Middlesex Centre

Conducted a background review of aquatic and fisheries data in support of the Delaware Water and Wastewater Servicing Study.

Regional Municipality of Halton

Project manager and lead aquatic biologist for the development of environmental impact assessment methodology for a municipal well pumping test at the Cedarvale well field in Georgetown, Ontario. The project included a background data review and the collection of fisheries, benthic, physical habitat and hydrogeological baseline data to be used toward the development of a pumping test for the proposed re-rating of the well field.

Municipality of Central Elgin

Conducted fish community and benthic surveys within Nineteen Creek and Norman Drain. This work was conducted upstream and downstream of potential discharge locations for the East Side Development Area Wastewater Treatment Plant.

Ontario Ministry of Transportation

Fisheries biologist for Class EA reconstruction of Highway 401 between Belle River Road and Highway 77, in southwestern Ontario. Conducted field surveys, prepared a fisheries impact assessment report and developed fish habitat mitigation measures, in consultation with MNR and DFO.

Town of Amherstburg

Project biologist for Class EA replacement of the Canard River Bridge # 3017 near Amherstburg, Ontario. Provided agency liaison with Essex Region Conservation Authority and DFO.

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York Region

Project fisheries biologist for Class EA for Leslie Street improvements in York Region, north of Bethesda Sideroad. Tasks included a fish community survey and habitat mapping in Haynes Lake and Bersczy Creek, and consultation with the Toronto and Region Conservation Authority regarding improvement alternatives.

Ontario Ministry of Transportation

Provided fisheries input and technical reporting for Class EA reconstruction of Highway 402 between Mandaumin Road and Oil Heritage Road, near Sarnia, Ontario. Conducted field surveys and prepared a fisheries impact assessment report.

Ontario Ministry of Transportation

Fisheries biologist for Class EA reconstruction of Highway 401 between Manning and Puce Road, in southwestern Ontario. Conducted field surveys, prepared a fisheries impact assessment report and developed fisheries compensation measures.

City of Hamilton

Conducted a background review of fisheries data for the Class EA replacement of the King Street Bridge over Battlefield Creek in Hamilton, Ontario. Provided input related to appropriate mitigation and agency approval requirements.

County of Essex

Provided a summary of existing fisheries/aquatic habitat information for the Environmental Conditions Report pertaining to the County Road 22 Class EA in the County of Essex, Ontario.

City of Hamilton

Conducted fish community surveys at several Hamilton watercourses to contribute to the City of Hamilton Ward One Combined Sewer Overflow Master Plan Class EA.

City of Barrie

Conducted aquatic assessments of watercourses potentially impacted by future improvements to 11 street crossings at Highway 400 in the City of Barrie. The assessments were carried out as part of the Municipal Class Environmental Assessment process to identify potential constraints and evaluate alternatives.

City of Mississauga

Conducted a fish community survey within Applewood Creek in Mississauga, Ontario in support of a Class Environmental Assessment and creek stabilization project.

Regional Municipality of Durham Works Department

Project biologist for post-construction monitoring activities at the Carruthers Creek re-alignment in Ajax, Ontario. Responsibilities included conducting a fish community survey, assessing the success of planted vegetation, and monitoring the stability of constructed fish habitat structures.

Municipality of Chatham-Kent

Conducted an inventory of aquatic resources associated within the Whitebread Tap Drain in the Municipality of Chatham-Kent, Ontario. Tasks included completing a fisheries survey and the collection of background fisheries information to determine appropriate mitigation measures for bridge replacement activities.

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Ontario Ministry of Transportation

Fisheries biologist for Class EA reconstruction of a 9 km section of Highway 402, east of Sarnia, Ontario. Field assessments of watercourse crossings were completed that included fish community surveys, habitat mapping, photograph documentation, and channel stability rapid assessments. A fisheries and aquatic ecosystem existing conditions report was prepared to provide a summary of existing fisheries and aquatic habitat and to describe potential impacts and proposed mitigation measures relating to reconstruction activities.

Municipality of Central Elgin

Fisheries biologist for Class EA road reconstruction of Dalewood Road, Mapleton Line and Brouwer's Line within the Municipality of Central Elgin. Project tasks included completing aquatic inventories of road crossings and identifying potential mitigation and fisheries compensation requirements.

Ontario Ministry of Transportation

Conducted aquatic inventories of watercourse crossings within a 10 km length of Highway 401 between Tilbury and Windsor. Potential mitigation and fisheries compensation requirements were identified for Tremblay Creek, Big Creek and 6-7th Sideroad Drain.

Regional Municipality of Halton

Fisheries biologist for Steeles Avenue improvements between Winston Churchill Boulevard and Trafalgar Road, as part of the Class EA process. Tasks included completing aquatic inventories of watercourse crossings, collecting background information, and providing input to the project team on road improvement alternatives.

Municipality of Central Elgin

Completed aquatic habitat assessments as part of a Collard Drain scoped subwatershed study in the Village of Belmont. Tasks included conducting electrofishing surveys, taking benthic and water samples and assisting with a geomorphic assessment of the drain.

City of Stratford

Conducted background fisheries research and field studies to determine classifications of drains within the City of Stratford. Field work was completed to assist in determining potential fisheries approval requirements for future realignments/developments proposed in a city-wide Storm System Master Plan.

Municipality of Central Elgin

Collected benthic invertebrate samples in Kettle Creek to monitor the benthic community upstream and downstream of the outfall from the Belmont sewage treatment facility.

City of London

Conducted benthic invertebrate sampling within the Coves oxbow ponds in London, Ontario. Samples were collected to provide a biological measure of the health of the aquatic community, and to assist in planning future restoration/ rehabilitation efforts within the Coves ponds.

City of Ottawa

Completed fish habitat assessments in support of preliminary design environmental studies for the proposed extension of Terry Fox Drive in Kanata, Ontario. Fish community surveys and habitat assessments in the Shirley's Brook subwatershed were

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BIOLOGIST
ASSOCIATE

used to determine areas where fish compensation would be required as a result of road construction.

Municipality of Minitonas, Manitoba

Conducted aquatic habitat assessments at the Swan River ford crossing near Swan River, Manitoba, to investigate potential fisheries issues. Input from these assessments was incorporated into a revised crossing design to ensure adequate fish passage to important upstream habitat.

Department of Community Government and Transportation, Government of Nunavut

Completed a project plan for the Hall Beach Bank Stabilization Project in Nunavut. The plan was completed to address potential impacts of construction activities on fish and fish habitat and included proposed mitigation measures to protect adjacent fisheries resources.

Nunavut Impact Review Board

Contacted stakeholders in Nunavut to survey perceptions of currently used waste management practices in the North. Collected information was used to develop Northern Remote Site Protocols to minimize the environmental impacts of site development.

Department of Indian Affairs and Northern Development/Government of the Northwest Territories

Territories Completed revisions and updates to the federal/territorial document "Interests and Needs of the Northwest Territories in Transboundary Water Negotiations in the Mackenzie River Basin" to reflect recent studies and changes in territorial legislation. Initiated contacts and collected data from agencies in the Northwest Territories, Yukon, Alberta, and British Columbia.

Town of Iqaluit

Completed a fisheries data assessment as part of the Town of Iqaluit's sewage treatment planning study.

Manitoba Water Services Board

Assessed fish habitat of the Seine River Diversion near Winnipeg, Manitoba, to assist in determining the cumulative impacts of releasing treated wastewater and to identify potential environmental sensitivities. Assessments included characterizing bottom substrates, macrophytes, fish cover, channel morphology, and the suitability of select reaches as fish habitat.

Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories

Contributed to territorial document "Environmental Considerations for Oil and Gas Activities in the Deh Cho Region." Completed aquatics/fisheries section reflecting existing information for the Deh Cho Region and future study needs. Also contributed to "Best Practices" section which outlined current oil and gas practices in British Columbia and Alberta, and existing environmental monitoring programs.

Department of Transportation, Government of the Northwest Territories

Assisted in the development of a Terms of Reference to carry out an aquatic effects study at several ferry landings in the Northwest Territories. Project requirements included an assessment of fish and fish habitat adjacent to the landings, a bathymetry and hydraulics study, and an investigation of substrate types and sediment loading at the Mackenzie and Peel River crossing locations.

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BC Hydro

Contributed to the development of environmental training modules and a field resource guide for BC Hydro employees. The modules and guide included sections on environmental policy, work planning, and best practices for working in and around water.

Department of Transportation, Government of the Northwest Territories

Contributed to the development of a training manual and training session which emphasized safe environmental practices related to fish and fish habitat for highway construction and maintenance activities. Facilitated the training session for highway operations staff, planners, and highway engineers.

Public Works and Government Services Canada

Completed a fish habitat survey and fish sampling program at Colomac Gold Mine, north of Yellowknife, Northwest Territories. Habitat assessments and fisheries data were used to assist in determining tailings discharge options as part of the Colomac Mine Closure Plan.

Department of Transportation, Government of the Northwest Territories

Assisted in the development of an aquatic assessment field program to study fisheries resources impacted by the new alignment of 90 kilometres of Highway 3 between Rae and Yellowknife. Conducted field assessments of water crossings to be affected by reconstruction.

Government of the Northwest Territories, Municipal and Community Affairs

Contributed to Repulse Bay's impact assessment for the community's wetland sewage treatment system; completed background literature search.

Department of Transportation, Government of the Northwest Territories

Assessed culverts for fish habitat issues along Highway 3 between Rae and Yellowknife as part of the Department of Transportation's ongoing road maintenance program.

Metro Toronto and Region Conservation Authority / Ontario Ministry of Natural Resources

Conducted stream assessments of Duffins Creek tributaries in the Seaton lands near Pickering, Ontario. Collected benthic invertebrate, physical habitat, and fish community composition data, which was used as input for a habitat based suitability index model for fish communities.

REAL ESTATE SECTOR

Lakewood Beach Properties Ltd.

Project manager and coordinator of field studies in support of an Environmental Impact Study for a proposed development on the Lake Erie shoreline west of Port Colborne. A key component of the investigation was to review background data with respect to the threatened Fowler's toad.

Monarch Homes

Coordinated development of fisheries restoration plan related to tributaries to Etobicoke Creek for a development in the Town of Caledon.

Block 59 Landowners Group

Project manager for existing environmental conditions, opportunities and constraints report related to proposed development on Block 59 in the City of Vaughan. Coordinated terrestrial, aquatic, and geomorphic studies.

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BIOLOGIST
ASSOCIATE

Ritchie Bros.

Coordinated aquatic field studies and background data review for a property located in the Municipality of Thames Centre adjacent to Reynolds Creek.

Elliott Grain Ltd. And Farms

Conducted background aquatic data review and coordinated the field component of an assimilative capacity study on Wye Creek and tributaries for a proposed development in the Thorndale area, north of London; provided input regarding effluent criteria for a proposed sanitary sewage treatment plant.

Riotrin Development Construction

Conducted background aquatic data review and field investigations on the Rouge River, and a tributary, to study existing conditions and develop mitigation measures related to construction dewatering in the Town of Richmond Hill. Developed a monitoring program to monitor water levels and seepage in adjacent natural features.

Metrus Development Inc.

Project manager and coordinator of a background review and field studies related to a proposed stormwater outfall for a development in the Town of Georgina on the shore of Lake Simcoe. Provided mitigation recommendations to minimize shoreline and fish habitat impacts.

Apra Truck Lines Transport

Project manager and coordinator of development of a fish habitat compensation package for a re-alignment of a tributary to West Rainbow Creek in the City of Vaughan. Developed off-site compensation measures and liaised with staff of the Toronto and Region Conservation Authority.

Monarch Homes

Conducted background fisheries studies in the Mayfield West Development Area in Caledon, Ontario. Tasks included fish community surveys, habitat mapping, determination of fisheries sensitivities and mapping of opportunities and constraints within the Etobicoke Creek and West Humber River watersheds.

Block 11 and 12 Developer Groups

Lead biologist conducting assessment of impacts of dewatering for the Bathurst trunk sewer in Vaughan, Ontario. Implemented an aquatic monitoring program and provided agency liaison services leading up to the Permit to Take Water application.

Block 18 and 12 Developer Groups

Coordination of Natural Environment staff in the identification of sensitive natural features in preparation for pumping tests required to assess impacts of dewatering for sewer construction in Vaughan, Ontario.

