Environment

NextEra Energy Canada, ULC
Bluewater Wind Energy Centre

Final Water Assessment and Water Body Report

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Project Number:

60155032

Date:

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Glossary of Terms

Access Roads	The access roads will be 11 m wide during the construction phase to accommodate the large cranes (with an additional 2 m clearance on each side for travel), and may be reduced in width at the landowner's request.
Area of Disturbance	The Area of Disturbance consists of: • A 60 m area for temporary access roads will be observed for the purpose of siting. The actual temporary access road will be sited within this area of disturbance in consultation with the landowner and taking into consideration potential environmental effects. • A 100 m square area around each turbine for the laydown and assembly of the wind turbine components. • A 20 m area for collection lines will be observed for the purpose of siting. The actual collection line will be sited within this area of disturbance in consultation with the landowner and taking into consideration potential environmental effects.
Area of Investigation	Area encompassed by 120 m setback from Project Location
Ecological Land Classification (ELC)	A system to delineate natural regions based on ecological factors. In Ontario, the Ministry of Natural Resources defines ecological units on the basis of bedrock, climate, physiography, and corresponding vegetation, creating an Ecological Land Classification System.
Geographic Information System (GIS)	A system for creating, storing, analyzing and managing spatial data and associated attributes.
Harmful Alteration, Destruction or Disruption of Fish Habitat (HADD)	According to Section 35(1) of the *Fisheries Act*, no one is allowed to cause a HADD unless an authorization, according to Section 35(2) of the *Fisheries Act*, has been obtained. "No net loss of the productive capacity of existing fish habitat" is the conservation goal guiding an authorization to cause a HADD.
Project Components	Refers to the turbine, access roads, collection lines, transmission lines and substation.
NextEra	NextEra Energy Canada, ULC
O. Reg. 359/09	Environmental Protection Act.
Project Study Area (Study Area)	Wind Energy Centre Study Area and Transmission Line Study Area

1. Introduction

Varna Wind Inc., a wholly owned subsidiary of NextEra Energy Canada, ULC (NextEra) is proposing to construct a wind energy project in the Municipalities of Bluewater and Huron East in Huron County, Ontario (**Figure 1-1**). The project will be referred to as the Bluewater Wind Energy Centre (the "Project") and will be located on private lands in the vicinity of the shoreline of Lake Huron. The wind turbine technology proposed for the Project is the 1.6 MW GE model wind turbine. With a total nameplate capacity of 60 MW, the Project will be categorized as a Class 4 facility. Although NextEra is seeking a Renewable Energy Approval (REA) for 41 wind turbines, up to 37 are proposed to be constructed for the Project.

This report was prepared in accordance with the Water Assessment and Water Body requirements of Ontario Regulation 359/09 (*O. Reg. 359/09*) and the Technical Guide to Renewable Energy Approvals (Ministry of the Environment, 2011). The REA process combines previous requirements under the *Ontario Environmental Assessment Act* with clear provincial rules and standards in a new regulation, *O. Reg. 359/09* under the *Environmental Protection Act*. The Regulation became law on September 24, 2009. Amendments to the regulation came into force on January 1, 2011.

1.1 The Proponent

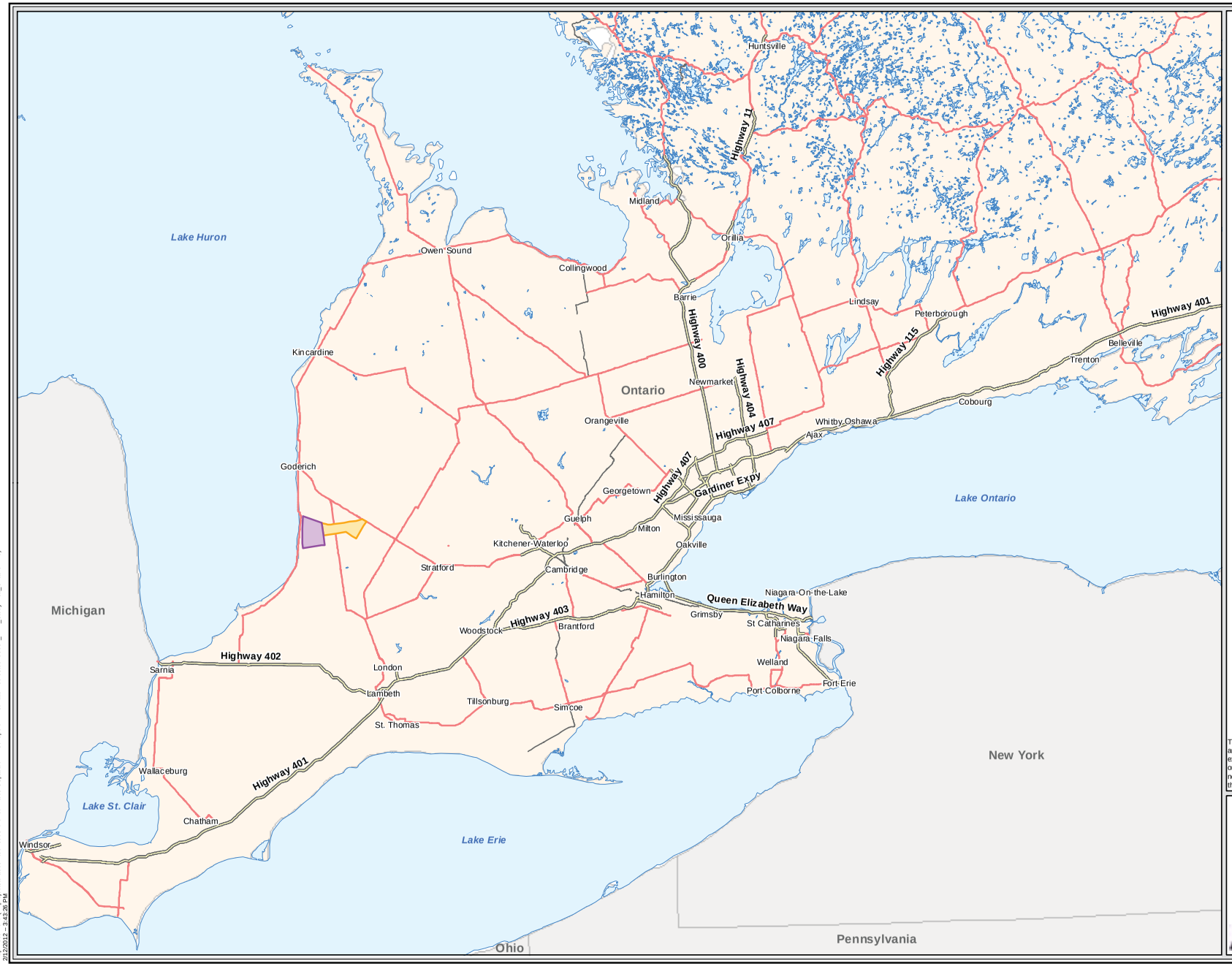
The Project will be owned and operated by Varna Wind Inc. NextEra's parent company is NextEra Energy Resources, LLC, a global leader in wind energy generation with a current operating portfolio of over 85 wind energy projects is North America. Wind energy centres currently owned and operated by NextEra Energy Canada include: Mount Copper and Mount Miller, (both 54 megawatts (MW)) located in Murdochville, Quebec; Pubnico Point, (31 MW) located near Yarmouth, Nova Scotia; and Ghost Pines (82 MW), located in Kneehill County, Alberta.

The primary contacts for the project are as follows:

Project Proponent	Project Consultant
Nicole Geneau Project Director NextEra Energy Canada, ULC 5500 North Service Road, Suite 205 Burlington, Ontario, L7L 6W6 Phone: 1-877-257-7330 Email: Bluewater.Wind@nexteraenergy.com Website: www.NextEraEnergyCanada.com	Marc Rose Senior Environmental Planner AECOM 300-300 Town Centre Blvd. Markham, Ontario, L3R 5Z6 Phone: 905-477-8400 x 388 Email: marc.rose@aecom.com

1.2 Project Location and Description

The proposed Project is located in Huron County, within the Municipalities of Bluewater and Huron East. The Project Study Area ('Study Area') consists of the areas being studied for the wind farm component (Wind Energy Centre Study Area), and for the interconnection route (*i.e.*, for transmission lines to connect the Project to the electrical grid) (Transmission Line Study Area) (**Figure 1-2**). The Wind Energy Centre Study Area is generally bounded by Blackbush/Bronson Line to the west, Mill Road to the north, Concession 5 Road to the east, and Danceland Road/Staffa Road to the south, in the Municipality of Bluewater; while the Transmission Line Study Area is located to the east of the Wind Energy Centre Study Area, and is generally bounded by Concession 5 Road to the west, Mill Road to the north, Huron Road and Perth 183 Road to the east, and Staffa Road to the south, extending into the Municipality of Huron East. The Project is located south of the Canadian Shield, and outside the Greenbelt Plan and Oak Ridges Moraine Plan Area.



Legend

- Wind Energy Centre Study Area
- Transmission Line Study Area
- Expressway
- Highway
- Secondary Highway

Basemapping from Ontario Ministry of Natural Resources

N
W E
S

Kilometers

0 10 20 40 60 80

1:1,500,000

UTM Zone 17N, NAD 83

Bluewater Wind Energy Centre
Water Assessment and Water Body Report

Study Area in Ontario

February 2012
Project 60155032

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Figure 1.1

Map Document: (N:\projects\0-aecom\60155032\2010Final\GIS\spatial\MXDs\ReportMXDs\WaterBodies\60155032_BLW_StudyArea_Ontario.mxd)
2/12/2012 – 3:43:26 PM

The location of the Project Study Area was defined early in the planning process for the proposed wind energy facility, based on the availability of wind resources, approximate area required for the proposed project, and availability of existing infrastructure for connection to the electrical grid.

The following co-ordinates define the external boundaries of the Project Study Area:

Longitude	Latitude
-81.680043	43.553413
-81.350138	43.534437
-81.402727	43.471275
-81.679229	43.433866

A Project Location was then identified within the Project Study Area. The Project Location is defined as per the Technical Guide to Renewable Energy Approvals (June, 2011) as "*.a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposes to engage in the project*". As described therein, the Project Location boundary is the outer limit of where site preparation and construction activities will occur (i.e., Disturbance Areas described below) and where permanent infrastructure will be located, including the air space occupied by turbine blades. The proposed Project Location is shown on Figure 1-2, and includes the locations of the components of the Project listed below.

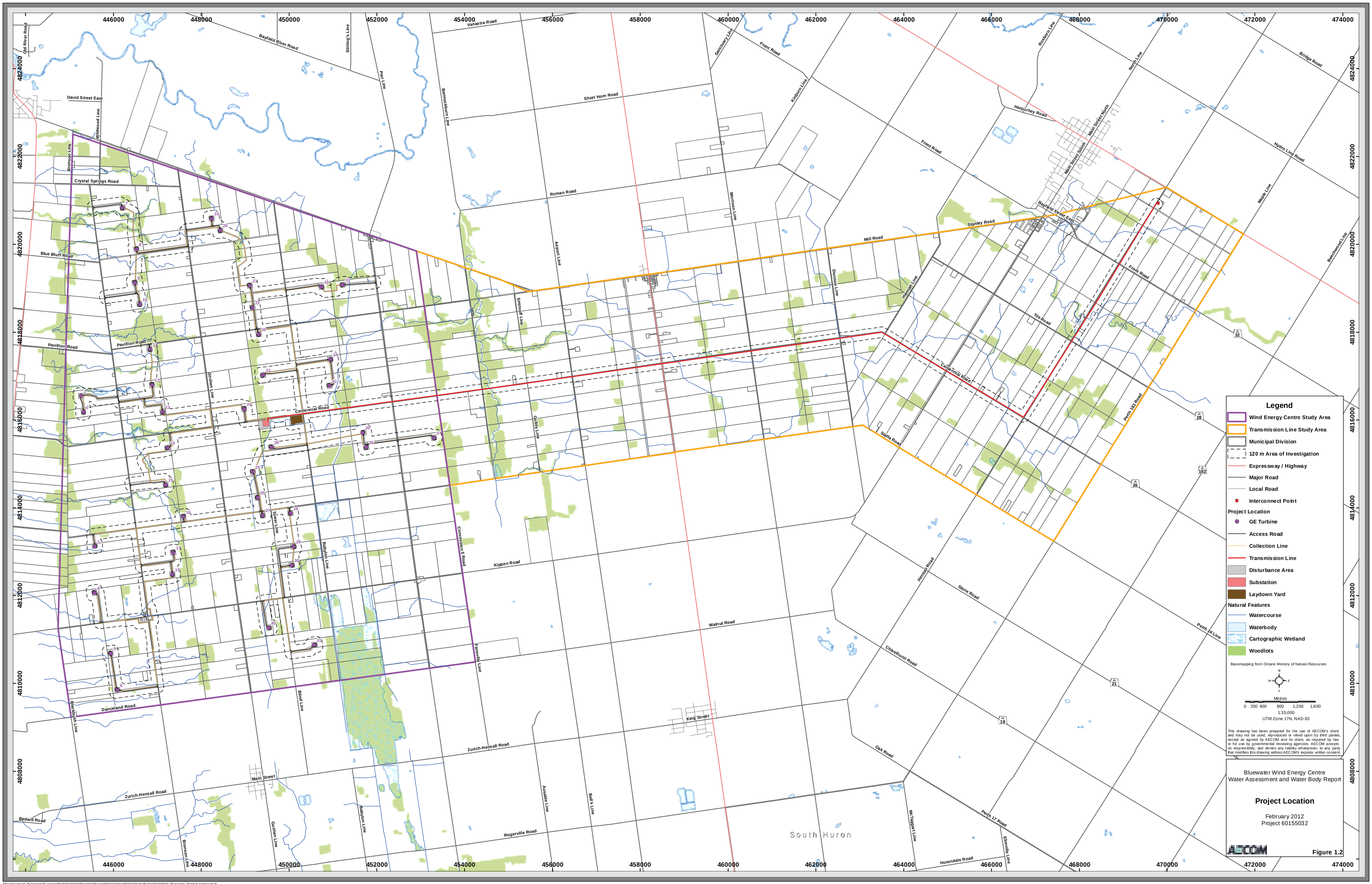
The Project Location includes three major watersheds: South Gullies; Bannockburn; and Bayfield Headwaters watersheds. A small proportion of the project area also encompasses the Black Creek and the Main Bayfield watersheds. In general terms, geology in all watersheds is dominated by Till Plains, followed by Till Moraines, Spillways and some Sand Plains. Soils across all watersheds are dominated by Clay Loam (44-72%); Silty Loam (14-29%); Loam (4-18%); Bottomland (3-6%) with some Landy Loam (8%), Organic (2%) and Sandy Loam (4%). Land use in the area is dominated by agriculture (70-90%) with woodlots (7-20%) across all five watersheds.

The major components of the Project include:

- Up to 41 1.6 MW GE model wind turbine generators and pad mounted step up transformers (a maximum of 37 turbines will ultimately be constructed);
- Laydown and storage areas (including temporary staging areas, crane pads and turnaround areas surrounding each wind turbine);
- Approximately 52 km of 34.5 kV underground electrical collection lines;
- Approximately 24 km of 115 kV transmission line along Centennial Road and Hensall Road;
- A transformer substation to connect to the Hydro One transmission system;
- Approximately 40 km of turbine access roads; and
- An Operations and Maintenance building.

Disturbance Areas have been identified surrounding various Project components, and are depicted on Figure 1-2. These denote areas where temporary disturbance during the construction phase may occur as a result of: temporary project component laydown and storage areas, crane pad construction and turbine turnaround areas. With the exception of the project components described above, no permanent infrastructure is proposed within these areas. Following construction activities, the Disturbance Areas will be returned to pre-construction conditions.

For the purposes of completing the Water Bodies Assessment, a 120 m Area of Investigation was defined, based on the requirements of O. Reg. 359/09 and the *Technical Guide to Renewable Energy Approvals* (MOE, June 2011). The Area of Investigation encompasses the Project Location and an additional 120 m surrounding the Project Location, measured from the Project Location boundary as described above. As part of the REA process, features located within the 120 m Area of Investigation must be investigated and evaluated to determine whether they are significant or provincially significant, in order to ascertain whether development prohibitions apply as per O. Reg. 359/09. The location of the 120 m Area of Investigation is shown on Figure 1.2.


Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Municipal Division
120 m Area of Investigation
Expressway / Highway
Major Road
Local Road
Interconnect Point
Project Location
GE Turbine
Access Road
Collection Line
Transmission Line
Disturbance Area
Substation
Laydown Yard
Natural Features
Watercourse
Waterbody
Cartographic Wetland
Woodlots
Basemapping from Ontario Ministry of Natural Resources
Metres
0 200 400 800 1,200 1,600
1:35,000
UTM Zone 17N, NAD 83
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Water Assessment and Water Body Report
Project Location
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Figure 1.2
South Huron
Centennial Road
Bayfield River Road
Mill Road
Stanley Road
Front Road
Tile Road
Kippen Road
Walnut Road
Zurich-Hensall Road
Rogerville Road
Danceland Road
Concession 5 Road
Babylon Line
Goshen Line
Blind Line
Main Street
King Street
Hensall Road
Staffa Road
Perth 183 Road

More information on the Project Location and the specific project components, including predicted areas of disturbance associated with construction of each of the project components, are found in the Construction Plan Report.

1.3 Water Assessment and Water Body Report Requirements

Under the REA process, a person who proposes to engage in a renewable energy project is required to conduct a Water Assessment (section 29), consisting of the following:

- A Records Review (Section 30);
- A Site Investigation (Section 31).

Through this process, applicants identify water bodies near the proposed Project Location and determine prohibitions and setbacks provisions.

According to O. Reg. 359/09, a water body includes a lake, permanent stream, intermittent stream and a seepage area, defined as:

- Permanent stream – a stream that continually flows in an average year;
- Intermittent stream – a natural or artificial channel, other than a dam, that carries water intermittently and does not have established vegetation within the bed of the channel, except vegetation dominated by plant communities that require or prefer the continuous presence of water or continuously saturated soil for their survival;
- Lake Trout Lake – a lake that has been designated by the Ministry of Natural Resources for Lake Trout management, as set out in records maintained by and available from that Ministry, and;
- Seepage Area – a site of emergence of groundwater where the water table is present at the ground surface, including a spring.

Under O. Reg. 359/09, a water body 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) Temporarily ponded areas that are normally farmed;
(f) Dugout ponds, and;
(g) Artificial bodies of water intended for the storage, treatment or recirculation or runoff from farm animal yards, manure storage facilities and sites and outdoor confinement areas.

The prohibition/setback requirements stipulate restrictions on the location of project components. Section 39, O.Reg. 359/09, prohibits construction or installation of turbines and sub-stations in or within 30 m of the average annual high water mark of a lake, a permanent or intermittent stream or within 30 m of the average annual high water mark of a permanent or intermittent stream, and a seepage area or within 30 m of a seepage area. However, ancillary equipment, such as a transmission line, access road, and collection line, can be built within those setbacks provided that a Water Body Report is prepared. The Water Body report identifies and assesses any negative environmental effects of the project on a water body and on the land within 30 m of the water body nearest to the Project Location, thereby capturing any potential impacts to the riparian zone as well.

Section 40, O.Reg. 359/09 allows all project components, including wind turbines, to be constructed or installed within 120 m of a lake, stream or seepage area, provided that a Water Body Report is prepared.

The setbacks described above apply to the footprint of the project components and to the area required to construct those components. As presented in **Figure 1-3** below, the Area of Disturbance is defined as the area around the turbine which includes the construction footprint of the turbine, equipment laydown area, and turnaround areas. The tip of blade is the furthest extent of the actual turbine. Water body setbacks were measured from the Area of Disturbance which extended further than the turbine tip of blade.

Figure 1-3 Turbine Buffer and Setback Zones for Water Bodies (O. Reg. 350/09)

Required setbacks for the construction of roads and other facility components were applied in accordance with O.Reg 359/09, including the exemption that development of other project components such as transmission lines, collection lines and roads can be constructed within the 30 m water body setbacks (section 39(2)). Required buffers and setbacks (**Figure 1-3**) were incorporated into planning the location of project components (i.e., turbines, access roads and collection lines).

Water bodies that are within the 120 m Area of Investigation of these project components are identified and assessed in this Water Body Report.

This Water Assessment and Water Body Report is intended to satisfy the requirements outlined within O. Reg. 359/09 (**Table 1-1**) and is to be submitted as a component of the REA application.

Table 1-1 Water Body and Water Assessment Report Requirements

Requirement	*O. Reg 359/09* section	Completed	Corresponding Section
Records Review	Section 30	Yes	3
Site Investigation	Section 31	Yes	4
Negative environmental effects of the project on a water body and on land within 30 m of the water body that may result from construction or installation activities within the 120 m setback	Section 40	Yes	5
Mitigation measures in respect of any negative environmental effects	Section 40	Yes	5

2. Overall Methodology

The assessment of water bodies for the purposes of submitting an application for a REA requires a staged approach to first identify the natural features within the proposed Project Location (in this case, water bodies), and then to identify potential effects and mitigations on any water bodies that are within the Project Location. Sections 29-31 of O.Reg. 359/09 outlines the requirements for the assessment, while sections 39-40 outline setback distances and the requirements for environmental effects and mitigation measures for any water bodies that are within these setback distances.

Figure 2-1 outlines the approach undertaken to identify, analyze, and evaluate all water bodies identified within the Project Location, in compliance with O. Reg. 359/09.

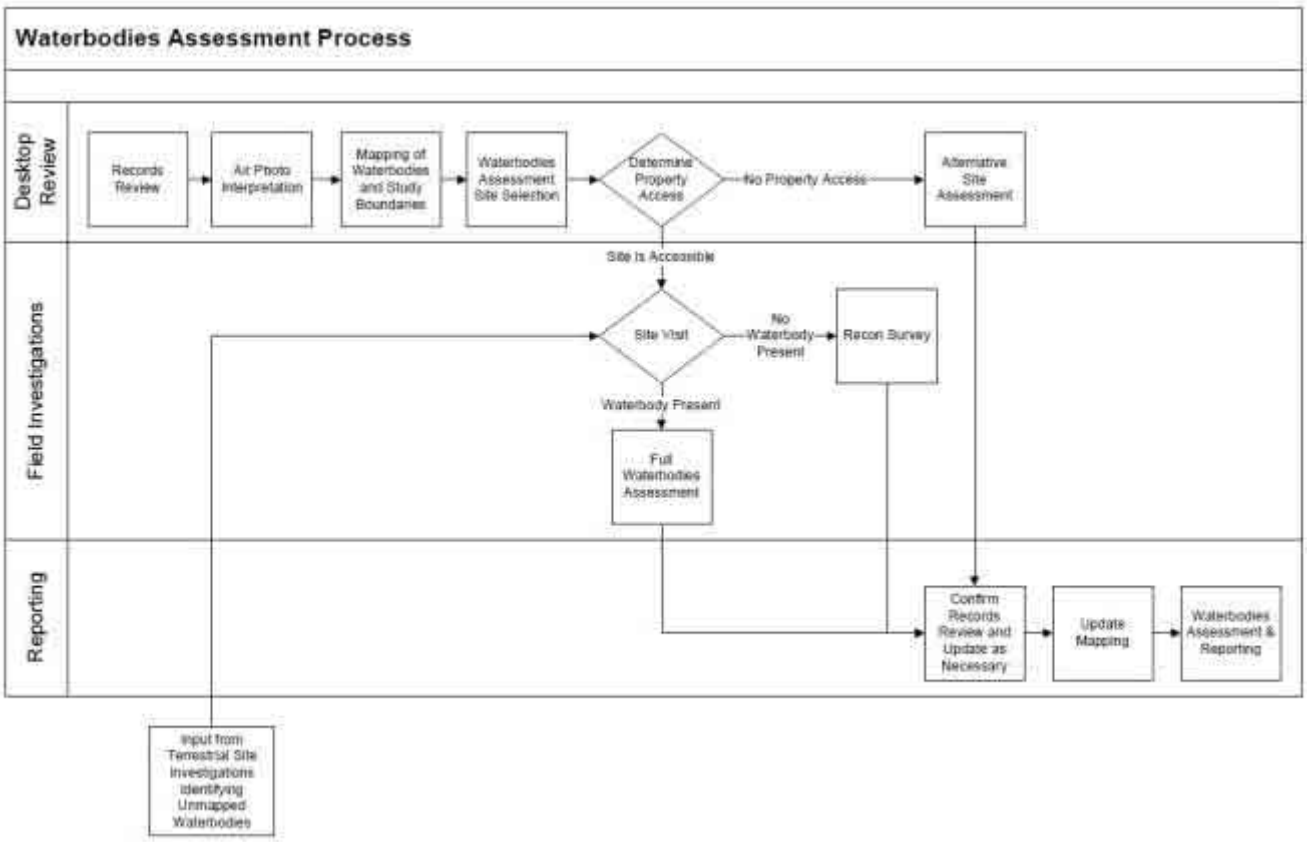


Figure 2-1 Overall Methodology Employed for the Water Body Assessment

3. Records Review

3.1 REA Requirements and Methods

Under Section 30 of *O. Reg. 359/09*, a Records Review is required to determine if water bodies exist in the vicinity of the Project Location. The records that are required to be searched and analyzed are listed in **Table 3-1**, along with applicable distances from the Project Location. Information gathered under this stage of the process was used to determine if water bodies may exist in the Area of Investigation, and to form the basis to subsequent site investigations.

Table 3-1 Requirements of Records Review (Section 30 O. Reg. 359/09)

Item	Records to Be searched and Analyzed	Determination to be Made
1.	Records that relate to natural features and that are maintained by: i. The Ministry of Natural Resources, ii. The Crown in right of Canada, iii. A Conservation Authority, if the Project Location is in the area of jurisdiction of the Conservation Authority, iv. Each local and upper-tier municipality in which the Project Location is situated, v. The planning board of an area of jurisdiction of a planning board in which the Project Location is situated, vi. The municipal planning authority of an area of jurisdiction of a municipal planning authority in which the Project Location is situated, vii. The local roads board of a local roads area in which the Project Location is situated, viii. The Local Services Board of a board area in which the Project Location is situated, and, ix. The Niagara Escarpment Commission, if the Project Location is in the area of the Niagara Escarpment Plan.	Whether the Project Location is: i. In a water body ii. Within 120 m of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity iii. Within 300 m of the average annual high water mark of a lake trout lake that is at or above development capacity iv. Within 120 m of the average annual high water mark of a permanent or intermittent stream v. Within 120 m of a seepage area

The Records Review was conducted via online searches, as well as by regulatory agency contact through either: face to face meetings, telephone requests, or email correspondence. A summary of all agency consultation and information obtained in relation to this project is provided in **Table 3-2**. Section 3.2, below, provides details on all records collected and reviewed in relation to the Project Location.

