Jericho Wind, Inc.

Final Water Assessment and Water Body Report – Jericho Wind Energy Centre

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60155032

Date:

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Glossary of Terms

Area of Disturbance	The Area of Disturbance consists of: • A 60 m wide area for construction of access roads. The actual access road will be sited within this area of disturbance in consultation with the landowner and taking into consideration potential environmental effects. • A 122 m square area around each turbine for the laydown and assembly of the wind turbine components. • A 20 m wide area for construction of collection lines. 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 within 120 m 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.
NextEra	NextEra Energy Canada, ULC
On-line Pond	A pond with a watercourse flowing into and out of the pond.
O. Reg. 359/09	Ontario Regulation governing Renewable Energy Approvals.
Project Components	Refers to the turbine, access roads, collection lines, meteorological towers, transmission line and substation / operations and management building.
Project Study Area (Study Area)	Wind Energy Centre Study Area and Transmission Line Study Area
Water Body Report	A report that identifies and assesses any negative environmental efforts of the project on a water body and on land within 30 m of the water body.

Acronyms

ABCA ..... Ausable Bayfield Conservation Authority
DFO ..... Federal Department of Fisheries and Oceans
MOE ..... Ontario Ministry of the Environment
MNR ..... Ontario Ministry of Natural Resources
MW ..... Megawatt
NextEra ..... NextEra Energy Canada, ULC
O.Reg. 359/09 ..... Ontario Regulation 359/09
PDR ..... Project Description Report
The Project ..... Jericho Wind Energy Centre
REA ..... Renewable Energy Approval
TC ..... Transport Canada
SCRCA ..... St. Clair River Conservation Authority

1. Introduction

Jericho Wind, Inc., a wholly owned subsidiary of NextEra Energy Canada, ULC, (NextEra) is proposing to construct a wind energy project in the Municipality of Lambton Shores and the Township of Warwick, in Lambton County, Ontario and in the Municipality of North Middlesex, in Middlesex County, Ontario. The Project is referred to as the Jericho Wind Energy Centre (the "Project"). All turbines will be located on private lands.

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 developed by the Ministry of the Environment (MOE, 2011).

1.1 The Proponent

The Project will be owned and operated by Jericho Wind, Inc., a subsidiary of NextEra. NextEra Energy Canada's indirect parent company is NextEra Energy Resources, LLC, a global leader in wind energy generation with a current operating portfolio of over 100 wind energy projects in North America. Wind farms currently owned and operated by NextEra Energy Canada include: Mount Copper and Mount Miller (both 54 megawatt (MW)), located in Murdochville, Quebec; Pubnico Point, (31 MW) located near Yarmouth, Nova Scotia; Ghost Pine (82 MW), located in Kneehill County, Alberta; and Conestoga (23 MW) located in Wellington County, Ontario.

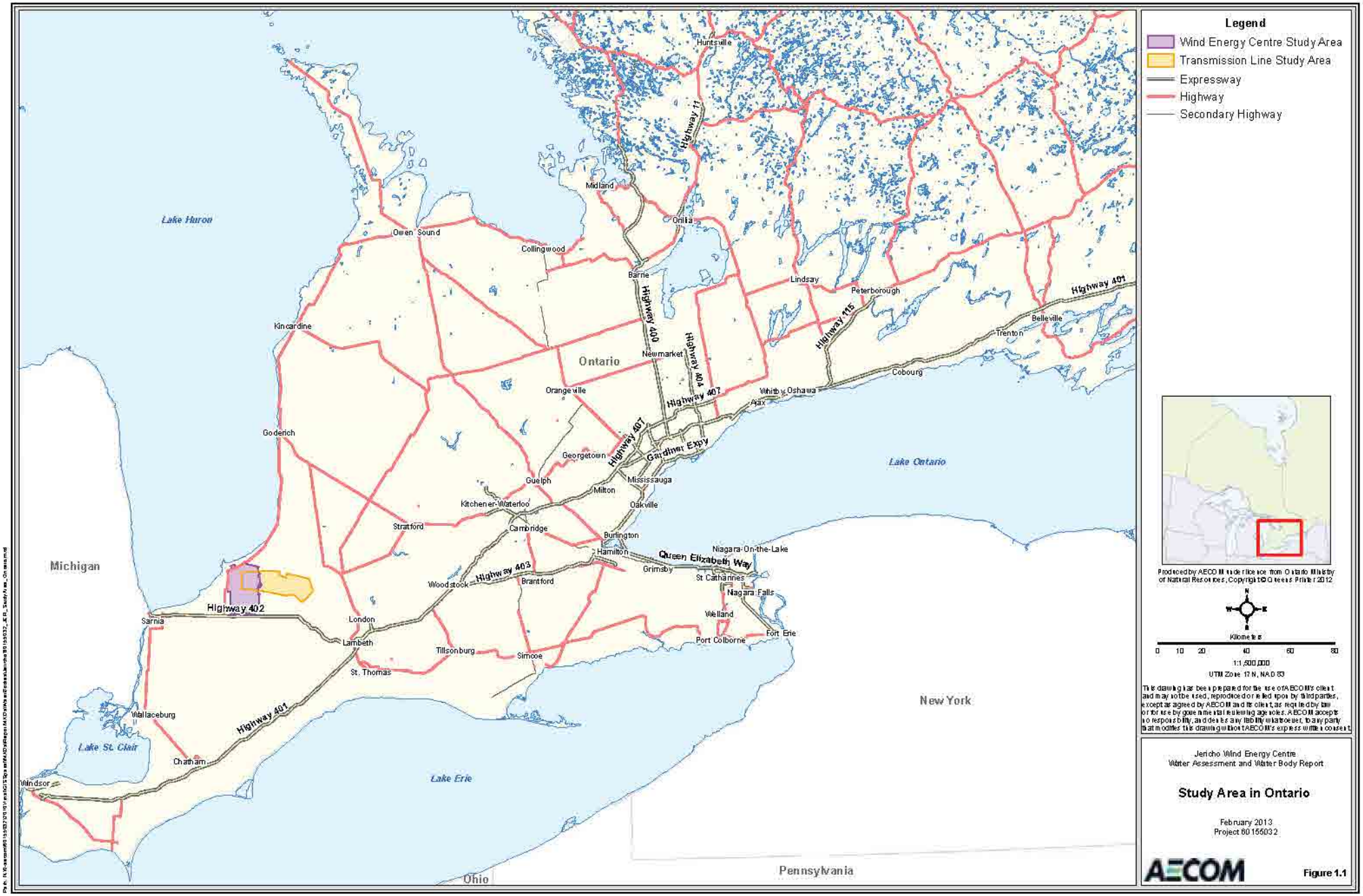
The primary contacts for the project are as follows:

Project Proponent	Project Consultant
Ross Groffman Project Director NextEra Energy Canada, ULC 390 Bay Street, Suite 1720 Toronto, Ontario, M5H 2Y2 *Phone:* .....416.364.9714 *Email:* .....Jericho.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 x388 *Email:* ..... marc.rose@aecom.com

1.2 Project Location and Description

The proposed Project is located in the Municipality of Lambton Shores and the Township of Warwick, in Lambton County, Ontario and in the Municipality of North Middlesex, in Middlesex County, Ontario. The Project Study Area consists of the areas being studied for the wind energy component (Wind Energy Centre Study Area), as well as for the interconnection route (i.e., the area being studied for transmission lines to connect the Project to the electrical grid) (Transmission Line Study Area). The Wind Energy Centre Study Area is generally bounded by Lakeshore Road/Bog Line to the north, Egremont Road to the south, the Lambton Shores/North Middlesex municipal boundary to the east and Rawlings Road/Elarton Road to the west, in Lambton County. The Transmission Line Study Area is generally bounded by Kennedy Line, Parkhill Drive and Elginfield Road to the north, Jura Line, Elm Tree Drive and Poplar Hill Road to the south, Fernhill Drive to the east, and the Jericho Road to the west, in Lambton and Middlesex Counties.

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 Project Study Area was used to facilitate information collection.



Jericho Wind Energy Centre
Water Assessment and Water Body Report

Study Area in Ontario

February 2013
Project 60155032

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Figure 1.1

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

UTM Coordinates

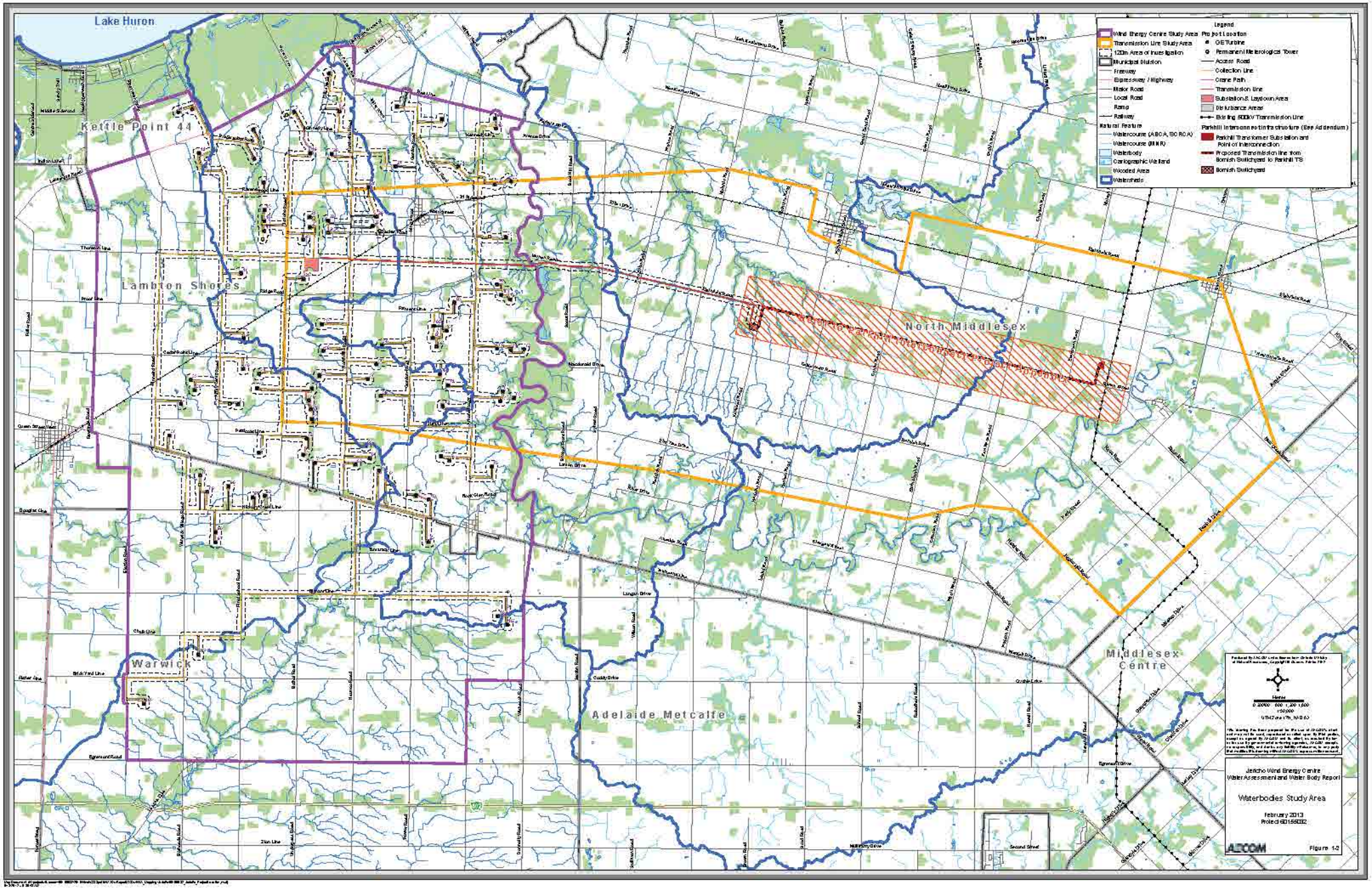
Easting	Northing
420938	4761752
419681	4780912
456597	4777307
453312	4766484

The Project Location is defined as per *O. Reg. 359/09* 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.

- 97 GE 1.6-100 Wind Turbine generator locations and pad mounted step-up transformers (however, only approximately 92 turbines will ultimately be constructed);
- Turbine laydown and storage areas (including temporary staging areas, crane pads and turnaround areas surrounding each wind turbine);
- Construction laydown area for the purposes of providing temporary storage of construction materials and temporary construction offices and ancillary equipment such as electrical service from the local electrical distribution line;
- A transformer substation and ancillary equipment;
- 34.5 kV electrical collection lines to connect the turbines to the proposed transformer substation and other ancillary equipment such as above-ground junction boxes;
- A 115 kV transmission line to run from the proposed Project transformer substation to the proposed Bornish switchyard. A common 115 kV transmission line will carry electricity from the proposed Adelaide, Bornish and Jericho Wind Energy Centres to a Point of Common Coupling (PCC) on Hydro One's 500 kV transmission line;
- Turbine access roads;
- Permanent meteorological towers; and
- An operations and maintenance building and ancillary equipment such as an electrical service line connected to the local distribution service.

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, turbine turnaround areas, and construction of access roads and electrical collection system. With the exception of the project components described above, no permanent infrastructure is proposed within these areas. Following construction activities, the land will be returned to pre-construction conditions.

The above mentioned Project components, with the exception of the common 115 kV transmission line from the Bornish switchyard to the PCC, are depicted in the Project Location figure below (please refer to **Appendix A** for the Water Assessment and Water Body Report for the Parkhill Interconnect Project).


Lake Huron
Kettle Point 44
Lambton Shores
Warwick
North Middlesex
Adelaide Metcalfe
Middlesex Centre
Legend
Wind Energy Centre Study Area
Transmission Line Study Area
120m Area of Investigation
Municipal Division
Freeway
Expressway / Highway
Major Road
Local Road
Ramp
Railway
Natural Feature
Watercourse (ABCA, SCRCA)
Watercourse (MNR)
Waterbody
Cartographic Wetland
Wooded Area
Watersheds
Project Location
GE Turbine
Permanent Meteorological Tower
Access Road
Collection Line
Crane Path
Transmission Line
Substation & Laydown Area
Disturbance Areas
Existing 500kV Transmission Line
Parkhill Interconnection Infrastructure (See Addendum)
Parkhill Transformer Substation and Point of Interconnection
Proposed Transmission line from Bornish Switchyard to Parkhill TS
Bornish Switchyard
Jericho Wind Energy Centre
Water Assessment and Water Body Report
Waterbodies Study Area
February 2013
Project 60155032
AECOM
Figure 1-2

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 (AECOM, 2012).