Block 11 Properties Inc.

Coordinated the design of four restoration areas within the Block 11 development in the City of Vaughan. The designs included channel realignments using natural channel design principles as well as aquatic and upland planting plans.

Mattamy Homes Ltd.

Inspected sediment controls and provided recommendations for environmental protection measures at a housing development being constructed near Black Creek in Georgetown, Ontario.

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Fanshore North Investments, Brampton

Project manager and coordinator for a three-year post-construction monitoring program required for a realignment of Fletcher's Creek in Brampton, Ontario. As the project fisheries biologist, responsibilities include completing fisheries surveys using an electrofishing unit, completing constructed fish habitat assessments, vegetation monitoring, and photographic documentation. Monitoring activities were required as part of the Department of Fisheries and Oceans' Fisheries Authorization.

773665 Ontario Ltd.

Project manager for a three-year post-construction monitoring program required for a realignment of a tributary of Fletcher's Creek associated with culvert construction in Brampton, Ontario (Chinguacousy Road). The monitoring program included vegetation, channel stability and fish habitat monitoring.

David Schaeffer Engineering Ltd.

Developed a training manual and facilitated a training session that taught best management practices to field staff of an engineering firm responsible for environmental inspections.

Box Grove Hill Developments Inc.

Developed a sediment and erosion control plan and voluntary restoration plan to address stabilization requirements for a tributary of the Rouge River in Markham, Ontario.

Ontario Potato Growers Association / Schaeffers Consulting Engineers

Conducted fish community surveys within Bailey Creek near Alliston, Ontario as part of an environmental review for the New Tecumseh Community.

Walt Spivak

Project fisheries biologist for the construction of Fire Rock Golf Course in Komoka, Ontario. Tasks included agency liaison, preparation of agency applications for temporary and permanent bridge crossings over Oxbow Creek, and the development of mitigation measures to protect aquatic resources of the creek during crossing construction and operation.

Mattamy Development Co., Brampton

Conducted construction inspection activities associated with a constructed stream and wetland system within a tributary of Fletcher's Creek, Brampton. Responsibilities included completing bi-weekly site inspections, liaising with regulatory agencies, and ensuring that adequate erosion controls were in place to protect downstream fish habitat.

Fieldgate Development, Vaughan

Project biologist for post-construction monitoring activities at the Block 32 development in Vaughan, Ontario. Responsibilities included benthic invertebrate collection, fish and fish habitat monitoring, and photographic documentation within a major stream realignment of a tributary to the West Don River.

Orlando Corporation, Brampton

Contributed to the post-construction monitoring of a stream realignment of a tributary of Etobicoke Creek. Activities included fish and fish habitat surveys and photographic documentation of constructed channel and valley works.

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BIOLOGICAL RESEARCH

Queen's University, Kingston, Ontario

Completed field work for salmon research on the Miramichi River, New Brunswick. Responsibilities included fish collection, field data recording, and tissue and blood sampling. Research was conducted to investigate the physiological effects of "catch and release" angling on Atlantic salmon for M.Sc. thesis. Analyzed salmon tissue and blood for physiological variables as part of thesis project.

Queen's University, Kingston, Ontario

Processed collected tissue data and carried out statistical analysis for scientific experiments and formal reports.

INDUSTRY SECTOR

Canadian Pacific Railway

Managed the acquisition of environmental approvals and construction environmental monitoring for emergency works and several culvert replacement and bridge maintenance sites within Canadian Pacific's Southern Ontario Service Area.

Canadian Pacific Railway

Coordinated field studies and background data review for an Environmental Study Report associated with a proposed railyard near Wolverton, Ontario. Participated in Risk Assessment for the project and provided key input regarding environmental approvals and mitigation requirements.

D'Orazio Infrastructure Group

Coordinated environmental approvals and agency liaison services associated with pipeline crossings of the Ausable River and a tributary near Exeter, Ontario for the Exeter-Hensall watermain.

Canadian Pacific Railway

Project manager for environmental monitoring associated with the bridge and rail crossing of the Gordon Pittock Reservoir and Thames River to the Toyota plant in Woodstock, Ontario. Coordinated monitoring staff and post-construction monitoring requirements of the Department of Fisheries and Oceans Authorization.

Canadian Pacific Railway

Project biologist and coordinator for acquisition of regulatory approvals relating to the bridge and rail crossing of the Gordon Pittock Reservoir and Thames River to the Toyota plant in Woodstock, Ontario. Tasks included agency liaison with the Department of Fisheries and Oceans, Upper Thames River Conservation Authority, Ministry of Natural Resources and Transport Canada – Marine to obtain the necessary approvals. Developed and negotiated a Fish Habitat Compensation Plan.

Toronto Port Authority

Developed a fish habitat compensation plan to compensate for habitat loss associated with construction of the Fixed Link Bridge to the Toronto City Centre Airport. The Plan was developed through discussions with the Toronto and Region Conservation Authority and the Department of Fisheries and Oceans.

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Toronto Port Authority

Conducted baseline water turbidity sampling within the Western Gap of Lake Ontario (Toronto waterfront). Sampling was conducted within multiple transects to provide baseline data for Fixed Link construction monitoring.

Browning Ferris Industries Limited

Project biologist for post-construction monitoring of drain realignments at the BFI Ridge Landfill near Blenheim, Ontario. Tasks included completing fisheries surveys and taking benthic samples for the annual monitoring report.

Greater Toronto Airports Authority

Completed assessments of degraded sections of Etobicoke Creek and Spring Creek at Toronto's Lester B. Pearson Airport as part of the Etobicoke and Spring Creek Rehabilitation Master Plan. Tasks included mapping out areas of concern, determining appropriate bioengineering treatments, and completing a schedule and cost estimate for future restoration works.

RESOURCES SECTOR

Enbridge Ontario Wind Power

Developed fish habitat compensation measures and secured *Fisheries Act* approval for access road crossings associated with the Enbridge Ontario Wind Power Project in the Municipality of Kincardine.

Lakeview Power L.P.

Coordinated aquatic field and background studies and conducted agency liaison services in support of an Environmental Assessment for a proposed new generation project in Mississauga, Ontario.

Hydro One Networks Inc.

Conducted an aquatic overview of site conditions and potential impacts of a Hydro One switching station located near Fletcher's Creek in the City of Brampton. Provided input into the development of mitigation measures to protect aquatic resources.

Invenergy Services Canada

Conducted background fisheries review related to a potential wind farm project east of Lake Simcoe in the Beaver Creek subwatershed. Information was provided as input to a Provincial Environmental Assessment.

Enbridge Inc.

Carried out aquatic impact assessments on the Rouge River and a tributary to investigate potential impacts of frac-outs from direction drilling on aquatic resources, and to recommend restoration measures.

Hydro One Networks Inc.

Provided aquatic input to a transmission line environmental assessment from the Jim Yarrow transmission station to the Hurontario switching station in Brampton. Provided input regarding the development of mitigation measures to protect aquatic resources, including Fletcher's Creek.

Invenergy Services Canada

Conducted background fisheries review related to a potential wind farm project in the South Saugeen River subwatershed. Information was provided as input to a Provincial Environmental Assessment.

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Enbridge Pipelines Inc.

Fisheries biologist responsible for conducting screening level aquatic assessments for a wind farm project in the Kincardine area. Responsibilities included agency consultation, field reconnaissance of aquatic features/fish habitat and documentation of aquatic conditions for the Provincial EA Screening Report.

Hydro One Networks Inc.

Provided fisheries input regarding fish habitat compensation design and existing conditions for stream realignments required at the Parkway Transformer Station in Markham, Ontario.

Echo Wind

Fisheries biologist responsible for conducting screening level aquatic assessments for a proposed wind farm project in the Port Burwell area. Responsibilities included agency consultation, field reconnaissance of aquatic features/fish habitat and documentation of aquatic conditions and potential constraints associated with transmission line and road crossings.

Northland Power Inc.

Conducted fish habitat assessments for wind farm projects on Manitoulin Island and in the Grand Bend area. These assessments were carried out in support of environmental screening documentation.

Water Working Group – Cumulative Environmental Management Association

Contributed to a review and compilation of surface water research for selected water bodies in the oil sands area of the Municipal District of Wood Buffalo. Extensively reviewed surface water quality and fish contaminant data to investigate the current status and historical trends in the aquatic environment.

Diavik Diamond Mines Inc

Conducted biotelemetry survey of radio-tagged lake trout and hydroacoustic shoal surveys as part of a habitat utilization study on Lac de Gras, Northwest Territories.

Cigar Lake Mining Corporation

Monitored vegetation in reclamation research test plots to assess various soil treatments and seeding regimes at Cigar Lake Uranium Mine in northern Saskatchewan. Collected data will assist in determining re-vegetation strategies upon site decommissioning.

Trace Metals and Air Contaminants Working Group – Cumulative Environmental

Management Association Project coordinator for the review and assessment of trace metals deposition in the oil sands area. Responsibilities included reviewing trace metals data for aquatic and terrestrial biota from environmental impact assessments and historical studies, compiling input from key team members, and assisting with report preparation. Reviewed data was used to assist in evaluating potential impacts of trace metals deposition in the oil sands area with respect to ecological and human health issues.

Westcoast Energy Inc.

Completed aquatic habitat assessments and fisheries investigations related to a proposed pipeline looping project in northeastern British Columbia. Assessments included evaluations of channel and bank characteristics and fish habitat suitability.

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BHP Diamonds Inc.

Supervised a field crew undertaking baseline fisheries work at Ekati Diamond Mine, Northwest Territories to determine the presence of fish species in several water bodies. Gillnetting and electrofishing techniques were utilized to inventory fish presence and to determine stream migration opportunities. Aerial surveys were also completed to ascertain fish habitat quality and quantity. Collected data assisted in determining potential habitat losses from mine expansion so that habitat compensation issues could be addressed.

BHP Diamonds Inc.

Contributed to fish habitat compensation plan at BHP's Ekati Diamond Mine. Assisted in determining potential fish habitat losses as a result of planned mine expansion so that habitat replacement options could be calculated.

Royal Oak Mines Inc.

Conducted aquatic habitat assessments of Baker Creek at Giant Mine, Yellowknife, as part of a rehabilitation program to be included in the mine's Abandonment and Restoration Plan. Assessments included benthic invertebrate sampling, electrofishing and seining, and the measurement of water quality parameters.

BHP Diamonds Inc.

Researched fish passage issues with respect to culvert sizing within the Panda Diversion Channel at Ekati Diamond Mine, Northwest Territories.

BHP Diamonds Inc.

Fisheries biologist and project coordinator for the Panda Diversion Channel Monitoring Program in 1998 and 1999 at Ekati Diamond Mine, Northwest Territories. Responsibilities included undertaking habitat assessments, fish tagging and sampling for age structures, measuring water flows within the channel, and supervising BHP summer students.

BHP Diamonds Inc.

Participated in a sedimentation impact analysis for Kodiak Lake at Ekati Diamond Mine, Northwest Territories.

BHP Diamonds Inc.

Participated in fish habitat design for the Panda Diversion Channel at Ekati Diamond Mine in the Northwest Territories. Designs were utilized to provide productive fish habitat within the channel to enhance fish passage, spawning opportunities, and nursery habitat.

TEACHING/INSTRUCTION

BHP Diamonds Inc.

Instructed environmental technicians in safe work practices for assisting in electrofishing. Developed a training course which included basic principles of electrofishing, safety issues, and field techniques.

Aurora College, Fort Simpson, Northwest Territories

Instructor for health sciences program in Fort Simpson, Northwest Territories. Taught students in a cross-cultural setting; developed detailed lesson plans.

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Queen's University, Kingston, Ontario

Taught students in laboratory components of two university level courses: Introductory Biology and Animal Physiology. Graded reports and presentations, and helped in setting up and conducting physiological experiments.