Table 3-2 Summary of Agency Consultation

Agency	Information Source/Method and Date of Consultation	Information Obtained
Ausable Bayfield Conservation Authority (ABCA)	• Geoff Cade (Supervisor of Water and Planning) and Andrew Bicknell (Regulations Co-ordinator/Officer) • meeting (ABCA offices) • August 12, 2010	• Provided constraints used to guide preliminary turbine layout, based on Land Information Ontario (LIO), Natural Heritage Information Centre (NHIC) and Natural Resources and Values Information System (NRVIS) databases. Request for aquatic data including water quality, benthics, fisheries, generic regulation mapping, stream flow, and any available terrestrial information.
	• Geoff Cade, Andrew Bicknell and Tracy Boitson (GIS/CAD Information Systems Specialist) • meeting (ABCA offices) • May 2, 2011	• Preliminary discussion regarding the permitting process and background data request.

Table 3-2 Summary of Agency Consultation

Agency	Information Source/Method and Date of Consultation	Information Obtained

	• Tracy Boitson
	• Email correspondence
	• May 15, 2011
		• Received fish collection locations and associated data
		• ABCA Shape files (1999)
		  • Regulation Limit
		  • 1 m Contours
		  • Natural Features
		  • Watershed Boundary
		  • ABCA ESAs
		• Waterflow with thermal regimes and names

	• Tracy Boitson • Email correspondence • July 20, 2011	• Requested average annual high water mark data from the CA. CA does not have this information.
	• Geoff Cade • Phone conversation • November 16 2011	• Discussion regarding CA setbacks from watercourses
	• Andrew Bicknell • Phone conversation • November 22, 2011	• Discussion regarding CA setbacks from watercourses and ideas to streamline permitting process.
Ministry of Natural Resources (MNR) – Clinton Office	• Tara Lessard (Acting Area Biologist) • Phone conversation • September 7, 2010	• Response to the proponent's request for a blanketed Scientific Collector's Permit (SCP) for each Project Location. MNR confirmed they would prefer a specific list of watercourses before a permit will be given. A SCP can be issued quickly, but Species-at-Risk (SAR) permits can take three (3) months to one (1) year to be developed and approved.
	• Tara Lessard • Phone conversation • December 15, 2010	• Requested specific list of water bodies/crossing locations to summarize fish information.
	• Tara Lessard • Email correspondence • March 11, 2011	• Follow-up to correspondence on February 7, 2011 regarding fish records. Indicated MNR needs to make modifications to the current fish database before facilitating a fish information request of this size.

	• Chris Godwin (Acting Area Biologist)
	• Phone conversation
	• May 18, 2011
		• Requested the following data:
		  • Fish records;
		  • Water temperature;
		  • Habitat mapping;
		  • Benthic invertebrate date;
		  • SAR records – with permission from Pud Hunter; and,
		  • Mussel records

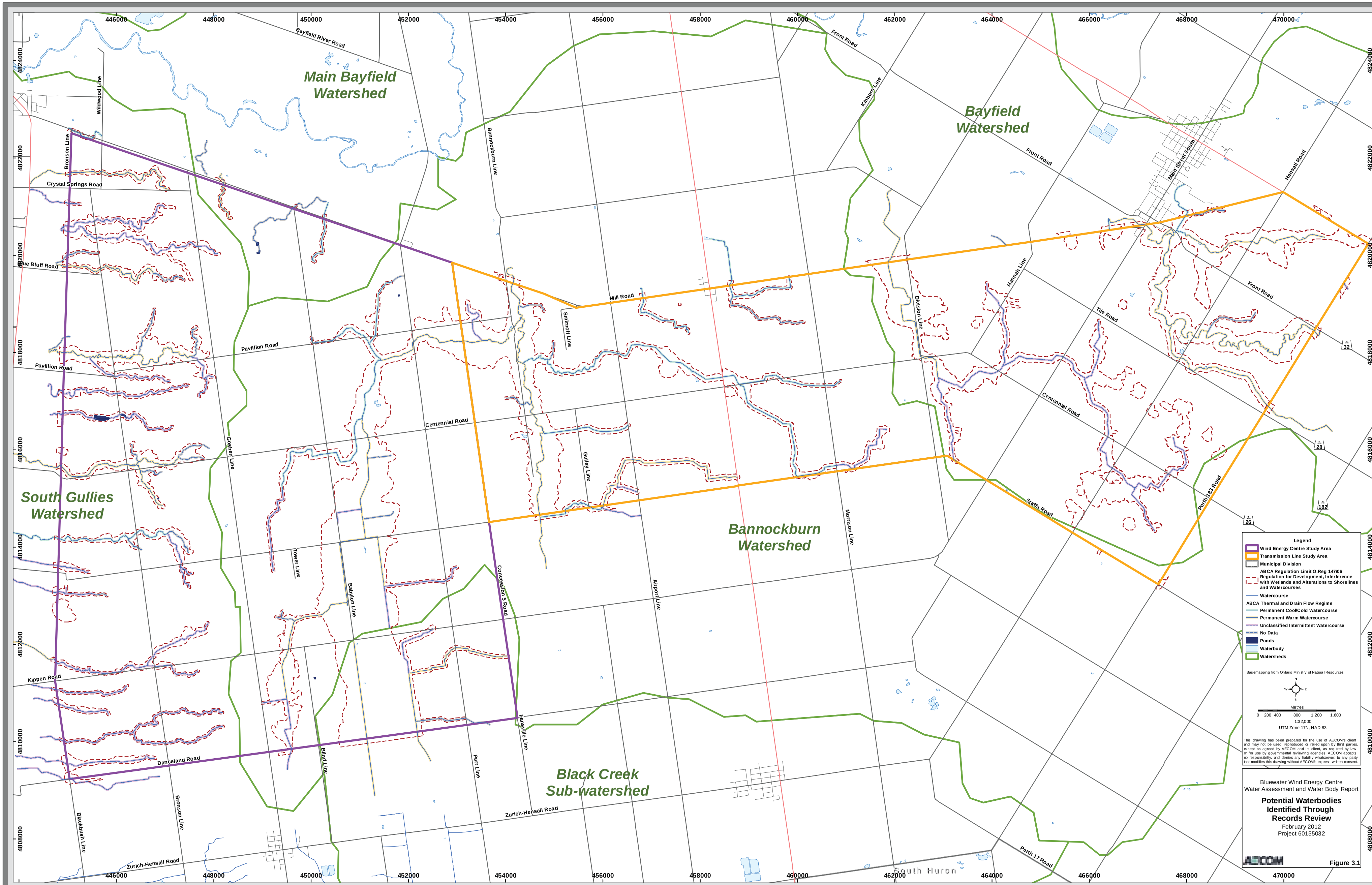
	• Chris Godwin • Email correspondence • May 20, 2011	• MNR provided map of stream classifications and confirmed data will be compiled for the Study Area.
	• Chris Godwin • Meeting at MNR Clinton Office • June 20, 2011	• Received fisheries records, fish habitat and water quality information.
	• Chris Godwin • Email correspondence • October 24, 2011	• Data request for Study Area.
	• Chris Godwin • Email correspondence • October 25, 2011	• Data request from the proponent on October 24 has been compiled and in the mail.
	• Chris Godwin • Email correspondence • November 1, 2011	• Data request from the proponent for Study Area.
MNR – Guelph Office	• April Nix (Renewable Energy Planning Ecologist) • Email correspondence • March 28, 2011	• MNR confirmed the Great Lakes are not considered Lake Trout Lakes for the purpose of REA regulation. Only lakes listed in the *Inland Ontario Lakes Designated for Lake Trout Management (May 2006)* are considered Lake Trout Lakes for the regulation.

Table 3-2 Summary of Agency Consultation

Agency	Information Source/Method and Date of Consultation	Information Obtained
Ministry of the Environment (MOE)	• Shannon McNeil (Senior Project Evaluator - REA) • Phone conversation • March 28, 2011	• Discussed the requirements of the water bodies field investigations, regarding requirements for water quality, fisheries and work plan.
	• Shannon McNeil • Email correspondence • March 31, 2011	• Confirmation of information exchanged in the previous phone conversation (28/03/11).
	• Shannon McNeil • Email correspondence • May 11, 2011	• Confirmed that work plan does not require MOE approval.
	• Shannon McNeil • Email correspondence • October 14, 2011	• Requesting advice regarding the protocol for the MOE water bodies Alternative Site Investigation.
	• Shannon McNeil • Phone conversation • October 20, 2011	• Response from MOE regarding requirements for Alternative Site Investigations. Use of Records Review data, investigations of sites upstream and downstream of study access and studies from adjacent properties was acceptable.
	• Shannon McNeil • Email correspondence • November 3, 2011	• Submitted protocol for Alternative Site Investigations.
	• Shannon McNeil • Email correspondence • November 16, 2011	• Email correspondence from Oct 14th, 2011 and phone conversation from 20th October 2011 was documented through email regarding Alternative Site Investigations. MOE confirmed context of confirmation was according to MOE records.
	• Shannon McNeil • Phone conversation • November 29, 2011	• Regarding classification of certain water features and requirements for Water bodies Report.
Upper-tier and Lower-tier Municipalities	• Arlene Parker (Municipality of Bluewater) • Email correspondence • November 1, 2011	• Email to the proponent in response to request for water bodies information relevant to the project. The Municipality suggests contacting the MNR and the ABCA for this information. Any information on natural environments, floodplains and wellhead protection areas can be found in the Municipality's Official Plan.
	• Claire Dodds (Municipality of South Huron) • Email correspondence • November 1, 2011	• Email to the Municipality to request water bodies information relevant to the project. The Municipality suggests contacting ABCA for this information.
	• Brad Knight (Municipality of Huron East) • Email correspondence • November 1, 2011	• Request for water bodies information relevant to the project. The Municipality identified a few drains in Huron East within 120 m of the Study Area.
	• Arlene Parker • Email correspondence • November 24, 2011	• Request for municipal drain information.
	• Arlene Parker • Phone conversation • November 28, 2011	• Arlene provided a website to obtain the municipal drain mapping.

3.2 Summary of Records Received

The records received from the regulatory agencies are shown in **Table 3-3**. The type of information provided and the Study Area coverage is noted. All water bodies identified from this Records Review were mapped and set as the basis for further investigation (**Figure 3-1**).



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Bluewater Wind Energy Centre
Water Assessment and Water Body Report

Potential Waterbodies Identified Through Records Review

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Figure 3.1

Table 3-3 Summary of Records Received

Agency	Record Type	Project Study Area Coverage
MNR	Water body, watercourse, wetland layers	Entire Study Area
	Thermal Regime	Entire Study Area
	Fish Records	Fish Records (59) within the Study Area. Reference to Fish Records located outside of the Study Area.
	Fish Habitat	Records(18) of fish habitat with the associated Fish Records
	Water Quality	Records (43) of water quality (mostly water temperature) with the associated Fish Records
ABCA	Regulated Areas (*O.Reg. 97/04*)	Entire Study Area
	Natural Features	Entire Study Area
	Thermal Regime	Entire Study Area
	Municipal Drain Classifications	Entire Study Area
	Fish Records	Records (6) for five watercourses within Study Area
	Source Water Protection	Entire Study Area
	Watercourse Names	Entire Study Area
Upper and Lower Tier Municipalities	Municipal Drain Classifications	Entire Study Area

3.2.1 Records Related to Lakes

The Project Study Area does not include any inland lakes and the Study Area is not located within 120 m of the average annual high water mark of a lake. This was confirmed using the NRVIS layers as Ontario Base Maps (OBM) published by MNR and calculation of distances using GIS tools.

3.2.2 Records Related to Lake Trout Lakes

The Project Study Area does not contain any Lake Trout lakes and is not located within 300 m of the average annual high water mark of a Lake Trout lake that is at or above development capacity. This was determined through review of the Inland Ontario Lakes Designated for Lake Trout document produced by MNR (2006).

3.2.3 Records Related to Permanent or Intermittent Streams

3.2.3.1 Ausable Bayfield Conservation Authority

The Project Study Area is located in the Ausable Bayfield Watershed. ABCA provided 2010/2011 watercourse and wetland shapefiles, as well as mapping for regulated areas (flooding and erosion hazards) under the Generic Regulation; *Ontario Regulation 97/04 – Development, Interference with wetlands and Alterations to Shorelines and Watercourses*. These layers were applied to the base mapping to update constraints mapping and identify water bodies within the Study Area. Both thermal regime and drain classifications were provided for all watercourses on this mapping, and the thermal regimes are classified as either warmwater, coolwater, coldwater or unknown.

The water bodies located within the Project Study Area are part of the South Gullies, Bannockburn, Main Bayfield, Black Creek and Bayfield Headwaters watersheds and all drain into Lake Huron (**Figure 3-1**). The fish community in the South Gullies watershed is warm water baitfish, and a warm water fishery also dominates in the Bayfield Headwaters, with baitfish in tributaries. A migratory trout fishery is found in the main channel of the Bannockburn watershed and Main Bayfield watershed, with a cold water fishery in the tributaries. The Black Creek fish community consists of warm water species within the main channel and a cold water fishery within the tributaries (ABCA, 2007).

ABCA provided seven fish records for five different watercourses located within the Project Study Area. Of the five watercourses there are three records that apply to three different water bodies located within the Project Location.

The fish communities located within the three watercourses are a mix of warm water, cool water and cold water species including Rainbow Trout (*Oncorhynchus mykiss*) found in two of the three watercourses. Table 3-4 provides the fish species identified in the study area by ABCA.

Table 3-4 Fish Records Obtained from ABCA

Common Name	Latin Name
Blacknose Dace	*Rhinichthys atratulus*
Bluntnose Minnow	*Pimephales notatus*
Brook Stickleback	*Culaea inconstans*
Common Carp	*Cyprinus carpio*
Common Shiner	*Luxilus cornutus*
Creek Chub	*Semotilus atromaculatus*
Fantail Darter	*Etheostoma flabellare*
Hornyhead Chub	*Nocomis biguttatus*
Johnny Darter	*Etheostoma nigrum*
Northern Hogsucker	*Hypentelium nigricans*
Rainbow Darter	*Etheostoma caeruleum*
Rainbow Trout	*Oncorhynchus mykiss*
Rock Bass	*Ambloplites rupestris*
Rosyface Shiner	*Notropis rubellus*
Smallmouth Bass	*Micropterus dolomieu*
Stonecat	*Noturus flavus*
Striped Shiner	*Luxilus cornutus*
White Sucker	*Catostomus commersonii*

Department of Fisheries and Oceans (DFO) Drain Classification was obtained from ABCA. The Class Authorization process was developed to help streamline the review and approval process for the Fisheries Act for drain maintenance. The Class Authorization System classifies drains into six categories based on the sensitivity of the fish habitat. Table 3-5 provides the Drain Classification below.

Table 3-5 DFO Drain Classification System

Drain Type	Flow	Temperature	Drain Classification
A	Permanent	Cold/Cool	No sensitive species and/or communities present
B	Permanent	Warm	Sensitive species and/or communities present
C	Permanent	Warm	No sensitive species and/or communities present
D	Permanent	Cold/Cool	Sensitive species and/or communities present
E	Permanent	Warm	Sensitive species and/or communities present
F	Intermittent/Ephemeral	Not Applicable	Not Applicable

Source: http://www.dfo-mpo.gc.ca/regions/central/pub/factsheets-feuilletsinfos-on/l2-eng.htm (DFO, 2010)

Water quality is similar across all of the watersheds in the project area, with some ecosystem conditions that need improvements with regard to *E.coli* (*Escherichia coli*) and benthic invertebrates, and overall good ecosystem conditions with regard to total phosphorus levels, with some enhancements required.

ABCA did not have any data on the average high water mark for water bodies within the Project Study Area.

3.2.3.2 Ministry of Natural Resources

The Project Study Area is located in the Guelph MNR District. Water body, watercourse and wetland layers (NRVIS 2007) were obtained from MNR to identify water bodies within the Project Study Area.

MNR provided thermal and flow regime mapping, however the data were greater than 10 years old and therefore more current data from ABCA were applied to the Project Study Area.

Fish records, fish habitat data and water quality data were provided by MNR for the entire Study Area. Generally, the water bodies within the study provide suitable habitat for a mix of both coolwater and warmwater cyprinids, centarchides, catostomidae and percidae. Fish species identified in the study area are presented in Table 3-6 below.

Table 3-6 Fish Records Obtained from MNR

Common Name	Latin Name
Blacknose Dace	*Rhinichthys atratulus*
Bluntnose Minnow	*Pimephales notatus*
Brook Stickleback	*Culaea inconstans*
Central Mudminnow	*Umbra limi*
Central Stoneroller	*Campostoma anomalum*
Common Shiner	*Luxilus cornutus*
Creek Chub	*Semotilus atromaculatus*
Fathead Minnow	*Pimephales promelas*
Finescale Dace	*Phoxinus neogaeus*
Hornyhead Chub	*Nocomis biguttatus*
Johnny Darter	*Etheostoma nigrum*
Logperch	*Percina caprodes*
Longnose Dace	*Rhinichthys cataractae*
Northern Hog Sucker	*Hypentelium nigricans*
Northern Redbelly Dace	*Chrosomus eos*
Pumpkinseed	*Lepomis gibbosus*
Rainbow Darter	*Etheostoma caeruleum*
Rock Bass	*Ambloplites rupestris*
Rosyface Shiner	*Notropis rubellus*
Smallmouth Bass	*Micropterus dolomieu*
White Sucker	*Catostomus commersonii*
Redside Dace X Creek Chub Hybrid	-

3.2.3.3 Upper tier and Lower Tier Municipalities

Municipal drain information was provided from the Municipality of Bluewater and the Municipality of Huron East. Drain classifications (under the *Drainage Act*) were obtained from the Huron County website and are located within the Hay and Stanley wards.

3.2.3.4 Ministry of the Environment

Water quality data are available from the Provincial Water Quality Monitoring Network (PWQMN) (http://www.ene.gov.on.ca/en/water/lakepartner/index.php) website. Available on this website is stream water quality data for a number of different parameters. There were no datasets for any watercourses within the Project Study area.

3.2.3.5 Environment Canada

Stream flow data were found at the Environment Canada's Water Office (http://www.wateroffice.ec.gc.ca) website, however there are no flow monitoring stations located within the Project Study area.

3.2.3.6 Air Photo Interpretation

The air photo interpretation was conducted using 2006 aerials, NRVIS and Conservation Authority (CA) GIS layers and 1 m contours to identify low lying areas. Air photo interpretation was also conducted to locate potential first order tributaries that may now be tile drained. Specific features identified were:

- Vegetated swale features;
- Potential ponding areas;
- Branched swales.

3.2.4 Records Related to Seepage Areas

Mapping was obtained from the Upper Thames River Conservation Authority website regarding a Groundwater Modelling Project conducted by six conservation authorities including ABCA (UTRCA, 2010). The Estimated Zones of Potential Recharge and Discharge Areas were determined and presented in Figure A-1 (**Appendix A**). There are no identified groundwater discharge areas located within the Project Study Area.

3.2.5 Species of Conservation Concern

The NHIC and information provided by MNR for the preparation of this Records Review were used to identify Species of Conservation Concern that occur or have the potential to occur within the Project Study Area. Information pertaining to endangered or threatened species is excluded from this report. As noted above, endangered and threatened species are addressed through a parallel review and approval process administered by the MNR Guelph District.

Four species of conservation concern were identified through the Records Review as occurring or having the potential to occur within the Project Study Area, which are:

- Northern Brook Lamprey
- River Redhorse
- Chestnut Lamprey
- Grass Pickerel

These results were identified from a search of the NHIC database, MNR fish records and DFO Species at Risk mapping. These species have been designated as Special Concern under Species at Risk in Ontario (SARO) or have a provincial ranking of S1-S3. This list does not include species that are designated as Endangered or Threatened in Ontario.

Descriptions of the preferred habitat of each species were obtained from the Species at Risk Public Registry (Environment Canada, 2011) and are included in Table 3-7.

3.2.6 Species at Risk

Species at risk listed under the federal Species at Risk Act (SARA; 2002) and the provincial Endangered Species Act (ESA; 2007), with the potential to interact with the Project Location and/or adjacent lands, are being considered in consultation with the appropriate agency. Reporting related to the protection of these species at risk is being provided to the appropriate agency under separate cover. This reporting format meets the requirements as set out in O. Reg. 359/09, and is consistent with the direction provided by the MNR and the MOE.

Table 3-7 Species of Conservation Concern

Common Name	Scientific Name	G-rank	S-rank	COSEWIC Status	MNR Status	Preferred Habitat	Last Observed Date	Source
Northern Brook Lamprey	*Ichthyomyzon fossor*	G4	S3	Special Concern	Special Concern	Rocky or gravel substrate with swift-flowing water is the preferred spawning area for northern brook lamprey. They require a small amount of silt-free sand or some other fine material to which the eggs can adhere, uni-directional current, and suitable water temperatures (SARA, 2011). Nests have been found in interstices beneath large stones (18 to 36 cm in diameter) (Lanteigne 1991), usually in gravel shallows just above riffles (Hankinson 1932). Larval northern brook lamprey are usually found in depositional areas with soft silt and sand substrate.	6/27/1974	NHIC
River Redhorse	*Moxostoma carinatum*	G4	S2	Special Concern	Special Concern	Moderate to large rivers where the current is fast, and the bottom is composed of stones, rubble and bedrock with very little siltation.	8/10/1936	NHIC
Chestnut Lamprey	*Ichthyomyzon castaneus*	G4	S1	Data Deficient	none	Large creeks and main channels of small- to medium-sized rivers; ammocoetes inhabit sand- and silt-bottomed pools and backwaters	Unknown	DFO SAR Mapping (2011)
Grass Pickerel	*Esox americanus vermiculatus*	G5T5	S1	Special Concern	Special Concern	It is known in the lower Ottawa and St. Lawrence rivers, as well as in shallow bays and tributaries of eastern and southwestern Lake Ontario, and along the north shore of Lake Erie. Populations occur in Lake St. Clair and some of its tributaries. It is also found in several tributaries in the Lake Huron watershed.[1] Lives in heavily vegetated, warm water streams and wetlands in Southern Ontario.	Unknown	DFO SAR Mapping (2011)

1. ***G-rank*** *G Global ranks are assigned by a consensus of the network of Conservation Data Centres (CDCs), scientific experts, and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species, subspecies or variety. Definitions are as follows:*

   G1 Extremely rare; usually 5 or fewer occurrences in the overall range or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
   G2 Very rare; usually between 5 and 20 occurrences in the overall range or with many individuals in fewer occurrences; or because of some factor(s) making it vulnerable to extinction.
   G3 Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
   G4 Common; usually more than 100 occurrences; usually not susceptible to immediate threats.
   G5 Very common; demonstrably secure under present conditions.

2. ***S-rank:*** *The Natural Heritage provincial ranking system (provincial S-rank) is used by the MNR Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities.*

   Definitions are as follows:
   S1..... Extremely rare in Ontario; usually 5 or fewer occurrences in the province or very few remaining individuals; often especially vulnerable to extirpation.
   S2..... Very rare in Ontario; usually between 5 and 20 occurrences in the province or with many individuals in fewer occurrences; often susceptible to extirpation.
   S3..... Rare to uncommon in Ontario; usually between 20 and 100 occurrences in the province; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances. Most species with an S3 rank are assigned to the watch list, unless they have a relatively high global rank.
   S4..... Common and apparently secure in Ontario; usually with more than 100 occurrences in the province.
   S5..... Very common and demonstrably secure in Ontario.
   SE..... Exotic; not believed to be a native component of Ontario's flora.
   SH..... Possibly Extirpated (Historical)— Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years.

3. **COSEWIC *Status*** *COSEWIC (Committee on the Status of Endangered Wildlife in Canada) assigns a federal status ranking for all species that it assesses.*

   EXT..... Extinct. A species that no longer exists
   EXP..... Extirpated. A species that no longer exists in the wild in Canada, but occurring elsewhere in the world
   END..... Endangered. A species facing imminent extirpation or extinction throughout its range.
   THR..... Threatened. A species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction
   SC..... Special Concern. A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events, but does not include an extirpated, endangered or threatened species.
   IND..... Indeterminate. A species for which there is insufficient information to support a status designation.
   NAR..... Not at Risk. A species that has been evaluated and found to be not at risk.

4. **MNR *Status:*** *Based on consultation with COSSARO (Committee on the Status of Species at Risk in Ontario). COSSARO is the Ministry of Natural Resources (MNR) committee that evaluates the conservation status of species occurring in Ontario.*

   Definitions are as follows:
   EXT Extinct..... A Species that no longer exist anywhere.
   EXP Extirpated..... Any native species no longer existing in the wild in Ontario, but existing elsewhere in the wild.
   END R Endangered (Regulated)..... A species facing imminent extinction or extirpation in Ontario which has been regulated under Ontario's Endangered Species Act
   END Endangered (not regulated)..... A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under the Ontario Endangered Species Act
   THR Threatened..... Any native species that, on the basis of the best available scientific evidence, is at risk of becoming endangered throughout all or a significant portion of its Ontario range if the limiting factors are not reversed.
   SC Special Concern [formerly Vulnerable]..... A species with characteristics that make it sensitive to human activities or natural events.
   NAR Not at Risk [formerly Not In Any Category]..... A species that has been evaluated and found not to be at risk.
   DD Data Deficient [formerly Indeterminate]..... Any native species for which there is insufficient scientific information on which to base a status recommendation

3.3 Summary of Key Findings from the Records Review

The Records Review determined that there is no separate planning board; the project is not located within the Oak Riders Moraine, Lake Simcoe Protection area, Niagara Escarpment or the Great Lakes area.

The majority of the water bodies located within the Project Study Area were classified as agricultural drains and underground tile drains. The water bodies in the Study Area appear to provide suitable habitat for a mix of coolwater and warmwater fish species such as cyprinids, centarchides, catostomidae and percidae.

The location of water bodies within the 120 m setback of the Project Location was mapped using GIS tools. NRVIS layer mapping overlaid with natural features mapping and the locations of project components, as well as air photo interpretation, determined that there were a total of 70 locations where the Project Location overlapped with a water body or potential water body. Of these 70 sites, 11 potential swales and 8 potential ponds were identified through air photo interpretation and were included on the mapping for site investigation.