1.3 Water Assessment and Water Body Report Requirements

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 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 for the Jericho Study Area is shown on Figure 1-2.

Under the REA process, a person who proposes to engage in a renewable energy project is required to conduct a Water Assessment (O.Reg. 359/09, 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 of 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 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 the average annual high water mark of a lake, permanent or intermittent 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. 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 and water body setbacks were measured from this point.

Required setbacks for the construction of turbines 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)).

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

This Water Assessment and Water Body Report is intended to satisfy the requirements of O. Reg. 359/09 outlined below (**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 within the Area of Investigation and on land within 30 m of the water body that may result from the project	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 purpose of submitting an application for a Renewable Energy Approval requires a staged approach to first identify the water bodies within the Area of Investigation and then to identify potential effects and mitigations on any water bodies and associated land. Sections 29-31 and 39-40 of O.Reg. 359/09 outlines the requirements for the assessment.

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.

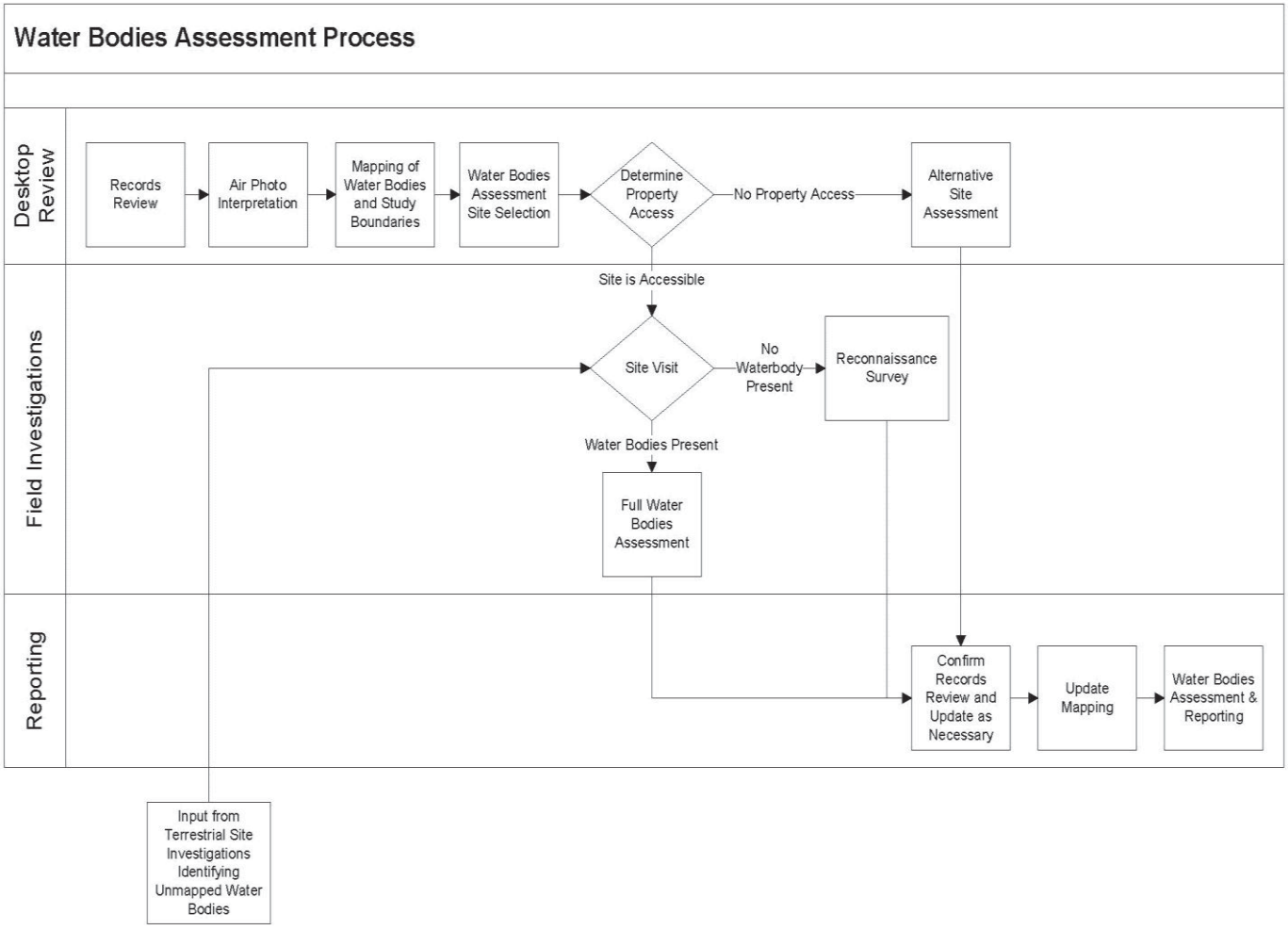


Figure 2-1 Overall Methodology Employed for the Water Body Assessment

3. Records Review and Summary of Background Information

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 for the Jericho Wind Energy Centre.

As part of the REA process, features located with 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. Additional information was therefore collected from agencies and background sources, where available, to help inform not only where water bodies were located, but also to provide some indication of their form and function. This information collected during the Records Review phase was assessed by qualified ecologists to determine whether the information collected was useful in determining the status of water bodies, i.e. non-REA or REA water bodies, and to further provide background information that could be used in the Effects Assessment.

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 search of online databases and contact with regulatory agencies and municipalities through: meetings; telephone requests; or email correspondence. A summary of agencies contacted is provided below and a detailed summary of the agency consultation in relation to this project is provided in **Appendix B**.

Agencies contacted for Records Review information include:

- Ausable Bayfield Conservation Authority (ABCA);
- St. Clair Region Conservation Authority (SCRCA)
- Ministry of Natural Resources (MNR), Aylmer Office;
- Ministry of the Environment (MOE);
- Natural Heritage Information Centre (NHIC);
- Lambton County;
- Middlesex County;
- Warwick Township;
- Municipality of Lambton Shores; and,
- Municipality of North Middlesex

3.2 Summary of Records Received

The records received from the regulatory agencies are shown in Table 3-2. The type of information provided and the Project Study Area coverage is noted. All water bodies identified from this Records Review were mapped and set as the basis for further site investigation as required under Section 31 of O.Reg 359/09 (**Figure 3-1**). The additional background information collected during the Records Review, where relevant, was incorporated into the assessment for each water body and the subsequent effects assessment.

Table 3-2 Summary of Records Received

Agency	Record Type	Project Study Area Coverage
MNR	Water body, watercourse, wetland layers	Entire Project Study Area
	Thermal Regime	Entire Project Study Area
	Fish Records	Fish Records (28) for eleven watercourses within Project Study Area.
ABCA	Regulated Areas (*O.Reg. 97/04*)	Entire Project Study Area
	Natural Features	Entire Project Study Area
	Floodline Mapping	Entire Project Study Area
	Thermal Regime	Entire Project Study Area
	Municipal Drain Classifications	Entire Project Study Area
	Fish Records	Records (27) for six watercourses within Project Study Area.
	Mussel Records	Records (2) for 11 stations within the Ausable River.
	Source Water Protection	Entire Project Study Area
	Watercourse Names	Entire Project Study Area
SCRCA	Regulated Areas (*O.Reg. 97/04*)	Entire Project Study Area
	Natural Features	Entire Project Study Area
	Thermal Regime	Entire Project Study Area
	Municipal Drain Classifications	Entire Project Study Area
	Fish Records	Records (6) for five watercourses within Project Study Area
	Watercourse Names	Entire Project Study Area
NHIC	Species of Conservation Concern	Entire Project Study Area

3.2.1 Records Related to Lakes

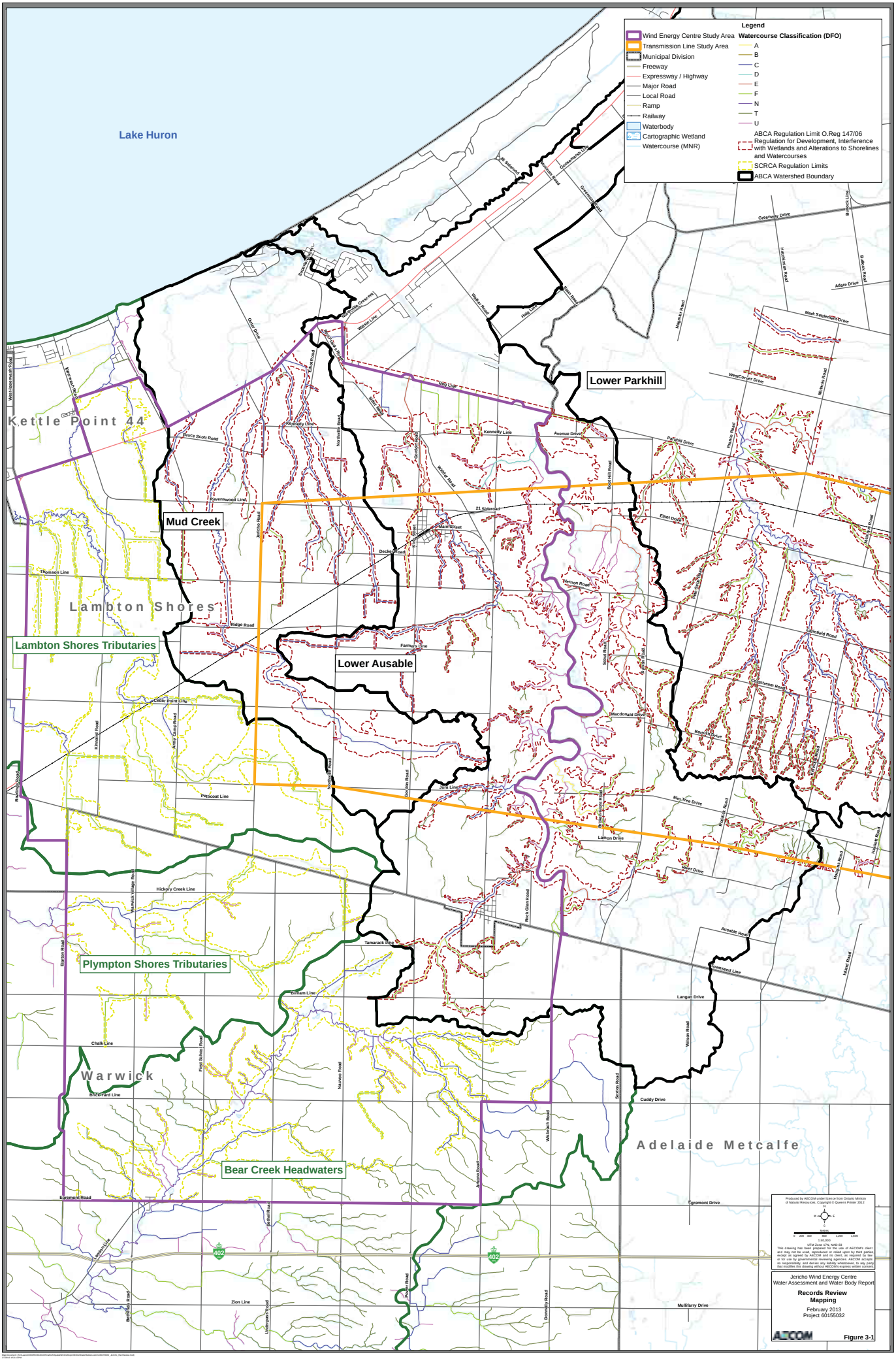
The Project Study Area does not include any inland lakes and is not located within 120 m of the average annual high water mark of a lake. This was confirmed using the NRVIS layers as Ontario Base Maps (OBM) published by MNR and calculation of distances using GIS tools.

No records were therefore reviewed for these water bodies as they do not exist in the Project Study Area.

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).

No records were therefore reviewed for these water bodies as they do not exist in the Project Study Area.


Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Municipal Division
Freeway
Expressway / Highway
Major Road
Local Road
Ramp
Railway
Waterbody
Cartographic Wetland
Watercourse (MNR)
Watercourse Classification (DFO)
A
B
C
D
E
F
N
T
U
ABCA Regulation Limit O.Reg 147/06
Regulation for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses
SCRCA Regulation Limits
ABCA Watershed Boundary
Lake Huron
Kettle Point 44
Lambton Shores
Warwick
Adelaide Metcalfe
Lower Parkhill
Mud Creek
Lower Ausable
Lambton Shores Tributaries
Plympton Shores Tributaries
Bear Creek Headwaters
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Metres
0 200 400 800 1,200 1,600
1:40,000
UTM Zone 17N, NAD 83
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Water Assessment and Water Body Report
Records Review
Mapping
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Figure 3-1

3.2.3 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 and SCRCA (UTRCA, 2010). The Estimated Zones of Potential Recharge and Discharge Areas were determined and presented in Figure A-1 (**Appendix D**). This mapping indicates that there are small pockets of discharge areas identified in the Project Study Area; however this area is classified as a recharge area.

There is no specific mapping available which identifies groundwater seepage areas within the Project Study Area.

3.2.4 Records Related to Permanent or Intermittent Streams

The Project Study Area is within 120 m of the average annual high water mark of permanent or intermittent streams. Therefore the Records Review process was initiated and background information was collected from various sources to confirm the location of these water bodies (as required under O.Reg 359/09), as well as to provide more detailed information to aide in the water bodies effects assessment.

The following sections outline records and data provided by various agencies and other sources, all related to permanent or intermittent streams in the Project Study Area.

3.2.4.1 Ausable Bayfield Conservation Authority (ABCA)

The Project Study Area is located in the Ausable Bayfield Watershed. ABCA provided 2010/2011/2012 watercourse and wetland mapping, drain classifications, Regulated Areas (flooding and erosion hazards mapping) under the Generic Regulation; *Ontario Regulation 97/04 – Development, Interference with wetlands and Alterations to Shorelines and Watercourses*. This information was provided in a GIS framework, and used to identify potential water bodies within the Study Area. ABCA did not have any data on the average high water mark for water bodies within the Project Study Area.