EMPLOYMENT HISTORY

Dillon Consulting Limited

2010-Present Practice Leader, Natural Environment Management Practice
2008-2010 Office Manager
1997-Present Biologist

Aurora College, Fort Simpson, Northwest Territories

1996-1997 Instructor

Metro Toronto and Region Conservation Authority, Downsview, Ontario

1996 Biologist/Crew Leader

Ontario Ministry of Natural Resources, Glenora, Ontario

1996 Biologist, Salmonid Ecology Unit

Queen's University, Department of Biology, Kingston, Ontario

1995 Research Assistant
1993-1995 Teaching Assistant

AWARDS AND SCHOLARSHIPS

1995 – Olin Fellowship, Atlantic Salmon Federation
1993/94 – Queen's Graduate Award, renewed 1994/95
1989 – Medical Associates Scholarship

PUBLICATIONS AND PRESENTATIONS

Brobbel, M.A., D. Burr, N. Krygsman and C. Baker. 2006. Incorporating Ecological Impact Assessment in Groundwater Supply Assessments. Presented to Joint Annual Conference of the Ontario Water Works Association and Ontario Municipal Water Association.

Brobbel, M.A. and Roul, I. 2004. Working Around Water Seminar. Presented to staff of David Schaeffer Engineering Ltd.

Brobbel, M.A. and C.J. Thomas. 1999. Environmental Practices Related to Fish and Fish Habitat for Highway Construction and Maintenance, Training Manual. Prepared for Department of Transportation, Government of the Northwest Territories.

Wilkie, M.P., M.A. Brobbel, K. Davidson, L. Forsyth, B.L. Tufts, 1997. Influences of temperature upon the post-exercise physiology of Atlantic salmon (*Salmo salar*). Canadian Journal of Fisheries and Aquatic Sciences. 54: 503-511.

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**BIOLOGIST
ASSOCIATE**

Brobbel, M.A., M.P. Wilkie, K. Davidson, J.D. Kieffer, A.T. Bielak, and B.L. Tufts. 1996. Physiological effects of catch and release angling in Atlantic salmon (*Salmo salar*) at different stages of freshwater migration. *Canadian Journal of Fisheries and Aquatic Sciences*. 53: 2036-2043.

Tufts, B.L., M.A. Brobbel, K. Davidson, and A.T. Bielak. 1996. Fresh evidence justifies kelt fishing. *Atlantic Salmon Journal*, Vol. 45, No. 3: 48-50.

Wilkie, M.P., K. Davidson, M.A. Brobbel, J.D. Kieffer, R.K. Booth, A.T. Bielak, and B.L. Tufts. 1996. Physiology and survival of wild Atlantic salmon following angling in warmer waters. *Transactions of the American Fisheries Society*. 125: 572-580.

Brobbel, M.A. 1995. Physiological effects of catch and release sportfishing in Atlantic salmon (*Salmo salar*) at different stages of river acclimation. Poster presentation at Canadian Society of Zoologists' Conference, Rimouski, Quebec.

PROFESSIONAL DEVELOPMENT

Trans-Boundary Issues in Water Quality Management, CWRA Workshop, 2010.

Leadership in Energy and Environmental Design (LEED®) Accredited Professional, 2009.

Adaptation to Climate Change – Understanding Water Management Needs, CWRA Workshop, 2009.

Integrated Watershed Management Workshop. 2008.

Project Management 201 Training, Dillon Consulting Limited, 2007.

MTO/ DFO / OMNR Protocol, Fisheries Specialist Training Course, June 2006.

Leadership Roundtable, Dillon Consulting Limited, 2005.

Improving Performance through People, HSA Learning & Performance Solutions, 2005.

Making it Work: Erosion and Sediment Control Workshop, 2005.

Class 2 Electrofishing Crew Leader Certification Course, 2004.

OMNR Stream Habitat Assessment Training Course, Fish Community Sampling Module, 2004.

Regulations and Responsibilities: Urban Erosion and Sediment Control, Training Course, 2002.

Training Course on "How to Build Fish Friendly Stream Crossings," 2000.

Workshop Facilitator Training, 1999.

Canadian Environmental Assessment Act (CEAA) Course; Preparation and Management of Comprehensive Studies, 1998.

Mining Supervisor Certificate, Level 1, Northwest Territories Mine Health and Safety Act, 1998.

Ontario Ministry of Natural Resources Stream Assessment Protocol Training, 1996.

Ontario Fish Identification Workshop, Royal Ontario Museum, 1996.

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BIOLOGIST
ASSOCIATE

SEPTEMBER 2010
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**DANIEL
KNEE**

BIOLOGIST

Education

B.Sc. (Honours Biology), Trent University, Peterborough, Ontario, 2000

Diploma (Integrated Resource Management Technology), Sir Sandford Fleming College, Lindsay, Ontario, 1996

Affiliations

American Fisheries Society, Ontario Chapter

Trout Unlimited Canada, Toronto Chapter

Language

English

PERSONAL PROFILE

Daniel is an aquatic biologist with ten years of experience. His specific expertise is rooted in aquatic habitat assessment, fish and benthic invertebrate community sampling, HADD determination and negotiation, regulatory agency consultation, and permit and approval acquisition.

RELEVANT EXPERIENCE

ROADWAY PROJECTS

Coordinated fisheries and aquatic habitat assessment along Bush Street and Mississauga Road near Caledon, Ontario. EA tasks included background review, agency meetings, fieldwork, and review of road improvement alternatives (Region of Peel).

Conducted fisheries and aquatic habitat assessment along Fruitland Road near Stoney Creek, Ontario. EA tasks included background review, agency meetings, fieldwork, and review of road improvement alternatives (City of Hamilton).

Provided fisheries and aquatic habitat assessment services along Malden Road and the Laurier Parkway Extension in LaSalle, Ontario. EA tasks included background review, agency meetings, fieldwork, and review of road improvement alternatives (Town of LaSalle).

Provided fisheries and aquatic habitat assessment input to the Waterdown-Aldershot Transportation Master Plan and EA in Waterdown, Ontario. EA tasks included background review, agency meetings, fieldwork, and review of road alignment alternatives (City of Hamilton/City of Burlington).

Conducted fish habitat assessment and fish community sampling at various MTO watercourse crossings to determine habitat sensitivity and potential impacts of proposed highway work in and around water. Latest projects include: Highway 61 & Highway 11/17 (Thunder Bay), Highway 6 (Guelph), Highway 7 (Rockwood), Highway 21 (Shashawandah Creek), Highway 7/8 (Kitchener), Highway 402 (London) intersection and/or road improvements (Ministry of Transportation, Ontario).

Developed a fish habitat enhancement plan to procure a letter of advice from DFO for a large culvert extension on Brown Drain in Chatham, Ontario (Municipality of Chatham-Kent).

RAILWAY PROJECTS

Assisted in the procurement of letters of advice from DFO for three culvert replacements along a rail corridor (Canadian Pacific – Mactier Subdivision).

Conducted field investigations and agency consultation to acquire a letter of advice from DFO to facilitate the construction of a new rail yard near Ayr, Ontario (Canadian Pacific).

Completed a two-season inventory (spring and fall) of existing aquatic habitat along the shorelines of the Gordon Pittock Reservoir at the proposed preferred alignment of a new rail spur over the reservoir (Canadian Pacific).

Provided numerous Environmental Screenings at potential rail work sites to assist the client in project planning and scheduling purposes (Canadian Pacific).

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HYDRO PROJECTS

Responsible for the assessment and management of aquatic features on the preferred site for a new Transmission Station near Tremaine Road in Halton Region. Tasks included on-site habitat assessment, evaluation of alternative sites, regulatory agency consultation and permitting (Hydro One).

Responsible for the assessment and permitting of aquatic features (i.e., crossings) associated with new hydro line installation and station upgrades in Guelph, Ontario (Hydro One).

OFFSHORE PROJECTS

Conduct annual fish habitat screenings and assessment for new natural gas pipeline works in Lake Erie (Dundee Energy Ltd).

Responsible for developing a new streamlined protocol document for the procurement of DFO approval annually for natural gas exploration and development works on Lake Erie (Talisman Energy Inc/Fisheries and Oceans Canada).

WIND/SOLAR/WATER POWER PROJECTS

Reviewed fisheries and aquatic habitat components of various Renewable Energy Applications (REA) for approval from the Ministry of the Environment (MOE) in Ontario (Invenergy).

Coordinated all fisheries and aquatic habitat work, including agency permitting, for an underwater marine cable installation associated with the McLean's Mountain Wind Farm Project on Manitoulin Island, Ontario (Northland Power Inc.).

Assessed fish and fish habitat at potential access road crossings as part of the new Greenwich Lake Wind Farm in Thunder Bay, Ontario. Tasks included habitat assessment at numerous watercourse crossings and overhead transmission lines, agency meetings and consultation, and procurement of DFO approval (Renewable Energy Systems).

Assessed fish and fish habitat at potential watercourse crossings as part of a new wind farm REA near Palmyra, Ontario. Tasks included habitat assessment at numerous watercourse crossings for access road and overhead transmission line construction, agency consultation, and permit/approval acquisition (Renewable Energy Systems).

Assessed fish and fish habitat at potential watercourse crossings as part of a wind farm REA on Manitoulin Island, Ontario. Tasks included habitat assessment at numerous watercourse crossings for access road and overhead transmission line construction, regulatory agency consultation, and permit/approval acquisition (Northland Power).

Assessed the potential impacts of transportation corridor expansion associated with the Waterdown/Aldershot Transportation Master Plan (WATMP) EA on fish and fish habitat. Tasks included inventory of fish and assessment of habitat at all existing and new crossings, determination of sensitivity, and reporting.

NEW DEVELOPMENT PROJECTS

Completed an evaluation and assessment of fish habitat conditions along the Trent River adjacent to lands proposed for development (Sifton Properties Ltd).

**DANIEL
KNEE**

BIOLOGIST

Procured Fisheries Act authorizations for a channel realignment and large bridge crossing of Lampman-Lock Drain in Woodstock, Ontario, to facilitate the construction of a rail yard and staging area to service the new Toyota plant in Woodstock. (Toyota Motor Manufacturing North America).

Conducted a detailed aquatic habitat assessment and fish community composition survey in two municipal drains that bisected the proposed Airport Road Industrial Park site to gather sufficient information needed for environmental approvals from Fisheries and Oceans Canada, Ontario Ministry of Natural Resources and the Upper Thames River Conservation Authority. (City of London).

Aided in the completion of an environmental impact study (EIS) for 2,000 acres of lands to be developed to accommodate their new car manufacturing facility. These lands contained portions of the Vansittart Woods provincially significant wetland, the Lampman-Lock Drain, and the non-provincially significant Eastwoods wetland. (Toyota Motor Manufacturing North America).

WATER/WASTEWATER PROJECTS

Provided fish habitat assessment services during the preliminary design of the Boyne Sewer Project in Oakville, Ontario (Halton Region).

Conducted fish and fish habitat surveys in Wainfleet, Ontario, at watercourse crossings along the proposed water/wastewater servicing alignment (Niagara Region).

Conducted water quality sampling at stations upstream and downstream of a new waste water treatment plant in Acton, Ontario, to satisfy MOE Certificate of Approval conditions (Halton Region).

Provided fish and fish habitat assessment services for the Watershed 5 and 6 Class EA Study in Hamilton, Ontario. Tasks included agency consultation, field investigations, assessment of watercourse sensitivity and identification of appropriate mitigation measures (City of Hamilton).

Provided aquatic and fishery assistance to the overall EA in an effort to identify and recommend an alternative town water supply pipeline alignment that has the least negative impact on fishery resources in the study area. Tasks included field investigations along each alignment, agency consultation, literature review, contribution to the ESR and meeting attendance (Town of Milton).

AQUATIC RESTORATION/REMEDIATION PROJECTS

Prepared a detailed fish habitat enhancement strategy for two old oxbows along the Lower 12 Mile Creek in St. Catharines, Ontario, to improve local fishery resources and to satisfy NPCA goals and objectives for the watershed (Niagara Peninsula Conservation Authority).

Conducted a detailed aquatic habitat assessment and fish community composition survey to acquire sufficient information in order to procure all environmental approvals from Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, Nickel District Conservation Authority, and Transport Canada (Navigable Waters Permit) to facilitate site remediation works within the Junction Creek floodplain (City of Greater Sudbury).

**DANIEL
KNEE**

BIOLOGIST

Characterized and assessed fish habitat conditions in the Murray Marr channelized drain in London, Ontario, to determine which portions were to be restored to natural conditions during development of the stormwater facility (City of London).