Table 3-8 Summary of Potential Water Bodies in the Study Area Identified from Records Review that were Carried Forward to Site Investigations

Feature	Number of Water Bodies
Within 120 m of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity	0
Within 300 m of the average annual high water mark of a lake trout lake that is at or above development capacity	0
Within 120 m of the average annual high water mark of a permanent or intermittent stream	70
Within 120 m of a seepage area	0

4. Site Investigation

4.1 REA Requirements and Methods

Site investigations were completed to confirm the findings of the Records Review, as required by Section 31 of O. Reg. 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 Records Review are correct or require correction, and to identify 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.
- The distance from the Project Location to the boundaries of any water body that was identified in the Records Review.

As such, site investigations were completed to determine the accuracy and completeness of the records collected.

4.2 Site Investigation Methodology

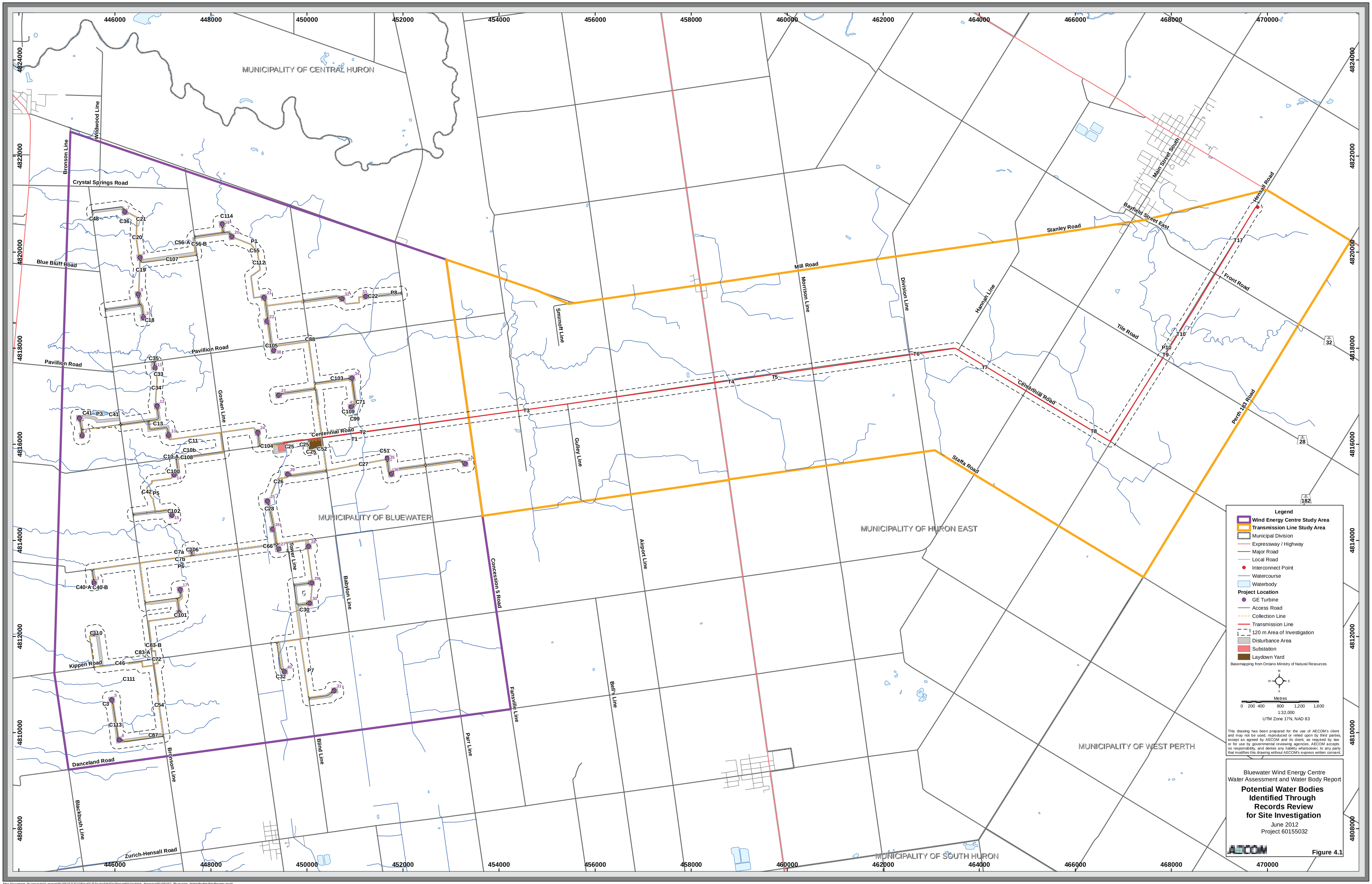
Site investigations were conducted for water bodies within 120 m of the proposed components of the Project (see Section 1.3 for further details on the project components and infrastructure). Water bodies identified through the Records Review process were assessed to determine their presence, composition, form and function. Any corrections to the Records Review, including changes to the boundaries of water bodies or new water bodies, were identified and are documented in Section 4.6. In addition to this, mapping of the Project Location was revised accordingly.

AECOM incorporated a three step process to ensure all water bodies within the Area of Investigation were identified and physically investigated. Within this three step process, protocols were developed for detailed field surveys (Step 1) and reconnaissance level field surveys (Step 2). Detailed field surveys were undertaken for water bodies identified through the Records Review process and reconnaissance level surveys were undertaken at sites where water bodies were not identified through the Records Review (**Figure 4-1**).

To ensure additional accuracy, efforts were co-ordinated with the team of site investigators conducting the Natural Heritage Assessment (NHA) for the same Area of Investigation. During their site investigations in the Study Area, any seepage areas and water bodies were recorded. These were crossed referenced with the mapping to determine if these sites were identified during the Records Review and initial site selection. If water was noted at these sites, a full water bodies assessment was conducted (Step 3).

4.2.1 Reconnaissance Surveys

Reconnaissance-level investigations were conducted on sites where no water body features were identified during the Records Review process. If a potential water body was identified during the air photo interpretation stage or identified from one of the other field teams (NHA or micrositing), a reconnaissance survey of the physical features of the water body was conducted. This involved visiting the potential water body, detailing the feature, taking photographs and documenting if water was present. If water was present and the feature was deemed to be a water body (according to O. Reg 359/09), a full water body assessment was completed. If no water body was found to be present, the information collected was presented alongside a description of water bodies to provide an accurate baseline of the Area of Investigation.


MUNICIPALITY OF CENTRAL HURON
MUNICIPALITY OF BLUEWATER
MUNICIPALITY OF HURON EAST
MUNICIPALITY OF WEST PERTH
MUNICIPALITY OF SOUTH HURON
Bronson Line
Wildwood Line
Crystal Springs Road
Blue Bluff Road
Pavillion Road
Goshen Line
Kippen Road
Danceland Road
Blackbush Line
Zurich-Hensall Road
Babylon Line
Blind Line
Tower Line
Concession 5 Road
Fansville Line
Parr Line
Smirnoff Line
Gulley Line
Airport Line
Bell's Line
Morrison Line
Division Line
Mill Road
Hannah Line
Stanley Road
Tile Road
Centennial Road
Staffa Road
Front Road
Perth 183 Road
Hensall Road
Main Street South
Bayfield Street East
Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Municipal Division
Expressway / Highway
Major Road
Local Road
Interconnect Point
Watercourse
Waterbody
Project Location
GE Turbine
Access Road
Collection Line
Transmission Line
120 m Area of Investigation
Disturbance Area
Substation
Laydown Yard
Basemapping from Ontario Ministry of Natural Resources
Metres
0 200 400 800 1,200 1,600
1:32,000
UTM Zone 17N, NAD 83
This drawing has been prepared for the use of AECOM's client and may not be used, reproduced or relied upon by third parties, except as agreed by AECOM and its client, as required by law or for use by governmental reviewing agencies. AECOM accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without AECOM's express written consent.
Bluewater Wind Energy Centre
Water Assessment and Water Body Report
Potential Water Bodies
Identified Through
Records Review
for Site Investigation
June 2012
Project 60155032
AECOM
Figure 4.1

4.2.2 Water Body Assessment

Water bodies were identified according to O. Reg 359/09 and classified as either a permanent stream; an intermittent stream; or a seepage area based on observations made at the time of the field visit. The following nomenclature describes how the water bodies were labelled:

- C –identified water bodies within the vicinity of project components (*e.g.,* C12);
- BLW-T – identified water bodies associated with the Transmission Line (*e.g.,* BLW-T1), and;
- P – identified potential ponds (*e.g.,* P1)

The area of site investigation for each of the water body assessments consisted of the entire stretch of the water body that was within the setback of the disturbance area. This approach allowed the whole reach of the water body to be characterized and for an accurate assessment of effects and appropriate mitigation measures.

One field work form (see **Appendix C**) was completed for each water body (or feature, if no water body was found). An overall assessment of the water body was noted based on a number of criteria, such as whether the watercourse was a natural feature or modified feature (*i.e.*, channelized, straightened), as well as the type of the surrounding natural features and land uses.

Channel dimensions were collected as well as substrates and bank stability. These measurements were taken at more than one location along the water course and mean values were recorded, including:

- Mean wetted depth (MWD) (m);
- Mean wetted width (MWW) (m);
- Mean bankfull depth (MBW) (m); and,
- Mean bankfull width (MBW) (m)

As the average high water mark data were not available from ABCA, the Department of Fisheries and Oceans (DFO) Fish Habitat Management Program (2005) was applied to determine the Ordinary High Water Mark using the active channel/bank-full measurement. Mean bank full width and depth were collected by taking a measurement where indicators such as the active scour mark, location of perennial vegetation and root hair exposure were located.

Substrates were categorized based on the area of site investigation and reported in descending order of dominance. Where possible, basic field parameters for water chemistry (pH, conductivity and temperature) were collected, although water clarity and evidence of runoff, land use, suspended solids or algae growth were the primary indicators for water quality as these were considered more reliable than singular snapshots of water chemistry. Bank stability was documented based on visual observations and height measurements of the banks, as well as the amount of mature riparian vegetation, any observations of exposed root structures, and evidence of slumping or scouring.

Fish community surveys were not completed as the existing data from the Records Review stage were considered to provide sufficient information. However, the quality and quantity of potential fish habitat was recorded, based on the parameters recommended by DFO, and along with background data including thermal regime and species occurrence records, an assessment of the likelihood of fish presence was presented. Fish habitat was defined according to the federal *Fisheries Act*, 'spawning grounds and nursery, rearing, food supply, migration, and any other areas on which fish depend directly or indirectly in order to carry out their life processes'.

In-stream cover was documented based on the percent of cover provided by woody debris, boulders (<256 mm diameter), cobble (256-64 mm diameter), gravel (64-2 mm), aquatic vegetation and undercut banks. In-stream cover was classified as high if there was in-stream coverage between the areas of 76-100%; moderate 31-75%; and low 0-

30%. Riparian vegetation canopy cover was provided as a percentage of cover over the site of investigation. Overall canopy cover was classified as: high 61-100%; moderate cover 31-60%; and low cover 0-30%. Obstructions to fish passage were also noted within the area of site investigation, including possible low-flow barriers.

Adjacent land uses were noted for potential influences or impacts to the water bodies. This included residential, agriculture uses (crops and livestock), meadows, forests and wetland features. Farming practices were noted as well as the type of crops or livestock located within adjacent fields. Pollution sources were noted, such as tile drain discharges, other piped discharges, road runoff and any other surface runoff features causing potential nutrient loading or sediment loading. Topography of the land located within the 120 m Area of Investigation was documented.

Ecological Land Classification (Lee *et al.* 1998), undertaken as part of the NHA, was used to describe the lands within 30 m of a water body and therefore provide some assessment of the riparian zone.

During all site investigations, groundwater seepage areas were identified using the following indicators, as outlined in the Technical Guide to Renewable Energy Approvals:

- Occurrence of watercress (*Nasturtium officinale*);
- Presence of iron staining as indicated through red rust coloured soils along banks and stream beds;
- Air bubbles in the stream bed.

A representative photolog and site sketches were included to detail the general site layout as well as the layout of the water body.

Table 4-1 describes the site investigations that occurred within the Area of Investigation. **Appendix C** contains detailed field notes, **Appendix D** contains detailed weather information from Environment Canada and **Appendix E** contains qualifications (*i.e*., curriculum vitae) for all investigators.

The results of these site investigations are outlined in Section 4.4.

Table 4-1 Summary of Site Investigations

Date	Duration	Location	Weather	Field Notes	Name of Investigator(s) / Qualifications
July 5, 2011	8:45-17:00	C13, C33, C36	27.1°C; 0 mm of precipitation	S. Aitken C. Boros	S. Aitken, B.Sc. C. Boros, B.Sc.,
July 12, 2011	8:30-18:00	C18, C22, C26, C3	26.1°C; 0 mm of precipitation	S. Aitken N. Lower N. Hodges	S. Aitken N. Lower, Ph.D. N. Hodges, FWT
July 13, 2011	9:00-10:00	C32	21.1°C; 0 mm of precipitation	S. Aitken	S. Aitken
July 29, 2011	8:00 – 15:00	T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T17, T11, T12, T13	25.8°C; 10.1 mm of precipitation	C. Boros A. Dart	C. Boros A. Dart, ET
August 9, 2011	11:00 – 11:30	T13	23.7°C; 1.7 mm of precipitation	C. Boros A. Dart	C. Boros A. Dart
August 10, 2011	11:00	C7	21.2°C; 7.1 mm of precipitation	C. Boros A. Dart	C. Boros A. Dart
September 28, 2011	7:15-14:00	C11, C34, C35, C19, C21, C10	22.3°C; 0 mm of precipitation	N. Hodges	N. Hodges
October 5, 2011	9:00-14:00	C25, C28, C27	18.9°C; 0 mm of precipitation	N. Hodges	N. Hodges
October 12, 2011	10:30-14:00	C20, C41	19°C; 13.1 mm of precipitation	N. Hodges	N. Hodges
October 25, 2011	10:25-17:00	C42, C40, C102	10.1°C; 10.9 mm of precipitation	S. Aitken	S. Aitken G. Ferris, B. Sc.

Date	Duration	Location	Weather	Field Notes	Name of Investigator(s) / Qualifications
October 26, 2011	10:18-14:00	C83, C72, C46, C87, C54	8.3°C; 0 mm of precipitation	S. Aitken	S. Aitken G. Ferris
November 3, 2011	15:30-17:00	C52, C88, C99, C71, C66, C103	12.4°C; 0 mm of precipitation	S. Aitken	S. Aitken G. Ferris
November 4, 2011	8:45-13:30	C32, C30, C51, C104	9.2°C; 0 mm of precipitation	S. Aitken	S. Aitken G. Ferris
November 17, 2011	10:00-12:00	C50, C48, C56, C55	2.9°C; 0 mm of precipitation	S. Aitken	S. Aitken
December 15, 2011	16:15 – 16:45	C113	6.2°C; 1.1 mm of precipitation	C. Boros	C. Boros
April 19, 2012	10:40-12:00	C114	10°C, 0 mm of precipitation	C. Boros	C. Boros

Note: Weather taken from Environment Canada Website, accessed December 1, 2011
Temperature = Maximum Temperature recorded
Precipitation = total mm of rain on given day

4.2.3 Alternative Site Investigation

In certain instances, it was necessary to conduct an Alternative Site Investigation, as described in Section 31 (4) 7 of O.Reg 359/09. Alternative site investigations were conducted on water bodies where property access was restricted by landowners.

Alternative site investigations consisted of a desktop-based investigation of the data collected from the Records Review, which included:

- ABCA watercourse layer;
- MNR NRVIS water body layer;
- ABCA Regulation Limit mapping;
- Municipal Drain classification data;
- MNR fish records;
- ABCA fish habitat information;
- Air photo interpretation,

In addition, field investigations of water bodies upstream or downstream of the Area of Investigation were undertaken at road crossings or adjacent properties, where possible.

This information was used to assess the general characteristics of the water body such as flow regime, thermal regime and habitat quality, while air photos and reconnaissance field investigations determined if the features are classified as a water body and examined the surrounding natural features or land use.

4.3 Sensitivity Classification

To aid in the assessment of each water body and to inform the potential environmental effects and mitigation measures, a sensitivity classification was designed and applied to each feature within the Area of Investigation. The overall objective was to assess the resiliency of the aquatic ecosystem – *i.e*. the ability of the system to recover from changes in the environmental conditions. Each water body feature was classified as high, moderate or low sensitivity based on the parameters identified in **Table 4-2**. This system provided some objectivity to the assessment process and incorporated the attributes of DFO's Risk Management Framework (species sensitivity; habitat resiliency; species dependence on habitat; rarity) that is used to analyze fish and fish habitat sensitivity and to then categorize project risk. Not all indicators had to be present at one water body for an assignment into a particular classification, and water bodies were assigned based on where the majority of indicators occurred. For example, a water body with a cold water regime could be classified as moderate sensitivity if it was a channelized channel, with unstable banks,

with intermittent flow. Where there were an equal number of indicators, professional opinion and consideration of the overall site was used to assign the water body to one classification.

Table 4-2 Sensitivity Classification Indicators

High Sensitivity	Moderate Sensitivity	Low Sensitivity
• Cool/cold water thermal regime • Headwater area • Permanent flow • Natural channel • Natural stream process observed (e.g., riffle/run/pool sequence and meanders) • Located in natural area (e.g., woodland, wetland) • Groundwater seepage indicators present • High quality and quantity fish habitat • No fish barriers • Water quality appears good (e.g., clear, no obvious agricultural runoff, no algae)	• Cool/warm water thermal regime • Permanent or intermittent flow • Natural or channelized channel • Natural stream process observed (e.g., riffle/run/pool sequence and meanders) • In natural or impacted areas • Groundwater seepage indicators present • Overall moderate quality and quantity fish habitat • No fish barriers • Some concern for water quality (e.g., suspended solids or algae growth)	• Warm water thermal regime • Permanent or intermittent flow • Channelized channel • Uncontrolled stream processes (e.g., erosion, unstable banks) • Within highly impacted areas • No groundwater indicators present • Low quality and quantity fish habitat • Fish barriers • Concern for water quality (e.g., turbid water, high suspended solids or uncontrolled algae growth)
System is generally considered not to be resilient to environmental perturbations and cannot easily buffer change.	**System is somewhat stable and resilient to change and perturbation**	**System is stable and resilient to change and perturbation.**

As some of the survey sites were found not to contain water bodies after a reconnaissance survey, these features were assigned a classification of 'Not sensitive' as they did not meet the criteria for a water body under O.Reg. 359/09, and therefore were not assessed further in this report. However, these sites will still be subjected to mitigation measures, to ensure that sites that may be important for seasonal surface water conveyance are appropriately protected.

4.4 Results of Site Investigations

Based on the water body assessments that were conducted (as outlined in sections 4.2.1- 4.2.2), the occurrence of water bodies within 120 m of the Project Location is documented below (**Table 4-4**). These results include a description of the surrounding topography and general area, the physical features of the water body and the riparian zone, and ELC of the land within 30 m of the water body, as well as an assessment of the sensitivity of the feature as described in section 4.3. Project Components are also presented in relation to each water body. Potential impacts are differentiated between water bodies that are either crossed by a project component (e.g., road crossing) or water bodes that are located within the 120 m buffer to a project component, and where no direct crossing is proposed (e.g., water body that runs parallel to a road). Representative photos are provided for each site, but physical characteristics were often conducted on longer reaches than identified in the photos.

Of the 11 potential swales that were identified through air photo interpretation in Records Review, all were confirmed as non-REA water bodies (**Appendix B**). Of the 8 ponds, 3 could not be confirmed if they were REA water bodies due to land access, 3 were determined to be non-REA water bodies, and two of these features have been classified as vernal pools and are discussed in the NHA due to the associated wildlife significance.

Alternative site investigations were conducted at 16 sites, although physical site investigations were only conducted at 12 locations via roadside or adjacent properties. Four sites remain unknown with regard to potential REA water bodies.

Table 4-3 provides a summary of the Alternative Site Investigations conducted for the Bluewater Wind Energy Centre.

Table 4-3 Alternative Site Investigations

Location	Rationale for Alternative Site Assessment	Field Visit date	Type of Field Assessment	Results
C10-B	No land access to parcel 1023	September 28, 2011	Visual inspection completed from 1032	Confirmed non-REA water body feature
		November 4, 2011	Roadside	Confirmed non-REA water body feature
C11	No land access to 1023	September 28, 2011	Visual inspection completed from 1032	Confirmed non-REA water body feature
C26	No land access to 1677	July 12, 2011	Visual inspection completed from 1036	Confirmed REA water body
C32	No land access to 1617	November 4, 2011 - roadside	Roadside	Confirmed REA water body
C41	No land access to 1502	November 4, 2011	Roadside	Confirmed REA water body
C42	No land access to 1500	October 25, 2011	Visual inspection from 1074	Confirmed REA water body
C44	No land access to 1499	October 25, 2011	Visual inspection from adjacent property 1524	Could not confirm REA water body feature
C46	No land access to 1459	October 26, 2011	Roadside	Confirmed REA water body
C48	No land access 1478	November 17, 2011	Visual inspection from road	Confirmed REA water body
C52	No land access to 1659	November 3, 2011	Roadside	Confirmed REA water body
C56	No land access to 1511	November 17, 2011	Roadside	Confirmed non-REA water body feature
C7	No land access to 1499 and 1055	August 10, 2011	Roadside	Confirmed REA water body on north side
C87	No land access to 1807	October 26, 2011	Roadside	Confirmed REA water body
P5	No land access to 1500	October 25, 2011	Visual inspection from 1074	Pond not confirmed
P6	No land access to 1055	October 25, 2011	Roadside	Pond not confirmed
P8	No land access to 1613	November 4, 2011	Roadside	Pond not confirmed

Table 4-4 provides a summary of the Site Investigations conducted for the Bluewater Wind Energy Centre.

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C10-A **C10-B***	• Collection Line Buffer • Road Buffer	September 28, 2011	• The watercourse (C10-A) is located in deciduous forest (classified as FOD5-2, ELC Feature ID 487). The upstream portion appears to be tile drain fed(C10-B). Of note, C11 feeds into C10 approximately 500 m downstream from headwater start. • C10-B is discussed in Table 4.6.	• The watercourse is a defined natural feature. The water was clear and had minimal flow during the time of investigation. There is a natural meander with a riffle, run, pool sequence. The banks are unstable with evidence of erosion and slumping. Substrate consists of sand, boulder, cobble with some gravel. High canopy cover consisting of trees. Instream habitat cover was high and consisted of boulder, cobble followed by woody debris. Groundwater indicators watercress, iron staining, and bank seepage were all observed at the site. The downstream fish species is baitfish community (MNR, 2008). **C10** **MWW(m):** 1.25 **MBW(m):** 3.0 **C10** **MWD(m)** 0.1 **MBD(m):** 0.6	High

Photos

Photograph 1. Site overview ↑

Photograph 2. Iron staining ↑

Photograph 3. Watercourse substrate ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C35	• Turbine 11 • Road Buffer	September 28, 2011	• The watercourse is found entirely in a mixed forest (classified as FOM3-2, ELC Feature ID 518). Rolling crop agricultural fields were observed in the adjacent lands.	• The watercourse is a defined natural feature and is classified as a permanent warmwater system by ABCA. The water was clear and flowing at the time of investigation. There is a riffle, run, pool sequence present, and the banks are unstable. Substrate is dominated by cobble and sand followed by boulder and gravel. Canopy cover is high and dominated by trees. Instream cover is high and is dominated by cobble and boulder followed by undercut banks and woody debris. Groundwater indicators watercress and bank seepage were observed. Fish observed during investigation. **C35** **MWW(m):** 3.8 **MBW(m):** 8.05 **C35** **MWD(m)** 0.12 **MBD(m):** 0.7	High

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

Photograph 3. Woody debris ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C19	• Collection Line Crossing • Road Buffer	September 28, 2011	• The watercourse is located in a mix of deciduous forest, meadow marsh, and swamp thicket (classified as FOD5-1, MAM2-10, SWT2-5, ELC Feature ID 532). There is a 60 m buffer to the surrounding pasture agricultural fields.	• The watercourse is a defined natural feature. Water was turbid and flowing at the time of investigation. It is a low gradient sinuous channel with unstable banks – slumping and erosion noted. Substrate is dominated by sand followed by boulder, gravel and cobble. High canopy cover observed that is a mix of trees, shrubs and grasses. Instream cover is moderate and consists of cobble, undercut banks, boulder, and woody debris. Groundwater bank seepage was noted.	Moderate

	C19
MWW(m):	1.4
MBW(m):	2.4

	C19
MWD(m)	0.12
MBD(m):	0.65

Photos

Photograph 1. Site overview ↑

Photograph 2. Downstream overview ↑

Photograph 3. Upstream overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C21	• Collection Line Crossing	September 28, 2011	• The watercourse is found in a deciduous forest (classified as FOD7b, CUW1h, SWD2-2 ELC Feature ID 541)	• The watercourse is a defined natural feature and includes a riffle, run, pool sequence. It is classified as intermittent by ABCA. During time of investigation water was flowing. The banks are unstable with evidence of erosion. The water is clear and substrate is dominated by sand, cobble and gravel followed by boulder and silt. Canopy cover is high and dominated by trees. Instream habitat cover is high and dominated by cobble and woody debris followed by undercut banks, aquatic vegetation and boulders. Groundwater indicators watercress and bank seepage were noted. Fish observed during site investigation. The downstream fish species is baitfish community (MNR, 2008).	Moderate

	C21
MWW(m):	1.6
MBW(m):	4.1

	C21
MWD(m)	4.1
MBD(m):	0.55

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

Photograph 3. Bank seepage ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C25	• Collection Line Buffer • Substation and Laydown Area Buffer	October 5, 2011	• The site is located in an agricultural field that has flat topography on either side. Flowing tile drain inputs noted throughout the site.	• The watercourse is a defined channelized feature. It is classified as a permanent cool/cold water system by ABCA, and during time of investigation water was flowing. It is a straight channel that has stable well vegetated banks. The water is clear and the substrate consists of silt. There is high canopy cover consisting of grasses. Instream cover is moderate to high and dominated by emergent aquatic vegetation. Groundwater indicator watercress was noted.	Moderate