The Project Study Area includes three major subwatersheds within the Ausable Bayfield watershed: Lower Ausable; Mud Creek; and Lower Parkhill subwatersheds (Figure 3-1).

There are 4 main drainage areas located within the ABCA jurisdiction: Ptsebe Creek; the main Ausable River and associated tributaries; Nesbit Drain/Decker Creek/Trick Drain; and Mud Creek (Figure 4-1). Each of these drainage areas are discussed further below.

Ptsebe Creek

Ptsebe Creek is located in the Lower Parkhill subwatershed and flows in a north westerly direction where it converges with Parkhill Creek. The main branch of Ptsebe Creek and associated tributaries are located within the Transmission line study area, east of the Ausable River and for the purpose of this study have been identified as Reach 1 (e.g., R1). There are 6 potential water bodies associated with the Ptsebe Creek that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

Lower Ausable River

The Ausable River located within the Jericho study area is located in the Lower Ausable subwatershed. The Ausable River drains in a north westerly direction into Lake Huron. There are several tributaries that drain into the Lower Ausable River, including Boothill Creek and Hobbs-McKenzie Drain. The Ausable River and its tributaries are

located in the transmission line and wind energy centre study area and for the purpose of this study have been identified as Reach 2 (e.g., R2). There are 41 locations associated with the Ausable River that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

Nesbit Drain, Decker Creek and Trick Drain

This drainage area consists of three systems Nesbit Drain, Decker Creek, Trick Drain and their tributaries that eventually drain into the Ausable River Cut. These three watercourses are located within the Lower Ausable subwatershed. Trick Drain originates South of Farmers Line through a series of fields that are tiled. Trick Drain flows in an easterly direction where it drains into Decker Creek. Decker Creek originates south of Thompson Line and flows in a northerly direction towards the town of Thedford where it merges with Nesbitt Drain which then flows into the Ausable River Cut. Nesbit Drain, Decker Creek, Trick Drain and their tributaries are located in the wind energy centre study area and for the purpose of this study have been identified as Reach 3 (e.g., R3). There are 16 potential water bodies associated with the Nesbit Drain, Decker Creek and Trick Drain that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

Mud Creek

Mud Creek and its associated tributaries are located within the Mud Creek subwatershed. Mud Creek flows in a north westerly direction into Lake Huron. Mud Creek and its tributaries are located in the wind energy centre study area and for the purpose of this study have been identified as Reach 4 (e.g., R4). R4 consists of Upper and Lower Mud Creek Drain, Jericho Creek, Elliot McBryan Drain, Campbell Jameson Drain and Golden Creek Drain and their tributaries. There are 39 locations associated with Mud Creek that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

ABCA Watershed Report Cards

A summary of the key findings from the 2007 Ausable Bayfield Watershed Report Card (ABCA, 2007) for each subwatershed is provided below in Table 3-3. The geology and soil conditions are summarized in the table as well as surrounding land use based on percent found within the subwatershed. Two parameters for water quality are summarized, total phosphorus and benthic invertebrates. Sources of phosphorus include human and animal waste; soil erosion; and fertilizers. Excess phosphorus can lead to eutrophication, leading to algal blooms and a decrease in oxygen available in the water. Benthic macroinvertebrates are commonly used as indicators of watershed health. Their sedentary life history and species differences in tolerance levels to pollutants, means that benthic communities can be used as reliable indicators of water quality.

Table 3-3 Summary of ABCA 2007 Subwatershed Report Cards

Watershed	Geology	Soils	Land Use	Fisheries	Water Quality
Lower Ausable	32% Till Moraines 19% Bevelled Till Plains 19% Till Plains 10% Sand Plains 8% Peat and Muck 7% Clay Plains 4% Sand Beaches and Shore Cliffs 1% Water	47% Clay 18% Silty Clay Loam 14% Sandy Loam 12% Loam 4% Bottomland 2% Sand 2% Silty Loam 1% Organic	76% Agriculture 18% Woodlot 3% Urban	Warmwater fishery in the main channel, baitfish in tributaries. Potential habitat for fish SAR.	• Total Phosphorus – B • Benthic Invertebrates – C
Mud Creek	69% Bevelled Till Plains 25% Till Moraines 6% Sand Beaches and Shore Cliffs	68% Clay 15% Sand 10% Sandy Loam 5% Loam 3% Bottomland	70% Agriculture 24% Woodlot 5% Urban	Warmwater baitfish.	• Total Phosphorus – **C** • Benthic Invertebrates – D

Watershed	Geology	Soils	Land Use	Fisheries	Water Quality
Lower Parkhill	35% Till Moraines 25% Bevelled Till plains 23% Sand Plains 10% Clay Plains 4% Sand Beaches and Shore Cliffs	27% Silty Clay Loam 24% Clay Loam 23% Sandy Loam 11% Loam 6% Silty Loam 5% Clay	83% Agriculture 14% Woodlot 1% Urban	Warmwater fishery in the main channel, baitfish in tributaries.	• Total Phosphorus – C • Benthic Invertebrates - C

Notes: Watershed Report Card Grades and Explanation (ABCA, 2007):
A – Indicates excellent ecosystem conditions and protection may be required. Some areas may require enhancement.
B – Indicates good ecosystem conditions. Some areas may require enhancement.
C – Indicates ecosystem conditions that need to be enhanced.
D – Indicates poor ecosystem conditions that need to be improved.
F – Indicates degraded ecosystem conditions that need considerable improvement.

In general terms, geology in most subwatersheds is dominated by Till Moraines, followed by Bevelled Till Plains, Sand Plains, Clay Plains, Sand Beaches and Shore Cliffs, Peat and Muck, and Water. Soils across all subwatersheds are dominated by Clay, followed by Silty Clay Loam, Sandy Loam, Clay Loam, Loam and Sand. Land use in the area is dominated by agriculture with some woodlots across all three subwatersheds.

According to the ABCA Watershed Report Cards, water quality is fairly similar across all of the subwatersheds in the Project Study Area (ABCA, 2007). The majority of the subwatersheds have ecosystem conditions that need to be enhanced 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. The MOE has established an Provincial Water Quality Objective (PWQO) concentration of 0.03 mg/L for Total phosphorus (TP). All of the TP concentrations in the subwatersheds were above this concentration and ranged from 0.07 mg/L (Lower Ausable) to 0.12 mg/L (Upper Parkhill), indicating nutrient run-off from primarily agricultural sources. The Family Biotic Index (FBI) was used to describe the benthic invertebrates found in sediment samples throughout the subwatersheds. FBI values provide stream health information and the values range from 1 (healthy) to 10 (degraded). FBI values ranged from 5.5 indicating good ecosystem conditions in the Lower Ausable and Upper Parkhill to 7.9 indicating a degraded ecosystem in Mud Creek.

ABCA Fish and Mussel Records

The watercourses located within the Project Study Area all drain into Lake Huron (**Figure 3-1**). The fish community in all three subwatersheds is one of a warmwater thermal regime (ABCA, 2007).

In addition, ABCA provided 27 fish records for the six different watercourses located within the Project Study Area. **Appendix C** presents the locations of the fish records. The fish records identify a total of 48 different fish species within the six watercourses found within the Project Study Area. The fish communities located within the six watercourses are a mix of warmwater, coolwater as well as coldwater species. Two introduced (non-native) species are also found in the Project Study Area- Common Carp (*Cyprinus carpio*) and Rainbow Trout (*Oncorhynchus mykiss*). Table 3-4 provides the fish species identified in the Project Study Area by ABCA as well as their preferred thermal regime, Provincial Ranking (S-Rank), watershed location and watercourse sampled. The S-Ranks are a provincial ranking used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare and natural communities. These are not legal designations and are evaluated on a continual basis and lists are produced annually (NHIC, 2009).

Table 3-4 Fish Records Obtained from ABCA for Seven Watercourses within the Project Study Area

Common Name	Latin Name	Thermal Regime	Provincial Ranking (S-Rank)*[1]	Record Location (Subwatershed)*[2]	Record Location (Watercourse)
American Brook Lamprey	*Lampetra appendix*	Coldwater	S3	LA	Ausable River
Black Bullhead	*Ameiurus melas*	Warmwater	S4	MC	Jericho Creek
Blackchin Shiner	*Notropis heterodon*	Coolwater	S4	LA	Ausable River
Blacknose Dace	*Rhinichthys atratulus*	Coolwater	S5	LA	Hobbs-McKenzie Drain, From Baird Heaman Drain
Blackside Darter	*Percina maculata*	Coolwater	S4	LA	Ausable River, Decker Creek
Bluegill	*Lepomis macrochirus*	Warmwater	S5	LA	Ausable River, Hobbs-McKenzie Drain
Bluntnose Minnow	*Pimephales notatus*	Warmwater	S5	LA, MC, LP	Ausable River, Jericho Creek, Decker Creek, Hobbs-McKenzie Drain, From Dewar-Thompson Drain
Brassy Minnow	*Hybognathus hankinsoni*	Coolwater	S5	LA	Decker Creek
Brook Stickleback	*Culaea inconstans*	Coolwater	S5	LA, MC	Wilcox Drain, Jericho Creek, Hobbs-McKenzie Drain, Golden Creek Drain Branch East, Decker Creek, Boothill Creek, Wilcox Drain
Brown Bullhead	*Ameiurus nebulosus*	Warmwater	S5	LA	Ausable River
Central Mudminnow	*Umbra limi*	Coolwater	S5	LA	Ausable River, Wilcox Drain
Central Stoneroller	*Campostoma anomalum*	Coolwater	S4	LA	Ausable River, Decker Creek
Channel Catfish	*Ictalurus punctatus*	Warmwater	S4	LA	Ausable River
Common Carp	*Cyprinus carpio*	Warmwater	SNA	LA, LP	Ausable River, Decker Creek, From Dewar-Thompson Drain
Common Shiner	*Luxilus cornutus*	Coolwater	S5	LA, MC	Ausable River, Jericho Creek, Decker Creek
Creek Chub	*Semotilus atromaculatus*	Coolwater	S5	LA, MC, LP	Ausable River, Jericho Creek, Decker Creek, Hobbs McKenzie Drain, Golden Creek Drain Branch East, Ptsebe Trib WW F Trib B Trib, Boothill Creek, Wilcox Drain, From Baird Heaman Drain
Emerald Shiner	*Notropis atherinoides*	Coolwater	S5	LA	Ausable River
Fathead Minnow	*Pimephales promelas*	Warmwater	S5	LA, MC	Ausable River, Jericho Creek, Decker Creek, Boothill Creek
Freshwater Drum	*Aplodinotus grunniens*	Warmwater	S5	LA	Ausable River
Gizzard Shad	*Dorosoma cepedianum*	Coolwater	S4	LA, LP	Ausable River, From Dewar-Thompson Drain
Golden Redhorse	*Moxostoma erythrurum*	Warmwater	S4	LA	Ausable River
Greater Redhorse	*Moxostoma valenciennesi*	Warmwater	S3	LA	Ausable River
Greenside Darter	*Etheostoma blennioides*	Warmwater	S4	LA	Ausable River
Green Sunfish	*Lepomis cyanellus*	Warmwater	S4	LA	Ausable River, Decker Creek
Hornyhead Chub	*Nocomis biguttatus*	Coolwater	S4	LA	Ausable River
Johnny Darter	*Etheostoma nigrum*	Coolwater	S5	LA, MC	Ausable River, Jericho Creek, Decker Creek
Largemouth Bass	*Micropterus salmoides*	Warmwater	S5	LA	Decker Creek, Hobbs-McKenzie Drain
Lopperch	*Percina caprodes*	Warmwater	S5	LA, LP	Ausable River, From Dewar-Thompson Drain
Mimic Shiner	*Notropis volucellus*	Warmwater	S5	LA	Ausable River
Northern Hogsucker	*Hypentelium nigricans*	Warmwater	S4	LA	Ausable River
Northern Redbelly Dace	*Phoxinus eos*	Coolwater	S5	LA	Ausable River, Hobbs-McKenzie Drain, Boothill Creek
Pumpkinseed	*Lepomis gibbosus*	Warmwater	S5	MC, LP	Jericho Creek, Decker Creek, From Dewar-Thompson Drain
Quillback	*Carpiodes cyprinus*	Coolwater	S4	LA	Ausable River
Rainbow Trout	*Oncorhynchus mykiss*	Coldwater	SNA	LA	Ausable River
River Chub	*Nocomis micropogon*	Coolwater	S4	LA	Ausable River
Rock Bass	*Ambloplites rupestris*	Coolwater	S5	LA	Ausable River
Rosyface Shiner	*Notropis rubellus*	Warmwater	S4	LA	Ausable River

Common Name	Latin Name	Thermal Regime	Provincial Ranking (S-Rank)*[1]	Record Location (Subwatershed)*[2]	Record Location (Watercourse)
Shorthead Redhorse	*Moxostoma macrolepidotum*	Warmwater	S5	LA	Ausable River
Silver Redhorse	*Moxostoma anisurum*	Coolwater	S4	LA	Ausable River
Smallmouth Bass	*Micropterus dolomieu*	Coolwater	S5	LA	Ausable River
Spotfin Shiner	*Cyprinella spiloptera*	Warmwater	S4	LA, LP	Ausable River, From Dewar-Thompson Drain
Stonecat	*Noturus flavus*	Warmwater	S4	LA	Ausable River
Striped Shiner	*Luxilus cornutus*	Coolwater	S4	LA, MC	Ausable River, Jericho Creek, Decker Creek
Trout-perch	*Percopsis omiscomaycus*	Coldwater	S5	LA	Ausable River
Walleye	*Sander vitreus*	Coolwater	S5	LA	Ausable River
White Crappie	*Pomoxis annularis*	Warmwater	S4	LA	Ausable River
White Sucker	*Catostomus commersonii*	Coolwater	S5	LA, MC	Ausable River, Decker Creek, Hobbs-McKenzie Drain, Golden Creek Drain Branch East, Jericho Creek, Boothill Creek
Yellow Perch	*Perca flavescens*	Coolwater	S5	LA	Ausable River, Decker Creek

*Notes: *1 SRank - Subnational conservation status ranks are assigned for Ontario by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species. S1 – Critically Imperiled, S2 – Imperiled, S3 – Vulnerable, S4 – Apparently Secure, S5 – Secure, SNA – Not Applicable*

**2 MC= Mud Creek; LA = Lower Ausable; LP = Lower Parkhill*

The majority of fish species located in the study area were ranked as S3, indicating it is vulnerable as well as S4 or S5 meaning that they are not rare or of conservation concern, but rather common and demonstrably secure.