BIOMONITORING PROJECTS

Sampled and evaluated the benthic invertebrate community to assess changes in the biotic state of the aquatic environment in relation to the construction of a new storm sewer outfall that discharges to the Sydenham River in Dresden, Ontario. This work was in response to MOE concerns and request for a monitoring plan (Municipality of Chatham-Kent).

Sampled and evaluated the benthic invertebrate community to assess changes in the biotic state of the aquatic environment in relation to the construction of a new Sewage Treatment Plant in Woodslee, Ontario, that discharges to the Belle River. This work was undertaken to satisfy monitoring conditions outlined within the issued MOE Certificate of Approval (Town of Lakeshore).

Completed benthic invertebrate, fish habitat, and water quality assessment as part of the Mill Creek Subwatershed Study in London, Ontario (City of London).

Participated in an annual benthic invertebrate monitoring program adjacent to the new landfill site in Sault Ste. Marie, Ontario (The City of Sault Ste. Marie).

Conducted a benthic invertebrate survey to address water quality concerns raised by MOE in relation to a new Sanitary Sewer Treatment Plant outfall to Wye Creek in Thorndale, Ontario (Elliot Grain Ltd. and Farms).

Participated in a study to determine potential impacts of an adjacent housing/golf course community (River Bend) and stormwater inputs on the macroinvertebrate community in the Thames River, London, Ontario. Tasks included invertebrate field collection, sampling site mapping, data analysis using selected bio-assessment protocols, and annual report preparation (Sifton Properties Ltd.).

Participated in a study to determine the potential impacts of effluent discharge from a new water pollution control plant in Field, Ontario. The study focused on the potential effects of chlorinated effluent on the fish and aquatic macroinvertebrate communities upstream and downstream of the discharge zone (Municipality of Nipissing).

CONSTRUCTION MONITORING PROJECTS

Started DFO pre and post construction monitoring services for intersection improvement works at Wanless Drive and Chinguacousy Road (City of Brampton).

Provided DFO pre and post construction monitoring services during and after the building of a new rail spur over Pittock Reservoir in Woodstock, Ontario (Canadian Pacific).

Completed DFO pre and post construction monitoring services during an open-cut watermain installation across the Grand River in Brantford, Ontario (City of Brantford).

**DANIEL
KNEE**

BIOLOGIST

EMPLOYMENT HISTORY

	<i>Dillon Consulting Limited</i>
2006-Present	Biologist
	<i>Earth Tech Canada, Kitchener, Ontario</i>
2003-2006	Aquatic & Fisheries Biologist
	<i>Azimuth Environmental Consulting Limited, Barrie, Ontario</i>
2002-2003	Aquatic Biologist
	<i>Golder Associates Limited, Saskatoon, Saskatchewan</i>
2001	Fisheries Biologist
	<i>Ministry of Natural Resources, Peterborough, Ontario</i>
2000	Field Support
	<i>Watershed Science Centre, Trent University</i>
2000	Field Support

PROFESSIONAL DEVELOPMENT

Fish Species at Risk (SAR) Identification Workshop, ROM/DFO
Class 1 Electrofishing Recertification, OMNR/Laurier University
MTO/DFO/OMNR Protocol Training for Fisheries Specialists
Identification of Ontario's Freshwater Mussels, DFO
Making It Work: Erosion and Sediment Control Workshop
In-stream Barrier Remediation Workshop, Canadian Centre for Inland Waters
Class 1 Electrofishing Certification, OMNR/Watershed Science Centre
Identification of Ontario Fishes, Royal Ontario Museum
Animal Care Course, Trent University

SEPTEMBER 2010

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**LINDSAY
KNEZEVICH**

AQUATIC
BIOLOGIST

Education

B.Sc. (Biology), University of
New Brunswick, 2007

Ecosystem Survey-Field Skills
Certificate, Sault College, 2009

Language

English

PERSONAL PROFILE

Lindsay has seven years of education and employment in the biological sciences. She has acquired an in-depth knowledge of aquatic and terrestrial environmental systems and the legislation/policies that protect them.

RELEVANT EXPERIENCE

CLASS, PROVINCIAL AND FEDERAL ENVIRONMENTAL ASSESSMENTS

Energy Transmission and Generation

EDF-EN Canada Solar

Completed a background review and incorporated field inventory data into natural heritage system and water assessment reports for four separate projects as part of the Renewable Energy Act Regulation 159/09.

Invenergy Services Canada Inc.

Working with a team of biologists to complete an assessment of impacts and possible mitigation for a wind farm proposed in Essex County, Ontario. Documentation was submitted as part of the Renewable Energy Act Regulation 159/09.

Northland Power Inc.

Completed a fish and fish habitat evaluation at future road and transmission line crossings for a wind farm proposed on Manitoulin Island to assess potential impacts. Field data and photos were incorporated into an assessment report.

ENVIRONMENTAL PLANNING

Natural Heritage Systems Planning and Management

Conservation Halton, Ontario

Completing a background review and documentation of the natural heritage system and its attributes associated with four conservation areas within the Conservation Halton Watershed. Based on the particular sensitivities of the natural heritage system, recommended management criteria will be designed to help protect the natural environment and will be incorporated into park management plans.

City of Welland, Ontario

In consultation with the City of Welland, Region of Niagara and local Conservation Authority, specific criteria will be identified to refine the natural heritage system and connecting corridor mapping within the urban boundary. This work will be part of the Official Plan update that is currently being undertaken.

City of Hamilton, Ontario

Background review and field assessment of fisheries and aquatic habitat present in Borer's Creek. Incorporated field data, pictures and indices into the assessment report.

EMPLOYMENT HISTORY

Dillon Consulting Limited

2010-present Aquatic Biologist

**LINDSAY
KNEZEVICH**

AQUATIC
BIOLOGIST

Ontario Federation of Anglers and Hunters

2009 Atlantic Salmon Adult Assessment Technician

Toronto and Region Conservation Authority

2009 Field Technician – Regional Watershed Monitoring

Agriculture and Agri-Food Canada

2008 Plant Pathology/Microbiology Intern

PROFESSIONAL DEVELOPMENT

Ecosystem Restoration Workshop, 2010

Supervisor Safety Training, 2010

WHMIS Certification, 2010

Ontario Stream Assessment Protocol, 2009

Class 2 Electrofishing Certification, 2009

Standard First Aid and CPR, 2009

Canada Safety Council ATV Certification, 2009

Pleasure Craft Operator's Card, 2009

JULY 2010

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**BENJAMIN P.
GOTTFRIED**

**FISH AND WILDLIFE
TECHNICIAN**

Education

Fish and Wildlife Technician
Diploma, Sir Sandford Fleming
College, Lindsay, Ontario,
2006

Language

English

PERSONAL PROFILE

Ben is a fish and wildlife technician with experience in fish habitat assessment and restoration, fish community sampling, creek realignment design and benthic studies. He is actively involved in numerous aquatic management projects and as a skilled field technician he brings a broad level of understanding in several aquatic and environmental disciplines to every project.

RELEVANT EXPERIENCE

Erosion Control Monitoring (Mayfield)

Weekly and rainfall sampling events. Monitored a residential development and the off-site transport of sediment to a section of the downstream Etobicoke Creek. Weekly reports are submitted and on-site issues were resolved through coordination with the contractor, client and TRCA.

Sediment Removal and Fish Salvage (Barker Business Park, Vaughan)

Completed a dewatering of an on-site stormwater pond outfall channel which included installation of mitigation measures, dewatering, fish recovery and relocation, sediment removal and flow reinstatement.

Sediment Sampling (Public Works, Owen Sound, Sarnia, Cornwall)

Sediment samples were collected from the potentially affected harbours and off-site reference locations from a boat via Ponar grab for analysis of contaminants.

Fish Sampling (Public Works, Owen Sound, Sarnia, Cornwall)

Fish tissue samples were collected from the potentially affected harbours and off-site reference locations via gill nets, seine nets and minnow traps for analysis of contaminants.

Fisheries Assessments (Terry Fox Drive, Ottawa)

Conducted field research and fisheries assessments along the future highway extension at watercourse crossings and nearby aquatic habitat along the right-of-way.

Initial Field Research and Reconnaissance (Pristine Power, Thunder Bay)

Conducted initial site condition research and general habitat assessment for potential wind turbine locations for Pristine Power.

Fisheries Review (Town of Markham)

Researched and completed reporting on fish species requirements including habitat, water quality, spawning preferences and food supply.

Fisheries Assessments (MTO, Thunder Bay, Guelph, Kitchener, Brampton)

Successfully live captured, assessed and released fish using MTO protocol for backpack electrofishing to determine species identification, population estimates, overall health and success in natural habitats.

Fisheries Assessments (St. Marys Cement)

Conducted a five-day fish inventory of Westside Marsh using 3', 4' and 6' trap nets. All fish were measured, identified, assessed for overall health and population dynamics and released.

Sediment Sampling (St. Marys Cement)

Collected creek bed sediment samples throughout the year from Westside Creek for analysis of abundance of phosphorus.

**BENJAMIN P.
GOTTFRIED**

FISH AND WILDLIFE
TECHNICIAN

Habitat Assessments (MTO, Thunder Bay, Guelph, Kitchener, Brampton)

Assessed and mapped according to MTO standard protocol

Carp Relocation (St. Marys Cement)

Relocation consisted of carp removal from largemouth bass and northern pike spawning habitat using 3' and 4' trap nets. The carp were then released into their intended habitat.

Fish Removal (MTO, Town of Bethany)

Exercised skills necessary to capture, process and release fish from habitats lost to development.

Carp Control (St. Marys Cement)

Exercised, installed and repaired common carp control measures initiating the prevention of carp influence and degradation on the mature spawning populations of northern pike and largemouth bass in Westside Marsh in Bowmanville, Ontario.

Benthic Invertebrate Sampling (Sault Ste. Marie Landfill)

Performed benthic invertebrate sampling for the town of Sault Ste Marie on Canon Creek and the Root River.

Water Quality Testing

Performed numerous water quality monitoring tasks including habitat loss prevention to Etobicoke Creek in Brampton and productivity monitoring to Westside Creek and Marsh in Bowmanville.

Creek Surveying (City of Brampton)

Performed complete survey of a stretch of Fletcher's Creek in the City of Brampton.

Maplewood Creek Realignment Design (Department of North Vancouver)

Completed a preliminary design of a proposed realignment of Maplewood Creek in North Vancouver, British Columbia, where migratory salmon spawning habitat and manageable park lands were of concern.

Invertebrate Sampling (City of Brampton)

Collected benthic samples of aquatic invertebrates according to standard protocol within Etobicoke Creek in the City of Brampton.

Amphibian Monitoring Survey (Town of Newmarket, Richmond Hill, and London)

Completed amphibian monitoring surveys in appropriate habitat areas according to the Ontario Marsh Monitoring Protocol.

EMPLOYMENT HISTORY

Dillon Consulting Limited

2008-Present Fisheries Technician

Peregrine Lodge

2007 Fishing Guide

Waterloo Marine

2006 Mechanic Apprentice

Laurel Creek Conservation Area

2005 Park Maintenance

**BENJAMIN P.
GOTTFRIED**

FISH AND WILDLIFE
TECHNICIAN

PROFESSIONAL DEVELOPMENT

WHMIS, 2008

Standard First Aid and CPR, 2007

Marine Emergency Duties A3, 2007

VHF Marine Radio Operator, 2007

Ontario Ministry of Natural Resources Class 1 Backpack Electrofishing, 2006

Radio and Ultrasonic Telemetry, 2005

Boater's Competency Certification, 2001

NOVEMBER 2009

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APPENDIX C

Photographs and Field Notes



APPENDIX C

Photographs and Field Notes



APPENDIX C

C1: Photographs



Photo 1

McLean's Mountain
Windfarm

October 26, 2004
North Channel:
Station #11

Photo taken from
the south (Little
Current) side of the
channel, looking
east from the swing
bridge at the shore.



Photo 2

McLean's Mountain
Windfarm

October 26, 2004
North Channel:
Station #11

Photo taken from
the south (Little
Current) side of the
channel, looking
north across the
channel.



Photo 3

McLean's Mountain
Windfarm

October 26, 2004
North Channel of
Lake Huron
Station #11

Photo taken from
the north side of the
channel, looking
south at the shore
area and channel.



Photo 4

McLean's Mountain
Windfarm

October 26, 2004
North Channel of
Lake Huron
Station #11

Photo taken from
the north side of the
channel, looking
north at the swing
bridge and
shoreline.