	C25
MWW(m):	3.1
MBW(m):	3.85

	C25
MWD(m)	0.26
MBD(m):	0.61

Photos

Photograph 1. Site overview ↑

Photograph 2. In channel view ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C26* C28	• Collection Line Crossing • Road Crossing • Turbines 25, 26, and 39	July 12, 2011 October 5, 2011	• Two separate sections of the same watercourse were investigated. The investigations occurred on different dates. • The watercourse flows through crop agricultural fields and pockets of deciduous forest and cultural meadow (classified as FOD7-2, and CUM1-2 ELC Feature ID470).	• The watercourse is a defined channelized feature. It meanders through fields and is starting to naturalize. It is classified as intermittent in the headwaters (C28) but as cool/coldwater system downstream (C26). During both investigations water was present, however only flowing in July. The banks are stable. The water is clear and channel substrate is a clay silt muck. Canopy cover is high and dominated by trees followed by shrubs and grasses. Instream habitat cover is low and dominated by aquatic vegetation followed by woody debris and undercut bank. Groundwater indicator watercress was noted.	Moderate

	C26	C28		C26	C28
MWW(m):	2.0	2.59	**MWD(m)**	0.6	0.24
MBW(m):	4.5	3.97	**MBD(m):**	0.9	0.75

Photos

Photograph 1. C26, channel overview ↑

Photograph 2. C26, channel overview ↑

Photograph 3. C28, channel ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C42*	• Collection Line Crossing	October 25, 2011	• The watercourse is located in a meadow marsh and cultural meadow (classified as MAM2-10 and CUW1a, CUT1a, ELC Feature ID 480) area that is surrounded by crop agricultural fields. There is an online pond, P5, that has an outflow that converges with this watercourse within the study area.	• The watercourse is a defined natural feature. It is classified as a permanent warmwater system by ABCA and during the time of investigation water was flowing. It is a braided channel that meanders and has areas of riffle, run and flats. The banks are stable and well vegetated. The water is clear and substrate consists of silt and sand with gravel. Canopy cover is low consisting of grasses and shrubs. Instream habitat cover is moderate and dominated by undercut banks followed by aquatic vegetation. Groundwater indicator watercress was observed. The downstream fish species is baitfish community (MNR, 2008). **C42**: MWW(m): 1.57; MBW(m): 3.5; MWD(m) 0.3; MBD(m): 0.6	Moderate

Photos

Photograph 1. Site overview, north end ↑

Photograph 2. Channel overview ↑

Photograph 3. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C20	• Collection Line Crossing	October 12, 2011	• The watercourse flows through a deciduous forest and swamp thicket area (classified as FOD4-2, FOD5-1, FOD5-6 and SWT2-2, ELC Feature ID 541).	• The watercourse is a defined natural feature. It is classified as intermittent by ABCA and during the time of investigation a trickle flow was observed. The water is clear and the stream naturally meanders and has a riffle, run, pool sequence. The banks are moderately unstable. The substrate consists of sand silt with gravel and detritus. Canopy cover is high and is a mix of trees, shrubs, and grasses. Instream habitat cover is moderate with a mix of woody debris, aquatic vegetation, and undercut banks. Groundwater indicator watercress was observed. Fish observed during site investigation. The downstream fish species is baitfish community (MNR, 2008). **MWW(m):** 1.4 (C20) **MBW(m):** 2.7 (C20) **MWD(m)** 0.3 (C20) **MBD(m):** 0.8 (C20)	Moderate

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C41*	• Turbine 1 • Road and Collection Line Buffer	October 12, 2011	• The watercourse flows through an agricultural field that has a swamp thicket and shallow marsh buffer approximately 15 m (classified as SWT2-2, SWT2 and MAS, ELC Feature ID495). The surrounding topography is flat with areas of rolling hills.	• The watercourse is a defined natural feature. It is classified as intermittent by ABCA but during time of investigation water was flowing. It meanders and has a riffle, run, pool sequence. The banks were moderately unstable with evidence of erosion. The substrate is dominated by sand and silt followed by gravel then boulder and cobble. The canopy cover is high and mixed between trees and shrubs. The instream cover is moderate and dominated by woody debris, followed by undercut bank, boulders, and aquatic vegetation. Groundwater indicators watercress, iron staining and bubbling were observed. Fish observed during site investigation. Also fish barrier observed – perched outlet. **C41** **MWW(m):** 0.9 **MBW(m):** 2.1 **C41** **MWD(m)** 0.1 **MBD(m):** 0.6	Moderate

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Channel overview ↑

Photograph 4. Iron staining ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C54	• Collection Line Crossing	October 26, 2011	• The watercourse runs through crop agricultural fields and flows under Bronson Line.	• The watercourse is a defined channelized feature. It is classified as intermittent by ABCA but was flowing during the time of investigation. The channel is fairly straight and is almost all run with only sparse areas of riffles. The banks are slightly unstable as there is an area of scouring. The water is clear and the substrate consists of sand and silt with gravel and cobble. Canopy cover is low and only grasses. Instream cover is moderate and is dominated by aquatic vegetation followed by undercut banks and woody debris. Groundwater indicator watercress was observed. Fish observed during site investigation. The downstream fish species is baitfish community (MNR, 2008).	Moderate

	C54
MWW(m):	2.5
MBW(m):	3.7

	C54
MWD(m)	0.2
MBD(m):	0.9

Photos

Photograph 1. West site overview ↑

Photograph 2. Culvert on west side ↑

Photograph 3. East side overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C46*	• Collection Line Crossing • Road Crossing	October 26, 2011	• As the watercourse flows from east to west it begins in a deciduous forest and cultural woodland (classified as CUW1f, ELC Feature ID 442) buffer area then moves along parallel to the roadside, which flows into a crop agricultural field within the study area. Tile drain inputs were noted throughout. Topography was relatively flat. • A man-made access road was observed in the stream. This consists of large rock slabs that have been placed across the bankfull width of the channel to allow vehicular access to the adjacent agricultural field. Water was observed flowing over these slabs during the investigation, however, this may present a seasonal low flow fish barrier.	• The watercourse is a defined channelized feature. It is classified as intermittent by ABCA however, during time of investigation flow was observed. The stream morphology is dominated by riffle and run with few areas of pools. The banks are slightly to moderately unstable as scouring and erosion was observed. Substrate is dominated by sand and gravel followed by a mix of silt, cobble, and boulder. Moderate canopy cover present with a mix of trees, shrubs and grasses. Instream cover is low and dominated by aquatic vegetation then undercut banks, cobble and boulder. Groundwater indicator watercress was observed. The downstream fish species is baitfish community (MNR, 2008). **C46** **MWW(m):** 2.5 **MBW(m):** 3.5 **C46** **MWD(m)** 0.2 **MBD(m):** 1.1	Moderate

Photos

Photograph 1. Site overview, looking into forest ↑

Photograph 2. Site overview, looking upstream into forest ↑

Photograph 3. Site overview, looking downstream into agricultural field ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C87*	• Collection Line Crossing • Road Buffer	October 26, 2011	• The watercourse flows through an agricultural field that has a meadow buffer approximately 5 m. Several tile drain inputs were observed. The surrounding topography is flat.	• The watercourse is a defined channelized feature. It is classified as an intermittent stream by ABCA however, during time of investigation water was flowing. It is a straightened channel that has runs and riffles. The banks are slightly to moderately stable as indicated by the areas of erosion and slumping. The water is clear and substrate consists of gravel silt sand. Canopy cover is low and is a mix of grasses and shrubs. Instream cover is high and is a mix of aquatic vegetation and undercut banks. Groundwater indicator watercress was observed. The downstream fish species is baitfish community (MNR, 2008). **C87** **MWW(m):** 3.0 **MBW(m):** 4.0 **C87** **MWD(m)** 0.12 **MBD(m):** 1.0	Moderate

Photos

Photograph 1. Site overview from Bronson Line ↑

Photograph 2. Site overview, midpoint ↑

Photograph 3. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C52*	• Collection Line Crossing	November 3, 2011	• The watercourse is located in two agricultural fields, that have 4 m meadow buffers, and are divided by Babylon Line. Tile drain inputs were observed on both sides. The surrounding topography is flat.	• The watercourse is a defined channelized feature. It is classified as permanent cool/cold system by ABCA and during time of investigation flow was observed. It is a straightened channel that is dominated by runs with some riffles. The banks are slightly unstable with some scouring observed. The water is clear and substrate consists of silty clay with some sand and gravel. Canopy cover is low with a mix of grasses, shrubs and trees. Instream cover is low with only aquatic vegetation present. Groundwater indicator watercress was observed.	Moderate

	C52
MWW(m):	2.0
MBW(m):	5.0

	C52
MWD(m)	0.2
MBD(m):	1.2

Photos

Photograph 1. East overview ↑

Photograph 2. West overview ↑

Photograph 3. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C30	• Turbine 30 • Road Crossing • Collection Line Crossing	November 4, 2011	• The watercourse flows through an agricultural field with crops into a cultural thicket and mixed forest (classified as CUT1f and FOM3-1, ELC Feature ID 460).	• The watercourse is a defined channelized feature. It is classified as a warm water system by ABCA. It is a straightened channel with a riffle, run and pool sequence present. It was flowing at time of investigation. The banks are slightly unstable due to minor scouring. The water is clear and substrate consists of gravely sand with silt and cobble. Canopy cover is low and is a mix of grasses, shrubs and trees. Instream cover is low and consists of aquatic vegetation and cobble. Groundwater indicator watercress was observed. **C30** **MWW(m):** 1.5 **MBW(m):** 3.0 **C30** **MWD(m)** 0.2 **MBD(m):** 1.2	Moderate

Photos

Photograph 1. Channel overview, upstream ↑

Photograph 2. Channel overview, downstream ↑

Photograph 3. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C51	• Turbine 35 • Road Buffer	November 4, 2011	• This watercourse originates from tile drains and flows through an agricultural field with crops. There is a cultural meadow riparian buffer of approximately 5 m. The surrounding land topography is relatively flat. • The watercourse ultimately flows into a cultural thicket and deciduous forest (classified as CUT1b ELC Feature ID 488).	• The watercourse is a defined channelized feature. During the site investigation there was minimal flow. The channel is straight and has riffle and run structure. The banks are stable and well vegetated. The water is clear and the substrate is sand silt with gravel. Canopy cover is moderate and is a mix of trees, grasses, and shrubs. Instream cover is moderate and dominated by woody debris followed by aquatic vegetation. Groundwater indicator watercress was observed.	Moderate

	C51
MWW(m):	0.5
MBW(m):	2.0

	C51
MWD(m)	0.03
MBD(m):	0.2

Photos

Photograph 1. Start of channel ↑

Photograph 2. Tile drain input ↑

Photograph 3. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C48* and C50	• Road Buffer	November 17, 2011	• The watercourse flows through a deciduous forest and meadow marsh (classified as FOD7-4 , ELC Feature ID 539, classified at MAM2-10 for ELC Feature ID 541)). Site investigations occurred only on east side of Bronson Line as there was no access to the west.	• The watercourse is a defined natural feature. It is classified as intermittent flow by ABCA however during the time of investigation there was good flow. The channel meanders and has a good riffle, run, pool sequence. The banks are slightly unstable and slumping was observed. The water is clear and the substrate is a gravel cobble sand with boulder and detritus. Canopy cover is moderate and dominated by grasses then followed by trees. Instream habitat cover is high and dominated by cobble and woody debris followed by undercut banks and aquatic vegetation. Groundwater indicator watercress was observed. The downstream fish species is baitfish community (MNR, 2008). Fish were observed during the site investigation.	Moderate

	C48 & C50
MWW(m):	0.73
MBW(m):	2.2

	C48 & C50
MWD(m)	0.25
MBD(m):	0.88

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C56-A*	• Collection Line Crossing	November 17, 2011	• Site investigations occurred only on west side (C56-A) of Goshen Line as the watercourse was buried on the east (C56-B). • The watercourse flows through an agricultural crop field with a minimal cultural meadow riparian buffer. • C56-B is discussed in Table 4.6.	• The watercourse on the west side is a defined channelized feature. It is classified as intermittent by the ABCA however during site investigation water was fast flowing. The morphology of the stream is uniform flat. The banks are stable and well vegetated. The water is clear and the channel substrates consist of cobble and sand. Canopy cover is low and a mix of grasses and trees. Instream habitat cover is high and dominated by aquatic vegetation followed by cobble and woody debris. Groundwater indicator watercress was observed. The downstream fish species is baitfish community (MNR, 2008). **C56** **MWW(m):** 1.36 **MBW(m):** 3.29 **C56** **MWD(m)** 0.2 **MBD(m):** 0.71	Moderate

Photos

Photograph 1. Buried channel on east side ↑

Photograph 2. Buried channel on east side ↑

Photograph 3. West channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C36	• Turbine 7 • Road and Collection Line Buffer	July 6, 2011	• The watercourse is located within a deciduous forest (classified as FOD7-1 ELC Feature ID 541). The forest is riparian approximately 30 m before agricultural fields began. Pockets of new growth forest were found amongst the mature forest patch.	• The watercourse is a defined natural feature. It is classified as intermittent by the ABCA however at the time of investigation it was flowing. The watercourse has a natural meander with riffle, run, pool sequences. The banks are slightly unstable with some evidence of slumping. The water is turbid and substrate consists of clay bottom covered with sand and gravel. High canopy cover for entire reach. Instream habitat cover is moderate and consists of woody debris, undercut banks and cobble. Groundwater indicators noted were watercress and bank seepage. Fish were observed during the site investigation. Downstream fish species consist of a baitfish community (MNR 2008). **MWW(m):** 1.5 (C36) **MBW(m):** 3.0 (C36) **MWD(m)** 0.15 (C36) **MBD(m):** 0.3 (C36)	Moderate

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview↑

Photograph 3. Bank seepage ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C18	• Turbine 10 • Road Buffer	July 12, 2011	• The watercourse flows from a deciduous forest area, which appears to be the headwaters of the watercourse, then proceeds to flow through a cultural meadow and then into a forest area again (classified as FOD5-2 ELC Feature ID 518, classified as CUM1-1 and FOD5-1 in ELC Feature 525). Immediately east of the wetland is a meadow, and to the west is an agricultural field. The agricultural field slopes towards the wetland.	• The watercourse is a defined natural feature. There was minimal flow at the time of investigation. A braided channel flows through the wetland area into a defined channel in the forest. It has a slight meander and is dominated by run. The banks are moderately unstable. The substrate is clay covered by gravel and cobble. The channel has high canopy cover consisting of grasses, and contains moderate in-stream habitat cover dominated by cobble then woody debris. No groundwater indicators.	Moderate

	C18
MWW(m):	1.0
MBW(m):	3.1

	C18
MWD(m)	0.10
MBD(m):	0.4

Photos

Photograph 1. Wetland area ↑

Photograph 2. Dry channel from wetland to forest ↑

Photograph 3. Watercourse in forest ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C22	• Turbine 33 • Road Crossing	July 12, 2011	• The watercourse starts at the north end of the site in a deciduous swamp (classified as SWD3-3, ELC Feature ID 534) and then flows into an agricultural field. There is slight sloping towards the channel.	• The watercourse is a defined channelized feature. It is classified as a permanent cool/cold water system by ABCA. It is a straight channel and has a uniform run. Banks are well vegetated and stable. The substrate consists of clay. There is minimal canopy cover, however, in-stream cover is high and is dominated by aquatic vegetation. Groundwater indicator watercress was abundant.	Moderate

	C22
MWW(m):	0.6
MBW(m):	1.0

	C22
MWD(m)	0.12
MBD(m):	0.32

Photos

Photograph 1. Looking downstream ↑

Photograph 2. Looking upstream ↑

Photograph 3. Watercress ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T1-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse on the north and south side runs through agricultural fields with minimal meadow buffer.	• The watercourse is a defined channelized feature. It is a straight channel that is uniform run. It is classified as a permanent cool/cold water system by ABCA. The water was turbid and the channel was flowing at bankfull at time of investigation. The banks are stable and well vegetated. Canopy cover is low for entire reach consisting of grasses and shrubs. In-stream cover is moderate consisting of woody debris, undercut banks, grasses and submergent aquatic vegetation. Groundwater indicator watercress was noted. Downstream fish species consist of a baitfish community (MNR, 1992). **MWW(m):** North 2.0, South 2.0; **MBW(m):** North 2.0, South 2.0 **MWD(m)** North 0.5, South 0.5; **MBD(m):** North 0.5, South 0.5	Moderate

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

Photograph 3. Watercress on North side ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T2-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse is located in a cultural woodlot and deciduous swamp area (classified as CUW1, SWD3 ELC Feature ID 514) that provides a 30 m buffer prior to the agricultural fields on the north side. On the south side it has a deciduous swamp (classified as SWD3, ELC Feature ID 488) on the east side and agricultural field on the west. The watercourse was too deep to wade and collect in-stream information.	• The watercourse is a defined natural feature. It has a slight meander with stable well vegetated banks and is classified as warmwater by ABCA. The watercourse was turbid and flowing at bankfull at the time of investigation. Low canopy cover for the entire reach consisting of trees and shrubs. In-stream cover was difficult to assess but did consist of woody debris and submergent aquatic vegetation. No groundwater indicators were noted. Fish species consist of a baitfish community (MNR, 1992). **MWW(m):** North 3.5, South 4.0; **MBW(m):** North 3.5, South 4.0 **MWD(m)** North 0.5, South 0.6; **MBD(m):** North 0.5, South 0.6	Moderate

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T3-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse flows through a deciduous forest (classified as FOD, ELC Feature ID512 and 494) that provides a buffer for more than 30 m on both the north and south side. The watercourse was too deep to wade and collect in-stream information.	• The watercourse is a defined natural feature. It is a straight channel that is uniform run. It is classified as a warmwater system by ABCA. The water was turbid and flowing at just below bankfull at the time of investigation. Banks are stable and well vegetated. Low canopy cover for entire reach consisting of trees and shrubs. In-stream cover could not be observed due to turbidity of water and un-wadeable water depths. Groundwater indicator iron staining was noted. Fish species include Northern Pike (*Esox lucius*)(MNR, 1999). **MWW(m):** North 15, South 15; **MBW(m):** North 17, South 17 **MWD(m)** North n/a, South n/a; **MBD(m):** North n/a, South n/a	Moderate

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

Photograph 3. Riparian area on North side ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T4-North and South	• Transmission Line Crossing	July 29, 2011	• The north side of the investigation area has a roadside ditch flowing into the main channel and then flowing north after convergence. The south side contains the main channel. The surrounding land use includes residential and crop agriculture. There is a 10 m meadow riparian buffer present.	• The watercourse is a defined channelized feature. It is classified as a permanent cool/cold water system by ABCA. The channel is straight and classified as run. The water was turbid and flowing just below bankfull at time of investigation. The banks are stable and well vegetated. Good canopy cover for entire reach consisting of grasses and shrubs. Moderate in-stream cover that is comprised of aquatic vegetation and cobble. Groundwater indicator watercress was noted throughout the site. Fish species at crossing and downstream contain baitfish community (MNR 1997, 2010). **MWW(m):** North 0.5, South 1.0; **MBW(m):** North 0.5, South 3.0 **MWD(m)** North 0.2, South 0.5; **MBD(m):** North 0.3, South 0.6	Moderate

Photos

Photograph 1. Site overview looking east on roadside on the North side ↑

Photograph 2. Site overview after convergence looking North ↑

Photograph 3. Site overview looking South ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T5-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse runs from an agricultural field towards a residential property and again through an agriculture field. The riparian buffer is 5 – of mixed and deciduous forest (classified as FOM2 and FOD5, ELC Feature ID 551 and classified as CUW1 on the south side in ELC Feature 552) area on both sides of the road.	• The watercourse is a defined channelized feature that appears to be naturalizing. It is classified as a permanent cool/cold water system by ABCA. The watercourse has riffle, run, pool sequences. The water was slightly turbid and had a moderate flow at the time of investigation. The substrate is silty clay, with gravel and cobble. The banks are stable and well vegetated on the south side, however on the north side there is evidence of slumping on both banks. Dense canopy cover occurred for entire reach consisting of trees and shrubs. In-stream cover is moderate and consists of cobble, aquatic vegetation, and woody debris. No groundwater indicators were noted. Downstream fish species consist of baitfish community (MNR 1997, 2010). **MWW(m):** North 2.0, South 1.5; **MBW(m):** North 3.0, South 2.5 **MWD(m)** North 0.15, South 0.1; **MBD(m):** North 0.25, South 0.3	Moderate

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

Photograph 3. Bank slumping on North side ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T6-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse runs adjacent to the roadside with a meadow buffer between the watercourse and road. The west side of the north reach and the south side of the south reach are adjacent to crop agricultural field.	• The watercourse is a defined channelized feature that is classified as a warmwater system by ABCA. The water was turbid and flowing at the time of investigation. The channel is straight and classified as all run and has stable well vegetated banks. Substrate consists of sandy gravel muck bottom with cobble and boulders. Low canopy cover for entire reach consisting of shrubs and grasses. Low instream cover consisting of cobble, boulder, and aquatic vegetation. Groundwater indicator watercress was noted. Fish observed during site investigation. **MWW(m):** North 2.0, South 2.5; **MBW(m):** North 3.0, South 3.5 **MWD(m)** North 0.25, South 0.15; **MBD(m):** North 0.4, South 0.3	Moderate

Photos

Photograph 1. Site overview looking North West ↑

Photograph 2. Site overview looking South East ↑

Photograph 3. Concrete box culvert ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

<table>
<tr><th>Feature ID</th><th>Project Component</th><th>Investigation Date</th><th>Description of Site</th><th>Feature Description</th><th>Feature Sensitivity</th></tr>
<tr><td>BLW-T7-North and South</td><td>• Transmission Line Crossing</td><td>July 29, 2011</td><td>• The watercourse flows through agricultural fields; both pasture and crop, and has an average meadow buffer of 4 m. Tile drain input was observed on the north side approximately 6 m from culvert and appears to substantially add to the flow.</td><td>• The watercourse is a defined channelized feature. The water was clear and had slow flow during the time of investigation. The channel is straight and classified as run. Banks are stable and well vegetated. The substrate is a sandy gravel with cobble and muck. Moderate canopy cover for entire reach consisting of grasses and shrubs. Moderate instream cover consisting of cobble and aquatic vegetation. Groundwater indicator watercress was noted. Fish were observed during the site investigation.
<table>
<tr><th></th><th>North</th><th>South</th></tr>
<tr><td>MWW(m):</td><td>3.0</td><td>1.5</td></tr>
<tr><td>MBW(m):</td><td>4.0</td><td>2.0</td></tr>
</table>
<table>
<tr><th></th><th>North</th><th>South</th></tr>
<tr><td>MWD(m)</td><td>0.15</td><td>0.09</td></tr>
<tr><td>MBD(m):</td><td>0.25</td><td>0.3</td></tr>
</table></td><td>Moderate</td></tr>
</table>

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

Photograph 3. Substrate on South side ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T8-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse flows through agricultural crop fields with an average meadow riparian buffer of 3 m.	• The watercourse is a defined channelized feature. It is a straight channel classified as run. The water was slightly turbid and flowing during the time of investigation. The banks are stable and well vegetated. The substrate consists of silty sandy gravel with cobble. Low canopy cover for the entire reach consisting of grasses. High instream cover is dominated by aquatic vegetation followed by cobble. Groundwater indicator watercress was abundant throughout the reach surveyed.	Moderate

	North	South
MWW(m):	2.0	1.5
MBW(m):	3.5	2.5

	North	South
MWD(m)	0.15	0.15
MBD(m):	0.35	0.35

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

Photograph 3. Watercress on North side ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T9-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse on the north side flows through a deciduous forest area (classified as FOD7-2 and SWD4-1ELC Feature ID 562 and classified as CUP3 in ELC Feature 563) with a buffer larger than 25 m, while the watercourse on the south side flows through an agricultural crop field with a cultural plantation buffer of approximately 10 m. • The watercourse was not wadeable therefore water depths could not be obtained.	• The watercourse is a defined natural feature on the north side and a channelized defined feature on the south side. The channel on both sides is straight and classified as flats and is warmwater classified by the ABCA. The water was turbid flowing slowly during the time of investigation. The substrate is mucky sand. On the north side there was dense canopy cover comprising of trees, on the south side low canopy cover consisting of grasses and shrubs. Instream cover is low on both sides and was a mixed cover of and aquatic vegetation. Groundwater indicator watercress was noted. Fish were observed during the site investigation. **MWW(m):** North 4.0, South 4.5; **MBW(m):** North 6.0, South 6.0; **MWD(m)** North n/a, South n/a; **MBD(m):** North n/a, South n/a	Moderate

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T10-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse flows through a residential property on the north side, and through agricultural fields on the south side. The watercourse is buffered by a 15 m meadow marsh (classified as MAM2 in ELC Features 565 and 564, ELC Feature ID 588) on the south side. The watercourse was not wadeable during the site investigation therefore observations were taken from the bridge.	• The watercourse is a defined natural feature that slightly meanders. It is classified as a warmwater system by ABCA. Water was turbid and flowing slowly during the time of investigation. Banks are stable and well vegetated. Low canopy cover for entire reach consisting of grasses and shrubs. Due to turbid water instream cover was difficult to assess but a low amount of floating aquatic vegetation was observed. No groundwater indicators were noted.	Moderate

	North	South
MWW(m):	15	13
MBW(m):	16	14

	North	South
MWD(m)	n/a	n/a
MBD(m):	n/a	n/a

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
BLW-T17-North and South	• Transmission Line Crossing	July 29, 2011	• The watercourse flows through an agricultural field with crops with an average meadow riparian buffer of 5 m. Tile drain inputs were observed on the north side approximately 3 m from the culvert contributing to the in-stream flow.	• The watercourse is a defined channelized straightened, uniform feature. It is classified as a warmwater system by ABCA. The water was clear and flowing during the time of investigation. The banks are stable and well vegetated. Substrate consists of sandy gravel with cobble. Moderate to dense canopy cover for entire reach consisting of grasses. Instream cover is moderate and consisted of aquatic vegetation and cobble. Groundwater indicator watercress was noted. Fish were observed during the time of the investigation.	Moderate

	North	South
MWW(m):	1.0	1.8
MBW(m):	1.5	2.3

	North	South
MWD(m)	0.2	0.2
MBD(m):	0.35	0.4

Photos

Photograph 1. Site overview looking North ↑

Photograph 2. Site overview looking South ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C113*	• Road Crossing • Collection Line Crossing	December 15, 2011	• The watercourse flows through an agricultural field that has a meadow buffer with deciduous trees approximately 5 m. The surrounding topography is flat.	• The watercourse is a defined channelized feature. It is classified as an intermittent stream by ABCA, however, during time of investigation water was flowing. It is a straightened, naturalized channel that has runs and riffles. The banks are slightly unstable as indicated by the areas of erosion and slumping. The water is turbid and substrate consists of silt, cobble/boulder and clay. Canopy cover is moderate and is a mix of trees, shrubs and grasses. Instream cover is moderate and is a mix of woody debris, aquatic vegetation and undercut banks. The downstream fish species is baitfish community (MNR, 2008). **C113** **MWW(m):** 2 **MBW(m):** 3 **C113** **MWD(m)** 0.33 **MBD(m):** 0.8	Moderate