ABCA also provided mussel records sampled from 11 stations in the Ausable River between 1998 and 2011. All records provided by ABCA were used to identify both potential water bodies in the Project Study Area and as a basis for assessing the characteristics and significance of the water body. The mussel species identified are presented below in Table 3-5.

Table 3-5 Mussel Records Obtained from ABCA for the Ausable River

Common Name	Latin Name	Provincial Ranking
Black Sandshell	*Ligumia recta*	S3
Creeper	*Strophitus undulatus*	S5
Deertoe	*Truncilla truncata*	S3
Elktoe	*Alasmidonta marginata*	S3
Fatmucket	*Lampsilis siliquoidea*	S5
Flutedshell	*Lasmigona costata*	S5
Fragile Papershell	*Leptodea fragilis*	S4
Giant Floater	*Pyganodon grandis*	S5
Pimpleback	*Quadrula pustulosa*	S3
Pink Heelsplitter	*Potamilus alatus*	S3
Plain Pocketbook	*Lampsilis cardium*	S54
Purple Wartyback	*Cyclonaias tuberculata*	S3
Spike	*Elliptio dilatata*	S5
Threeridge	*Valvata tricarinata*	S4
Wabash Pigtoe	*Fusconaia flava*	S2S3
White Heelsplitter	*Lasmigona complanata*	S4

*Notes: *1 SRank - Subnational conservation status ranks are assigned for Ontario by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species. S1 – Critically Imperiled, S2 – Imperiled, S3 – Vulnerable, S4 – Apparently Secure, S5 – Secure, SNA – Not Applicable*

The majority of mussel species located in the study area were ranked as S3, indicating it is vulnerable as well as S4 or S5 meaning that they are not rare or of conservation concern, but rather common and demonstrably secure.

Four mussel species protected under the ESA, 2007 and SARA were identified within the Ausable River during these surveys.

3.2.4.2 St. Clair Region Conservation Authority (SCRCA)

Only a small portion of the Jericho study area falls under the SCRCA jurisdiction.

SCRCA provided watercourse and wetland mapping, drain classifications, Regulated Areas (flooding and erosion hazards mapping) under the Generic Regulation; *Ontario Regulation 97/04 – Development, Interference with wetlands and Alterations to Shorelines and Watercourses*. This information was provided in a GIS framework, and used to identify potential water bodies within the Study Area. SCRCA did not have any data on the average high water mark for water bodies within the Project Study Area.

The Project Study Area includes three subwatersheds within the St. Clair Region watershed: Bear Creek Headwaters; Lambton Shores Tributaries; and Plympton Shoreline Tributaries subwatersheds. There are 5 main drainage areas located within the SCRCA watershed and include Duffus Creek, Shashawanah Creek, Wood Creek, McPherson Drain and Hickory Creek, and the Bear Creek Headwaters (Figure 4-1). Each of these drainage areas is discussed further below.

Duffus Creek

Duffus Creek is located in the Lambton Shores Tributaries and flow in a north westerly direction into Lake Huron. The main branch of Duffus Creek and associated tributaries are located within the wind energy centre and for the purpose of this study has been identified as Reach 5 (e.g., R5). There are 6 locations associated with Duffus Creek that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

Shashawanah Creek

Shushawanah Creek is located in the Lambton Shores Tributaries subwatershed and flows in a north westerly direction into Lake Huron. The main branch of Shushawanah Creek and associated tributaries are located within the wind energy centre and for the purpose of this study has been identified as Reach 6 (e.g., R6). There are 10 locations associated with Shashawanah Creek that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

Wood Creek

Wood Creek is located in the Lambton Shores Tributaries subwatershed and flows in a north westerly direction into Lake Huron. The main branch of Wood Creek and associated tributaries are located within the wind energy centre and for the purpose of this study has been identified as Reach 8 (e.g., R8). There are 2 locations associated with Wood Creek that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

McPherson Drain, Hickory Creek

McPherson Drain and Hickory Creek and its associated tributaries are located within the Plympton Shorelines Tributaries subwatershed. Both McPherson and Hickory Creek flow in a north westerly direction into Lake Huron. McPherson Drain and Hickory Creek and its tributaries are located in the wind energy centre study area and for the purpose of this study have been identified as Reach 9 (e.g., R9). There are 11 locations associated with McPherson Drain and Hickory Creek that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

Bear Creek

Bear Creek and its associated tributaries are located within the Bear Creek Headwaters subwatershed. Bear Creek flows in a south westerly direction where it drains into the Syndenham River. Bear Creek and its tributaries are located in the wind energy centre study area and for the purpose of this study have been identified as Reach 12 (e.g., R12). There are 5 locations associated with Bear Creek that have been identified through Records Review and intersect with Project Components within the Jericho Study Area.

SCRCA Watershed Report Cards

A summary of the key findings from the 2008 St. Clair Region Watershed Report Card (SCRCA, 2008) for each subwatershed is provided below in Table 3-6. Two parameters for water quality are summarized, total phosphorus and benthic invertebrates. Sources of phosphorus include human and animal waste; soil erosion; and fertilizers. Excess phosphorus can lead to eutrophication, leading to algal blooms and a decrease in oxygen available in the water. Benthic macroinvertebrates are commonly used as indicators of watershed health. Their sedentary life history and species differences in tolerance levels to pollutants, means that benthic communities can be used as reliable indicators of water quality.

Table 3-6 Summary of SCRCA 2007 Subwatershed Report Cards

Watershed	Geology	Soils	Land Use	Fisheries	Water Quality
Bear Creek Headwaters	70% Bevelled Till Plains 16% Till Moraines 10% Till Plains 4% Sand Plains	84% Silt and Clay 5% Loam 5% Silt and Clay Loams 4% Bottomland and Beach 2% Sand Loams	85% Agriculture 11% Woodlot 3% Urban/Industrial	Warmwater fishery community with 46 species. Important habitat for fish SAR.	• Total Phosphorus – D • Benthic Invertebrates – B
Lampton Shores Tributaries	54% Bevelled Till Plains 26% Till Moraines 20% Sand Plains	80% Silt and Clay 9% Silt and Clay Loams 6% Loam 3% Bottomland and Beach 2% Sand Loams	77% Agriculture 19% Woodlot 3% Urban/Industrial	No information available.	• No data.
Plympton Shoreline Tributaries	63% Bevelled Till Plains 37% Till Moraines	90% Silt and Clay 4% Sand Loams 3% Bottomland and Beach 3% Loam	86% Agriculture 11% Woodlot 2% Urban/Industrial	Warmwater fishery community with 23 species.	• Total Phosphorus – No data • Benthic Invertebrates – B

Notes: Watershed Report Card Grades and Explanation (SCRCA, 2008):
A – Indicates excellent ecosystem conditions and protection may be required. Some areas may require enhancement.
B – Indicates good ecosystem conditions. Some areas may require enhancement.
C – Indicates ecosystem conditions that need to be enhanced.
D – Indicates poor ecosystem conditions that need to be improved.
F – Indicates degraded ecosystem conditions that need considerable improvement.

In general terms, geology in most subwatersheds is dominated by Bevelled Till Plains, followed by Till Moraines, and Sand Plains and Till Plains. Soils across all subwatersheds are dominated by Silt and Clay, followed by Silt and Clay Loams, Loam, Bottomland and Beach, and Sand Loams. Land use in the area is dominated by agriculture with some woodlots across all three subwatersheds.

According to the SCRCA Watershed Report Cards, there is very little data for water quality (SCRCA, 2008). The majority of the subwatersheds have good ecosystem conditions with regards to benthic invertebrates. The Bear Creek Headwaters was the only subwatershed with measured total phosphorus and *E. coli* values, total phosphorus levels are creating poor ecosystem conditions and need to be improved. According to the Report Card grading, *E. coli* values need to be improved. The Bear Creek Headwaters total phosphorus concentrations were exactly 0.22 mg/L failing to meet the Provincial Water Quality Objective concentration of 0.03 mg/L for total phosphorus. The Bear Creek Headwaters high total phosphorus value likely reflects that it is a larger river system that is the

receiving water body to several tributaries that primarily flow through agricultural lands. The Family Biotic Index (FBI) was used to describe the benthic invertebrates found in sediment samples throughout the subwatersheds. FBI values provide stream health information and the values range from 1 (healthy) to 10 (degraded). The FBI values in the Bear Creek Headwaters and Plympton Shoreline Tributaries, was 5.7, indicating good ecosystem conditions.

SCRCA Fish Records

SCRCA provided 7 fish records for five different watercourses, two of which are located within the Project Study Area. All records provided by SCRCA were used both to identify potential water bodies in the Project Study Area as well as to provide a basis for assessing the characteristics and significance of the water body. The fish records identify a total of 13 different fish species found within the Project Study Area. The fish communities located within the two watercourses are a mix of warmwater and coolwater species that are commonly found in Southern Ontario. Common Carp, an introduced (non-native) species is found in the Project Study Area. Table 3-6 shows the complete list of fish species identified in the Project Study Area.

Table 3-7 Fish Records Obtained from SCRCA for Two Watercourses within the Project Study Area

Common Name	Latin Name	Thermal Regime	Provincial Ranking (S-Rank)*[1]	Record Location (Subwatershed)*[2]	Record Location (Watercourse)
Black Bullhead	*Ameiurus melas*	Warmwater	S4	PST	Hickory Creek
Blackside Darter	*Percina maculata*	Coolwater	S4	BC, PST	Bear Creek, Hickory Creek
Bluntnose Minnow	*Pimephales notatus*	Warmwater	S5	BC, PST	Bear Creek, Hickory Creek
Common Carp	*Cyprinus carpio*	Warmwater	SNA	BC, PST	Bear Creek, Hickory Creek
Common Shiner	*Luxilus cornutus*	Coolwater	S5	BC, PST	Bear Creek, Hickory Creek
Creek Chub	*Semotilus atromaculatus*	Coolwater	S5	BC, PST	Bear Creek, Hickory Creek
Fathead Minnow	*Pimephales promelas*	Warmwater	S5	PST	Hickory Creek
Green Sunfish	*Lepomis cyanellus*	Warmwater	S4	PST	Hickory Creek
Johnny Darter	*Etheostoma nigrum*	Coolwater	S5	BC, PST	Bear Creek, Hickory Creek
Largemouth Bass	*Micropterus salmoides*	Warmwater	S5	BC	Bear Creek
Northern Redbelly Dace	*Phoxinus eos*	Coolwater	S5	PST	Hickory Creek
Rock Bass	*Ambloplites rupestris*	Coolwater	S5	BC	Bear Creek
White Sucker	*Catostomus commersonii*	Coolwater	S5	BC, PST	Bear Creek, Hickory Creek

*Notes: *1 SRank - Subnational conservation status ranks are assigned for Ontario by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species. - S1 – Critically Imperiled, S2 – Imperiled, S3 – Vulnerable, S4 – Apparently Secure, S5 – Secure, SNA – Not Applicable*

**2 BC= Bear Creek Headwaters; PST = Plympton Shoreline Tributaries*

All of the fish species known to be located in the Project Study Area were ranked as S4 or S5 meaning that they are not rare or of conservation concern, but rather common and demonstrably secure

All records provided by SCRCA were used both to identify potential water bodies in the Project Study Area as well as to provide a basis for assessing the characteristics and significance of the water body.

3.2.4.3 Ministry of Natural Resources

The Project Study Area is located in the Alymer MNR District. Water body, watercourse, wetland layers (NRVIS 2007) and drain classifications were obtained from MNR to identify potential water bodies within the Project Study Area. The Natural Resources and Values Information System (NRVIS) layers were used to identify potential water bodies within the Project Study Area and fish records from the MNR were used to assess habitat sensitivity of water bodies in the Area of Investigation, where data was available.

Fish records were provided by MNR for four watercourses within the Project Study Area. **Appendix C** presents the locations of the MNR fish records. Generally, the watercourses within the study provide suitable habitat for a mix of coolwater and warmwater species that are commonly found in Ontario. The majority of fish species located in the Project Study Area were ranked as S4 or S5 on a provincial scale, meaning that they are not rare or of conservation concern, but rather common and demonstrably secure. One introduced (non-native) species, Common Carp, was also found in the Project Study Area. Fish species identified in the Project Study Area are presented in Table 3-7 below. Some records are from further upstream in the Shashawandan River and Duffus Drain, which are outside of the Project Study Area, but are included here to provide a comprehensive review.