Photo 5

McLean's Mountain
Wind Farm

May 7, 2010

Perch Creek
Station #1

Marsh area at
downstream end of
Perch Creek

Looking downstream



Photo 6

McLean's Mountain
Wind Farm

May 7, 2010

Perch Creek
Station #1

Looking upstream



Photo 7 McLean's Mountain Wind Farm May 7, 2010 Tributary of Perch Creek Station #2 Upstream grass channel with minimal flow Looking upstream	
Photo 8 McLean's Mountain Wind Farm May 7, 2010 Tributary of Perch Creek Station #2 Downstream culvert and open water wetland with small channel Looking downstream	

Photo 9

McLean's Mountain
Wind Farm

May 7, 2010

Tributary of Perch
Creek
Station #3

Blocked upstream
double CSP culvert
preventing flow
downstream

Looking upstream



Photo 10

McLean's Mountain
Wind Farm

May 7, 2010

Tributary of Perch
Creek
Station #3

Double CSP culvert
downstream

Looking downstream



Photo 11

McLean's Mountain
Wind Farm

May 7, 2010

Tributary of Perch
Creek
Station #3

Wetland area upstream
of back road (extension
of Guida's Sideroad)

Looking upstream



Photo 12

McLean's Mountain
Wind Farm

May 7, 2010

Tributary of Perch
Creek
Station #3

Wetland area with
braided channels
downstream of back
road (extension of
Guida's Sideroad)

Looking downstream



Photo 13

McLean's Mountain
Wind Farm

May 6, 2010

Tributary of Perch Lake
Station #4

Open marsh wetland
upstream of dry
channel

Facing upstream



Photo 14

McLean's Mountain
Wind Farm

May 6, 2010

Tributary of Perch Lake
Station #4

Wet low lying area
with standing water
downstream of open
wetland; no defined
channel

Facing downstream



Photo 15

McLean's Mountain
Wind Farm

May 5, 2010

Tributary of Bass Lake
Station #5

High gradient stream
with multiple
waterfall barriers

Looking upstream



Photo 16

McLean's Mountain
Wind Farm

May 5, 2010

Tributary of Bass Lake
Station #5

Cattail wetland area
upstream

Looking upstream



Photo 17

McLean's Mountain
Wind Farm

May 6, 2010

Tributary of Bass Lake
Station #6

Channel formed by
depressed tire marks
with small flow
through culvert north
of Green Bush Rd.

Looking upstream



Photo 18

McLean's Mountain
Wind Farm

May 6, 2010

Tributary of Bass Lake
Station #6

Pool and small
channel flowing into
farm field south of
Green Bush Rd.

Looking downstream



Photo 19

McLean's Mountain
Wind Farm

May 6, 2010

Tributary of
Manitowaning Bay
Station #7

Channel formed by
depressed tire marks
with small flow
through culvert north
of Green Bush Rd.

Looking upstream



Photo 20

McLean's Mountain
Wind Farm

May 6, 2010

Tributary of
Manitowaning Bay
Station #7

Pool and small
channel flowing into
farm field south of
Green Bush Rd.

Looking downstream



Photo 21

McLean's Mountain
Windfarm

May 5, 2011

Tributary of
Manitowaning Bay
Station #9

West of Boozeneck
Road.

Facing downstream



Photo 22

McLean's Mountain
Windfarm

May 5, 2011

Tributary of
Manitowaning Bay
Station #9

Pond near Boozeneck
Road Crossing.

Facing upstream



Photo 23

McLean's Mountain
Windfarm

May 5, 2011

Unnamed Tributary
Station #10

Grass channel on the
south side of
Harbourview Road.

Facing upstream



Photo 24

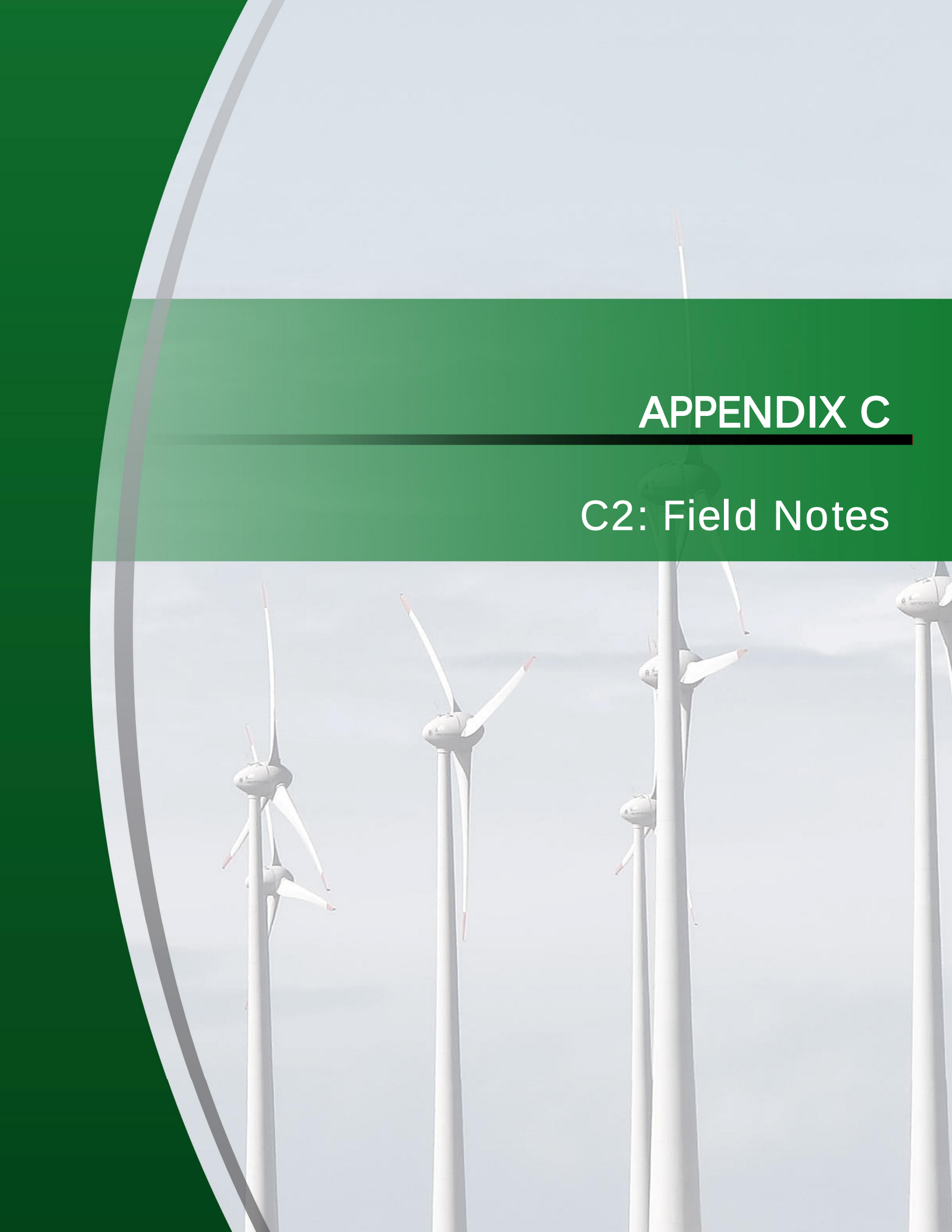
McLean's Mountain
Windfarm

Unnamed Tributary
Station #10

Undefined grass
channel on the north
side of Harbourview
Road.

Facing upstream.



A background image of a wind farm with several white wind turbines against a cloudy sky. A large green curved shape is on the left side of the page, and a horizontal green bar is across the middle.

APPENDIX C

C2: Field Notes

Ministry of Transportation
Environmental Guide for Fish and Fish Habitat

Section 4: Field Investigations
Appendix 4.A: Watercourse Field Record Form

① 3567 - Marsh area d/s view
3569 - d/s view blue sections
② 3570 - d/s view

Downstream

GENERAL INFORMATION									
PROJECT #: 691983		PROJECT DESCRIPTION: McLean's		DAY: 07	MONTH: 05	YEAR: 2010			
Is STREAM REALIGNMENT required for this section: ☐ Yes ☒ No ☐ Unknown									
COLLECTORS: BPG LAK		WEATHER CONDITIONS: overcast		TIME STARTED: 4:10		TIME FINISHED: 5:00			
AIR TEMP: 13		WATER TEMP: —		CONDUCTIVITY (µS/cm): —					
PHOTO NUMBERS AND DESCRIPTIONS: see habitat map									
LOCATION									
NAME OF WATERBODY: Perch Creek		DRAINAGE SYSTEM: Perch Lake		CROSSING #: 1		STATION #: 1			
LOCATION OF CROSSING: Perch creek 200m D/s of Atv bridge just w/s of wetland									
GPS COORDINATES: 17T 0415880 5082790				MTO CHAINAGE: N/A					
TOWNSHIP: Manitoulin				MNR DISTRICT: ESPANOLA					
LAND USE AND POLLUTION									
SURROUNDING LAND USE: natural woodlot, open field, wetland				SOURCES OF POLLUTION: Nearby Atv trail					
EXISTING STRUCTURE TYPE									
Bridge ☐		Box Culvert ☐		Open Foot Culvert ☐		CSP ☐		N/A ☒	
Other ☐ Describe:						Size (w x h) m ²			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER: D/S			SECTION LOCATION: (include on habitat map)						
TYPE:	Stream / river ☒	Channelized ☒	Permanent ☒	Intermittent ☐	Ephemeral ☐	ASSOCIATED WETLAND: Yes			
TOTAL SECTION LENGTH (m): 100				CURRENT VELOCITY (m/s): 1 m/s					
SUB-SECTION(S)	Run ☒	Pool ☐	Riffle ☒	Flats ☒	Inside culvert ☐	Other			
Percentage of area	70	—	20	10	—	—			
Mean depth wetted (m)	0.10	—	0.06	0.3	—	—			
Mean width wetted (m)	2.8	—	2.5	20.0	—	—			
Mean bankfull width (m)	3	—	2.5	N/A	—	—			
Mean bankfull depth (m)	0.25	—	0.2	N/A	—	—			
Substrate	Gr, s, co	—	Be, co, gr	Br, D	—	—			
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	0	0	0	0			
Right Upstream Bank	0	0	0	0			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris	Organic debris	Vascular Macrophytes	None
			60	Instream 5 Overhanging 5	5	Instream 10 Overhanging 5	10
SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None		
	0	0	0	0	0		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
Predominant Species					15 terrestrial grass		85
MIGRATORY OBSTRUCTIONS:	None		Seasonal		Permanent		
	✓						
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater		Other		
	N/A		N/A				
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
- addition of finer gravel - increase diversity of instream structure - increase shore cover							
COMMENTS:							
- good flow, good gradient - Substrate predominantly broken bedrock - channel becomes less defined as proximity to wetland increases. - 2 beaver dams observed ~80m D/S And 120m D/S - abundant beaver activity							
Additional Notes Appended? ☒ No ☐ Yes number of pages _____							

SECTION IDENTIFIER: D/S	SECTION LOCATION: 3/5 from Abv bridge	SECTION LENGTH (m): 100	SCALE (cm / m): 5:1	
				PROJECT #: 09 1983
				MAPPER: B. Gottfried
				NAME OF WATERBODY: Perch Creek
				CROSSING #: 1
				STATION #: 1
DATE: DD-MMM-YY 07-May-10				
LEGEND				
10d depth (cm) 6w width → Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar . Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree AAA Dam/Weir/Obstruction ® Riparian Tree └▶ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line □ Culvert				
PROFILE: Horz. Scale 1:2 Vert. Scale 1:1				