Photos

Photograph 1. Facing Downstream ↑

Photograph 2. Facing downstream ↑

Photograph 3. Facing Upstream ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C72	• Collection Line Crossing	October 26, 2011	• The watercourse flows parallel to Kippen Road prior to flowing under Bronson Line into C46. There are several tile drains flowing into it. The surrounding land use is crop agricultural and residential.	• The watercourse is a defined channelized feature. It is classified as intermittent by ABCA but was flowing during the time of investigation. It runs along roadside in a straight channel. The banks are slightly unstable with undercutting and erosion. The water is clear and substrate is dominated by silt and sand followed by gravel and cobble. Canopy cover is low with a mix of trees, shrubs and grasses. Instream habitat cover is low with only some areas of undercut banks. Groundwater indicator watercress was observed. The downstream fish species is baitfish community (MNR, 2008). **C72** **MWW(m):** 1.3 **MBW(m):** 4.5 **C72** **MWD(m)** 0.25 **MBD(m):** 1.8	Low

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C7-A*	• Collection Line Crossing	August 10, 2011	• Investigations occurred on the north and south side of Staffa Line. The south side (7-B) did not have a defined watercourse – only a depression area that was ploughed through at the time of investigation. The north side (7-A) of the watercourse flowed through a crop agricultural field. Rolling hills are present in the investigation area. • 7-B is discussed in detail in Table 4.6.	• The north side watercourse is a defined feature that has been channelized through the agricultural field. No flow was noted at the time of investigation. The banks are stable and well vegetated with meadow vegetation. The substrate consists of cobble and fines. Canopy cover is moderate consisting of shrubs, grasses, and trees. Instream cover is low consisting of cobble and aquatic vegetation. No groundwater indicators were observed.	Low

	C7
MWW(m):	0.5
MBW(m):	0.7

	C7
MWD(m)	0.02
MBD(m):	0.3

Photos

Photograph 1. South side overview ↑

Photograph 2. North side overview ↑

Photograph 3. North side vegetation ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C34	• Collection Line Crossing	September 28, 2011	• The watercourse flows through a cultural plantation (classified as CUP1-3/MAM and CUP3-2 ELC Feature ID 501). The forest and meadow are surrounded by crop agricultural fields.	• The watercourse is a defined natural feature. It is a braided channel with no flow, only pooled water during time of investigation. It is classified as intermittent by ABCA. The banks are stable and well vegetated. The water is clear and substrate consists of silt. Canopy cover is high and dominated by trees. Instream habitat cover is low and consists of undercut banks. No groundwater indicators were noted.	Low

	C34
MWW(m):	0.35
MBW(m):	1.1

	C34
MWD(m)	0.03
MBD(m):	0.25

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

Photograph 3. Pooling ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C66	• Collection Line Crossing	November 3, 2011	• Investigations occurred on the north and south side of Staffa Road. On both sides the watercourse flows through agricultural fields. There is a 5 m meadow buffer between the agricultural fields and the watercourse.	• The watercourse is a defined channelized feature. It is classified as intermittent by ABCA and during the time of investigation water was present but not flowing. The channel is straight and has stable well vegetated banks. The water is turbid and substrate consists of silty clay with detritus. Canopy cover is moderate consisting of grasses and shrubs. Instream habitat cover is moderate consisting of aquatic vegetation. No groundwater indicators were observed.	Low

	C66
MWW(m):	1.0
MBW(m):	4.0

	C66
MWD(m)	0.1
MBD(m):	0.5

Photos

Photograph 1. Site overview looking south ↑

Photograph 2. Site overview looking north ↑

Photograph 3. Channel overview, north side ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C40-A	• Turbine 3 • Road Buffer	October 25, 2011	• The watercourse is buried on the east side (C40-B) of the study area and flows out of a tile drain into the west end (C40-A). It is located in a crop agricultural field with a 10 m meadow buffer. • C40-B is discussed in Table 4.6.	• The watercourse in the west end is a defined channelized feature. It is classified as intermittent by ABCA but was flowing at the time of investigation. It flows in a uniform channel that is a mix of riffle and run. The banks are slightly unstable as there is evidence of erosion. The water is clear and substrate consists of cobbly gravely sandy clay. Canopy cover is low and dominated by grasses. Instream cover is low and dominated by undercut banks followed by cobble. No groundwater indicators were observed. The downstream fish species is baitfish community (MNR, 2008). **C40** **MWW(m):** 1.0 **MBW(m):** 5.0 **C40** **MWD(m)** 0.1 **MBD(m):** 1.5	Low

Photos

Photograph 1. East site overview, buried channel ↑

Photograph 2. Tile drain inputs at point where channel flows openly ↑

Photograph 3. West site overview, open channel ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C83-A	• Collection Line Crossing	October 26, 2011	• A detailed water assessment occurred only on west side of Bronson Line (C83-A) as the watercourse was buried on the east (C83-B). • There is a culvert located on the east side that discharges water from a tile drain and flows under Bronson Line to a defined channel with flowing water. The watercourse on the west side flows through a crop agricultural field and has a swamp thicket riparian buffer (classified as SWT2-10, ELC Feature ID 442). • C83-B is discussed in Table 4.6.	• For the west side of Bronson Line the watercourse is a defined natural feature. It is classified as intermittent by ABCA but was flowing during the time of investigation. The stream morphology is dominated by riffle and run with few areas of pools. The banks are slightly unstable and erosion was observed. The water was clear and substrate consisted of cobble gravel clay. Canopy cover is low and is a mix of grasses and shrubs. Instream cover is moderate and consists of aquatic vegetation followed by undercut bank, cobble, woody debris and boulder. Groundwater indicator watercress was observed. The downstream fish species is baitfish community (MNR, 2008). **C83** **MWW(m):** 1.5 **MBW(m):** 2.5 **C83** **MWD(m)** 0.15 **MBD(m):** 0.45	Low

Photos

Photograph 1. East site overview, buried channel ↑

Photograph 2. West channel overview ↑

Photograph 3. West side overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C88	• Collection Line Buffer	November 3, 2011	• The watercourse runs parallel with the adjacent road with agriculture fields as the surrounding land use. The channel starts from the output of a tile drain from the adjacent west field. Tile drain inputs were observed throughout the site investigation area.	• The watercourse is a defined channelized feature. This feature is classified as cool/cold water by ABCA. It runs along the roadside and is a straightened watercourse consisting of run only. The banks are slightly unstable to observed scouring. The water is clear and the substrate is sandy silt clay. Canopy cover is low and is a mix of grasses, trees and shrubs. No instream habitat cover was noted. Groundwater indicator watercress was observed. The downstream fish species is baitfish community (MNR, 1992).	Low

	C88
MWW(m):	1.0
MBW(m):	2.0

	C88
MWD(m)	0.2
MBD(m):	1.0

Photos

Photograph 1. Site overview looking east ↑

Photograph 2. Site overview looking north ↑

Photograph 3. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C99	• Turbine 41 • Road Buffer	November 3, 2011	• The watercourse flows through an agricultural field with crops and into a meadow marsh and deciduous swamp (classified as MAM2-2 and SWD3, ELC Feature ID 514). No tile inputs were noted and topography is flat. • Of note, a beaver dam was observed downstream just outside of the site investigation area (within C71 study area).	• The watercourse is a defined channelized feature. This site is classified as cool/cold water by ABCA. No observable flow due to beaver dam. It is a straight channel that is uniform run. The banks are slightly unstable. The water is turbid and has a green colour. Substrate consists of sandy silt clay. Canopy cover is low and consists of grasses, trees, and shrubs. Instream cover is moderate and consists of aquatic vegetation and woody debris. No groundwater indicators were observed. Downstream fish species consist of a baitfish community (MNR 1992, 1995). **C99** **MWW(m):** 3.5 **MBW(m):** 5.0 **C99** **MWD(m)** 0.75 **MBD(m):** 2.0	Low

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C71	• Turbine 41 • Road and Collection Line Buffer	November 3, 2011	• The watercourse runs through a meadow marsh and deciduous swamp (classified as MAM2-2, CUM1-1 and SWD3, ELC Feature ID 514) into an agricultural field with crops. There is a beaver dam located in the upstream portion of the site.	• The watercourse is a defined channelized feature. It is classified as cool/cold water by ABCA. It is a straight channel that is uniform run. The banks are slightly unstable due to minor slumping. The water is turbid and green in colour. The substrate is a sandy silty clay. Canopy cover is low that consists of grasses, shrubs and trees. Instream cover was very low with minor incidents of undercut banks. No groundwater indicators were observed. Downstream fish species consists of a baitfish community (MNR 1992, 1995). **C71** **MWW(m):** 3.5 **MBW(m):** 8.0 **C71** **MWD(m)** 0.6 **MBD(m):** 2.5	Low

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Beaver dam ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C32*	• Turbine 40 • Road Crossing • Collection Line Crossing	July 13 and November 4, 2011	• The watercourse runs through an agricultural field with crops and has a cultural meadow buffer. Tile drain inputs are found throughout. The surrounding topography is flat.	• The watercourse is a defined channelized feature. It is classified as a warm water system by ABCA. It has a moderate flow and is a straightened channel. The morphology is dominated by riffles and runs but also has some pools. The banks are slightly unstable as there is evidence of erosion. The water is turbid and changed colour throughout the site from green to yellow/brown in colour. Substrate consists of sand, silt and muck. Canopy cover is low with a mix of grasses and shrubs and some tree cover. Instream cover is moderate and consists of aquatic vegetation. Groundwater indicator watercress was observed.	Low

	C32
MWW(m):	1.7
MBW(m):	4.0

	C32
MWD(m)	0.25
MBD(m):	0.8

Photos

Photograph 1. Channel overview, upstream ↑

Photograph 2. Channel overview, midway ↑

Photograph 3. Channel overview, downstream (north of Kippen Road) ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C3	• Turbine 5 • Road Buffer	July 12, 2011	• The watercourse is located in the middle of an agricultural field. A 5 m meadow riparian buffer was present. Tile drains were observed throughout the channel but were not flowing.	• A defined channel was observed, however was not flowing at the time of the investigation. It is classified as intermittent by the ABCA. Pools of standing water were present and the stream bed was sandy silt. The banks are well vegetated and the channel was densely vegetated with cattails. Canopy cover was high and dominated by cattails, and instream habitat was high due to the dense cattails. No groundwater indicators observed.	Low

	C3
MWW(m):	n/a
MBW(m):	n/a

	C3
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 2. Looking downstream ↑

Photograph 3. Looking upstream ↑

Photograph 4. Channel overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C33	• Turbine 11 • Collection Line Crossing • Road Buffer	July 5, 2011	• The watercourse flows in a westerly direction through a deciduous forest (classified as FOD5-2, ELC Feature ID 508 and classified as MAM2-10 and MAS2-9 ELC Feature 506) into an active agricultural field. During the time of the investigation the agricultural field had been ploughed and the watercourse had been ploughed through. A small wetland area was noted at the west side of the area of investigation in the agricultural field that appears to be tile drain fed.	• The watercourse is classified as intermittent by ABCA and during the investigation flow was observed in the forest but not in the agricultural field. • In the forest the watercourse is a defined natural feature. It meanders and contains a riffle, run, pool sequence. The substrate is a silty sandy clay with some gravel and cobble. The banks are ill defined and sparsely vegetated. Canopy cover is high and dominated by trees. In-stream cover is moderate and consists of woody debris and cobble. No groundwater indicators were noted. • In the agricultural field the channel was dry with no defined banks. Evidence of intermittent flow was noted through vegetation growth. There is a defined channel within the wetland feature.	Low

	C33
MWW(m):	0.5
MBW(m):	0.7

	C33
MWD(m)	0.05
MBD(m):	0.15

Photos

Photograph 1. Watercourse in forest

Photograph 2. Forest and agricultural interface

Photograph 3. . Wetland in agricultural field

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C13	• Road Crossing • Collection Line Crossing	July 5, 2011	• The watercourse had a crop agricultural corn field to the north, and a coniferous hedgerow to the south.	• The watercourse is a defined channelized feature. It is classified as intermittent by ABCA. The upper reach surveyed appears to be the headwaters of the stream where there is minimal flow, and further downstream the water becomes pooled and no visible flow was observed. The substrate is a silty sandy clay with gravel. The banks are stable and highly vegetated. Canopy cover is low and consists of grasses. Instream cover is high due to dense cattail presence in stream. Groundwater indicator watercress was observed. **MWW(m):** 0.6 (C13) **MBW(m):** 1.0 (C13) **MWD(m)** 0.1 (C13) **MBD(m):** 0.23 (C13)	Low

Photos

Photograph 1. Site overview ↑

Photograph 2. Meander bend ↑

Photograph 3. Looking upstream ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C27	• Collection Line Crossing	July 12, 2011	• The site is located in an agricultural field with a 10 m cultural meadow buffer. The land topography is flat on either side.	• The watercourse is a defined channelized feature. It is classified as a permanent warm water system by the ABCA and during the time of investigation water was flowing. The channel is modified and straightened and consists of runs. The banks are stable and highly vegetated. The substrate consists of silty clay and water is turbid. There was little canopy cover and instream habitat. No groundwater indicators were noted.	Low

	C27
MWW(m):	7.0
MBW(m):	9.0

	C27
MWD(m)	0.25
MBD(m):	1.5

Photos

Photograph 1. Looking north ↑

Photograph 2. Looking south ↑

Photograph 3. Culvert inlet ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C112	• Collection Line Buffer	November 17, 2011	• Located within deciduous forest between two agricultural fields. • C112 is discussed in Table 4.6.	• Defined channel located within deciduous forest. Three branches were observed. Middle branch originated from tile drain and surface water drainage within forest feature. North branch originated in P2 feature and origin of P3 is unknown as it was located on restricted property. The main branch flows in an easterly direction, however when it reaches the agricultural field water is not observed. At the time of the investigation there was water in all three branches with very little flow. Channel width was approximately 0.5 m wide and water depth was approximately 0.05 m deep. All three channels were full of leaf litter. There was evidence of high water levels through bank scouring and exposed tree roots.	Low

	C112
MWW(m):	n/a
MBW(m):	n/a

	C112
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. End of channel in agricultural field. ↑

Photograph 2. Main branch looking north in deciduous forest.↑

Photograph 3. View of south branch.↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C11*	• Collection Line Buffer	September 28, 2011	• The site investigation revealed a grassed swale for the portion located in the buffer area. • C11 is discussed in Table 4.6.	• There is no watercourse found at location C11. The location C11 found within the buffer area is a grass swale forms the headwaters of the watercourse downstream.	Not Sensitive

	C11
MWW(m):	n/a
MBW(m):	n/a

	C11
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C55	• Collection Line Crossing	November 17, 2011	• The site has several low lying areas with no obvious channel. It is likely that during spring melts or large rain events water converges and flows into nearby vernal pools. No channel was obvious in the adjacent agricultural fields. • C55 is discussed in Table 4.6.	• The feature is defined as ephemeral and there is no obvious channel and no water or flow was observed during time of investigation. Not classified as a water body. **MWW(m):** n/a; **MBW(m):** n/a **MWD(m)** n/a; **MBD(m):** n/a	Not Sensitive

Photos

Photograph 1. North end of site ↑

Photograph 2. Low lying area in forest ↑

Photograph 3. Low lying area in forest ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1 and P2	• Collection Line Buffer	November 17, 2011	• The ponds are located in a mixed meadow and deciduous forest. There is no permanent connection between ponds however during spring and large rain events there is potential for connectivity.	• The ponds are permanent natural features and considered vernal pools	Not Sensitive

	P1 & P2
MWW(m):	n/a
MBW(m):	n/a

	P1 & P2
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. P1 ↑

Photograph 2. P1 ↑

Photograph 3. P2 ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C100	• Turbine 14	October 25, 2011	• Located within an agricultural field	• A grassed swale was present within the agricultural field. During the time of the investigation no water was present. During spring melt or high rain events, swale may act as surface water conveyance, potentially contributing flow to Campbell Drain Tributary.	Not sensitive

	C100
MWW(m):	n/a
MBW(m):	n/a

	C100
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Facing north ↑

Photograph 2. Facing south ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C101	• Turbine 18	October 26, 2011	• Located within active agricultural field.	• Low lying swale feature that is ploughed and driven through. At the time of investigation there was no water.	Not sensitive

	C101
MWW(m):	n/a
MBW(m):	n/a

	C101
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Facing south east ↑

Photograph 2. Facing east ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C102	• Road Buffer • Turbine 15	October 25, 2011	• Located within cultural meadow area.	• Cement culvert was located on edge of agricultural field and cultural meadow area. There was no defined channel and during site investigation standing water was observed in pool area below culvert. Potentially tile fed feature. **C102** **MWW(m):** n/a **MBW(m):** n/a **C102** **MWD(m)** n/a **MBD(m):** n/a	Not sensitive

Photos

Photograph 1. View of cement culvert ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C103	• Road Buffer	November 3, 2011	• Swale feature located in agricultural field.	• Swale feature in low lying area within field. Farmer drives/ploughs through swale. At time of investigation soils were moist, however, no standing water.	Not sensitive

	C103
MWW(m):	n/a
MBW(m):	n/a

	C103
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Facing east at swale feature. ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C104	• Turbine 24	November 4, 2011	• Swale feature in active agriculture field.	• Grassed swale feature in undulating field. Evidence of tile drain feature within low lying area.	Not sensitive

	C104
MWW(m):	n/a
MBW(m):	n/a

	C104
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Facing north east at swale feature ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C105	• Turbine 38 • Road and Collection Line Buffer	November 4, 2011	• Swale feature located in agricultural field on either side of Pavillion Road	• Tile drained field with grassed swale features. No water at time of investigation.	Not sensitive

	C105
MWW(m):	n/a
MBW(m):	n/a

	C105
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C106	• Turbine 16	October 25, 2011	• Swale features located in agricultural field.	• Two grassed swale features merge to form one slightly defined channel. Standing water in north swale at time of investigation. Swales may act as surface water conveyance during spring melt and high rain events. Channel directs flow in a north west direction towards C44. No surface connection between swale features and C44.	Not sensitive

	C106
MWW(m):	n/a
MBW(m):	n/a

	C106
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Facing east at grass swales ↑

Photograph. Slight channel draining water ↑

Photograph 3. Where swale features end, facing east. ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C107	• Road Crossing • Collection Line Crossing	November 4, 2011	• Swale features located in agricultural fields on both side of Blue Bluff Road.	• This feature directs surface water flow towards the north side of Blue Bluff Road into a roadside drain (Photo 2). The north side of the road is a low lying swale feature that has been ploughed. This swale acts as surface water conveyance during spring melt and high rain events.	Not sensitive

	C107
MWW(m):	n/a
MBW(m):	n/a

	C107
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Facing south at grass swale.

Photograph 2. Tile drain in ditch on north side of Blue Bluff Road.

Photograph 3. Facing north at swale in agricultural field.

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C108	• Collection Line Crossing	November 4, 2011	• Swale features located in agricultural fields on both side of Centennial Road.	• Two grassed swale features are located on the south side of Centennial road and convey water to the north side into C10.	Not sensitive

	C108
MWW(m):	n/a
MBW(m):	n/a

	C108
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. East swale feature ↑

Photograph 2. West swale feature ↑

Photograph 3. Facing north at swale in field, no defined channel. ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C109	• Turbine 41	November 3, 2011	• Located within an agricultural field	• A grassed swale was present within the agricultural field. During the time of the investigation no water was present. During spring melt or high rain events, swale may act as surface water conveyance.	Not sensitive

	C109
MWW(m):	n/a
MBW(m):	n/a

	C109
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Facing north-west of swale feature. ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P7	• Road Buffer • Collection Line Buffer	November 4, 2011	• Located within agricultural field.	• Low lying area with tile drainage observed. • Feature P7 discussed further in Table 4.6.	Not Sensitive

	P7
MWW(m):	n/a
MBW(m):	n/a

	P7
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. Facing east looking at low lying feature. ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P8	• Road Buffer	November 4, 2011	• Located within an agricultural field	• A low lying area located behind barn. No water was observed at time of investigation. • P8 is discussed in further detail in Table 4.6.	Not sensitive

	P8
MWW(m):	n/a
MBW(m):	n/a

	P8
MWD(m)	n/a
MBD(m):	n/a

No photographs due to legal constraints

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C110	• Turbine 4	October 26, 2011	• Located within an agricultural field	• Small swale features present throughout agricultural field. Evidence of low lying area within turbine buffer. No water observed during time of investigation.	Not sensitive

	C110
MWW(m):	n/a
MBW(m):	n/a

	C110
MWD(m)	n/a
MBD(m):	n/a

Photos

Photograph 1. View of depression in agricultural field. ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P3	• Road Buffer	November 4, 2011	• Large pond located within residential property.	• A large on-line pond was created by damming C41. Pond is man-made. • P3 is discussed in further detail in Table 4.6.	Not Sensitive

	P3
MWW(m):	n/a
MBW(m):	n/a

	P3
MWD(m)	n/a
MBD(m):	n/a

Photos

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P10	• Transmission Line	April 25, 2012	• Large man-made pond located adjacent to mobile home community	• Pond is man-made with berms surrounding it and is offline. • At time of investigation, Canada geese were using the water body.	Not Sensitive

	P10
MWW(m):	n/a
MBW(m):	n/a

	P10
MWD(m)	n/a
MBD(m):	n/a

Photos

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

Table 4-4 Water Bodies within 120 m of Project Location

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
C114	• Turbine 19	April 19, 2012	• This water body flows through a forest feature 542 which is surrounded by agricultural land. The surrounding land topography consists of slightly rolling hills. • C114 is discussed in Table 4.6.	• Defined channel located within deciduous forest. The channel is a narrow meandering watercourse and appears to be intermittent flow within un-mapped reach. It is classified as a permanent warmwater system by ABCA. The banks are stable and well vegetated. High canopy cover for entire reach consisting of trees, grasses and shrubs. Moderate in-stream cover that is comprised of woody debris, detritus, aquatic vegetation and cobble. Groundwater indicator watercress was noted throughout the site.	Moderate

	C114
MWW(m):	0.4
MBW(m):	0.5

	C114
MWD(m)	0.07
MBD(m):	0.2

Photos

Photograph 1. Facing downstream. ↑

Photograph 2. Water body located in forest. ↑

*Note: * Denotes feature where an Alternative Site Investigation was conducted*

The seepages identified in the Project Study Area are described as localized and isolated seeps (**Table 4-5**). No large defined seepage areas were identified in the Project Study Area.