Table 3-8 Fish Records Obtained from MNR for Seven Watercourses within the Project Study Area

Common Name	Latin Name	Thermal Regime	Provincial Ranking (S-Rank)*[1]	Record Location (Subwatershed)*[2]	Record Location (Watercourse)
Black Crappie	*Pomoxis nigromaculatus*	Coolwater	S4	LST	Duffus Drain
Blackside Darter	*Percina maculata*	Coolwater	S4	LST	Shashawandah Creek
Bluntnose Minnow	*Pimephales notatus*	Warmwater	S5	LST	Duffus Drain, Shashawandah Creek
Brook Silverside	*Labidesthes sicculus*	Warmwater	S4	LST	Shashawandah Creek
Brook Stickleback	*Culaea inconstans*	Coolwater	S5	LST, LP	Duffus Drain, Parkhill Creek
Central Mudminnow	*Umbra limi*	Coolwater	S5	LA	Ausable River
Common Carp	*Cyprinus carpio*	Warmwater	SNA	LST, LP	Shashawandah Creek, Parkhill Creek
Common Shiner	*Luxilus cornutus*	Coolwater	S5	LST, LA, LP	Duffus Drain, Ausable River, Shashawandah Creek, Parkhill Creek
Creek Chub	*Semotilus atromaculatus*	Coolwater	S5	LST	Duffus Drain, Shashawandah Creek
Fathead Minnow	*Pimephales promelas*	Warmwater	S5	LST	Duffus Drain
Finescale Dace	*Chromsomus meogaeus*	Coolwater	S5	LP	Parkhill Creek
Gizzard Shad	*Dorosoma cepedianum*	Coolwater	S4	LST	Shashawandah Creek
Johnny Darter	*Etheostoma nigrum*	Coolwater	S5	LST, LA, LP	Shashawandah Creek, Ausable River, Parkhill Creek
Largemouth Bass	*Micropterus salmoides*	Warmwater	S5	LP	Parkhill Creek
Mimic Shiner	*Notropis volucellus*	Warmwater	S5	LST	Shashawandah Creek
Northern Hogsucker	*Hypentelium nigricans*	Warmwater	S4	LA	Ausable River
Northern Redbelly Dace	*Chrosomus eos*	Coolwater	S5	LST	Duffus Drain
Pumpkinseed	*Lepomis gibbosus*	Warmwater	S5	LP, LST	Parkhill Creek, Shashawandah Creek
Rainbow Darter	*Etheostoma caeruleum*	Coolwater	S4	LST, LA	Shashawandah Creek, Ausable River
Rock Bass	*Ambloplites rupestris*	Coolwater	S5	LST	Shashawandah Creek
Redfin Shiner	*Lythrurus umbratilis*	Coolwater	S4	LST	Shashawandah Creek
Smallmouth Bass	*Micropterus dolomieu*	Coolwater	S5	LST, LA	Duffus Drain, Shashawandah Creek, Ausable River
Spottail Shiner	*Notropis hudsonius*	Coolwater	S5	LST	Duffus Drain
White Crappie	*Pomoxis annularis*	Warmwater	S4	LP	Parkhill Creek
White Sucker	*Catostomus commersonii*	Coolwater	S5	LA, LST, LP	Ausable River, Duffus Drain, Shashawandah Creek, Parkhill Creek
Yellow Bullhead	*Ameiurus natalis*	Warmwater	S4	LA, LP	Ausable River, Parkhill Creek

*Notes: *1 SRank - Subnational conservation status ranks are assigned for Ontario by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species. - S1 – Critically Imperiled, S2 – Imperiled, S3 – Vulnerable, S4 – Apparently Secure, S5 – Secure, SNA – Not Applicable*

**2 LA = Lower Ausable; LP = Lower Parkhill; LST = Lambton Shores Tributaries*

3.2.4.4 Upper Tier and Lower Tier Municipalities

The Upper Tier and Lower Tier municipalities contacted did not provide any water bodies information, however they did advise AECOM to contact the local conservation authorities to obtain information related to watercourses and fisheries.

These agencies were contacted through the records review process.

3.2.4.5 Ministry of the Environment

The MOE operates the Provincial Water Quality Monitoring Network (PWQMN) (http://www.ene.gov.on.ca/en/water/lakepartner/index.php) which collects information on the quality of stream-water from over 400 locations across Ontario. Water quality samples are tested in the MOE Laboratory for indicative parameters including chloride, phosphorus, nitrates, suspended solids and chlorides. There are two PWQMN stations located in the Project Study Area; the first is located in the Ausable River (Stn – 08002100202) and the second is located on Decker Creek (Stn – 08002201902) these stations are presented on **Appendix C**. The water quality parameters provided on the PWQMN website are summarized below.

The Ausable River station is located at the crossing of Bog Line northeast of the Town of Thedford. The station is active and data was first collected in 1980. Total phosphorus concentrations over the 8 year sampling period were below 0.26 mg/L. This value is above the Provincial Water Quality Objective (PWQO) of 0.03 mg/L. Nitrates were variable across the 8 year sampling period but remained below 14 mg/L. Suspended solids were below 70 mg/L, however there were 6 occasions where the concentration was between 70 and 140 mg/L. Chloride concentrations were consistently around 26 mg/L over the 8 year sampling period

The Decker Creek station is located at the crossing of Gordon Road, north of the Town of Thedford. The station is currently active and data was first collected in 2000. Total phosphorus concentrations were well below 0.6 mg/L over the 8 year sampling event. One phosphorus concentration was between 0.6 and 1.2 mg/L during the 2008 sampling event. This value is above the Provincial Water Quality Objective (PWQO) of 0.03 mg/L. Nitrates were variable over the 8 year sampling event and did not exceed 18 mg/L. Suspended solids were consistently below 280 mg/L and one record was near 560 mg/L during the 2008 sampling year. Chlorides were consistently below 100 mg/L over the 8 year sampling period with one record near 200 mg/L.

High phosphorus and nitrate concentrations can be attributed to fertilizers and nutrients found in runoff from agricultural fields. Given the location of the study area and the high concentration of the agricultural landuse these concentrations are likely background conditions and concentrations likely increase during the spring freshette and rainfall events. Both of these PWQO stations are located at road crossings where there is likely high concentration of surface water runoff from the road. Chlorides may be high at these stations as they are used during the winter season to salt the roads.

These stations may be used as reference stations during the construction phase of the wind energy centre. Particularly phosphorus and total suspended solids which has the potential to impact streams from changes in surface water drainage and runoff.

3.2.4.6 Environment Canada

Environment Canada's Water Survey of Canada Water Office (http://www.wateroffice.ec.gc.ca) website was used to access water level and flow data for the Project Study Area. **Appendix C** presents the locations of the Environment Canada flow stations. Two sites were found within the Project Study Area (02FF010 and 02FF004). Station (02FF010) is located on the Ausable River at Bog Line/Parkhill Drive. This station provides real-time hydrometric data and has been recording water level since 1997. Data downloaded during the timeframe of field investigations from May 2012 to August 2012 indicated that the river has maintained a mean water level of approximately 1.6 m with a maximum water level of 4.3 m and a minimum water level of approximately 0.9 m. Station (02FF004) is located on South Parkhill Creek at Elliot Drive. This station has recorded seasonal flow from 1955 to 1965, continuous flow since 1966 and flow and water level since 2002. Data downloaded during the timeframe of field investigation from May 2012 to August 2012 indicated that the river had maintained a mean water level of approximately 1.6 m with a maximum water level of 2.4 m and a minimum water level of approximately 1.3 m.

Aside from this summary of available data, the records from Water Survey of Canada were not used any further to aide in the classification of water body sensitivities These data can be used to understand the high water levels that flow through the systems in the study area and the associated response times.

3.2.4.7 Ontario Ministry of Agriculture, Food and Rural Affairs and DFO Drain Classification

Municipal and agricultural drains were identified by using the OMAFRA Agricultural Information Atlas available at http://www.omafra.gov.on.ca/english/landuse/drain-map.htm. Constructed drain mapping was overlaid on the Jericho Study area and water bodies were classified as channelized, natural or tiled and this information was used to help inform water body sensitivity. Municipal Drains are described as drainage systems located primarily in agricultural areas of Ontario that may consist of either ditches or closed systems such as pipes or tiles, grasses waterways, storm water detention ponds, culvert and bridges. Some creeks and small rivers may also be considered municipal drains (OMAFRA, 2011).

According to OMAFRA the study area falls within the Williams, Bosanquet, Warwick and Adelaide Township drainage zones.

In addition, the Department of Fisheries and Oceans (DFO) Drain Classification was obtained from ABCA, SCRCA and MNR. Construction and maintenance of agricultural drains is regulated under the Ontario *Drainage Act*. The Class Authorization process was developed by DFO to help streamline the review and approval process for drain maintenance to protect fish and fish habitat under the *Fisheries Act*. The Class Authorization System classifies drains into six categories based on the sensitivity of the fish habitat (Table 3-9). ABCA and SCRCA included two additional drain type classifications (T) which indicates a tiled feature and (U) which indicates a drain that is not classified. SCRCA also provided a N-class which indicates a natural channel. Drains are classified by local Conservation Authorities and are based on field data and knowledge of the area. The sensitivity of drains is classified according to the following parameters (DFO, 2012):

Flow ..... Permanent watercourses are more sensitive than intermittent watercourses that are dry for more than two consecutive months.

Temperature..... Cold/cool water watercourses are more sensitive than warm water watercourses.

Fish Species ..... The presence of sensitive fish species (e.g., trout, bass, sculpin and pike) and fish species identified under the federal *Species at Risk Act* indicates the presence of a more sensitive habitat.

Stability..... A watercourse that has not recently undergone a full clean-out has most likely reached a higher state of ecological stability. The combined productivity of riparian vegetation and in-stream habitat components can be easily disrupted by maintenance activities.

Table 3-9 provides the Drain Classifications used for the water body assessments below.

Table 3-9 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)

All drain classifications provided by ABCA and SCRCA were used to either identify potential water bodies in the Project Study Area and provided a basis for assessing the characteristics of the water body. The drainage information from the OMAFRA website was used to confirm findings from the site investigations (e.g., where a tiled watercourse was observed in the field).

The majority of the watercourses within the Jericho Project Study Area are classified as C-class (permanent warmwater systems – no sensitive species or communities) and tiled with some watercourses classified as F-class (intermittent/ephemeral systems) and unclassified. There are a few watercourses that are classified as E-class (permanent warmwater systems with some sensitive species and/or communities present) and one watercourse classified as D-class (permanent cold/coolwater – sensitive species or communities).

3.2.4.8 Air Photo Interpretation

The air photo interpretation was conducted using 2010 aerials for the 2012 site investigations. In addition, NRVIS layers, Conservation Authority (CA) GIS layers and 1 m contours were used 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.

Several swale features were identified from this review process, mainly from the presence of darker areas indicating the potential location of water or wetted areas. These areas were ground-truthed during the site investigations. Air photo interpretation was also used to assess potential water bodies where land access was denied. The results of the air photo interpretation are presented below in Table 4-6.

3.2.5 Species of Conservation Concern and Species at Risk (SAR)

The Natural Heritage Information Centre (NHIC) Biodiversity Explorer was searched for records of species at risk and conservation concern. As defined in the *Significant Wildlife Habitat Technical Guide* (MNR, 2000), species that may be considered species of conservation concern include:

- *species identified as Nationally Endangered or Threatened by the Committee on the Status of Endangered Wildlife in Canada, which are not protected in regulation under Ontario's Endangered Species Act;*
- *species identified as Provincially Vulnerable based on lists of Vulnerable, Threatened, Endangered or Extirpated Species of Ontario that are updated periodically by the OMNR;*
- *species that are listed as rare or historical in Ontario based on records kept by the Natural Heritage Information Centre in Peterborough (S1 is extremely rare, S2 is very rare, S3 is rare to uncommon);*
- *species whose populations are known to be experiencing substantial declines in Ontario;*
- *species that have a high percentage of their global population in Ontario and are rare or uncommon in the planning area;*
- *species that are rare within the planning area, even though they may not be Provincially rare;*
- *species that are subjects of recovery programs; and*
- *species considered important to the municipality, based on recommendations from the Conservation Advisory Committee.*

The NHIC data 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 species designated as Endangered or Threatened in the Province of Ontario is excluded from this report. As noted above, Endangered and Threatened species are addressed through a parallel Species at Risk review and approval process under the *Endangered Species Act* (2007) administered by the MNR Guelph District.

There are seven fish species of conservation concern (ranked S1-S3) and seven mussel species that were identified as occurring or having the potential to occur within the Project Study Area (Table 3-10). This list does not include species that are listed and protected under ESA (2007), as Threatened or Endangered. This was confirmed from a screening of the MNR fish records, DFO Species at Risk mapping and DFO SAR screening as outlined above.

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 be within the Project Location and/or adjacent lands, are being considered in consultation with the appropriate agencies. Reporting related to the protection of these Species at Risk is being provided to the appropriate agency under separate cover. This 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 3-10 Species of Conservation Concern

Common Name	Scientific Name	Type of Species	S-rank	COSEWIC Status	MNR Status	Preferred Habitat	Last Observed Date	Source
American Brook Lamprey	*Lampetra appendix*	Fish	S3	NAR	NAR	The adult American Brook Lamprey prefers gravel/sand riffles and runs of creeks and small to medium sized rivers with strong flow and clear water. Ammocoetes prefer sandy or silty pools.	(2009) Ausable River	ABCA Fish Records
Black Sandshell	*Ligumia recta*	Mussel	S3	NAR	NAR	Black Sandshell inhabits medium to large sized rivers in riffles or raceways in gravel or firm sand and occasionally mud. They are often found in very shallow water.	(1998-2011) Ausable River	ABCA Mussel Records
Blackstripe Topminnow	*Fundulus notatus*	Fish	S2	SC	SC	Blackstripe Topminnows prefer sluggish rivers and streams with low gradients, where there is extensive edge cover offered by plants. This fish tolerates waters with high turbidity. During the summer, Blackstripe Topminnows are found near the surface, but in the winter they are found in deeper waters.	Ausable River	DFO
Chestnut Lamprey	*Ichthyomyzon castaneus*	Fish	S1?	SC	NAR	The Chestnut Lamprey inhabits large creeks and main channels of small to medium sized rivers. Chestnut lampreys live their entire life in coolwater streams, mostly as an ammocoete buried in soft bottoms of silt and sand in pools and backwaters.	(2012) Ausable River	DFO SAR Mapping
Deertoe	*Truncilla truncata*	Mussel	S3	NAR	NAR	Deertoe is typically found in medium to large sized rivers and shallow areas of the Great Lakes in mud, sand or gravel.	(1998-2011) Ausable River	ABCA Mussel Records
Elktoe	*Alasmidonta marginata*	Mussel	S3	NAR	NAR	Elktoe prefer small to medium sized rivers in gravel or mixed sand and gravel in riffles. They are usually found deeply buried in the substrate.	(1998-2011) Ausable River	ABCA Mussel Records
Grass Pickerel	*Esox americanus vermiculatus*	Fish	S3	SC	SC	The habitat of the Grass Pickerel is characterized by warm, slow-moving streams, ponds and shallow bays of larger lakes, with clear to tea-coloured water, and abundant aquatic vegetation. Bottom substrate is usually mud with exceptions of rock and gravel. Adults reach sexual maturity by two years of age.	(2012) Ausable River	DFO SAR Mapping
Greater Redhorse	*Moxostoma valenciennesi*	Fish	S3	NAR	NAR	The Greater Redhorse prefers moderate to swift current riffles, runs and pools of medium to large rivers with clear water and substrates of gravel, cobble or boulders; lakes.	(2009) Ausable River	ABCA Fish Records
Northern Brook Lamprey	*Ichthyomyzon fossor*	Fish	S3	SC	SC	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 (Manion and Hanson 1980). 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 lampreys are usually found in depositional areas with soft silt and sand substrate.	(2012) Ausable River	DFO SAR Mapping
Pimpleback	*Quadrula pustulosa*	Mussel	S3	NAR	NAR	Pimpleback inhabits medium to large sized rivers and reservoirs in substrates of coarse gravel, sand and silt in flowing water.	(1998-2011) Ausable River	ABCA Mussel Records
Pink Heelsplitter	*Potamilus alatus*	Mussel	S3	NAR	NAR	Pink Heelsplitter is typically found in medium to large sized rivers in mixed mud, sand and gravel. They are especially abundant in quiet backwaters.	(1998-2011) Ausable River	ABCA Mussel Records
Purple Wartyback	*Cyclonaias tuberculata*	Mussel	S3	NAR	NAR	Purple Wartyback inhabit small to large rivers in gravel or mixed sand and gravel, in areas with moderate to swift current.	(1998-2011) Ausable River	ABCA Mussel Records
River Redhorse	*Moxostoma carinatum*	Fish	S2	SC	SC	River Redhorses inhabit moderate to large rivers where the current is fast, and the bottom is composed of stones, rubble and bedrock with very little siltation.	(2012) Ausable River	DFO SAR Mapping
Wabash Pigtoe	*Fusconaia flava*	Mussel	S2S3	NAR	NAR	Wabash Pigtoe typically inhabits medium to large sized rivers, as well as small creek and the Great Lakes in mud, sand or gravel.	(1998-2011) Ausable River	ABCA Mussel Records

1. ***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.*

2. **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.*

3. **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

Data collected during the Records Review stage, in particular the 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 162 locations where the Project Location overlapped with a water body or potential water body.