Ministry of Transportation
Environmental Guide for Fish and Fish Habitat

Section 4: Field Investigations
Appendix 4.A: Watercourse Field Record Form

GENERAL INFORMATION									
PROJECT #: 09-1983		PROJECT DESCRIPTION: McLean's Mountain		DAY: 07	MONTH: May	YEAR: 2010			
Is STREAM REALIGNMENT required for this section: ☐ Yes ☒ No ☐ Unknown									
COLLECTORS: LK, BG		WEATHER CONDITIONS: Cloudy		TIME STARTED: 4:00		TIME FINISHED: 5:00			
AIR TEMP: ~13°C		WATER TEMP: —		CONDUCTIVITY (µS/cm): —					
PHOTO NUMBERS AND DESCRIPTIONS: 3570 (on habitat map) 3571 (on map)									
LOCATION									
NAME OF WATERBODY: Perch Creek		DRAINAGE SYSTEM: Perch Lake		CROSSING #: 7		STATION #: 1			
LOCATION OF CROSSING: Perch creek ~200m south of ATV bridge just north of wetland.									
GPS COORDINATES: 17 T 0415878 5082790				MTO CHAINAGE: N/A					
TOWNSHIP: manitoulin				MNR DISTRICT: Espanola					
LAND USE AND POLLUTION									
SURROUNDING LAND USE: marshy thicket, deciduous forest, atv/snowmobile trail				SOURCES OF POLLUTION: ATV bridge crossing / trails					
EXISTING STRUCTURE TYPE									
Bridge ☐		Box Culvert ☐		Open Foot Culvert ☐		CSP ☐		N/A ☒	
Other ☐ Describe:						Size (w x h) m ²			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER: Upstream		SECTION LOCATION: North of wetland along Perch creek (include on habitat map)							
TYPE:	Stream / river ☒	Channelized ☒	Permanent ☒	Intermittent ☐	Ephemeral ☐	ASSOCIATED WETLAND: Yes			
TOTAL SECTION LENGTH (m): 50m				CURRENT VELOCITY (m/s): 1m/s					
SUB-SECTION(S)	Run 0	Pool 0	Riffle 0	Flats 0	Inside culvert 0	Other			
Percentage of area	25	5	70						
Mean depth wetted (m)	0.10	0.15	0.10						
Mean width wetted (m)	4.5	5.5	6.0						
Mean bankfull width (m)	4.5	5.5	6.0						
Mean bankfull depth (m)	0.15	0.20	0.15						
Substrate	Br, Co, Gr	Br, Co, Gr	Br, Co, Gr						
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	0	X	0	0			
Right Upstream Bank	0	X	0	0			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris	Organic debris	Vascular Macrophytes	None
	—	5	60	Instream — Overhanging 5	—	Instream 5 Overhanging 10	15
SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None		
	0	0	0	X	0		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
	50		—		10		40
Predominant Species	moss		—		grasses		
MIGRATORY OBSTRUCTIONS:	None		Seasonal lack of flow		Permanent		
	—				—		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning suitable substrate		Evidence of Groundwater		Other		
			N/A		—		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
increase gravel or sediment substrate. Increase cover on shores and pool areas.							
COMMENTS:							
- Landowner said this streams dries up in the summer - Entire length is bedrock and cobble - High beaver activity in the area							
Additional Notes Appended? X No ☐ Yes ☐ number of pages _____							

SECTION IDENTIFIER: Upstream	SECTION LOCATION: T92 Perch Creek near wetland	SECTION LENGTH (m): 50m	SCALE (cm / m): 1/3.13
			PROJECT #: 09-1983
			MAPPER: LK
			NAME OF WATERBODY: Perch Creek
			CROSSING #: 1
			STATION #: 1
			DATE: DD-MMM-YY 07-May-10
			LEGEND
PROFILE: Horz. Scale 1/0.54m Vert. Scale 1/0.6m picture 3570			10d depth (cm) 6w width ➡ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar . Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ® Riparian Tree ▶ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line □ Culvert

Fish

Ministry of Transportation
Environmental Guide for Fish and Fish Habitat

Section 4: Field Investigations
Appendix 4.E: Fish Community
Inventory Record Form

GENERAL INFORMATION							
PROJECT #: 09-1983		PROJECT DESCRIPTION: McLean's Mountain		DAY: 07	MONTH: May	YEAR: 2010	
COLLECTORS: BG, LK				TIME STARTED: 5:00		TIME FINISHED: 10:00	
WEATHER CONDITIONS: Cloudy, cool				SURFACE CONDITIONS (if applicable):			
				Calm 0	Rippled ☒	Wavy 0	Rough 0
GENERAL LOCATION							
NAME OF WATERBODY: Perch Creek				LOCATION OF STATION: Perch creek north of wetland near T42 proposed turbine			
TOWNSHIP:				MNR DISTRICT: Espanola			
SAMPLING LOCATIONS AND WATER CHEMISTRY							
LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)	
Upstream							
Downstream							
Culvert / Hwy ROW							
WATER COLOUR:		Colourless ☒	Yellow/brown 0	Blue/green 0	Turbid 0	Other 0	
GEAR							
ELECTROFISHER: ☒							
Length (m): 150m		Settings: 250/60			Seconds: 1116		
NETS and TRAPS: Dip net (1)							
MINNOW TRAP: 0 #		DIP NET ☒			TRAP NET 0		
SEINE: 0		GILL 0			OTHER 0 specify		
HAULS (#): N/A		Period Of Time (24 hour clock):					
		Set Time N/A			Clear time N/A		
LENGTH (m): N/A		MESH SIZE:			DEPTH OF CAPTURE:		
		Smallest (cm):			Minimum (m): 0.10m		
		Largest (cm):			Maximum (m): 0.15m		
SAMPLE COLLECTION							
FISH KEPT?		# OF BAGS		PRESERVATIVE:			
0 Yes ☒ No				Formalin 0	Frozen 0	Alcohol 0	Other 0
COMMENTS:							
Mainly bedrock substrate. Some areas with high debris made shocking/netting difficult							
Additional Notes Appended? ☒ No ☐ Yes number of pages _____							

Circle number if a sample was kept

Number all pages

17 T 0417256
5085130

(3) 3574 - old channel, no flow
(1) 3575 - old open water

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Section 4: Field Investigations
Appendix 4.C: Fish Habitat Mapping

SECTION IDENTIFIER: Guida's Sideroad	SECTION LOCATION: Feeder Line 1	SECTION LENGTH (m): 100m	SCALE (cm / m): 1/6.25m
			PROJECT #: 09-1983
			MAPPER: L. Knezevich
			NAME OF WATERBODY: unknown
			CROSSING #: 2
			STATION #: 1
			DATE: DD-MMM-YY 07-May-10
PROFILE:			LEGEND 10d depth (cm) 6w width → Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar • Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree ^ Dam/Weir/Obstruction ® Riparian Tree Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line └ Culvert

Pictures: 3575- Downstream open water/wetland (facing south)
3574- Upstream dry channel into open water wetland (north)
3573- Upstream and road (facing west)

17 T 0417794
5085106

* Bear track, American Bittern call,
ducks observed
* pic 3577 - Bear track

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Section 4: Field Investigations
Appendix 4.C: Fish Habitat Mapping

SECTION IDENTIFIER: Feeder Line 2 Crossing	SECTION LOCATION: Guida's Sideroad	SECTION LENGTH (m): 120m	SCALE (cm / m): 1/7.5
			PROJECT #: 09-1983
			MAPPER: L. Knezevich
			NAME OF WATERBODY: Unknown
			CROSSING #: 3
			STATION #: 1
DATE: DD-MMM-YY 07-May-10			LEGEND 10d depth (cm) 6w width ➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ▨ Fine Substrate ### Gravel Substrate oooo Cobble / Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank XXX Riprap / Other Stabilization ○ Instream Log/Tree AAA Dam/Weir/Obstruction ® Riparian Tree ▶ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line □ Culvert
PROFILE: Horiz. Scale 1/0.92 Vert. Scale 1/0.4 			

3583 - stream trickle through road
 Pictures 3582 - Road w marsh on each side (facing west)
 — ⑥ 3581 - Downstream double culvert (facing south)

- ⑤ 3580 - Blocked upstream culvert
- ⑧ 3579 - Downstream wetland (facing south)
- ⑦ 3578 - Upstream marsh (facing north)

GENERAL INFORMATION									
PROJECT #: 091983		PROJECT DESCRIPTION: McLeans		DAY: 06	MONTH: 05	YEAR: 2010			
Is STREAM REALIGNMENT required for this section: ☐ Yes ☒ No ☐ Unknown									
COLLECTORS: BPG LK		WEATHER CONDITIONS: Sunny		TIME STARTED: 5:40		TIME FINISHED: 6:30			
AIR TEMP: 12°		WATER TEMP: N/A		CONDUCTIVITY (µS/cm): N/A					
PHOTO NUMBERS AND DESCRIPTIONS: See habitat map									
LOCATION									
NAME OF WATERBODY: _____		DRAINAGE SYSTEM: Perch Lake		CROSSING #: 7		STATION #: 1			
LOCATION OF CROSSING: Small section of channel from wetland to Perch Lake near T23									
GPS COORDINATES: 17T 0423756 5086220				MTO CHAINAGE: N/A					
TOWNSHIP: Manitoulin				MNR DISTRICT: ESPANOLA					
LAND USE AND POLLUTION									
SURROUNDING LAND USE: wetland, forest, atv trail, Perch Lake (unobserved)				SOURCES OF POLLUTION: Nearby Atv trail crossing					
EXISTING STRUCTURE TYPE									
Bridge ☐		Box Culvert ☐		Open Foot Culvert ☐		CSP ☐		N/A ☒	
Other ☐ Describe:						Size (w x h) m ²			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER: whole channel		SECTION LOCATION: (include on habitat map) channel north of Atv trail, wetland south of trail							
TYPE:	Stream / river ☐	Channelized ☐	Permanent ☐	Intermittent ☒	Ephemeral ☐	ASSOCIATED WETLAND: Yes			
TOTAL SECTION LENGTH (m): 65				CURRENT VELOCITY (m/s): N/A					
SUB-SECTION(S)	Run ☐	Pool ☐	Riffle ☐	Flats ☒	Inside culvert ☐	Other			
Percentage of area				100					
Mean depth wetted (m)				6.02					
Mean width wetted (m)				5					
Mean bankfull width (m)				N/A					
Mean bankfull depth (m)				N/A					
Substrate				mu, d					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

43
1.5
N 65

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	0	0	0	0 (no banks)			
Right Upstream Bank	0	0	0	0 (no banks)			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris	Organic debris	Vascular Macrophytes	None
				Instream 10 Overhanging 5	5	Instream 75 Overhanging 5	0
SHORE COVER (% stream shaded):	100 - 90 % 0	90 - 60 % 0	60 - 30 % 0	30 - 1 % 0	None 0		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
Predominant Species					100 cattails/terrestrial grass/horsetails		marsh marigold
MIGRATORY OBSTRUCTIONS:	None		Seasonal		Permanent		
					Dense wood/mud barriers during low water		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater		Other		
			Yes				
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
-define channel -flow vs standing/pocket water -coarse substrate							
COMMENTS:							
-only somewhat channelized in 1st ~6m (u/s) -No flow -outlet of u/s wetland is isolated due to mud/log barrier + low water -only standing/pocket water in "channel" -No real channelization D/S of top 6m							
Additional Notes Appended? ☐ No ☐ Yes number of pages _____							

* headed South into conifer thicket → no sign of opening (70m South of 17 T 0423675 5086094)
(No sign of Lake)

SECTION IDENTIFIER: Channel south of wetland	SECTION LOCATION: Channel off ATV trail	SECTION LENGTH (m): 60m	SCALE (cm / m): 1/3.75
			PROJECT #: 09-1983
			MAPPER: Lk
			NAME OF WATERBODY: Perch Lake
			CROSSING #: 1
			STATION #: 1
			DATE: DD-MMM-YY 06-May-10
PROFILE:			LEGEND
Horz. Scale 1/0.46 Vert. Scale 1/0.3			10d depth (cm) 6w width → Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ● Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank XXX Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ® Riparian Tree ▶ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line └ Culvert

* other photos

3548 - South looking at marsh
3549

Oct-06

3550 - Stream channel through marsh
3551

3552 - marsh, looking to the west

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Section 4: Field Investigations
Appendix 4.A: Watercourse Field Record Form