Table 4-5 Seepage Areas within 120 m of Project Location

Feature ID	Project Component (associated infrastructure)	Indicators Found	Description of Site Where Found (water body or terrestrial feature – ELC code)
C10-A	Road and Collection Line Buffer	Watercress, bank seepage, iron staining	Water body
C13	Road Crossing; Collection Line Crossing	Watercress	Water body
C19	Collection Line Crossing, Road Buffer	Bank seepage	Water body
C20	Collection Line Crossing	Watercress	Water body
C21	Collection Line Crossing	Watercress, bank seepage	Water body
C22	Turbine 33; Road Crossing; Collection Line Crossing	Watercress	Water body
C25	Collection Line Buffer; Substation and Laydown Area Buffer	Watercress	Water body
C26 & C28	Collection Line Crossing; Road Crossing; Turbines 25,26, 39.	Watercress	Water body
C30	Turbine 30; Road Crossing; Collection Line Crossing	Watercress	Water body
C32	Turbine 40; Road Crossing; Collection Line Crossing	Watercress, Jewelweed	Water body
C35	Turbine 11, Road Buffer	Watercress, bank seepage	Water body
C36	Turbine 7; Road and Collection Line buffer	Watercress, bank seepage	Water body
C41	Road Buffer; Collection Line Buffer; Turbine 1.	Watercress	Water body
C42	Collection Line Crossing	Watercress	Water body
C46	Road Crossing; Collection Line Crossing	Watercress	Water body
C48	Road buffer	Watercress	Water body
C50	Road buffer	Watercress	Water body
C51	Turbine 35, Road Buffer	Watercress	Water body
C52	Collection Line Crossing	Watercress	Water body
C54	Collection Line Crossing	Watercress	Water body
C56-A	Collection Line Crossing	Watercress	Water body
C72	Collection Line Crossing	Watercress	Water body
C83-A	Collection Line Crossing	Watercress	Water body
C87	Collection Line Crossing; Road buffer	Watercress	Water body
C88	Collection Line buffer	Watercress	Water body
T1	Transmission Line Crossing	Watercress	Water body
T3	Transmission Line Crossing	Iron staining	Water body
T4	Transmission Line Crossing	Watercress	Water body
T6	Transmission Line Crossing	Watercress	Water body
T7	Transmission Line Crossing	Watercress	Water body
T8	Transmission Line Crossing	Watercress	Water body
T9	Transmission Line Crossing	Watercress	Water body
T17	Transmission Line Crossing	Watercress	Water body
C114	Turbine 19	Watercress	Water body
437	Turbine 40, Road buffer, Collection Line buffer	Jewelweed	SWD3-3
439	Turbine 40, Road buffer, Collection Line buffer	Jewelweed	FOD7-2
463	Turbine 17 and Turbine 18	Jewelweed	FOD5-8
470	Turbine 25	Jewelweed	FOD7-2
480	Turbine 15, Road buffer, Collection Line buffer	Jewelweed	CUW1, CUT1-e, CUM1-1
483	Turbine 39	Jewelweed	SWD3-2
496	Road buffer, Collection Line buffer	Jewelweed	MAS2-1
506	Collection Line buffer	Jewelweed	MAS2-9
510	Turbine 23	Jewelweed	FOD5-1, SWD3-3
514	Turbine 41	Jewelweed	CUW1
518	Turbine 11, Road Buffer	Watercress	FOM3-2
524	Collection Line buffer	Jewelweed	MAM2-9
534	Turbine 33	Watercress, jewelweed	SWD3-2
537	Collection Line Crossing	Jewelweed	FOD5-2
541	Road Crossing, Collection Line Crossing	Watercress, jewelweed, golden saxifrage	MAM2-10, FOD7, FOD7-1, FOD4-2

The NHA field investigators used the following plants as indicators of groundwater and seepage areas as defined in (Crow and Hellquist, 2000), (McKenny and Peterson, 1996)

- Pennsylvania bittercress (*Cardamine pensylvanica*),
- watercress (*Rorippa nasturtium-aquaticum*),
- jewelweed (*Impatiens capensis*), and
- golden saxifrage (*Chrysosplenium americanum*) Corrections to Records Review

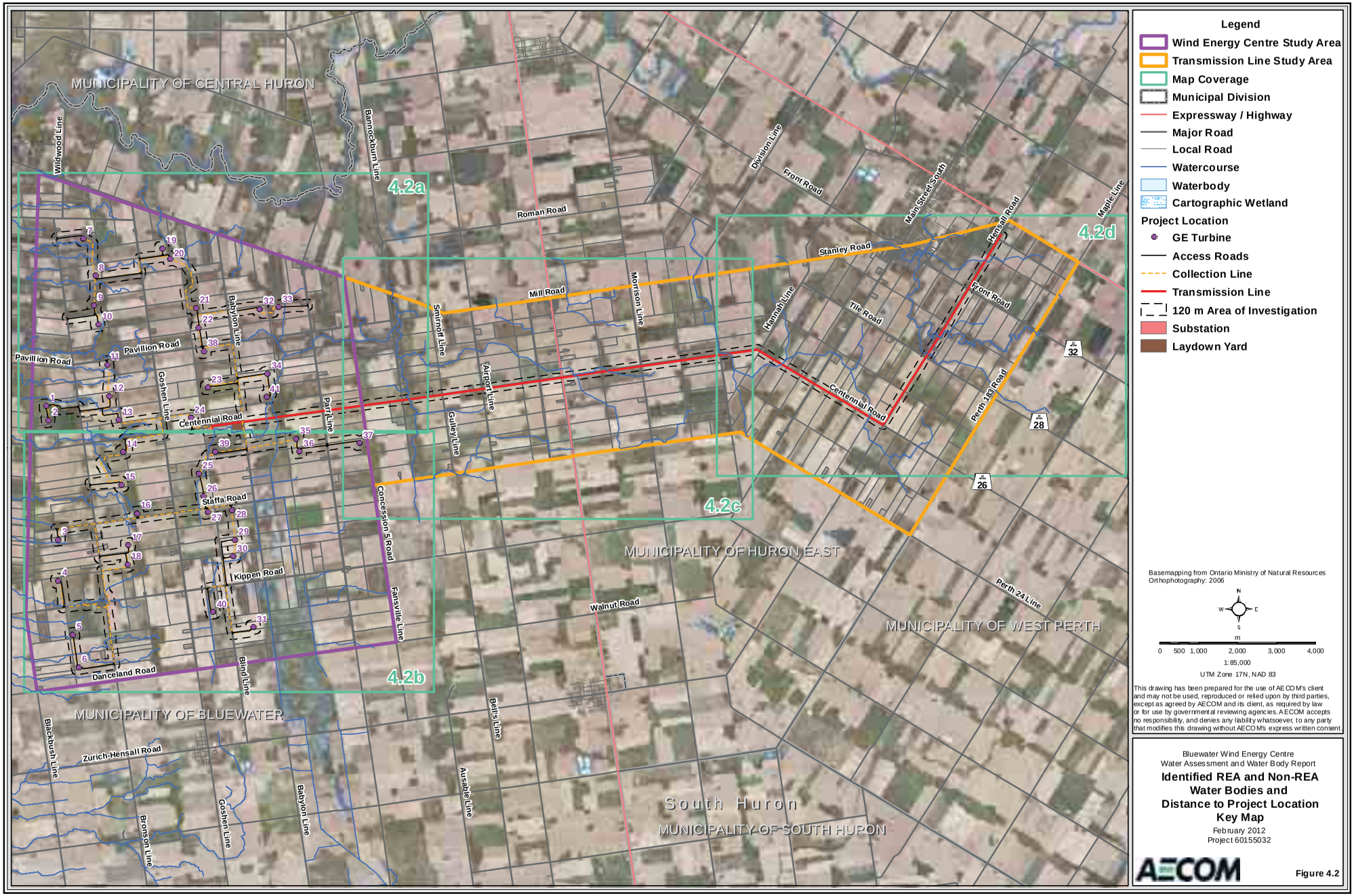
4.5 Corrections to Records Review

Table 4-6 summarizes any corrections that were made to the Records Review based on the findings from the Site Investigations. Table below outlines un-mapped water bodies that were identified and changes to mapped water bodies. The addition of a suffix (A or B) after a feature ID number indicates that after the physical site investigations, the originally identified water body differed throughout the reach to the extent that site investigations were conducted at two different locations. For example, water body C10 identified from Records Reviews as a stream was found not to exist in the upper reaches. To accurately assess the lower reaches of this water body (now identified as C10-A), two different site investigations were conducted, and the correction to Records Review highlighted C10-B as a non-REA water body.

Table 4-6 Summary of Corrections to Records Review

Feature #	Correction	Reason for Correction
C55	C55 does not exist	No channel was found, however some low lying areas that may provide seasonal surface water conveyance.
C7-B	Channel south of Staffa Road does not exist	Tile drain feature with potential for surface water conveyance during high rain events
C40-B	C40-B channel does not exist past farm crossing	Tile drain features
C83-B	C83-B channel does not exist on east side of Bronson Line	Tile drain feature that outputs through culvert at Bronson line. Surface water conveyance through grass swale during high rain events.
C56-B	C56-B channel does not exist on east side of Goshen Line	Tile drain outlets in ditch along Goshen Line and flows into defined channel on west side of Goshen Line.
C11	C11 channel does not exist	Tile drain with no surface feature
C10-B	C10-B channel does not exist	Tile drain with no surface feature
C112	A channel was observed in Feature 537 with trickling water in it at the time of the investigation	New water body feature observed – previously un-mapped
C114	A channel was observed in Feature 542, which flows through the forest and a small wetland pocket.	New water body feature observed – previously un-mapped

Based on the results of the site investigations, two previously unidentified water bodies (C112 and C114) were identified within 120 m of the Project Location. Results of the site investigation confirmed the boundaries of all water bodies and their distances to the Project Location as indicated on **Figure 4-2** and **Appendix B**



Legend

- Wind Energy Centre Study Area
- Transmission Line Study Area
- Map Coverage
- Municipal Division
- Expressway / Highway
- Major Road
- Local Road
- Watercourse
- Waterbody
- Cartographic Wetland

Project Location

- GE Turbine
- Access Roads
- Collection Line
- Transmission Line
- 120 m Area of Investigation
- Substation
- Laydown Yard

Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2006

N W E S

m
0 500 1,000 2,000 3,000 4,000

1:85,000

UTM Zone 17N, NAD 83

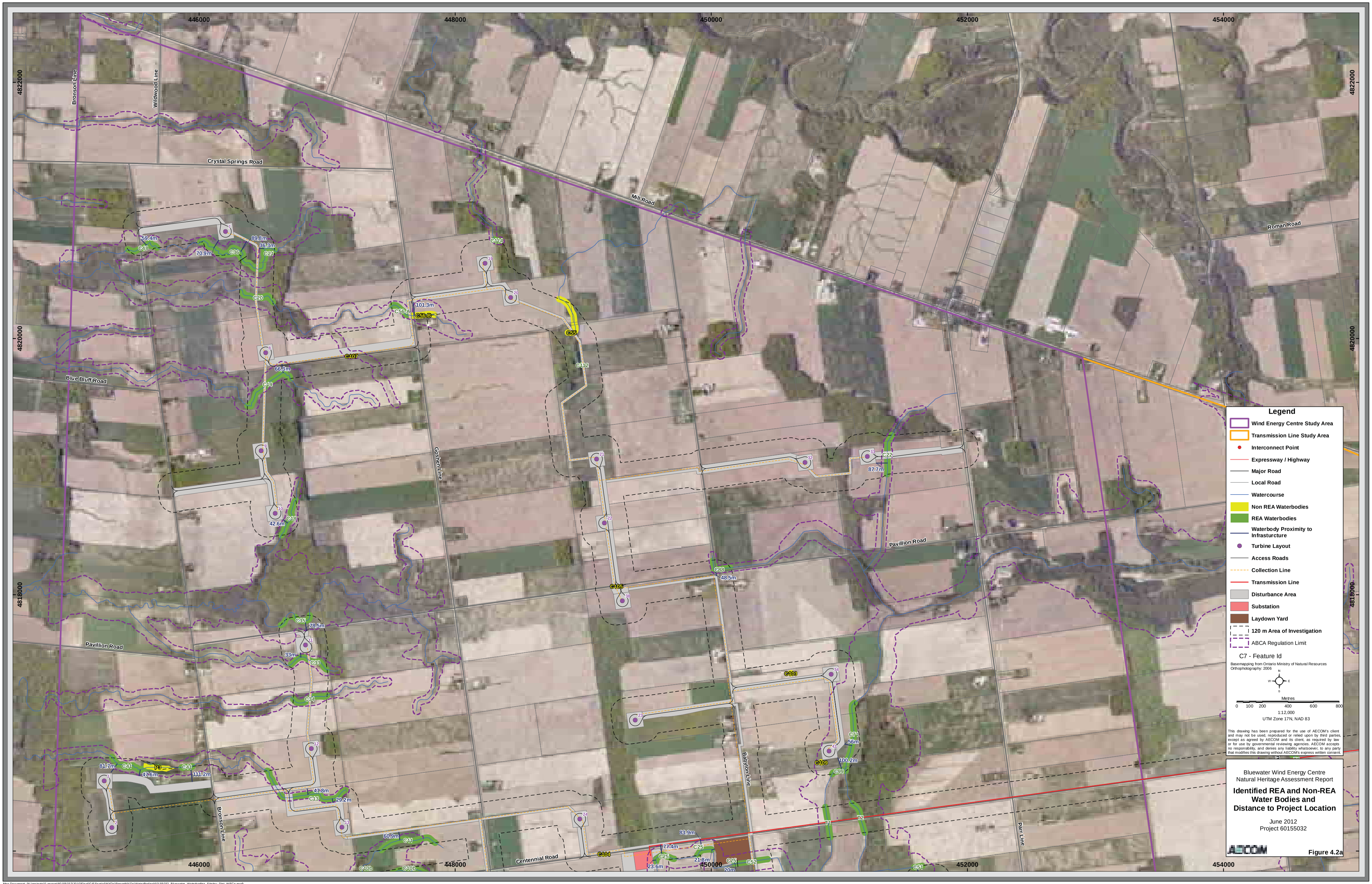
Bluewater Wind Energy Centre
Water Assessment and Water Body Report

Identified REA and Non-REA Water Bodies and Distance to Project Location Key Map

February 2012
Project 60155032

AECOM

Figure 4.2


Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Interconnect Point
Expressway / Highway
Major Road
Local Road
Watercourse
Non REA Waterbodies
REA Waterbodies
Waterbody Proximity to Infrastructure
Turbine Layout
Access Roads
Collection Line
Transmission Line
Disturbance Area
Substation
Laydown Yard
120 m Area of Investigation
ABCA Regulation Limit
C7 - Feature Id
Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2006
Metres
0 100 200 400 600 800
1:12,000
UTM Zone 17N, NAD 83
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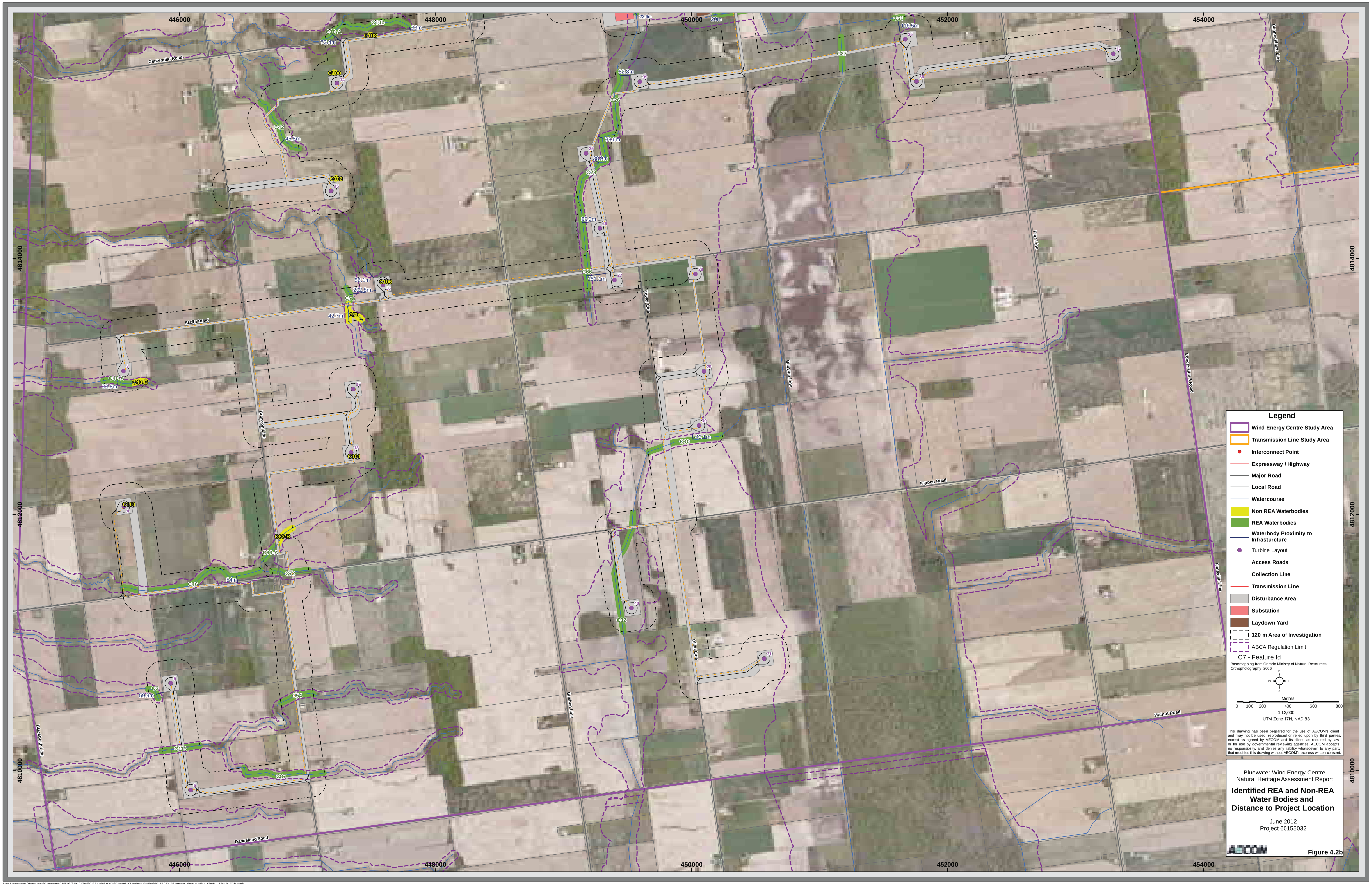
Bluewater Wind Energy Centre
Natural Heritage Assessment Report
Identified REA and Non-REA Water Bodies and Distance to Project Location
June 2012
Project 60155032
AECOM
Figure 4.2a
Crystal Springs Road
Mill Road
Roman Road
Bronson Line
Wildwood Line
Blue Bluff Road
Goshen Line
Pavilion Road
Babylon Line
Parr Line
Centennial Road
446000
448000
450000
452000
454000
4822000
4820000
4818000


Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Interconnect Point
Expressway / Highway
Major Road
Local Road
Watercourse
Non REA Waterbodies
REA Waterbodies
Waterbody Proximity to Infrastructure
Turbine Layout
Access Roads
Collection Line
Transmission Line
Disturbance Area
Substation
Laydown Yard
120 m Area of Investigation
ABCA Regulation Limit
C7 - Feature Id
Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2006
Metres
0 100 200 400 600 800
1:12,000
UTM Zone 17N, NAD 83
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Bluewater Wind Energy Centre
Natural Heritage Assessment Report
Identified REA and Non-REA Water Bodies and Distance to Project Location
June 2012
Project 60155032
AECOM
Figure 4.2b
Centennial Road
Staffa Road
Bronson Line
Goshen Line
Babylon Line
Blind Line
Kippen Road
Parr Line
Concession 5 Road
Bannockburn Line
Fansville Line
Walnut Road
Danceland Road
Blackbush Line
446000
448000
450000
452000
454000
4810000
4812000
4814000

Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Expressway / Highway
Major Road
Local Road
Interconnect Point
Watercourse
Non REA Waterbodies
REA Waterbodies
Waterbody Proximity to Infrastructure
Waterbody
Cartographic Wetland
Turbine Layout
Access Roads
Collection Line
Transmission Line
Disturbance Area
Substation
Laydown Yard
120 m Area of Investigation
C7 - Feature Id
Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2006
Metres
0 100 200 400 600 800
1:12,000
UTM Zone 17N, NAD 83
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Bluewater Wind Energy Centre
Water Assessment and Water Body Report
Identified REA and Non-REA Water Bodies and Distance to Project Location
June 2012
Project 60155032
AECOM
Figure 4.2c
Mill Road
Pavillion Road
Smirnoff Line
Centennial Road
Bannockburn Line
Gulley Line
Airport Line
Staffa Road
Morrison Line
Division Line
Concession 5 Road
Kippen Road
T3
T4
T5
T6
454000
456000
458000
460000
462000
4820000
4818000
4816000
4814000

Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Expressway / Highway
Major Road
Local Road
Interconnect Point
Watercourse
Non REA Waterbodies
REA Waterbodies
Waterbody Proximity to Infrastructure
Waterbody
Cartographic Wetland
Turbine Layout
Access Roads
Collection Line
Transmission Line
Disturbance Area
Substation
Laydown Yard
120 m Area of Investigation
ABCA Regulation Limit
C7 - Feature Id
Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2006
Metres
0 100 200 400 600 800
1:12,000
UTM Zone 17N, NAD 83
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Bluewater Wind Energy Centre
Water Assessment and Water Body Report
Identified REA and Non-REA Water Bodies and Distance to Project Location
June 2012
Project 60155032
AECOM
Figure 4.2d
464000
466000
468000
470000
472000
4820000
4818000
4816000
Division Line
Front Road
Front Street West
Bayfield Street East
Stanley Road
Mill Road
Kippen Road
Hannah Line
Hensall Road
Front Road
Perth 183 Road
Maple Line
Tile Road
Centennial Road
Staffa Road
Division Line
T6
T7
T8
T9
T10
T11
P10
32
26
26

5. Description of Environmental Effects

5.1 REA Requirements

This section presents potential negative effects of the Project on the identified water body and the area within 30 m of the water body. Mitigation measures and a summary of residual effects associated with the project components and the environment are outlined for the construction/decommissioning and operation phases. The potential effects described below are also presented in Section 3 of the PDR (AECOM, 2011).

5.2 Potential Effects of Project Components

Potential effects from the construction/decommissioning and operation of the project components, are summarized below.

5.2.1 Turbines

This discussion of the effects arising from turbines assumes a 122 m x 122 m turbine laydown area in which construction activities will occur and construction materials may be stored. The turbines themselves will be installed within the turbine laydown area. Therefore, the turbine laydown area represents the full extent of potential physical disturbance associated with turbine construction. All turbines in the Bluewater Wind Energy Centre will be located within agricultural fields. Therefore, no direct loss or fragmentation of significant natural features is expected as a result of turbine installations.

A minimum 30 m setback from the high water mark of water bodies has been implemented and measured from the outer limit of the Area of Disturbance.

There are 16 water bodies located within 120 m of the Project Location for turbine. Site preparation, grading and construction activities within 120 m of water bodies may result in a variety of potential negative effects including, but not limited to, increased erosion, sedimentation and turbidity in watercourses, windblown dust, reduced stability of sensitive landforms, and/or minor changes in natural drainage patterns and flow volume. The general landscape is quite flat and therefore not highly susceptible to erosion except where small valley features are present. If the facility is decommissioned and the turbine is to be removed at the end of its life, the procedures will be similar to the construction phase, but in the reverse sequence.

Potential effects associated with the construction, operation and decommissioning of the turbines (including the laydown area) are as follows:

- Reduced stream baseflows, groundwater upwelling areas and increase in water temperatures due to discharge from dewatering activities (if required) for excavation of foundation area.
- Increased flows to watercourses from temporary groundwater dewatering (if required). Discharges have potential to cause streambed and/or bank erosion and downstream sedimentation if not managed properly.
- Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of turbines, and pads/turnaround areas.
- Soil/water contamination by oils, grease and other materials from equipment.
- Release / discharge of sediment laden surface water into the adjacent watercourse or drainage features, which has the potential to transport nutrients and contaminants into the watercourse.
- Soil compaction, which may result in hardening of surfaces and increased runoff into watercourses.

5.2.2 Access Roads and Culverts

The effects associated with access roads and the associated temporary crane paths are related primarily to the 10-11 m wide footprint during the construction and operations phases. In addition, there will be effects associated with culverts that are constructed at watercourse crossings, and at any culverts required to maintain drainage in ditches at junctions with roadways, which will need to support construction equipment and delivery trucks.

Access roads and temporary crane paths can be constructed within the water body or within the 30 m setbacks as outlined in Section 39(2) of O. Reg 359/09. In the Project Location, there are seven water bodies that will require a watercourse crossing through installation of a culvert. There are 17 water bodies located within the 120 m buffer of an access road.

Site preparation, grading and construction activities within 120 m of water bodies may result in a variety of negative effects including, but not limited to, increased erosion, sedimentation and turbidity, mobilization of dust, reduced stability of sensitive landforms, and/or changes in natural drainage patterns and flow volume. The exact culvert details, installation details and erosion control measures will be determined in conjunction with the ABCA as part of their permitting process. Consequently, water bodies may be affected through changes in hydrology, temporary disruption to fish habitat and minor riparian vegetation removal.

Road bedding material will be removed and replaced with clean subsoil and topsoil for reuse by the landowner. It is proposed to leave culverts in place following the operation's phase.

Potential effects associated with the construction, operation and decommissioning of access roads are as follows:

- Temporary disruption of substrates/habitat at locations where in-water work is required (i.e., culvert installation).
- Where required, stream diversion for the installation of watercourse crossings for access roads or other Project infrastructure has the potential to increase sediment run-off, decrease bank stability and cause changes in chemical properties and temperatures, which can negatively affect fish or their habitat (if present) including spawning and patterns of movement. The magnitude of effects is largely dependent on the characteristics of the watercourse, sensitivity of aquatic communities, crossing technique and the mitigation techniques employed.
- Obstruction of lateral flows in watercourses and other water bodies from water crossings.
- Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of access roads, temporary crane paths and pads/turnaround areas.
- The withdrawal of surface water for construction activities such as dust suppression, equipment washing and land reclamation (e.g. hydroseeding) has the potential to reduce instantaneous streamflow of watercourses, with the magnitude and duration of these effects dependent on the amount of water being removed and the duration of the takings. Reduction in the instantaneous streamflow can result in the alteration of aquatic conditions which may negatively affect the local and downstream habitat and biota.
- Release / discharge of sediment laden surface water into the adjacent watercourse or drainage features, which has the potential to transport nutrients and contaminants into the watercourse.
- Soil/water contamination by oils, grease and other materials from equipment (applies to operation phase as well).

5.2.3 Collection Lines

Collection lines will be installed along access roads or existing road rights-of-way where feasible. The effects associated with collection lines, which are installed underground, are related to horizontal directional drilling under watercourses and other water bodies. Entrance and exit pits area will be excavated on either side of the feature to be drilled under. The directional drilling equipment will be set up at the entrance pit and a drill bit attached to rod segments will advance until it reaches the exit pit. A slurry of bentonite and/or polymer mixed with water will be injected into the hole while drilling to help stabilize the bore hole and reduce friction.

Collection lines can be constructed under the water body or within the 30 m setbacks as outlined in Section 39(2) of O. Reg 359/09. There are twenty-one locations where collection lines will be installed via horizontal directional drilling underneath water bodies. There are five water bodies located within the 120 m of collection lines. No direct effects to water bodies or loss of fish habitat are expected as a result of collection line construction.

Site preparation and construction activities (including excavation of entry and exit pits) within 120 m of water bodies may result in a variety of potential negative effects, as follows:

- Release of pressurized drilling fluids into watercourses due to fractures in substrate.
- Potential change to groundwater flow patterns.
- Potential increase in erosion and sedimentation from directional drilling activities.
- Release / discharge of sediment laden surface water release or discharge into the adjacent watercourse or drainage features, which has the potential to transport nutrients and contaminants into the watercourse.
- Soil / water contamination by oils, gasoline, grease and other materials from equipment for construction and directional drilling.

There are no effects associated with the collection lines during operation or decommissioning.

5.2.4 Transmission Lines

One transmission line is proposed for the Bluewater Wind Energy Centre. The transmission line will be installed along Centennial Road from west of Babylon Line easterly to Hensall Road and northerly to Huron Road. Discussion of the effects arising from the transmission line assumes that, where feasible, the transmission line will be installed on new hydro poles and will be installed within the existing road right-of-way.

Transmission lines can be constructed within the water body or within the 30 m setbacks as outlined in Section 39(2) of O. Reg 359/09. There are ten water body crossings associated with the installation of the overhead transmission lines.

While no direct effects to water bodies are expected as a result of transmission line construction/decommissioning, site preparation, grading and construction activities within 120 m of water bodies may result in a variety of potential negative effects as follows:

- Potential loss of riparian habitat adjacent to watercourses.
- Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of transmission lines.
- Release / discharge of sediment laden surface water release or discharge into the adjacent watercourse or drainage features, which has the potential to transport nutrients and contaminants into the watercourse.
- Soil/water contamination by oils, grease and other materials from equipment.

There are no effects associated with the transmission line during operation.

5.2.5 Substation and Laydown Area

A transformer substation will be built to connect the proposed transmission line to the Hydro One transmission system. The substation area will be laid with gravel with clean material imported to the site on an as needed basis and sloped to facilitate drainage. A secondary containment system will be installed around the transformer in the event of an oil leak to prevent any soil contamination. Construction is expected to last for about four months.

Site preparation, grading and construction activities within 120 m of significant natural features may result in a variety of potential negative effects including, but not limited to, increased erosion, sedimentation and turbidity, reduced stability of sensitive landforms, and/or changes in natural drainage patterns and flow volume. During construction of the substation, topsoil and subsoils will be stripped and stockpiled separately. Stripped topsoil and subsoil will be replaced in the temporary storage facility area and topsoil stripped from the substation area will be distributed on other Project properties. Construction equipment will include small trenchers, a small crane, forklifts and concrete trucks.