Of these 162 sites, 136 locations were identified as potential permanent or intermittent streams within the Project Location, while the remaining 26 sites were identified as potential ponds. These were included in the mapping for site investigations as it is important to assess their current ecological function and to determine whether they meet the criteria for REA water body after field assessment. Therefore a total of 162 sites were carried forward to field investigations as shown in Table 3-11.

Table 3-11 Summary of Potential Water Bodies in the Project 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	162
Within 120 m of a seepage area	0

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

Several of the potential water bodies located within the Project Study Area are classified as municipal drains.

Review of background records show that water quality within these drains is largely impacted from surrounding agricultural land use. All six watersheds show impacted systems with a watershed report card (ABCA and SCRCA) score of C with the exception of the Plympton Shoreline Tributaries which was given a B and Lambton Shores Tributaries which had no data. A report card score of C indicates that ecosystem conditions needs to be enhanced, while a score of B indicates good ecosystem conditions, some areas may require enhancement. The main water quality concern within these watersheds is related to the concentrations of total phosphorus and *E. coli*.

The Records Review suggested that water bodies in the Project Study Area may provide habitat for a mix of coolwater and warmwater fish species in particular, Cyprinids, Centarchides, Catostomidae and Percidae. The majority of species found from the background review were Provincially Ranked (S-Rank) as S4 or S5 meaning that they are common and demonstrably secure.

The Records Review highlighted seven fish species and seven mussel species of conservation concern in the Project Study Area. Fish species Greater Redhorse, American Brook Lamprey, Northern Brook Lamprey, and Grass Pickeral and mussel species Black Sandshell, Deertoe, Elktoe, Pimpleback, Pink Heelsplitter, and Purple Wartyback are ranked as S3. Fish species Blackstripe Topminnow and River Redhorses are ranked as S2. Wabash Pigote, a mussel species is ranked as S2S3, in between vulnerable and special concern. Chestnut Lamprey, a fish species is ranked as S1. All of the above mentioned species were only recorded in the Ausable River in the Project Study Area.

During the Records Review process five (5) fish and ten (10) mussel species at risk were identified as occurring or having the potential to occur, within the Project Study Area. The occurrence of these species is largely concentrated within the Ausable River, Hobbs-Mackenzie Drain a tributary to the Ausable River, as well as Bear Creek. The protection of these Species at Risk is being reported under separate cover and will not be considered further in this report.

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 water bodies within 120 m of the Project Location and of land within 30 m of such water bodies 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.

4.2 Site Investigation Methodology

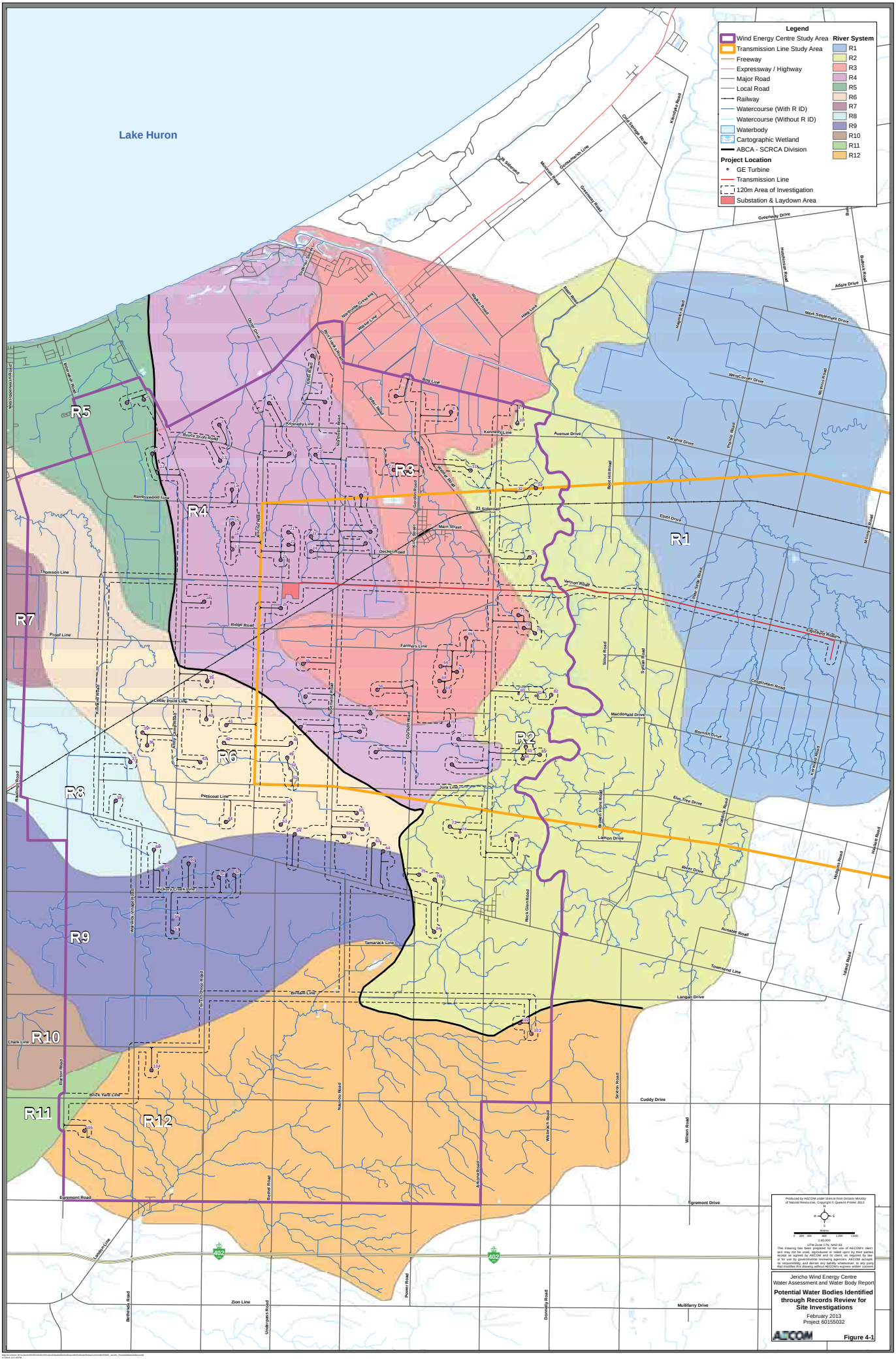
Site investigations were conducted for water bodies within 120 m of the Project Location (see Section 1.2 for further details on the project components and infrastructure). Water bodies identified through the Records Review process were assessed to determine their presence, composition, form and function. 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 4.5.

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) provided below in Section 4.2.2 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 potential water bodies were 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 Project Study Area, any seepage areas and water bodies were recorded. These were cross-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 through other site visits, 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, this information was documented and mapping was updated and noted in the correction to Records Review (Section 4.5).


Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Freeway
Expressway / Highway
Major Road
Local Road
Railway
Watercourse (With R ID)
Watercourse (Without R ID)
Waterbody
Cartographic Wetland
ABCA - SCRCA Division
Project Location
GE Turbine
Transmission Line
120m Area of Investigation
Substation & Laydown Area
River System
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
Lake Huron
R1
R2
R3
R4
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Produced by AECOM under licence from Ontario Ministry of Natural Resources, Copyright © Queen's Printer 2012
Metres
0 200 400 800 1,200 1,600
1:40,000
UTM Zone 17N, NAD 83
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Jericho Wind Energy Centre
Water Assessment and Water Body Report
Potential Water Bodies Identified through Records Review for Site Investigations
February 2013
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; ponds; or a seepage area based on observations made at the time of the field visit. AECOM divided the study area into 12 river systems and these are identified as River Systems 1 through 12, see Figure 4-1. The 12 river systems were delineated based on drainage and overland flow paths. Within each river system individual drainage networks were broken down according to main channels and minor tributaries. The main channels were given the ID value of R1-R12, while minor tributaries were assigned ID's based on their location in regards to the main channel (i.e., R1.106). All ID's started at the mouth of the individual river systems. The major and minor channels were given an ID value regardless of whether they were within proximity to the Project Location. Only 9 out of the 12 river systems overlap with the 120 m Area of Investigation for Project Components. River systems 1-4 are located within the ABCA watershed and 5, 6, 8, 9 and 12 are located within the SCRCA watershed.

- R prefix– identified potential water bodies within the vicinity of project components (*e.g.,* R12);
- P prefix – 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 Area of Investigation and land parcel. This approach allowed for a thorough characterization and for an accurate assessment of effects and appropriate mitigation measures.

A field work form (see **Appendix E**) was completed for each water body investigated (or feature, if no water body was found). Information recorded including date of investigation, field staff, start and end time of assessment, weather conditions and location of the assessment. An overall assessment of the water body was conducted 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 surrounding natural features and land uses.

Channel dimensions, substrate composition, channel morphology and bank stability were collected in the field. Measurements were taken at more than one location along the water course and mean values were averaged in the field and recorded, including:

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

Average high water mark data were not available from the Conservation Authorities or any other information sources contacted in the Records Review phase. Therefore, in its place the protocol under 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.

Stream morphology was assessed to describe habitat during the water body assessments, these include:

Runs: are typically deep, fast moving water with little to no turbulence of water

Riffles: are shallow, fast moving water typically running over rocks. Riffles provide areas of high oxygenated waters

Flats: low flowing water with a smooth un-agitated surface

Pools:..... are described as deep pockets of slow moving water that provide ideal habitat for fish

Substrate composition (e.g., clay, silt, sand, gravel, cobble, rock, boulder, muck and detritus) was recorded in descending order of dominance. Visual observations of water clarity, water colour, presence and type of macrophytes and algal growth, evidence of runoff, and surrounding land use, were recorded as indicators for water

quality. Basic field parameters of water chemistry (pH, conductivity, dissolved oxygen and temperature) were collected. Bank height measurements and presence of mature riparian vegetation, exposed root structures, and slumping or scouring were used to determine bank stability.

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 technical knowledge and the parameters recommended by DFO under its definition of fish habitat. Along with background data, including thermal regime and species occurrence records, an assessment of the likelihood of fish presence was presented. These parameters include the availability and quality of habitat features such as in-stream and riparian covers, as well as morphological conditions and connectivity of the water bodies to allow fish passage. 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'. The following characteristics were assessed and recorded for each water body and used in determination of habitat sensitivity for each water body.

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 observation of 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 recorded, 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 to identify areas of rolling hills or flat areas where water is more likely to accumulate in depressions versus flowing towards the watercourse.

Ecological Land Classification (Lee *et al.* 1998) was undertaken as part of the NHA by certified ELC ecologists and was used to describe the lands within 30 m of a water body and provide an indication of the riparian zone. This included documenting vegetation species present (e.g., trees, shrubs, grasses and herbaceous cover), percent of cover within study reach and width 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 (MOE, 2011):

- Occurrence of watercress (*Nasturtium officinale*), bittercress (*Cardamine pensylvanica*) and water speedwell (*Veronica anagallis-aquatica*);
- Presence of iron staining as indicated through red rust coloured soils along banks and stream beds;
- Bank seepage;
- Air bubbles in the stream bed.

Pond features were also assessed during the water assessment. Characteristics documented included type of pond (e.g. dugout, online, agriculture) and their surrounding landuse, percentage and type of in-situ habitat, estimated size of the pond and observations of wildlife and fish.

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

4.2.3 Alternative Site Investigation

As discussed in Section 4.4.3 below, in certain instances, it was necessary to conduct an Alternative Site Investigations (ASI), 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 and where possible, field investigations of water bodies upstream or downstream of the Area of Investigation were undertaken at road crossings or adjacent properties with land access.

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 (under REA) and examined the surrounding natural features or land use. For pond features that could not be accessed, air photo interpretation was used to determine if pond was REA or non-REA water body. If pond appeared isolated and in agricultural field, the pond was assumed to be non-REA, if the pond appeared to be connected to downstream watercourses, pond was classified as a REA water body.

Sites that were assessed by an Alternative Site Investigation are summarized in **Appendix F** and findings from the ASI and water bodies assessment are presented below in Table 4-3.