GENERAL INFORMATION										
PROJECT #: 09-1983		PROJECT DESCRIPTION: McLean's Mountain			DAY: 05		MONTH: 05		YEAR: 2010	
Is STREAM REALIGNMENT required for this section:										
☐ Yes ☒ No ☐ Unknown										
COLLECTORS: BG, LK		WEATHER CONDITIONS: Sunny, partial cloud			TIME STARTED: 5:30		TIME FINISHED: 7:40			
AIR TEMP: 15°C		WATER TEMP: —			CONDUCTIVITY (µS/cm): —					
PHOTO NUMBERS AND DESCRIPTIONS: 3518 (D/S Barrier) 3519-22 (u/s where stream meets wetland)										
LOCATION										
NAME OF WATERBODY: Unknown		DRAINAGE SYSTEM: Perch Lake?		CROSSING #: 8		STATION #: 1				
LOCATION OF CROSSING: Channel south of wetland flowing over high gradient channel b/w T30/34 proposed										
GPS COORDINATES: 17T 0423929 5084409				MTO CHAINAGE: N/A						
TOWNSHIP: Manitoulin				MNR DISTRICT: Espanola						
LAND USE AND POLLUTION										
SURROUNDING LAND USE: Moderate forest & open grassland					SOURCES OF POLLUTION: None					
EXISTING STRUCTURE TYPE										
Bridge ☐		Box Culvert ☐		Open Foot Culvert ☐		CSP ☐		N/A ☒		
Other ☐ Describe:							Size (w x h) m ²			
SECTION TYPE AND MORPHOLOGY										
SECTION IDENTIFIER: Between T30 & T34				SECTION LOCATION: South of Wetland between proposed T30 & T34 turbines						
TYPE: Stream / river ☐		Channelized ☒		Permanent ☐		Intermittent ☒		Ephemeral ☐		
ASSOCIATED WETLAND: North of stream → Source										
TOTAL SECTION LENGTH (m):					CURRENT VELOCITY (m/s): 1/2 m/s					
SUB-SECTION(S)	Run ☐	Pool ☒	Riffle ☒	Flats ☐	Inside culvert ☐	Other				
Percentage of area	—	50	50	—	—	—				
Mean depth wetted (m)	—	0.10m	0.05m	—	—	—				
Mean width wetted (m)	—	0.8m	0.5m	—	—	—				
Mean bankfull width (m)	—	1.0m	0.8m	—	—	—				
Mean bankfull depth (m)	—	—	—	—	—	—				
Substrate	—	Mu	Co/Gr	—	—	—				
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Ci	Muck Mu	Detritus D		

on habitat map.

ed turbines

* high gradient pool/riffle

→ lower part of stream (D/S) involves multiple waterfalls and drops down escarpment

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	0	0	0	0			
Right Upstream Bank	0	0	0	0			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris	Organic debris	Vascular Macrophytes	None
	20	—	30	5 Instream Overhanging	5	— Instream Overhanging	40
SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None		
	0	0	0	0	0		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
	10		—		—		90
Predominant Species							
MIGRATORY OBSTRUCTIONS:	None		Seasonal Lack of flow & waterfall barriers		Permanent multiple drops/escarpment		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning limited potential habitat exists		Evidence of Groundwater None		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
Fill in drops to allow fish migration to the wetland. widen stream bed							
COMMENTS:							
~ 30 barriers to fish migration, flows down escarpment area - very high graded running down grassy valley down stream - no fish observed							
Additional Notes Appended? 0 No 0 Yes number of pages _____							

channel splits
↑ over large decline

u/s

Upstream

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Section 4: Field Investigations
Appendix 4.C: Fish Habitat Mapping

SECTION IDENTIFIER: u/s		SECTION LOCATION: bto T30 + T34		SECTION LENGTH (m): 50m		SCALE (cm / m): 1:3	
						PROJECT #: 09-1983	
						MAPPER: B. Cottrell	
						NAME OF WATERBODY: -	
						CROSSING #: 8	
						STATION #: 1	
DATE: DD-MMM-YY 05-May-10						LEGEND 10d depth (cm) 6w width ➡ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ▨ Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ® Riparian Tree ▶ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line ┌ Culvert	
PROFILE:							
Horz. Scale 1/1							
Vert. Scale 1/1							
moist/pocky water							
350							
350							
350							
350							

D/S

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Section 4: Field Investigations
Appendix 4.A: Watercourse Field Record Form

GENERAL INFORMATION									
PROJECT #:		PROJECT DESCRIPTION:		DAY:	MONTH:	YEAR:			
09-1983		McLean's Mountain		06	May	2010			
Is STREAM REALIGNMENT required for this section:									
☐ Yes ☒ No ☐ Unknown									
COLLECTORS:		WEATHER CONDITIONS:		TIME STARTED:		TIME FINISHED:			
LK, BG		Sun, light cloud		12:40		2:20			
AIR TEMP:		WATER TEMP:		CONDUCTIVITY ($\mu\text{S/cm}$):					
~13°C		N/A		N/A					
PHOTO NUMBERS AND DESCRIPTIONS:									
3527 & 3528 → drawn on map									
LOCATION									
NAME OF WATERBODY:		DRAINAGE SYSTEM:		CROSSING #:	STATION #:				
unknown		—		9	1 D/S				
LOCATION OF CROSSING: Green Bush Road west of Burnett's Sideroad									
GPS COORDINATES:				MTO CHAINAGE:					
17 T 0426161 5087058				N/A					
TOWNSHIP:				MNR DISTRICT:					
Manitoulin				Espanola					
LAND USE AND POLLUTION									
SURROUNDING LAND USE:				SOURCES OF POLLUTION:					
Savannah grass				Road runoff, sedimentation					
EXISTING STRUCTURE TYPE									
Bridge ☐		Box Culvert ☐		Open Foot Culvert ☐		CSP ☒		N/A ☐	
Other ☐ Describe:						Size (w x h) m ² (diameter) 0.40m			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION:					
Culvert along road				(include on habitat map) Downstream					
TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:			
	☐	☐	☐	☒	☐	None			
TOTAL SECTION LENGTH (m):				CURRENT VELOCITY (m/s):					
~100m				0m/s					
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
	☐	☐	☐	☒	☐				
Percentage of area				100					
Mean depth wetted (m)				0.05					
Mean width wetted (m)				2.0					
Mean bankfull width (m)				2.0					
Mean bankfull depth (m)				0.20					
Substrate				Gr, Sa, D, Mu					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

0.16 m²

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	☒	☐	☐	☐			
Right Upstream Bank	☒	☐	☐	☐			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris	Organic debris	Vascular Macrophytes	None
	—	—	—	Instream — Overhanging	—	Instream 90 Overhanging	10
SHORE COVER (% stream shaded):	100 – 90 % ☐	90 – 60% ☐	60- 30% ☐	30 – 1% ☒	None ☐		
VEGETATION TYPE (%):	Submergent 20		Floating —		Emergent 70		None
Predominant Species	—				terrestrial grass		10
MIGRATORY OBSTRUCTIONS:	None —		Seasonal Lack of flow		Permanent Lack of flow + substrate		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning N/A		Evidence of Groundwater N/A		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
Lacks substrate, depth, pool-riffle sequence and definite channel							
COMMENTS:							
Poorly defined channel running through culvert through savannah type grass plains. Flow is low. High amounts of emergent grasses.							
Additional Notes Appended? ☒ No ☐ Yes number of pages _____							

Downstream

10m wide
for roads

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Section 4: Field Investigations
Appendix 4.C: Fish Habitat Mapping

SECTION IDENTIFIER: D/S		SECTION LOCATION: Culvert on Green Bush Rd		SECTION LENGTH (m): 70 m	SCALE (cm / m): 1/4.38
					PROJECT #: 09-1983
					MAPPER: LK
					NAME OF WATERBODY: Green Bush Rd wetland/stream area
					CROSSING #: 9
					STATION #: 1
					DATE: DD-MMM-YY 06-May-10
					LEGEND 10d depth (cm) 6w width Riffle Run/Glide Pool Island/Bar Fine Substrate Gravel Substrate Cobble /Boulder Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining Eroded Bank xxx Riprap / Other Stabilization Instream Log/Tree Dam/Weir/Obstruction Riparian Tree Seep/Spring Undercut Bank Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line Culvert
PROFILE:		Horz. Scale 1/0.23 Vert. Scale 1/0.1			

GENERAL INFORMATION									
PROJECT #: 09-1983		PROJECT DESCRIPTION: McLean's Mountain		DAY: 06	MONTH: 05	YEAR: 2010			
Is STREAM REALIGNMENT required for this section: ☐ Yes ☒ No ☐ Unknown									
COLLECTORS: B. Gottfried / L. Kozelich		WEATHER CONDITIONS: sunny / windy		TIME STARTED: 12:15		TIME FINISHED: 2:20			
AIR TEMP: 13°C		WATER TEMP: —		CONDUCTIVITY (µS/cm): —					
PHOTO NUMBERS AND DESCRIPTIONS: See habitat map									
LOCATION									
NAME OF WATERBODY: N/A		DRAINAGE SYSTEM: N/A		CROSSING #: 9		STATION #: 1			
LOCATION OF CROSSING: Greenbush rd West of Burnett's side road									
GPS COORDINATES: 17 T 0426161 5087058				MTO CHAINAGE: N/A					
TOWNSHIP: Manitoulin				MNR DISTRICT: Espeyola					
LAND USE AND POLLUTION									
SURROUNDING LAND USE: open pasture, gravel road, fenced				SOURCES OF POLLUTION: road run off					
EXISTING STRUCTURE TYPE									
Bridge ☐		Box Culvert ☐		Open Foot Culvert ☐		CSP ☒		N/A ☐	
Other ☐ Describe:						Size (w x h) m ² 0.40m			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER: u/s			SECTION LOCATION: (include on habitat map) 50m u/s crossing of Greenbush rd						
TYPE:	Stream / river ☐	Channelized ☐	Permanent ☐	Intermittent ☒	Ephemeral ☐	ASSOCIATED WETLAND:			
TOTAL SECTION LENGTH (m): 50				CURRENT VELOCITY (m/s): N/A (still)					
SUB-SECTION(S)	Run ☐	Pool ☐	Riffle ☐	Flats ☒	Inside culvert ☐	Other			
Percentage of area				100					
Mean depth wetted (m)				0.05					
Mean width wetted (m)				3.5					
Mean bankfull width (m)				N/A					
Mean bankfull depth (m)				N/A					
Substrate				Gr, Sa, Mu D					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	☒	0	0	0			
Right Upstream Bank	☒	0	0	0			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks —	Boulders —	Cobble —	Woody Debris Instream 5 Overhanging	Organic debris —	Vascular Macrophytes Instream 80 Overhanging 5	None 10
SHORE COVER (% stream shaded):	100 – 90 % 0	90 – 60% 0	60- 30% 0	30 – 1% ☒	None 0		
VEGETATION TYPE (%):	Submergent		Floating		Emergent 95		None
Predominant Species	—		—		terrestrial grass		5
MIGRATORY OBSTRUCTIONS:	None ☒		Seasonal —		Permanent —		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning —		Evidence of Groundwater water seep from ground		Other —		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
- addition of coarse substrate - addition of riffle/pool structure - added depth & shore cover							
COMMENTS:							
- ground seepage ~50cm w/s - low gradient, heavily vegetated w/ terrestrial grass - poorly defined channel, no bank full - minor amount of shrubs as shore cover.							
Additional Notes Appended? ☒ No ☐ Yes number of pages _____							

SECTION IDENTIFIER: t/s	SECTION LOCATION: green bush rd w of buckets side road	SECTION LENGTH (m): 60m	SCALE (cm / m): 1/3
			PROJECT #: 09-1983
			MAPPER: B. Gottfried
			NAME OF WATERBODY:
			CROSSING #: 9
			STATION #: 1
			DATE: DD-MMM-YY 06-MAY-10
PROFILE:			LEGEND
Horz. Scale 1/1	Vert. Scale 1/0.7	10d depth (cm) 6w width ➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ● Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder * * * Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ® Riparian Tree ▶ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement S- Seasonal Barrier -x-x- Fence line □ Culvert	

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Section 4: Field Investigations
Appendix 4.E: Fish Community
Inventory Record Form