A minimum 30 m setback from the high water mark of water bodies has been implemented and measured from the outer limit of the Area of Disturbance. There is one water body located within 120 m buffer of the substation and laydown area. Site preparation, grading and construction activities within 120 m of a water body may result in a variety of potential negative effects as follows:

- Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of substation.
- Release / discharge of sediment laden surface water release or discharge into the adjacent watercourse or drainage features, which has the potential to transport nutrients and contaminants into the watercourse.
- Soil / water contamination by oils, gasoline, grease and other materials from construction / maintenance equipment (applies to operation phase as well).

There are no effects associated with the substation during decommissioning.

5.3 Mitigation Measures

Mitigation techniques are proposed to offset possible effects of the construction, decommissioning and operation activities of the Bluewater Wind Energy Centre. Mitigation measures recommended to minimize risk associated with potential impacts to the water bodies include the implementation of standard Best Management Practices (BMPs), as described below.

BMPs are work practices that outline acceptable practices to follow when carrying out certain activities. DFO has developed a series of operational statements (BMPs) as guidelines to avoid conditions that may harmfully alter fish habitat. These are applicable to this Project:

Work Area

- Stabilize banks where necessary, minimizing the area and duration of soil exposure.
- Operate machinery on land and in a manner that minimizes disturbance to stream banks.
- Erect sediment fencing around water bodies and areas to be avoided (i.e., near unstable banks, vegetation communities).
- Locate staging areas away from watercourses to limit risk of impacts to aquatic habitat.

Equipment Use

- Ensure machinery arrives on site in a clean, washed condition and is maintained free of fluid leaks.
- Minimize vehicle traffic on exposed soils, avoid compacting or other hardening of natural ground surface, and avoid the movement of heavy machinery on areas with sensitive slopes.
- Locate site maintenance, vehicle washing and refuelling stations where contaminants are handled at least 30 m away from water bodies.
- Implement vehicle and equipment cleaning procedures and practices to minimize or eliminate the discharge of pollutants from vehicle/ equipment cleaning operations to watercourses.
- Limit speed of vehicles near watercourse crossings.

Erosion and Sediment Control

- Develop and implement an erosion and sediment control plan before commencement of construction.
- Utilize erosion blankets, erosion control fencing, straw bales, etc., where necessary to mitigate potential excessive erosion and sedimentation. Ensure any materials placed in floodline are free from silt and other such particles. Keep extra erosion and sediment control materials on site (*e.g.*, heavy duty silt fencing, strawbales).
- Keep sediment and erosion control measures in place until disturbed areas have been stabilized (i.e., re-vegetated).
- Schedule grading to avoid times of high runoff volumes (spring and fall). Temporarily suspend work if excessive flows of sediment discharges occur until mitigation measures are in place.
- Direct discharged water to an appropriately sized energy dissipating outlet device to prevent erosion at the point of discharge.
- Install a temporary storage basin to allow water to infiltrate, or use permanent stormwater management facilities as necessary.

Maintenance

- Maintain and repair permanent and temporary erosion and sediment control measures as needed to ensure continued performance of their intended function for the duration of the works.
- Remove temporary erosion and sediment control measures after the final site stabilization is achieved.
- Permanently stabilize disturbed soil resulting from removal of BMPs or vegetation.

Material Stockpiling and Handling

- Store any stockpiled materials away from water bodies to prevent deleterious substances from inadvertently discharging to the environment.
- Dispose of any waste material from construction activities by authorized and approved off-site vendors.

Grading and Excavation

- Minimize changes in land contours and natural drainage; maintain timing and quantity of flows.

Construction Timing Windows

- Time construction to avoid periods of habitat use to the extent possible, these timing windows are applied to protect fish from any works in and around water during spawning, migration and other critical life history stages. Construction timing windows are based on site specific criteria such as type of fish

species present, thermal regime and fish spawning times (spring or fall). The generic restricted in-water work timing windows established by DFO are

- Fall Spawning Period – October 1st to May 31st
- Spring Spawning Period – May 1st to July 15th

- Specific fisheries timing windows will be developed in co-operation with ABCA.

Isolated Crossing

- In-water works for permanent water bodies must occur in the dry via dam and pump method or creation of a diversion channel to maintain flow around the work site. For intermittent water bodies, work is preferred to be completed in the dry and carried out during seasonally dry or when the water body is frozen to the bottom.
- Develop and implement a fish rescue plan for dewatering areas. This will include appropriate sized end-of-pipe fish screen to prevent potential losses of fish due to entrainment or impingement as outlined in the DFO – Freshwater Intake End-of-Pipe Fish Screen Guideline.
- Retain an adequate portion of channel with sufficient width and depth to allow for fish passage if construction requires that an instream work area be isolated from the primary channel. In the event that an area must be blocked from bank to bank, construct a temporary by-pass to allow fish passage around the construction area.

Stream Flow

- Design and install culverts to prevent creation of barriers to fish movement and maintain bankfull channel functions.
- Design culverts to accommodate high flows of the watercourse.
- Embed the culvert below the streambed to maintain lateral flow.
- Install adequate gravel base to maintain flow of shallow groundwater.
- Locate crossings within straight sections of the stream, perpendicular to the bank. Avoid crossings on meander bends, braided streams and any other unstable areas.
- Use only clean material (i.e., rock or coarse gravel) for approaches to culverts.
- Regular maintenance to ensure no debris build-up is impeding stream flow.

Water Quality

- Develop a spill response plan and train staff on associated procedures.
- Maintain emergency spill kits on site.
- Pass groundwater from dewatering activities (if required) through a sediment filtration system prior to being discharged to a watercourse.
- Control soil / water contamination through best management practices.

Water Management

- Control rate and timing of water pumping; pump from deep wells to infiltration galleries adjacent to water bodies or wetlands.
- Control quantity and quality of surface water runoff using best management practices, and implement infiltration techniques to the extent possible.
- Restrict taking groundwater and surface water during drought conditions.

- The water taker will regulate the discharge at such a rate that there is no flooding in the downstream area and no soil erosion, or stream channel scouring is caused at the point of discharge. The water taker will use a discharge diffuser or other energy dissipation device, if necessary, to mitigate flows which physically alter the stream channel or banks.
- Siltation control measures will be installed at both the taking location upstream of the construction site and (if necessary) the discharge site and will be sufficient for the volumes pumped. All measures will be taken to properly maintain these control devices throughout the construction period.

Directional Drilling

- Conduct all drilling by licensed drillers in accordance with Regulation 903 under *Ontario Water Resources Act*, R.S.O. 1990.
- Locate drill entry and exit pits at least 30 m from water bodies.
- Collect drill cuttings as they are generated, and place in a soil bin or bag for off-site disposal.
- Ensure drill depth is at an appropriate depth below the water body to reduce the risk of a 'frac-out'.
- Monitor water bodies for signs of surface disturbance.
- Develop a 'frac-out' contingency plan prior to the start of construction outlining protocols to monitor, contain and clean up a 'frac-out'.

Rehabilitation

- Re-vegetate and restore the turbine staging area following turbine installation with tiling (if desired by the owner).
- Restore and maintain vegetative buffers around water bodies including within the foundation footprint where possible.
- Restore and maintain vegetative buffers around water bodies including within the temporary construction areas.
- Keep vegetation removal to a minimum.
- Add suitable stream substrates (e.g., gravel or rip rap) to stabilize sediment and provide cover.

Specific contingency plans will be developed for spill emergencies and in the unlikely event of a 'frac-out' release. This will include sediment and erosion controls to reduce impacts on water quality.

5.4 Description of Residual Effects

Residual effects, which are those effects that remain following the application of mitigation measures, are summarized using the descriptors outlined in **Table 5-1**. The residual effects were assessed based on professional judgment and related project experience.

Table 5-1 Residual Effects Criteria

Variable	Definition
Spatial Extent	The direct footprint of the development as well as the areas indirectly affected.
Frequency	The likelihood that the negative effects will occur on more than one occasion
Duration	The expected length of construction and the amount of time a residual effect will persist.
Magnitude	The degree and extent of change from the baseline condition. This usually varies according to the project phase.

The assessment of environmental effects characterizes and evaluates the nature of any anticipated negative effects within the Area of Investigation. The evaluation of the negative effects includes the spatial extent, magnitude, frequency and duration of the likely adverse effects.

The potential negative effects are presented in Tables 5.2 to 5.6 and are arranged in relation to the sensitivity of the water body determined in the site investigations table (Section 4.4) and project component.

5.4.1 Effects Associated with Turbines (including turbine staging area)

Table 5-2 describes the water body location and sensitivity, potential effects, mitigation measures, residual effect evaluation and residual effects associated with the construction and decommissioning, and operation of turbines as they relate to water bodies and the 30 m area surrounding the water body.

Effects during the construction phase are primarily related to uncontrolled sediment release or hardening of the soils. No laydown areas are within the 30 m buffer of the water body, and with adherence to timing windows to protect critical spawning habitat, and effective sediment and erosion control measures, no impacts are anticipated to the water body in the medium (months) or long term (years).

There are no anticipated effects on water bodies from the operation of turbines, however, routine turbine maintenance and will be required. This will require the use of maintenance vehicles and adherence to BMP with regard to equipment storage and handling.

5.4.2 Effects Associated with Access Roads

Table 5-3 describes the water body location and sensitivity, potential effects, mitigation measures, residual effect evaluation and residual effects associated with access roads and temporary crane paths as they relate to water bodies and the 30 m area surrounding the water body. Water body locations are presented below based on the associated potential effects. Water bodies that are crossed by a road are presented with general site mitigation measures (e.g., sediment fencing) and specific mitigation measures (e.g., timing windows) for culvert installation and general site mitigation measures were recommended for water bodies situated within the buffer of a road.

Residual effects associated with roads during the construction phase were evaluated as low. These potential effects may be a result of obstruction of lateral flows, temporary disturbance of fish habitat and degradation of fish habitat from the installation of a culvert. Potential effects of lateral flows will be mitigated by properly designing and installing an appropriate sized culvert, embedded in the stream bed. Installation of a road crossing will result in a temporary disturbance of fish habitat such as substrates, instream cover and riparian habitat from the construction works. These potential effects can be reduced by conducting works within the specified fisheries timing windows, completing the crossing works appropriately and in a timely manner and rehabilitation of the stream banks.

Degradation of fish habitat may occur as a result of a permanent culvert feature that may reduce the aquatic habitat quality. However, if fish passage is maintained through the culvert then the water body will continue to provide suitable habitat.

Routine and unplanned turbine maintenance will be required which will include the use of maintenance vehicles using the watercourse crossing. There is a risk for sediment laden water to enter the watercourse from vehicles using the culvert. There is a risk of spills during maintenance, however, all appropriate mitigation measures will be adhered to. There may be some reduction in the available fish habitat due to the presence of culverts, however, design principles will ensure maintenance of fish passage by consideration of low flow channels. The habitat will still provide the same function to the resident fish populations and there may be opportunities for compensation of fish habitat, such as native riparian plantings upstream or downstream of the culvert or the addition of natural stone substrate.

Table 5-2 Effects Associated with Turbines (including turbine staging area)

Activity	Project Component	Water Body Location and Sensitivity	Potential Effects	Mitigation Measures (see Section 5.3 for further details)	Residual Effect Evaluation	Residual Effect
Construction and Decommissioning	**Turbine**	• **High Sensitivity** – C35 • **Moderate Sensitivity** -C41, C30, C51, C36, C18, C22, C26, C28, C114 • **Low Sensitivity**– C32, C71,C99,C33, C40, C3	• Reduced stream baseflows, groundwater upwelling areas and increase in water temperatures due to discharge from dewatering activities (if required) for excavation of foundation area.	• Water management • Timing windows • Water quality	• Spatial Extent – isolated to area of disturbance (localized extent) • Frequency – During dewatering activities (if required) • Duration – short term (days) • Magnitude – small scale dewatering (if required) and no long-term change to the baseline flow	**No residual effects**
			• Increased flows to watercourses from temporary groundwater dewatering (if required) discharges have potential to cause streambed and/or bank erosion and downstream sedimentation if not managed properly.	• Erosion and sediment control • Water management • Timing windows	• Spatial Extent – isolated to area of disturbance (localized extent) • Frequency – during dewatering activities (if required) • Duration – short term (days) • Magnitude – small scale dewatering (if required) and no long-term change to the baseline flow	**No residual effects**
			• Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of turbines, and pads/turnaround areas.	• Erosion and sediment control • Grading and Excavation • Equipment use	• Spatial Extent – isolated to area of disturbance • Frequency – ongoing through construction period • Duration – short term (weeks) • Magnitude – with effective sediment and erosion control, no change expected from the baseline condition.	**No residual effects**
			• Soil compaction, which may result in hardening of surfaces and increased runoff into watercourses.	• Erosion and sediment control • Grading and Excavation • Water Quality	• Spatial Extent – isolated to area of disturbance • Frequency – ongoing through construction period • Duration – short term (weeks) • Magnitude – with effective sediment and erosion control, no change expected from the baseline condition.	**No residual effects**
			• Sediment laden surface water released or discharged into the adjacent watercourse or drainage features has potential to transport nutrients and contaminants into the watercourse.	• Water Quality • Erosion and sediment control • Timing windows	• Spatial Extent – localized area if mitigation is provided • Frequency – ongoing through construction period • Duration – short term (days to weeks) • Magnitude – with effective sediment and erosion control, no change expected from the baseline condition.	**No residual effects**
Operation	**Turbine**	• **High Sensitivity**– C35 • **Moderate Sensitivity** -C41, C30, C51, C36, C18, C22, C26, C28, C114 • **Low Sensitivity** – C32, C71,C99,C33, C40, C3	• Soil/water contamination by oils, grease and other materials from maintenance activities.	• Equipment Use • Material Stockpiling and Handling • Water Quality	• Spatial Extent – localized effect • Frequency – ongoing throughout operation period • Duration – long term (years) • Magnitude – no change expected to baseline conditions	**No residual effects**

Table 5-3 Effects Associated with Road Crossings, Temporary Crane Paths and Pads/Turnaround Areas

Activity	Project Component	Water body Location and Sensitivity	Potential Effects	Mitigation Measures (see Section 5.3 for further details)	Residual Effect Evaluation	Residual Effect
Construction and Decommissioning	**Road Crossing**	• **Moderate Sensitivity** - C46, C30, C22, C28, C113 • **Low Sensitivity** - C13, C32	• Obstruction of lateral flows in watercourses from water crossings	• Stream Flow • Isolated crossing	• Spatial Extent – limited to localized crossing of watercourse. • Frequency – one-time installation • Duration – short term (days) • Magnitude – temporary reduction in habitat suitability	**Low residual effects**
		• **Moderate Sensitivity** - C46, C30, C22, C28, C113 • **Low Sensitivity** - C13, C32	• Temporary disruption of substrates/habitat is likely to occur at locations where in-water work is required	• Timing windows • Isolated Crossing • Erosion and sediment control • Rehabilitation	• Spatial Extent – limited to localized crossing of watercourse. • Frequency – one-time installation • Duration – short term (days) • Magnitude – temporary reduction in habitat suitability	**Low residual effects**
		• **Moderate Sensitivity** - C46, C30, C22, C28, C113 • **Low Sensitivity** - C13, C32	• Degradation of fish habitat	• Stream flow	• Spatial Extent – localized at area of culvert • Frequency – once • Duration – long term (years) • Magnitude – permanent culvert may reduce the aquatic habitat quality but overall insignificant relative to the marginal habitat and common species. Fish passage will be maintained and will continue to provide habitat.	**Low residual effects**
		• **Moderate Sensitivity** - C46, C30, C22, C28, C113 • **Low Sensitivity** - C13, C32	• Stream diversion for the installation of watercourse crossing has the potential to increase sediment runoff, decrease bank stability, cause changes in water chemistry and temperature	• Work Area • Timing Windows • Isolated Crossing • Stream Flow • Water Management	• Spatial Extent – limited to localized crossing of watercourse. • Frequency – one-time installation • Duration – short term (days) • Magnitude – temporary reduction in habitat suitability	**Low residual effects**
	Road Crossing and Associated Buffer	**Road Crossing** • **Moderate Sensitivity** - C46, C30, C22, C28, C113 • **Low Sensitivity** - C13, C32 **Buffer** • **High Sensitivity** – C10-A, C35 • **Moderate Sensitivity** - C41, C87, C51, C48, C50, C56, C18, C19, C26, C36 • **Low** – C3, C33, C40, C71, C99	• Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of access roads, temporary crane paths and pads/turnaround areas.	• Erosion and sediment control • Grading and Excavation • Equipment Use	• Spatial Extent – isolated to area of disturbance • Frequency – one-time installation • Duration – short term (days to weeks) • Magnitude – no change to baseline conditions	**No residual effects**
			• Soil/water contamination by oils, grease and other materials from construction equipment	• Equipment Use • Material Stockpiling and Handling • Water Quality • Timing windows	• Spatial Extent – isolated to area of disturbance although some potential for downstream effects • Frequency – one-time installation • Duration – short term (days to weeks) • Magnitude – no change to baseline conditions	**No residual effects**
			• Sediment laden surface water released or discharged into the adjacent watercourse or drainage features has potential to transport nutrients and contaminants into the watercourse.	• Water Quality • Erosion and sediment control • Time Crossings	• Spatial Extent – isolated to area of disturbance • Frequency – N/A • Duration – short term • Magnitude – N/A	**No residual effects**
Operation	**Road Crossing**	• **Moderate Sensitivity** - C46, C30, C22, C28, C113 • **Low Sensitivity** - C13, C32	• Soil/water contamination by oils, grease and other materials from maintenance activities.	• Equipment Use • Material Stockpiling and Handling • Water Quality	• Spatial Extent – isolated to area of disturbance • Frequency – ongoing • Duration – long term (years) • Magnitude – no change expected to baseline conditions	**Low residual effects**

5.4.3 Effects Associated with Collection Lines

Table 5-4 describes the water body location and sensitivity, potential effects, mitigation measures, residual effect evaluation and residual effects associated with collection lines as they relate to water bodies and the 30 m area surrounding the water body. Water body locations are presented below based on the associated potential effects. Water bodies that are crossed by a collection line are presented with specific mitigation measures for directional drilling. General site mitigation measures have been implemented for water bodies crossed by collection lines and water bodies within proximity to a collection line. The mitigation measures will ensure protection to water bodies from the creation of entry and exit pits and associated directional drilling works.

Effects from construction can be mitigated through adherence to best management practices. There is some low residual risk to changes in groundwater flow patterns and water levels that will be monitored before, during and after construction to ensure that there are no changes to baseline conditions. A contingency plan will be developed for each specific water body where a collection line will be installed in the event that significant changes in baseflow occur.

5.4.4 Effects Associated with Transmission Lines

Table 5-5 describes the water body location and sensitivity, potential effects, mitigation measures, residual effect evaluation and residual effects associated with transmission lines as they relate to water bodies and the 30 m area surrounding the water body.

Residual effects associated with transmission lines during the construction phase were evaluated as low. These low residual effects would be a result of loss of riparian vegetation. Riparian vegetation occurs adjacent to the watercourse and directly contributes to fish habitat by providing shade, cover, and spawning and food production areas. Potential effects associated with the minor and temporary loss of riparian vegetation include, potential for erosion and sedimentation resulting from bank disturbance and loss of plant root systems. These potential effects can be reduced by stabilizing the work area, keep heavy machinery away from stream banks and create and implement a restoration plan.

5.4.5 Effects Associated with Substation and Lay down areas

Table 5-6 describes the water body location and sensitivity, potential effects, mitigation measures, residual effect evaluation and residual effects associated with the sub-station and lay down area as they relate to water bodies and the 30 m land surrounding the water body.

Residual effects associated with the construction and decommissioning of the substation and laydown area were evaluated as low residual effects. These low residual effects may be a result of clearing and grubbing of the land for the building. Potential effects associated with the clearing and grubbing include, potential for erosion and sedimentation resulting in streambed and bank erosion, and downstream sedimentation. These potential effects can be reduced by stabilizing the work area, erosion and sediment control measures and reducing any changes to land contours.

Table 5-4 Effects Associated with Collection Lines

Activity	Project Component	Water body Location and Sensitivity	Potential Effects	Mitigation Measures (see Section 5.3 for further details)	Residual Effect Evaluation	Residual Effect
Construction	**Collection Line Crossing**	• **Moderate Sensitivity** - C21, C42, C20, C54, C46, C87, C52, C56, C36, C19, C26, C28, C113 • **Low Sensitivity** – C33, C27, C34, C66, C72 C83, C13, C7-A	• Fractures in substrate may release pressurized drilling fluids into watercourse • Potential change to groundwater flow patterns	• Directional Drilling • Water Quality	• Spatial Extent – potential to impact channel reach or entire watercourse • Frequency – one-time installation • Duration – short term (days) • Magnitude – potential for minor change to baseline conditions	**Low residual effects**
	Collection Line Crossing and Associated Buffer	**Collection Line Crossing** • **Moderate Sensitivity** - C21, C42, C20, C54, C46, C87, C52, C56, C36, C19, C28, C26, C113 • **Low Sensitivity** - C33, C27, C34, C66, C72, C83, C13, C7-A **Collection Line Buffer** • **High Sensitivity** - C10-A, • **Moderate Sensitivity** - C88, C71, C25 • **Low Sensitivity** - C112	• Potential increase in erosion, and sedimentation from directional drilling activities.	• Erosion and sediment control • Water management	• Spatial Extent – Localized - isolated to area of disturbance • Frequency – during construction period • Duration – short term • Magnitude – no change to baseline conditions	**No residual effects**
			• Soil / water contamination by oils, gasoline, grease and other materials from construction equipment for construction and directional drilling.	• Equipment Use • Water Quality	• Spatial Extent – isolated to area of disturbance • Frequency – during construction period • Duration – short term (days to weeks) • Magnitude – no change to baseline conditions	**No residual effects**
			• Sediment laden surface water released or discharged into the adjacent watercourse or drainage features has potential to transport nutrients and contaminants into the watercourse.	• Water Quality • Erosion and sediment control	• Spatial Extent – localized area if mitigation is provided • Frequency – during construction period • Duration – short term (days) • Magnitude – no change to baseline conditions	**No residual effects**
Operation / Decommissioning	**N/A**	• **N/A**	• **N/A**	• **N/A**	• **N/A**	**N/A**

Table 5-5 Effects Associated with Transmission Lines

Activity	Project Component	Water body Location and Sensitivity	Potential Effects	Mitigation Measures (see Section 5.4 for further details)	Residual Effect Evaluation	Residual Effect
Construction and Decommissioning	**Transmission Line**	• **Moderate Sensitivity** - T1, T2, T3,T4, T5, T6, T7, T8, T9, T10, T17	• Potential loss of riparian habitat adjacent to watercourses.	• Rehabilitation	• Spatial Extent – Localized, isolated to area of disturbance • Frequency – one-time installation • Duration – medium term (months to one-year) • Magnitude – temporary minor reduction in riparian cover. Appropriate compensation measures to be discussed with ABCA.	**Low residual effects**
			• Damage to stream banks from the use of heavy machinery.	• Work Area • Erosion and sediment control • Rehabilitation	• Spatial Extent – Localized, isolated to area of disturbance • Frequency - one-time installation • Duration – short term (weeks) • Magnitude – no major change to baseline conditions	**No residual effects**
			• Increased erosion, sedimentation and turbidity from clearing and grubbing for pole installation.	• Erosion and sediment control	• Spatial Extent – Localized, isolated to area of disturbance • Frequency - one-time installation • Duration – short term (weeks) • Magnitude – no change to baseline conditions	**No residual effects**
			• Sediment laden surface water released or discharged into the adjacent watercourse or drainage features has potential to transport nutrients and contaminants into the watercourse.	• Water Quality • Erosion and sediment control	• Spatial Extent – Localized, isolated to area of disturbance • Frequency - one-time installation • Duration – short term (weeks) • Magnitude – no change to baseline conditions	**No residual effects**
Operations	**Transmission Line**	• **Moderate Sensitivity** - T1, T2, T3,T4, T5, T6, T7, T8, T9, T10, T17	• Soil/water contamination by oils, grease and other materials from maintenance activities.	• Equipment Use • Material Stockpiling and Handling • Water Quality	• Spatial Extent – Localized, isolated to area of disturbance • Frequency - ongoing • Duration – long term (years) • Magnitude – no change to baseline conditions	**No residual effects**

Table 5-6 Effects Associated with Substation and Laydown Areas

Activity	Project Component	Water body Location and Sensitivity	Potential Effects	Mitigation Measures (see Section 5.4 for further details)	Residual Effect Evaluation	Residual Effect
Construction and Decommissioning	**Substation and Laydown Areas**	• **Moderate Sensitivity** – C25	• Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of substation and laydown area.	• Erosion and sediment control • Grading and Excavation	• Spatial Extent – Localized, isolated to area of disturbance • Frequency – one time period construction • Duration – short term (4 months) • Magnitude – minor changes to baseline conditions due to removal of vegetation.	**Low residual effects**
			• Soil / water contamination by oils, gasoline, grease and other materials from construction equipment for construction.	• Equipment Use • Water Quality	• Spatial Extent – Localized, isolated to area of disturbance • Frequency – one time period construction • Duration – short term (4 months) • Magnitude – no changes to baseline conditions	**No residual effects**
			• Sediment laden surface water released or discharged into the adjacent watercourse or drainage features has potential to transport nutrients and contaminants into the watercourse.	• Water Quality • Erosion and sediment control	• Spatial Extent – Localized, isolated to area of disturbance • Frequency – one time period construction • Duration – short term (4 months) • Magnitude – no changes to baseline conditions	**No residual effects**
Operations	**Substation and Laydown Areas**	• **Moderate Sensitivity** – C25	• Soil/water contamination by oils, grease and other materials from maintenance activities.	• Equipment Use • Material Stockpiling and Handling • Water Quality	• Spatial Extent – Localized, isolated to area of disturbance • Frequency – ongoing • Duration – long term • Magnitude – no changes to baseline conditions	**No residual effects**

5.5 Summary of Environmental Effects

With adherence to the outlined mitigation measures, there are no significant residual effects to water bodies anticipated from the construction, decommissioning and operation phases of the turbines, collection lines, transmission lines and substation.

There is potential for minor disruption to fish habitat and obstruction of lateral flows. Disruption of fish habitat has the potential to impair spawning, feeding or routine activities of the resident fish community. There is also potential for fish to display avoidance behaviour of the actively disturbed area, which can result in the temporary displacement of fish. Fish passage within the channel may also become temporarily (*i.e*., days) restricted as a result of construction activities, disrupting migration patterns. Adherence to timing windows will ensure that critical spawning behaviours are not affected.