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 4-1**. This system provided some objectivity to the assessment process and incorporated some of 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. 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 4-1 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 should be resilient to change and perturbation**	**System is quite 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 determined to be non-REA water bodies as they did not meet the criteria for a water body under O.Reg. 359/09, and therefore were not assessed further.

Pond features were also assessed during the water body site investigations to determine if they were REA or non-REA water bodies. Ponds that were dugout, temporarily ponded or used for agricultural purposes were confirmed as non-REA water bodies. Pond features that were online or conveyed water to downstream systems were assessed as REA water bodies.

4.4 Results of Site Investigations

4.4.1 Summary of Site Investigations

A summary of site investigations is presented in **Appendix G**, and includes the date of investigation, duration, sites investigated that day, weather conditions, and names and qualifications of AECOM staff conducting the investigations. In some cases, sites were visited more than once if the 120 m Area of Investigation was updated or changed during the micro-siting process by NextEra. **Appendix G** contains detailed field notes for each site visit, and **Appendix H** contains the relevant qualifications (i.e., curriculum vitae) for all investigators.

4.4.2 Water Body Assessments

Based on the water body assessments that were conducted (as outlined in Sections 4.2.1- 4.2.3), the occurrence of water bodies within 120 m of the Project Location is documented below (**Table 4-2**). 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 bodies that are located within the 120 m Area of Investigation 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.

Information from Records Review is also provided in Table 4-2, including the watercourse name and DFO drain classification, if available for that particular watercourse. Fish records, watercourse name and DFO drain classification are not available for pond features. Information from both Records Review and field-based site investigations for each feature, provides some indication of the overall sensitivity of the site based on the available information. The table is organized according to Feature ID and includes:

- Associated proposed infrastructure within 120 m of the feature;
- Details of the site investigation, including date of site visit;
- A brief description of the site and surrounding land use;
- Description of the feature summarized from the field notes;
- Channel morphology measurements taken at the time of the investigation;
- Watercourse/drain name (if available);
- Fish records (if available);
- Presence of groundwater indicators;
- DFO drain classification (if available); and,
- Feature sensitivity based on criteria outlined in Table 4-1.

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.2	• Transmission Line Crossing	June 12, 2012	• The watercourse flows through a mix of deciduous forest, cultural meadow (classified as CUM1-1, FOD5-8, FOD7a, ELC Feature ID 90) and some soy bean fields. Roadside drainage was present at Elginfield Road. The watercourse is located in a valley. Riparian buffer is greater than 20 m.	• The watercourse is a defined natural feature. The watercourse is mostly flat channel with a few pools and riffles present. The water was turbid and had moderate flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Substrate consists of sand, silt, clay and gravel. Canopy cover is low and is dominated by shrubs. Instream habitat cover is low and consists of woody debris, cobble and boulders. No groundwater indicators were observed. A school of YOYs was observed at time of investigation. Fish species found at Elginfield Road consist of baitfish community, Rainbow Trout, Smallmouth Bass, Freshwater Drum, Quillback, Walleye, Gizzard Shad, American Brook Lamprey, Rock Bass, Brown Bullhead, Bluegill, White Crappie, Yellow Bullhead and Stonecat (ABCA, 2004, 2007, 2009; MNR 1974).	High

Watercourse Name	Ausable River
DFO Drain Classification	E

	R2.2
MWW(m):	12
MBW(m):	14

	R2.2
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.14*	• Collection Line Crossing and Buffer	May 15, 2012 May 24, 2012 May 30, 2012	• The watercourse flows through a mix of meadow marsh and swamp thicket (classified as MAM3-2, SWT3a, ELC Feature ID 249) surrounded by soybean fields originating as a tile drain. The watercourse becomes dammed to the north, creating a pond (P2.136) and continues flowing north into a mix of meadow marsh, swamp thicket and deciduous forest (classified as MAM3-8, SWT3-5, FOD6b, ELC Feature ID 250). The watercourse crosses Arkona Road and flows through a mixed forest (FOM6-2, ELC Feature ID 263) at the north end of the study area. Multiple seeps and iron staining were present throughout the meadow marsh areas. Surrounding topography is rolling hills sloping towards the watercourse. The riparian buffer is 10 m.	• The watercourse is a defined natural feature. The watercourse is mostly flat but meanders. The water was clear and was flowing slowly at time of investigations. The system is classified as a permanent cold/cool water system by ABCA. The banks are stable and well vegetated. Substrate is dominated by silt and muck, followed by sand and clay. Canopy cover is low, except in the deciduous forest where it is high. Instream habitat cover is low and consists of aquatic vegetation, vegetation debris, undercut banks and woody debris. Groundwater indicators were present in the form of iron staining and bank seeps. Downstream fish species at Arkona Road, consist of baitfish community (ABCA, 2001, 2003).	High

Watercourse Name	Marrison Drain
DFO Drain Classification	D

	R2.14
MWW(m):	0.73
MBW(m):	1.9

	R2.14
MWD(m):	0.15
MBD(m):	0.42

Photos

Photograph 1. Channel view in southern section ↑

Photograph 2. Channel view in forest ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.136	• Collection Line Buffer	May 15, 2012	• The pond is located in a forested area beside a residence. The pond is 80 m by 30 m. The pond is online with a riparian buffer greater than 3 m of trees and grasses.	• R2.14 is dammed by a manmade structure creating the pond. The water was turbid at time of investigation. *In-situ* cover contains algae and grasses around the perimeter of the pond.	Moderate

Photos

Photograph 1. Pond overview ↑

Photograph 2. Dam ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.18*	• Collection Line Buffer • Road Buffer • Turbine 31	May 15, 2012	• The watercourse is surrounded by deciduous forest (classified as FOD6b, FOD5-8, ELC Feature ID 250). Flowing tile drains were present at time of investigation. The surrounding land topography is slightly hilly. Riparian buffer is greater than 10 m.	• The watercourse is a defined natural feature. The watercourse meanders through the deciduous forest. The water was clear and had very slow flow at time of investigation. It is classified as unknown by ABCA. The banks are stable and well vegetated. Substrate is dominated by muck followed by clay silt and sand. Canopy cover is moderate and is dominated by trees. Instream habitat cover is high and consists of woody debris and aquatic vegetation followed by undercut banks. Groundwater indicator iron staining was observed throughout the watercourse. Downstream fish species at Arkona Road, consist of baitfish community (ABCA, 2001, 2003).	High

Watercourse Name	Wilcox Drain Branch
DFO Drain Classification	U

	R2.18
MWW(m):	0.7
MBW(m):	1.2

	R2.18
MWD(m):	0.05
MBD(m):	0.15

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.18*	• Collection Line Buffer • Road Buffer	May 15, 2012	• The pond is located in a deciduous forest (classified as FOD5-8, FOD6b, ELC Feature ID 250) surrounded by agricultural fields.	• The pond could not be assessed because access was not granted. Pond appears to be connected to R2.18.	High

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.51	• Transmission Line Crossing	June 1, 2012	• The watercourse flows through a mix of deciduous forest, swamp thicket, deciduous swamp and shallow marsh (classified as FOD7-2, FOD5-1, SWD3-3, SWT2-5, MAS2-1, ELC Feature ID 90) and crosses Elginfield Road. No tile drain inputs were noted at time of investigation. Surrounding topography is rolling hills. Riparian buffer is greater than 15 m.	• The watercourse is a defined natural feature. The watercourse follows a riffle/run sequence. The water was turbid and had low flow at the time of investigation. It is classified as unknown by ABCA. Banks are slightly unstable with evidence of erosion throughout the site. Substrate is dominated by silt followed by gravel, cobble and boulders. Canopy cover is high and dominated by trees. Instream habitat cover is low and consists of cobble, boulders and woody debris. No groundwater indicators observed. Fish are present approximately 400 m downstream in the Ausable River.	High

Watercourse Name	Ausable River Trib
DFO Drain Classification	U

	R2.51
MWW(m):	0.2
MBW(m):	2.0

	R2.51
MWD(m):	0.02
MBD(m):	0.6

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.70	• Transmission Line Buffer	June 12, 2012	• The watercourse begins as groundwater seeps and flows through deciduous forest, shallow marsh and cultural plantation (classified as CUP3-2, MAS2-1, FOD6a, ELC Feature ID 90). No tile drain inputs were noted at time of investigation. Surrounding topography is a valley sloped towards the watercourse. Riparian buffer is greater than 6 m.	• The watercourse is a defined natural channel. The watercourse was all run. The water was clear and had moderate flow at time of investigation. It is classified as unknown by ABCA. Banks are stable and well vegetated. Substrate is dominated by sand followed by silt, clay and organics. Canopy cover is high and is dominated by trees. Instream habitat cover is low and consists of only woody debris. The headwaters begin as a seep which is a groundwater indicator. The water level was very low creating a potential low flow barrier to fish passage.	High

Watercourse Name	Ausable River Trib WW Cc
DFO Drain Classification	U

	R2.70
MWW(m):	0.35
MBW(m):	0.45

	R2.70
MWD(m):	0.05
MBD(m):	0.07

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.73	• Road Buffer • Turbine 79	May 11, 2012	• The watercourse originates as bank seepage in a deciduous forest (classified as FOD7-4, ELC Feature ID 90) surrounded by agricultural fields. No tile drain inputs were observed. Surrounding topography is steep valley sloped towards the watercourse. Riparian buffer is greater than 50 m.	• The watercourse is a defined natural feature. The watercourse follows a riffle/run sequence. The water was clear and had moderate flow at time of investigation. The system is classified as unknown by ABCA. Banks are stable and well vegetated. Substrate is dominated by cobble followed by sand, gravel and detritus. Canopy cover is high and is dominated by trees. Instream habitat cover is high and dominated by aquatic vegetation followed by woody debris and detritus. The watercourse begins with bank seepage, a groundwater indicator. Fish are present approximately 1 km downstream in the Ausable River.	High

Watercourse Name	Ausable River Trib
DFO Drain Classification	U

	R2.73
MWW(m):	0.9
MBW(m):	3.0

	R2.73
MWD(m)	0.05
MBD(m):	0.8

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.101	• Collection Line Crossing • Road Crossing • Turbine 83	May 2, 2012	• The watercourse begins in a crop agricultural field, where it has been buried and ploughed over. It emerges through a tile drain into a mix of deciduous forest, meadow marsh and deciduous swamp (classified as FOD7-2, FOD5-1, SWD3-3, MAM2-2, ELC Feature ID 90). The surrounding land topography is valley and hills. Riparian buffer is greater than 30 m. This is a tributary to the Ausable River.	• The watercourse is classified as tiled in the agricultural field and unknown in the forested area by ABCA. There is no surface water feature in the field. The watercourse in the forested area is a defined natural feature and is described as permanent. The watercourse follows a riffle/run/pool sequence. The water was clear and flowing slowly at the time of investigation Banks are moderately unstable. Substrate is dominated by cobble and sand followed by boulder and gravel. Canopy cover is high and dominated by trees. Instream habitat cover is high and is dominated by cobble and detritus followed by woody debris. Groundwater indicators watercress and bank seepage were observed. Fish are present approximately 1 km downstream in the Ausable River.	High

Watercourse Name	Glenn Drain Trib B
DFO Drain Classification	T, U

	R2.101
MWW(m):	1.1
MBW(m):	1.5

	R2.101
MWD(m)	0.09
MBD(m):	0.4

Photos

Photograph 1. Site overview in agricultural fields ↑

Photograph 2. Site overview in forest ↑

Photograph 3. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R1.2*	• Transmission Line Crossing	June 18, 2012	• The watercourse is flows through a mix of meadow marsh, cultural meadow and cultural woodland (CUM1-1, CUW1m, MAM2-2, ELC Feature ID 341 and 351), crosses Elginfield Road into livestock pasture. No tile drains were noted at time of investigation. Surrounding topography is rolling hills, with the watercourse located in a small valley. Riparian buffer is greater than 15 m to the south of Elginfield Road.	• The watercourse is a defined channelized feature that is starting to naturalize. The watercourse is mostly flat with some run. The water had visible flow at time of investigation. It is classified as a permanent warm water system by ABCA. Banks are stable and well vegetated to the south. To the north the banks are slightly to moderately unstable with erosion and slumping present. Substrate consists of silt and clay. Canopy cover is low and is dominated by grasses. No groundwater indicators were observed. Downstream fish species consists of baitfish community and Yellow Bullhead (MNR, 1974). Approximately 4.5 km upstream, fish species includes Creek Chub (ABCA, 1999).	Moderate

Watercourse Name	Ptsebe Trib WWF
DFO Drain Classification	C

	R1.2
MWW(m):	0.5
MBW(m):	1.5

	R1.2
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview south of Elginfield Road↑

Photograph 2. Site overview north of Elginfield Road↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R1.49*	• Transmission Line Crossing	June 12, 2012	• The watercourse is surrounded by corn fields, deciduous forest, cultural meadow (classified as FOD7-4, CUM1-1, ELC Feature ID 340 and 351) and pasture crossing Elginfield Road. No tile drain inputs were observed at time of investigation. Surrounding topography is slightly hilly. Riparian buffer is 15 m on the left bank and 5 m to 15 m on the right bank.	• The watercourse is possibly a natural feature that has been slightly altered. The watercourse meanders and consists of flats with some pools present. No flow was observed at time of investigation. It is classified as an intermittent system by ABCA. Banks are stable and well vegetated. Substrate consists of silt. Canopy cover is low and is dominated by grasses. Approximately 4 km downstream, fish species consist of baitfish community, Common Carp, Gizzard Shad, Largemouth Bass, Pumpkinseed, White Crappie and Yellow Bullhead (ABCA, 1999; MNR, 1974).	Moderate

Watercourse Name	Dixon Nicholson Drain
DFO Drain Classification	F

	R1.49
MWW(m):	0.5
MBW(m):	0.5

	R1.49
MWD(m):	n/a
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.35*	• Transmission Line Buffer	June 12, 2012	• The pond is located in livestock pasture and in a valley. The pond is 10 m by 7 m. Riparian buffer consists of grasses.	• The pond is a natural online feature and connected to R1.49. The water was turbid at time of investigation. Duckweed was observed in the pond.	Moderate