GENERAL INFORMATION							
PROJECT #:		PROJECT DESCRIPTION:		DAY:	MONTH:	YEAR:	
09-1983		McLean's Mountain		06	May	2010	
COLLECTORS:				TIME STARTED:		TIME FINISHED:	
BG, LK				3:15		4:00	
WEATHER CONDITIONS:				SURFACE CONDITIONS (if applicable):			
Sunny, light cloud				Calm	Rippled	Wavy	Rough
				☒	☐	☐	☐
GENERAL LOCATION							
NAME OF WATERBODY:				LOCATION OF STATION:			
Unknown				Green Bush Rd. Roadside stream/wetland			
TOWNSHIP:				MNR DISTRICT:			
Manitoulin				Espanola			
SAMPLING LOCATIONS AND WATER CHEMISTRY							
LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)	
U/S (North road side)							
Upstream		13°C					
Downstream		13°C					
Culvert / Hwy ROW							
WATER COLOUR:		Colourless ☐	Yellow/brown ☒	Blue/green ☐	Turbid ☐	Other ☐	
GEAR							
ELECTROFISHER: ☒							
Length (m):		Settings:		Seconds:			
55m		250, 60		610			
NETS and TRAPS:							
MINNOW TRAP: ☐ #		DIP NET ☒		TRAP NET ☐			
SEINE: ☐		GILL ☐		OTHER ☐ specify			
HAULS (#):		Period Of Time (24 hour clock):					
		Set Time			Clear time		
LENGTH (m):		MESH SIZE:			DEPTH OF CAPTURE:		
		Smallest (cm):			Minimum (m):		
		Largest (cm):			Maximum (m):		
SAMPLE COLLECTION							
FISH KEPT?		# OF BAGS		PRESERVATIVE:			
☐ Yes ☒ No				Formalin ☐	Frozen ☐	Alcohol ☐	Other ☐
COMMENTS:							
All found in small pool near culvert, on upstream side (northern side)							
One additional fish observed							
Additional Notes Appended? ☒ No ☐ Yes number of pages _____							

[illegible]

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D/S

(15) 3532 u/s ditch

(16) 3529 D/S pool/ditch

Ministry of Transportation

Section 4: Field Investigations

Environmental Guide for Fish and Fish Habitat

Appendix 4.A: Watercourse Field Record Form

GENERAL INFORMATION									
PROJECT #: 09-1983		PROJECT DESCRIPTION: McLean's Mountain			DAY: 06	MONTH: May	YEAR: 2010		
Is STREAM REALIGNMENT required for this section:									
☐ Yes ☒ No ☐ Unknown									
COLLECTORS: BG, LK		WEATHER CONDITIONS: Sunny, light cloud			TIME STARTED: 2:30		TIME FINISHED: 3:00		
AIR TEMP: ~13°C		WATER TEMP: —			CONDUCTIVITY (µS/cm): —				
PHOTO NUMBERS AND DESCRIPTIONS: 3529 (road side/culvert) 3530 (downstream) — indicated on map									
LOCATION									
NAME OF WATERBODY: unknown		DRAINAGE SYSTEM: unknown		CROSSING #: 10		STATION #: 1			
LOCATION OF CROSSING: Downstream side of culvert on Green Bush Rd west of Burnett's Sideroad									
GPS COORDINATES: 11T 0426192 5087059				MTO CHAINAGE:					
TOWNSHIP:				MNR DISTRICT: Espanola					
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Open grass savannah					SOURCES OF POLLUTION: road side sedimentation / run off				
EXISTING STRUCTURE TYPE									
Bridge ☐		Box Culvert ☐		Open Foot Culvert ☐		CSP ☒		N/A ☐	
Other ☐ Describe:						Size (w x h) m ² 0.4m diam.			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER: Culvert D/S				SECTION LOCATION: Culvert on Green Bush Rd. (include on habitat map)					
TYPE:	Stream / river ☐	Channelized ☐	Permanent ☐	Intermittent ☒	Ephemeral ☐	ASSOCIATED WETLAND: None			
TOTAL SECTION LENGTH (m):					CURRENT VELOCITY (m/s):				
SUB-SECTION(S)	Run ☐	Pool ☐	Riffle ☐	Flats ☒	Inside culvert ☐	Other			
Percentage of area				100					
Mean depth wetted (m)				0.05					
Mean width wetted (m)				2.0					
Mean bankfull width (m)				2.0					
Mean bankfull depth (m)				0.20					
Substrate				Gr, Co, S, D					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	X	0	0	0			
Right Upstream Bank	X	0	0	0			

HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris Instream Overhanging	Organic debris	Vascular Macrophytes Instream Overhanging	None
	—	—	15	—	10	60 10	5

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None	
	0	0	0	X	0	

VEGETATION TYPE (%):	Submergent	Floating	Emergent	None
	15	15	60	10
Predominant Species	moss, filamentous algae	algae	grasses	

MIGRATORY OBSTRUCTIONS:	None	Seasonal flow, substrate throughout channel	Permanent flow, substrate, pool/riffle

POTENTIAL CRITICAL HABITAT LIMITING:	Spawning	Evidence of Groundwater	Other
		None	

POTENTIAL ENHANCEMENT OPPORTUNITIES:
More substrate throughout marshy channel, increase in depth

COMMENTS:
Similar to site 4. Potential for site 4 + 5 to merge downstream. Grass Savannah marsh/meadow.

Additional Notes Appended? ☐ No ☐ Yes	number of pages _____
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SECTION IDENTIFIER: D/S End	SECTION LOCATION: Green Bush Rd	SECTION LENGTH (m): ~50m	SCALE (cm / m): 1/3.85
---------------------------------------	---	------------------------------------	----------------------------------

PROJECT #:
09-1983

MAPPER:
LK

NAME OF WATERBODY:
Green Bush Rd Wetland/Culvert

CROSSING #:
10

STATION #:
1

DATE: DD-MMM-YY
06-May-10

LEGEND

10d depth (cm)
6w width

➔ Riffle
➡ Run/Glide
○ Pool
■ Island/Bar

▨ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
*** Debris

CT Cattail
SV/FV Submerg/Float Veg
EV Emergent Vegetation
W Watercress

Fe Iron Staining
///// Eroded Bank

xxx Riprap / Other Stabilization

○ Instream Log/Tree
AAA Dam/Weir/Obstruction
® Riparian Tree

▶ Seep/Spring
----- Undercut Bank

— Barrier to Fish Movement
-S- Seasonal Barrier
-x-x- Fence line
└ Culvert

PROFILE:

Horz. Scale 1/0.31

Vert. Scale 1/0.1

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Environmental Guide for Fish and Fish Habitat

Section 4: Field Investigations
Appendix 4.A: Watercourse Field Record Form

GENERAL INFORMATION									
PROJECT #: 091983		PROJECT DESCRIPTION: Mile 23		DAY: 06	MONTH: 05	YEAR: 2000			
Is STREAM REALIGNMENT required for this section: ☐ Yes ☒ No ☐ Unknown									
COLLECTORS: B. Goff, Fried, L. Kuzich		WEATHER CONDITIONS: Sunny / Windy		TIME STARTED: 2:25		TIME FINISHED: 3:00			
AIR TEMP: 13°		WATER TEMP:		CONDUCTIVITY (µS/cm):					
PHOTO NUMBERS AND DESCRIPTIONS: See habitat map									
LOCATION									
NAME OF WATERBODY: Unknown		DRAINAGE SYSTEM:		CROSSING #: 10		STATION #: 1			
LOCATION OF CROSSING: on green bush rd west of burnetts side rd									
GPS COORDINATES: 17T 0426193 5087063				MTO CHAINAGE: N/A					
TOWNSHIP: Manitoulin				MNR DISTRICT: Espanola					
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Gravel road, open field				SOURCES OF POLLUTION: road run off					
EXISTING STRUCTURE TYPE									
Bridge ☐		Box Culvert ☐		Open Foot Culvert ☐		CSP ☒		N/A ☐	
Other ☐ Describe:						Size (w x h) m ² : 0.60 m			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER: u/s				SECTION LOCATION: (include on habitat map) Culvert on Green Bush Rd.					
TYPE:	Stream / river ☐	Channelized ☐	Permanent ☐	Intermittent ☒	Ephemeral ☐	ASSOCIATED WETLAND: N/A			
TOTAL SECTION LENGTH (m): 50				CURRENT VELOCITY (m/s): N/A					
SUB-SECTION(S)	Run ☐	Pool ☐	Riffle ☐	Flats ☒	Inside culvert ☐	Other			
Percentage of area				100					
Mean depth wetted (m)				0.10					
Mean width wetted (m)				3.5					
Mean bankfull width (m)				N/A					
Mean bankfull depth (m)				N/A					
Substrate				Gr, Sa, Mu, D					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	☒	☐	☐	☐			
Right Upstream Bank	☒	☐	☐	☐			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris Instream Overhanging	Organic debris	Vascular Macrophytes Instream Overhanging	None
						85 5	10
SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None		
	☐	☐	☐	☒	☐		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
Predominant Species					terrestrial grass		
MIGRATORY OBSTRUCTIONS:	None ☒		Seasonal		Permanent		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater ground seeps further u/s		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
- addition of coarse substrate - addition of riffle/pool structure + depth - increase shoreline cover							
COMMENTS:							
- grassy ditch line w/ u/s source of ground water - low to no flow currently							
Additional Notes Appended? ☒ No ☐ Yes number of pages _____							

SECTION IDENTIFIER: u/s	SECTION LOCATION: green bush west of Burnetts	SECTION LENGTH (m): ~ 55 m	SCALE (cm / m): 1/3
			PROJECT #: 091983
			MAPPER: B.C.
			NAME OF WATERBODY:
			CROSSING #: 10
			STATION #:
			DATE: DD-MMM-YY 06/May/2010
PROFILE:			LEGEND
Horz. Scale 1/1 Vert. Scale 1/1 	10d depth (cm) 6w width ➔ Riffle ➡ Run/Glide ○ Pool ■ Island/Bar ⊞ Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ® Riparian Tree ▶ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line □ Culvert		

Ministry of Transportation
Environmental Guide for Fish and Fish Habitat

Section 4: Field Investigations
Appendix 4.E: Fish Community
Inventory Record Form

GENERAL INFORMATION						
PROJECT #:	PROJECT DESCRIPTION:		DAY:	MONTH:	YEAR:	
091983	McLean's Mountain		06	May	2010	
COLLECTORS:			TIME STARTED:	TIME FINISHED:		
BG, LK			4:00	4:30		
WEATHER CONDITIONS:			SURFACE CONDITIONS (If applicable):			
Sunny, light cloud			Calm	Rippled	Wavy	Rough
			☒	☐	☐	☐
GENERAL LOCATION						
NAME OF WATERBODY:			LOCATION OF STATION:			
Unknown			Green Bush Rd. West of Burnetts Sideroad			
TOWNSHIP:			MNR DISTRICT:			
Manitoulin			Espanola			
SAMPLING LOCATIONS AND WATER CHEMISTRY						
LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						
WATER COLOUR:		Colourless ☒	Yellow/brown ☐	Blue/green ☐	Turbid ☐	Other ☐
GEAR						
ELECTROFISHER: ☒						
Length (m):		Settings:		Seconds:		
~50m		250, 60		610		
NETS and TRAPS:						
MINNOW TRAP: ☐ #		DIP NET ☒		TRAP NET ☐		
SEINE: ☐		GILL ☐		OTHER ☐ specify		
HAULS (#):		Period Of Time (24 hour clock):				
		Set Time		Clear time		
LENGTH (m):		MESH SIZE:		DEPTH OF CAPTURE:		
		Smallest (cm):		Minimum (m):		
		Largest (cm):		Maximum (m):		
SAMPLE COLLECTION						
FISH KEPT?		# OF BAGS	PRESERVATIVE:			
☐ Yes ☒ No			Formalin ☐	Frozen ☐	Alcohol ☐	Other ☐
COMMENTS:						
No fish caught						
Additional Notes Appended? ☒ No ☐ Yes number of pages _____						

Circle number if a sample was kept

Number all pages

McLeans Mtn

May 5 2011

Water course crossing on Harbour View Road

photos 9883-9885 South Side Harbour View Rd.
 photos 9886-9888 North Side Harbour View Rd.

width 0.5 m

depth 5 cm

culvert ~30 cm

substrate: grass, channel poorly defined.

Water course crossing at Boozeneck Road

photos 9889-9891 West side looking downstream
 photos 9892-9894 crossing at Boozeneck looking
 Downstream

- width ~ 2.5-3 m at crossing

- depth ~ .5-1.0 m at crossing

- water from sewage treatment lagoons empties
 into creek

- water very green

- creek runs along Boozeneck ~ 200 m before
 crossing under bridge.