Effective sediment and erosion control measures and BMPs related to construction and equipment usage are particularly important for all project components. Adherence to these mitigation measures however, will ensure no impact to water quality or downstream reaches and therefore no residual effects.

Features given a 'Not Sensitive' ranking are not considered water bodies as outlined in Section 1.1. These features were identified as swales or low lying areas within agricultural fields. Basic mitigation measures will be implemented to prevent any transport of sediments, as some of these features may act as surface water conveyance to downstream water bodies during the spring freshet and high rain events.

5.6 Description of Cumulative Effects

Cumulative effects are described as 'residual effects on the environment (*i.e*., that occur after mitigation measures have been put in place) combined with the environmental effects of past, present and future projects or activities. Cumulative effects can also result from the combination of different individual environmental effects of the project acting on the same environmental component' (CEAA, 2010).

Within the Bluewater Study Area there are five watercourses that have several project components located within close proximity to them. These water bodies are as follows:

- Water bodies C46, C50, C36 and C21 are all located within the same watercourse. This watercourse is classified as moderate sensitivity due to its intermittent status, warmwater baitfish community and general moderate quality aquatic habitat. This watercourse is located within close proximity (120 m) to the buffer of one turbine, and outside of the laydown area of disturbance, therefore effects from the construction and decommissioning of the turbine are minimal for this water body. The water body is also in the buffer of an access road, and no direct effects are expected from construction or operation of this project component. The majority of potential impacts to this water body are expected to be from the crossing of a collection line. Adherence to the above-outline mitigation measures will ensure low to no residual effects. Despite project components occurring within 120 m of these water bodies, cumulative effects are not anticipated due to the distances of the proposed works from the water bodies as well as different phases of construction.
- Water bodies C13 and C41 are located within the same watercourse. This water course is classified as low to moderate sensitivity due to its intermittent status, and low to moderate habitat quality. C41 is located within 120 m of the Area of Disturbance for one turbine and road. Effects from the construction and decommissioning of the turbine are minimal for this water body. Upstream of C41, C13 is crossed twice by both a road and collection line and the road runs parallel to C13. The two crossings are located within close proximity of each other. The majority of potential effects to this water body are expected from the two

crossings of the road and collection line as well as the close proximity of the road running parallel to the water body. Construction timing of the different project components is not known. However, due to the amount of construction works required to complete the project components, there is likely to be a large amount of heavy machinery, increased amount of time spent near C13 to complete the works and increased likelihood for potential effects. Adherence to the above outlined mitigation measures will decrease any potential effects, however due to the two collection line crossings and two road crossings required at C13 and the frequency and duration of the works, cumulative effects will likely occur.

- Water bodies C46, C83 and C72 are located within the same watercourse. Both C83 and C72 are tributaries to the main channel. C83-A is a water body west of Bronson Line while C83-B is not a REA water body east of Bronson Line. C83-A and C72 are both classified as low sensitivity due to their intermittent status, and low aquatic habitat. In addition, C72 runs parallel to a road and the upstream reach is tile drained. C46 is classified as moderate sensitivity due to its intermittent status and the presence of groundwater indicators. C83 and C72 are both crossed by a collection line on the east side of Bronson Line. As the collection line crosses through C83-B, which is a tile drained feature, there are no anticipated residual effects to surface water flow. C46 is crossed by one road and one collection line and is located within the buffer of the collection line. There are existing impacts located at the proposed crossing as the current landowner has installed rock slabs across the bankfull width to create a road crossing through the water to the agricultural field. Adherence to the above outlined mitigation measures will decrease any potential effects; however due to the collection line crossing two tributaries, a road crossing and collection line crossing of the main branch, cumulative effects may occur.
- Water bodies C32 and C30 are located within the same watercourse. C32 and C30 are classified as low to moderate, respectively. Both C32 and C30 are channelized, warm water systems with low to moderate aquatic habitat. Both C32 and C30 are located within close proximity to a turbine and road buffer and are both crossed by a road and collection line. It is expected that construction of each project component will occur at varying times. It is anticipated that due to the close proximity of the road buffer and turbine buffer to C32 and C30 that there is an increased risk of potential negative effects including sediment runoff, increased spills from heavy equipment and the duration of works around the water body. Adherence to the above mentioned mitigation measures will decrease any potential negative effects, however due to the close proximity to two turbines, crossed by two roads and collections lines, cumulative effects are likely to occur.
- Water bodies C66, C28, C26, C25 and C52 are all located within the same watercourse. C66 is classified as low based on it being a channelized warm water feature and moderate aquatic habitat. C28, C26, C25 and C52 are all classified as moderate as they are within a permanent cold/cool water system with low aquatic habitat. This watercourse is located within 120 m of the Area of Disturbance of three turbines, is crossed by one road and two collection lines, and is within 120 m of the substation and laydown area. It is expected that construction of each project component will occur at varying times. It is anticipated that due to the close proximity of the road and turbines to the water bodies that there is an increased risk of potential negative effects including sediment runoff, increased spills from heavy equipment and an increase in the length of time of works due to the number of project components located near the water bodies. Adherence to the above mentioned mitigation measures will decrease any potential negative effects, however due to the close proximity to the three turbines, crossed by one road and two collection lines, cumulative effects are likely to occur.

In order to decrease any potential cumulative negative effects for the above mentioned water bodies, extra mitigation measures will be implemented including the use of heavy duty silt fencing, double silt fencing, stormwater management techniques, and turbidity monitoring. Construction monitoring will be increased during the works in and around the sites to ensure all mitigation measures are working appropriately and to ensure no un-mitigated impacts are occurring to the water body.

5.7 Environmental Effects Monitoring Plan

An adaptive management approach to water body protection will be implemented in conjunction with the conditions of the REA approval. This requires regular site inspections and monitoring by a designated on-site Environmental Monitor(s) (EM). Understanding the condition of the natural ecosystem throughout all phases of the project will form the basis upon which to consider altering construction methods, environmental protection measures, and monitoring programs. Ultimately, any determination related to the application of mitigation and contingency measures not addressed through conditions of the REA approval will be informed by ongoing analyses of monitoring data, and rely on the experience and judgment of the on-site EM in consultation with ABCA, MNR, MOE, and DFO as applicable regulatory agencies.

Active construction monitoring will be required at all locations where water bodies are present. Pre-construction monitoring is recommended to ensure all BMP's are properly installed and located appropriately. Post-construction monitoring will also be required to ensure that proper restoration, stabilization, and overall quality of runoff is returned to pre-construction conditions as well as to satisfy regulatory permitting and/or authorizations. The following are the general proposed monitoring activities related to construction in or near surface water features:

- On-site conditions such as erosion and sediment control (ESC), spills, flooding etc.;
- Monitor weather conditions;
- Ensure all timing windows are adhered to;
- Water quality; and
- Fish habitat.

Monitoring activities specific to construction related groundwater dewatering include the following:

- Water quality (groundwater and surface water);
- Stream baseflow;
- Receiving stream temperature; and
- Stream erosion and sedimentation.

The potential negative environmental effects associated with water takings during Construction and Decommissioning Phases of the Project are described in Section 5.2. In order to monitor these effects, discharge water will be sampled each day that water is discharged and analyzed for total suspended solids (TSS). In the event that sampling results show that TSS in the discharge water exceeds 25 mg/L, the construction contractor will implement appropriate contingency measures, such as utilizing a settling tank, geosock or similar device, to mitigate these impacts.

5.7.1 Mitigation Measures, Residual Effects and Monitoring Plan

Table 5-7 provides mitigation measures, residual effects and the monitoring plan for each potential effect identified above.

Table 5-7 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water and Groundwater

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Reduced stream baseflows, groundwater upwelling areas and increase in water temperatures due to discharge from dewatering activities (if required) for excavation of turbine foundation area.	• Minimize reduction of stream baseflows and groundwater upwelling areas, and increase in water temperatures.	**Water Management** • Control rate and timing of water pumping; pump from deep wells to infiltration galleries adjacent to water bodies or wetlands. • Control quantity and quality of stormwater discharge using best management practices, and implement infiltration techniques to the extent possible. • Restrict taking groundwater and surface water during drought conditions. • The water taker will regulate the discharge at such a rate that there is no flooding in the downstream area and no soil erosion, or stream channel scouring is caused at the point of discharge. The water taker will use a discharge diffuser or other energy dissipation device, if necessary, to mitigate flows which physically alter the stream channel or banks. • Siltation control measures will be installed at both the taking location upstream of the construction site and (if necessary) the discharge site and will be sufficient for the volumes pumped. All measures will be taken to properly maintain these control devices throughout the construction period. **Timing Windows** • Time construction to avoid periods of habitat use to the extent possible, these timing windows are applied to protect fish from any works in and around water during spawning, migration and other critical life history stages. Construction timing windows are based on site specific criteria such as type of fish species present, thermal regime and fish spawning times (spring or fall). The generic restricted in-water work timing windows established by DFO are ▪ Fall Spawning Period – October 1st to May 31st ▪ Spring Spawning Period – May 1st to July 15th **Water Quality** • Develop a spill response plan and train staff on associated procedures. • Maintain emergency spill kits on site.	• Reduced stream baseflows, groundwater upwelling areas and increase in water temperatures minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects as there will only be small scale dewatering (if required).	• Monitor water level and streamflow at proposed discharge locations for duration of dewatering activities using staff gauges, water level data loggers, and manual in-stream flow measurements tools to calculate watercourse assimilation capacity. • The findings of the monitoring program will be reported back to MOE following the completion of dewatering activities for the entire Project. • Contingency Measures: ▪ Control rate and timing of water pumping; pump from deep wells to infiltration galleries adjacent to water bodies or wetlands.

Table 5-7 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water and Groundwater

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
		• Pass groundwater from dewatering activities (if required) through a sediment filtration system prior to being discharged to a watercourse. • Control soil / water contamination through best management practices.		
Increased flows to watercourses from temporary groundwater dewatering (if required) discharges from turbine construction causing streambed and/or bank erosion and downstream sedimentation.	• Minimize increase in flows to watercourses and erosion and/or sedimentation.	**Erosion and Sediment Control** • Develop and implement an erosion and sediment control plan before commencement of construction. • Install erosion blankets, erosion control fencing, straw bales, etc., where necessary to mitigate potential excessive erosion and sedimentation. • Ensure any materials placed in floodline are free from silt and other such particles. • Maintain extra erosion and sediment control materials on site (e.g., heavy duty silt fencing, strawbales). • Maintain sediment and erosion control measures in place until disturbed areas have been stabilized (i.e., re-vegetated). • Schedule grading within 30 m of watercourses to avoid times of high runoff volumes. • Temporarily suspending work if excessive flows of sediment discharges occur until mitigation measures are in place. • Direct discharged water to an appropriately sized energy dissipating outlet device to prevent erosion at the point of discharge. **Water Management – See above** **Timing Windows – See above**	• Increased flows to watercourses and associated streambed and/or bank erosion minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects as there will only be small scale dewatering (if required).	• Monitor erosion and sedimentation of receiving watercourse before and during dewatering events, including cross-sections, bank erosion pins and bed material. • Monitor water level and stream flow at these locations to test watercourse depth and flow speed before, during, and potentially after construction. • Analyze surface water samples from discharge locations for general chemistry (e.g., temperature, pH, dissolved oxygen, and conductivity), suspended solids, turbidity, nutrients and total metals (e.g., copper, iron, zinc and aluminum). These data will be used to determine background watercourse water quality at discharge locations. In conjunction with the streamflow measurements, these data will allow for site-specific loading calculations to determine watercourse assimilation capacity. • The findings of the monitoring program will be reported back to MOE following the completion of dewatering activities for the entire Project. • Contingency Measures: ▪ Install a temporary storage basin adjacent to foundation area to allow water to infiltrate.
Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of turbines, pads/turnaround areas, access roads, and temporary crane paths, and from directional drilling activities.	• Minimize erosion, sedimentation and turbidity.	**Erosion and Sediment Control – See above** **Grading and Excavation** • Minimize changes in land contours and natural drainage; maintain timing and quantity of flows. **Equipment Use** • Ensure machinery arrives on site in a clean, washed condition and is maintained free of fluid leaks. • Minimize vehicle traffic on exposed soils,	• Increased erosion, sedimentation and turbidity from clearing and grubbing minimized through application of mitigation measures • Low likelihood and limited magnitude of effects as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, spills, flooding, etc.) where construction occurs within 30 m of a water course on the following basis: ▪ Weekly during active construction periods. ▪ Prior to, during and post forecasted large rainfall events (>20 millimetres in 24 hours) or significant snowmelt events (i.e., spring freshet).

Table 5-7 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water and Groundwater

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
		avoid compacting or other hardening of natural ground surface, and avoid the movement of heavy machinery on areas with sensitive slopes. • Locate site maintenance, vehicle washing and refuelling stations where contaminants are handled at least 30 m away from natural features including water bodies and significant woodlands, wetlands, and wildlife habitat. • Implement vehicle and equipment cleaning procedures and practices to minimize or eliminate the discharge of pollutants from vehicle/ equipment cleaning operations to watercourses or natural areas. • Limit speed of vehicles near watercourse crossings.		▪ Daily during extended rain or snowmelt periods. ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. • In the event that a spill / flooding occurs, the details of the event will be reported back to MOE, including a description of any assessment and remediation undertaken. • Contingency Measures: ▪ Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place. ▪ Water samples will be analyzed for general chemistry (e.g., temperature, pH, dissolved oxygen, and conductivity), suspended solids, turbidity, nutrients and total metals (e.g., copper, iron, zinc and aluminum).
Soil compaction, which may result in hardening of surfaces and increased runoff into watercourses	• Minimize soil compaction and increased runoff into watercourses.	• **Erosion and sediment control – See above** • **Grading and Excavation – See above** • **Water Quality – See above**	• Soil compaction and associated increase in runoff into watercourses minimized through application of mitigation measures • Low likelihood and limited magnitude of effects as a result.	• No monitoring or contingency measures required.
Release or discharge of sediment-laden surface water into the adjacent watercourse or drainage features from construction of turbines, access roads, collection lines, and water crossings	• Minimize release or discharge of sediment-laden surface water into adjacent watercourse or drainage features.	• **Water Quality – See above** • **Erosion and Sediment Control – See above** • **Timing Windows – See above**	• Release or discharge of sediment laden surface water into the adjacent watercourse or drainage features minimized through application of mitigation measures • Low likelihood and limited magnitude of effects as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, spills, flooding, etc.) where construction occurs within 30 m of a water course on the following basis: ▪ Weekly during active construction periods. ▪ Prior to, during and post forecasted large rainfall events (>20 millimetres in 24 hours) or significant snowmelt events (i.e., spring freshet). ▪ Daily during extended rain or snowmelt periods. ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. • In the event that a spill / discharge of sediment occurs, the details of the event will be reported back to MOE, including a

Table 5-7 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water and Groundwater

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
				description of any assessment and remediation undertaken. • Contingency Measures: ▪ Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place. ▪ Water samples will be analyzed for general chemistry (e.g., temperature, pH, dissolved oxygen, and conductivity), suspended solids, turbidity, nutrients and total metals (e.g., copper, iron, zinc and aluminum).
Obstruction of lateral flows in watercourses from water crossings	• Minimize obstruction of lateral flows in watercourses.	**Stream Flow** • Design and install culverts to prevent creation of barriers to fish movement and maintain bankfull channel functions. • Design culverts to accommodate high flows of the watercourse. • Embed the culvert below the streambed to maintain lateral flow. • Install adequate gravel base to maintain flow of shallow groundwater. • Locate crossings within straight sections of the stream, perpendicular to the bank. Avoid crossings on meander bends, braided streams and any other unstable areas. • Use only clean material (i.e., rock or coarse gravel) for approaches to culverts. **Isolated Crossing** • Install in-water works for permanent water bodies in the dry via dam and pump method or creation of a diversion channel to maintain flow around the work site. For intermittent water bodies, work is preferred to be completed in the dry and carried out during seasonally dry or when the water body is frozen to the bottom. • Develop and implement a fish rescue plan for dewatering areas. This will include appropriate sized end-of-pipe fish screen to prevent potential losses of fish due to entrainment or impingement as outlined in the DFO Freshwater Intake End-of-Pipe Fish Screen Guideline.	• Obstruction of lateral flows in watercourses avoided through application of mitigation measures. • No likelihood of effect occurring.	• No monitoring or commitments required.

Table 5-7 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water and Groundwater

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
		• Retain an adequate portion of channel with sufficient width and depth to allow for fish passage if construction requires that an instream work area be isolated from the primary channel. In the event that an area must be blocked from bank to bank, construct a temporary by-pass to allow fish passage around the construction area.		
Temporary disruption of substrates/habitat associated with in-water works	• Minimise temporary disruption of substrates/habitats.	**Timing Windows – See above** **Isolated Crossing – See above** **Erosion and Sediment Control – See above** **Rehabilitation** • Re-vegetate and restore the turbine staging area following turbine installation with tiling (if desired by the owner). • Restore and maintain vegetative buffers around water bodies including within the foundation footprint where possible. • Restore and maintain vegetative buffers around water bodies including within the temporary construction areas. • Keep vegetation removal to a minimum. • Add suitable stream substrates (e.g., gravel or rip rap) to stabilize sediment and provide cover.	• Temporary disruption of substrates/habitat associated with in-water works minimized through application of mitigation measures. • Moderate likelihood and magnitude of effect occurring due to number of watercourse crossings.	• Monitor fish habitat throughout duration of in-water construction to identify any minor or major disturbances caused by construction activities by undertaking the following : ▪ Temperature monitoring with the use of temperature data loggers set to record every hour and downloaded at end of each day; ▪ Turbidity monitoring for sediment loading; ▪ Monitoring bank stability; ▪ Monitoring substrate composition; ▪ Monitoring stream flow and ensure fish passage is maintained at all times. • Document changes to aquatic habitat as a result of construction activities and obtain photographic documentation. • The findings of the monitoring program will be reported back to MOE following the completion of in-water construction activities for the entire Project. • Contingency Measures: ▪ Mitigate or compensate for any harmful alteration, disruption or destruction (HADD) of fish habitat according to Department of Fisheries and Oceans Canada (DFO) authorization and in consultation with ABCA and MNR.

Table 5-7 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water and Groundwater

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Degradation of fish habitat.	• Minimize degradation of fish habitat.	**Stream Flow – See above**	• Degradation of fish habitat minimized through application of mitigation measures. • Moderate likelihood of effect occurring due to number of watercourse crossings; however, magnitude of effect limited due to marginal habitat and common species; as such fish passage will be maintained and will continue to provide habitat.	• Monitor fish habitat throughout duration of in-water construction to identify any minor or major disturbances caused by construction activities. • Document changes to aquatic habitat as a result of construction activities and obtain photographic documentation. • Contingency Measures: ▪ Mitigate or compensate for any harmful alteration, disruption or destruction (HADD) of fish habitat according to Department of Fisheries and Oceans Canada (DFO) authorization and in consultation with ABCA and MNR.
Soil/water contamination by oils, grease and other materials from construction equipment.	• Minimize soil/water contamination.	**Equipment Use – See above** **Material Stockpiling and Handling** • Store any stockpiled materials away from natural features to prevent deleterious substances from inadvertently discharging to the environment. • Dispose of any waste material from construction activities by authorized and approved off-site vendors. **Water Quality – See above** **Timing Windows – See above**	• Soil / water contamination minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects on surface water and groundwater as a result.	• Conduct daily inspections of construction equipment for leaks / spills. • Contingency Measures ▪ Install a spill collection pad for refuelling and maintenance. ▪ Notify MOE's Spills Action Centre of any leaks or spills. ▪ Assess and remediate affected soils and water. ▪ Water samples will be analyzed for general chemistry (e.g., temperature, pH, dissolved oxygen, and conductivity), suspended solids, turbidity, nutrients and total metals (e.g., copper, iron, zinc and aluminum).
Fractures in substrate releasing pressurized drilling fluids into watercourse and causing potential change to groundwater flow patterns due to directional drilling.	• Minimize fractures in substrates and release of pressurized drilling fluids into watercourse.	**Directional Drilling** • Conduct all drilling by licensed drillers in accordance with Regulation 903 under Ontario Water Resources Act, R.S.O. 1990. • Locate drill entry and exit pits at least 30 m from water bodies. • Collect drill cuttings as they are generated and place in a soil bin or bag for off-site disposal. • Ensure drill depth is at an appropriate depth below the water body to reduce the risk of a 'frac-out'. **Water Quality – See above**	• Fractures in substrate releasing pressurized drilling fluids into watercourse and causing potential change to groundwater flow patterns minimized through application of mitigation measures. • Low likelihood of effects as a result of mitigation measures; however magnitude of effects could be high as benthic invertebrates, aquatic plants and fish and their eggs could be smothered by the fine particles if bentonite were discharged to waterways.	• Monitor directional drilling for the duration of such activities to ensure that "frac-out" does not occur, and if it does, to ensure that there are no effects on surface or groundwater. • Contingency Measures: ▪ In the event of a "frac-out", immediately stop all work, including the recycling of drilling mud / lubricant. ▪ Monitor frac-out for 4 hours to determine if the drilling mud congeals. If drilling mud congeals, take no other action that would potentially suspend sediments in the water column. If drilling mud does not congeal, erect isolation/containment environment (underwater boom and curtain).

Table 5-7 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water and Groundwater

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
				▪ If the fracture becomes excessively large, engage a spill response team to contain and clean up excess drilling mud in the water. ▪ If the spill affects and area that is vegetated, the area will be seeded and/or replanted using species similar to those in the adjacent area, or allowed to re-grow from existing vegetation. Revegetated areas will be monitored twice per year for two years subsequent to frac-out to confirm revegetation is successful. ▪ Document post-cleanup conditions with photographs and prepare frac-out incident report describing time, place, actions taken to remediate frac-out and measures implemented to prevent recurrence. Provide incident report to MNR and MOE within 30 days of the incident.

6. Summary and Conclusions

This water assessment of the Bluewater Project Study Area includes both Records Review and site investigations with the purpose of identifying and characterizing water bodies in the Area of Investigation. Through a combination of Records Review, aerial photography interpretation, reconnaissance site visits, and site investigations, a total of 47 water bodies were identified in the Bluewater Project Location.

To aide in the assessment of water bodies and to focus mitigation measures, information was collected during site investigations that incorporated water quality, flow, aquatic habitat and riparian features in order to provide some understanding on the system's resiliency. The majority of the water bodies were found to be fairly resilient to environmental perturbations. This is supported by the data collated during the Records Review. Generally, coldwater habitat is more sensitive to environmental change than warmwater habitat. Water bodies in both the South Gullies and Bayfield Headwaters watersheds consist of warmwater baitfish communities, that are generally common, demonstrably secure on a global, national level, and local level and respond well to changing environmental conditions, and whose habitat preferences are wide-ranging. The fishery in Bannockburn is more sensitive as it consists of migratory trout in the main channel and cold water fishery in the tributaries; although no in-water works are proposed in this area as transmission lines are to be installed overhead.

In general, water quality throughout the Study Area was heavily influenced by agriculture, as evidenced by tile drain runoffs, high suspended solids and turbidity of the water, as well as algae growth in some of the channels. No impacts to water quality are expected during construction or operation of the Project, as potential sediment release and accidental spills from machinery will be mitigated through use of best management practices and sediment fencing. Although a large number of water bodies in the Study Area were classified as intermittent, these sites will be protected with the same recommended mitigation measures as for permanent streams, particularly as such sites may provide seasonal fish habitat, or provide important surface water conveyance to downstream reaches.

The potential cumulative impacts from the Project were also taken into consideration during the assessment of effects. There are five locations where more than one project component is proposed in the vicinity of the same water courses, and where necessary, additional mitigation measures and monitoring will be applied to these sites to ensure residual effects remain low.

This Water Body Assessment provides detail on individual water bodies within the Project Location in order to determine potential effects and mitigation for each site. The mitigation measures and Environmental Effects Monitoring Plan outline requirements for construction, operation and decommissioning of the Wind Energy Centre to ensure there are no residual effects from the Project. All of the potential effects from the construction and operation of this Project can be mitigated so that the effect on the water bodies are reduced to no residual effects, or low in the case of water body crossings.

6.1 Other Permitting Requirements

This report has been completed to meet the requirements of O. Reg. 359/09, although there may be other potential regulation requirements to consider. This will be particularly important when considering features classified as 'not sensitive' in this Report as they do not meet the REA requirements of a water body, yet may still provide vital function and connectivity to downstream seasonal fish habitat, for example. These features will be assessed in accordance with regulations under the federal *Fisheries Act* and the *Conservation Authorities* Act.

The following is an outline of other legislation and policies relevant to water body features and functions as they relate to the REA application for the Bluewater Wind Energy Centre.

6.1.1 *Conservation Authorities Act*

Any works to be completed within water bodies and floodplains will require review and input from the Ausable Bayfield Conservation Authority (ABCA) for any proposed plans involving these features.

The subject lands also contain features regulated by the *Conservation Authorities Act* Ontario Generic Regulation 97/04, with the implementation of it falling under ABCA's local Ontario Regulation 147/06. The proposed development application will therefore, require review by the ABCA and will require the submission of an "Application for Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses".

The CA's role in this project would largely be related to fisheries, aquatic and floodplain requirements.

6.1.2 *Fisheries Act*

Any in-water works will require review by the ABCA due to potential harmful, alteration, disturbance and destruction (HADD) of fish habitat. The *Fisheries Act* defines fish habitat as "spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes". ABCA has a Level 2 agreement to review projects on behalf of the Department of Fisheries and Oceans (DFO) and can authorize a Letter of Advice if mitigation can be used to reduce the impacts to fish habitat. If the potential impacts cannot be mitigated, a Section 35(2) HADD authorization is required, and a project review will be conducted by DFO.

In the absence of fisheries data required to obtain approvals for in-water works, fish community surveys will be conducted at the request of the CA.

6.1.3 *Endangered Species Act*, 2007

An Endangered Species permit may be required from MNR in the event that an Endangered Species is encountered or the proposed works are located near protected habitat. A permit is required if the proposed works have an adverse effect on a protected species or its habitat. Endangered Species permitting will be completed in co-operation with MNR.

6.1.4 *Municipal Drainage Act*, 1990

Any work proposed on, through, over, under, or next to a municipal drain would need to be approved by the corresponding municipalities, Municipal Drainage Engineer.

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