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R1.60*	• Transmission Line Crossing	June 12, 2012	• The watercourse is tiled through an agricultural field and emerges at the roadside running parallel to Elginfield Road. No tile drain inputs were observed at time of investigation. Surrounding topography is slightly rolling. Riparian buffer is 1 to 15 m and consists of grasses and meadow.	• The watercourse is a defined channelized feature. The watercourse is straight flat channel. The water was turbid and was stagnant during the time of investigation. It is classified as tiled and intermittent by ABCA. Banks are stable and well vegetated. Substrate consists of silt, clay and sand. Canopy cover is moderate and is dominated by grasses. Instream habitat cover is high and consists of only aquatic vegetation. The channel is cattail and grass choked. Groundwater indicator water speedwell was observed. Fish were observed at time of investigation. Approximately 4 km downstream, fish species consist of baitfish community, Common Carp, Gizzard Shad, Largemouth Bass, Pumpkinseed, White Crappie and Yellow Bullhead (ABCA, 1999; MNR, 1974).	Moderate

Watercourse Name	Dixon Nicholson Drain
DFO Drain Classification	T, F

	R1.60
MWW(m):	0.8
MBW(m):	2.0

	R1.60
MWD(m):	0.12
MBD(m):	0.45

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

Photograph 3. Site overview in agricultural field ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R1.82*	• Transmission Line Crossing	June 12, 2012	• The watercourse flows through deciduous forest, cultural woodland, meadow marsh (classified as FOD7-4, CUW1g, MAM2-10, ELC Feature ID 344 and 348) and pasture and crosses Elginfield Road. Tile drain inputs that were not flowing were observed at time of investigation. Surrounding topography is slightly hilly. Riparian buffer is 10 m.	• The watercourse is a historically channelized feature that is starting to naturalize. The watercourse is mostly flat with some pools present. The water was clear and had slow flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly to moderately unstable with some highly eroded areas. Substrate is dominated by silt, clay and sand, followed by gravel. Canopy cover is low and is dominated by grasses. Instream habitat cover is high and consists of aquatic vegetation, followed by undercut banks. No groundwater indicators were observed. Adult and YOYs were observed at time of investigation. Approximately 5 km downstream, fish species consist of baitfish community, White Crappie, Yellow Bullhead and Largemouth Bass (MNR, 1974).	Moderate

Watercourse Name	Ptsebe Trib WW C/ O'Hanley Award Drain
DFO Drain Classification	C

	R1.82
MWW(m):	0.7
MBW(m):	1.0

	R1.82
MWD(m):	0.14
MBD(m):	0.4

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R1.84*	• Transmission Line Crossing	June 12, 2012	• The watercourse flows through cultural meadow (classified as CUM1-1, ELC Feature ID 344) along a residential property and into a deciduous forest. Flowing tile drains were noted at time of investigation. Surrounding topography is flat, with the watercourse located in a small valley. Riparian buffer is 10 m.	• The watercourse is a natural feature that may have historically been channelized. The watercourse is mostly flat with some riffle run pool sequences. The water was slightly turbid and had moderate flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with evidence of erosion and slumping. Substrate is dominated by silt, sand, clay and muck followed by gravel and cobble. Canopy cover is moderate and consists of trees and grasses. Instream habitat cover is high and consists of aquatic vegetation and woody debris, followed by cobble and undercut banks. No groundwater indicators were observed. Adult and YOY Cyprinids were observed at time of investigation. Approximately 5 km downstream, fish species consist of baitfish community, White Crappie, Yellow Bullhead and Largemouth Bass (MNR, 1974).	Moderate

Watercourse Name	Ptsebe Trib WW C
DFO Drain Classification	C

	R1.84
MWW(m):	2.0
MBW(m):	3.0

	R1.84
MWD(m):	0.2
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.10-B*	• Collection Line Crossing • Road Crossing • Turbine 33	May 24, 2012	• The watercourse is located in a soybean field to the west and corn field to the east. Tile drain inputs were noted and at time of investigation they were not flowing. Surrounding land topography is flat, with some sloping between the two agricultural fields to the west. Riparian buffer is 5 m of herbaceous vegetation. This is a tributary to the Ausable River.	• The watercourse is classified as a channelized feature. The watercourse has a straight uniform channel. The water was turbid and had low flow with stagnant areas at time of investigation. It is classified as unknown by ABCA. Banks are stable and well vegetated. Substrate consists of silt. Canopy cover is low consisting of shrubs. Instream habitat cover is high and consists only of aquatic vegetation. Patches of groundwater indicator watercress were observed. Cyprinids were observed near the culvert at the laneway crossing. Fish are present approximately 1.5 km downstream in the Ausable River.	Moderate

Watercourse Name	Borthwicke Drain
DFO Drain Classification	U

	R2.10-B
MWW(m):	2.3
MBW(m):	4.5

	R2.10-B
MWD(m):	0.2
MBD(m):	0.8

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.27	• Collection Line Crossing	May 30, 2012	• Watercourse is located in a meadow marsh (classified as MAM3-2, ELC Feature ID 249) surrounded by soy bean fields and a residential property. Flowing tile drains were observed at time of investigation. Surrounding land topography is sloped towards the watercourse. Riparian buffer is greater than 25 m.	• The watercourse is a defined natural feature. The watercourse consists of mostly flat with runs. The water was clear and had low flow at time of investigation. It is classified as unknown by ABCA. Banks are stable and well vegetated. Substrate consists of silt. Canopy cover is high and consists of shrubs and grasses. Instream habitat cover is moderate and dominated by aquatic vegetation. No groundwater indicators were observed. A perched culvert at a laneway crossing creates a 0.5 m high barrier to fish passage. Approximately 600 m downstream, fish species consist of baitfish community (ABCA, 2001, 2003).	Moderate

Watercourse Name	Wilcox Drain Branch
DFO Drain Classification	U

	R2.27
MWW(m):	0.35
MBW(m):	0.65

	R2.27
MWD(m)	0.05
MBD(m):	0.3

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.30	• Transmission Line Crossing	June 1, 2012	• The watercourse originates as a tile drain at the edge of an agricultural field and flows through a deciduous forest (classified as FOD5-6, ELC Feature ID 90 and 490), crossing Elginfield Road. Surrounding land topography is sloped towards the watercourse. Riparian buffer is greater than 10 m.	• The watercourse is a defined natural feature. There was no water at time of investigation. It is classified as unknown by ABCA. Banks are stable and vegetated. Substrate is dominated by silt followed by cobble and boulders. Canopy cover is high and is dominated by trees. Instream habitat cover is low and consists of boulders and cobble. No groundwater indicators were observed. Fish are present approximately 900 m downstream in the Ausable River.	Moderate

Watercourse Name	Ausable River Trib
DFO Drain Classification	U

	R2.30
MWW(m):	n/a
MBW(m):	1.75

	R2.30
MWD(m)	n/a
MBD(m):	0.3

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Tiled portion in agricultural field ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.40*	• Transmission Line Crossing	May 16, 2012	• The watercourse is located in a mix of meadow marsh, swamp thicket and deciduous forest (classified as MAM2-2, SWT2-9, FOD5-1, FOD7-4, ELC Feature ID 90 and 339) crossing Elginfield Road. No tile drain inputs were noted at time of investigation. Surrounding topography is a forested ravine with a wide floodplain. Riparian buffer is greater than 30 m.	• The watercourse is a defined natural feature. The watercourse is all flat. The water was turbid and had low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Canopy cover is low and consists of trees, shrubs and grasses. No groundwater indicators were observed. Approximately 2 km downstream, fish species consists of baitfish community (ABCA, 1999).	Moderate

Watercourse Name	Boothill Creek
DFO Drain Classification	E

	R2.40
MWW(m):	4.5
MBW(m):	5.25

	R2.40
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview north ↑

Photograph 2. Site overview south ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.72*	• Transmission Line Crossing	May 16, 2012 May 30, 2012	• The watercourse flows through a deciduous forest, crosses Elginfield Road where it is buried for approximately 60 m before emerging in another deciduous forest (classified as FOD5-1, FOD, ELC Feature ID 90 and 339). No tiled drain inputs were noted at time of investigations. Surrounding topography is rolling hills. Riparian buffer is approximately 30 m south of Eliginfield Road and less than 5 m north of Elginfield Road.	• The watercourse is a defined natural channel. The watercourse was all run and flat. The water was clear and had moderate flow at time of investigations. It is classified as tiled by ABCA. Banks are stable and well vegetated. Substrate is dominated by silt and sand followed by clay and gravel. Canopy cover is moderate and is dominated by trees. Instream habitat cover is moderate and consists of aquatic vegetation followed by undercut banks. Groundwater indicator watercress was observed at time of first investigation. The watercourse is dammed south of Elginfield road. Approximately 2 km downstream, fish species consists of baitfish community (ABCA, 1999).	Moderate

Watercourse Name	Boothill Creek Trib G
DFO Drain Classification	T

	R2.72
MWW(m):	0.5
MBW(m):	0.66

	R2.72
MWD(m):	0.08
MBD(m):	0.2

Photos

Photograph 1. Site overview north of Elginfield Road ↑

Photograph 2. Chanel south of Elginfield Road ↑

Photograph 3. Dammed area ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.138	• Transmission Line Buffer	May 30, 2012	• The pond is located surrounded by deciduous forest (classified as FOD5-1, ELC Feature ID 339). The pond is 12 by 25 m and approximately 0.15 m deep. Riparian buffer ranges from 1 to 8 m of grasses and forest.	• The pond is a dammed portion of R2.72. The water was turbid at time of investigation. Substrate consists of muck. *In-situ* cover consists of emergent grasses. No groundwater indicators were observed.	Moderate

Photos

Photograph 1. Pond overview ↑

Photograph 2. Dam ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.76	• Collection Line Buffer • Road Buffer • Turbine 80	May 15, 2012	• The watercourse flows through agricultural fields (1 m riparian buffer) and into a mix of deciduous forest and cultural woodland (greater than 15 m riparian buffer) (classified as FOD6-5, CUW1a, ELC Feature ID 90). Flowing tile drains were present by the agricultural fields. The surrounding landscape was rolling. This is a tributary to the Ausable River.	• The watercourse is a defined channelized feature in the agricultural field and a natural feature in the forest. The watercourse follows a riffle/run/pool sequence. The water was clear and had low flow at time of investigation. It is classified as unknown by ABCA. Banks are slightly unstable in the agricultural field with evidence of slumping and moderately unstable in the forest area with signs of erosion. Substrate is a mix of clay, muck, sand and gravel in the agricultural field and a mix of clay, sand, gravel and cobble followed by muck in the forest area. Canopy cover is low and dominated by grasses in the agricultural field. Canopy cover is high and dominated by trees in the forest area. Instream habitat cover is high and consists of aquatic vegetation followed by cobble and undercut banks in the agricultural field. Channel is grass choked in the agricultural field. Instream cover is high and consists of aquatic vegetation followed by woody debris, cobble and undercut banks. Groundwater indicators water speedwell and iron staining were noted. Fish are present approximately 900 m downstream in the Ausable River.	Moderate

Watercourse Name	Wight Drain Branch
DFO Drain Classification	U

	Agri	Forest
MWW(m):	0.7	1.5
MBW(m):	2.0	1.8

	Agri	Forest
MWD(m)	0.13	0.2
MBD(m):	0.3	0.35

Photos

Photograph 1. Site overview from agricultural field ↑

Photograph 2. Site overview from forest ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.84*	• Transmission Line Buffer	October 5, 2012	• The watercourse is tiled through an agricultural field and emerges in a deciduous forest (classified as FOC5-1, ELC Feature ID 339). Riparian buffer is greater than 10 m. **Watercourse Name**: Boothill Creek Trib E **DFO Drain Classification**: F	• The watercourse appears to be a natural feature. It is classified as intermittent by ABCA. The watercourse flows into R2.40. Approximately 2 km downstream, fish species consists of baitfish community (ABCA, 1999). **R2.84** **MWW(m):** n/a **MBW(m):** n/a **R2.84** **MWD(m):** n/a **MBD(m):** n/a	Moderate

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.53*	• Transmission Line Buffer	October 5, 2012	• The pond is located in a deciduous forest (classified as FOD5-1, ELC Feature ID 339). The pond is approximately 40 m by 10 m. Riparian buffer is greater than 40 m.	• The pond appears to be an online feature and connected to R2.84.	Moderate

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.102	• Collection Line Buffer • Road Buffer • Turbine 83 and 85	May 2, 2012	• The watercourse begins as a tile drain input and runs through a deciduous forest and a small patch of cultural meadow (classified as FOD5-1, CUM1-1, ELC Feature ID 90). The surrounding land topography is hilly and sloping towards the watercourse. Riparian buffer is greater than 30 m.	• The watercourse is a defined natural feature. The watercourse follows a riffle/run/pool sequence. The water was clear and had very low flow with some stagnant areas during time of investigation. The system is classified as tiled and unknown by ABCA. Banks are slightly unstable with some areas of erosion. Substrate consists of silt, clay, gravel and cobble followed by detritus. Canopy cover is high and dominated by trees. Instream habitat cover is moderate consisting of cobble followed by woody debris, aquatic vegetation and undercut banks. Groundwater indicators watercress and water speedwell were observed. Fish are present approximately 800 m downstream in the Ausable River.	Moderate

Watercourse Name	Glenn Drain Trib A
DFO Drain Classification	T, U

	R2.102
MWW(m):	0.6
MBW(m):	1.0

	R2.102
MWD(m):	0.1
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Tiled portion ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.131*	• Collection Line Crossing and Buffer	May 29, 2012	• The watercourse flows through meadow marsh and cultural thicket (classified as MAM2-2, CUT1a, ELC Feature ID 100) in livestock pasture and corn fields crossing Jura Line. The watercourse than flows through cultural woodland, swamp thicket and deciduous forest (classified as SWT2-2, CUW1I, FOD5-8, FOD7-4, ELC Feature ID 149) before crossing Arkona Road into cultural meadow (classified as CUM1-1, ELC Feature ID 90). Tile drain inputs that were not flowing were noted at the beginning of the watercourse. Surrounding topography is mostly flat with some rolling hills. Riparian buffer is 5 m in the agricultural and livestock fields and greater than 10 m in the forested areas.	• The watercourse is a defined channelized feature in the fields and a natural feature in the forests. The watercourse follows a riffle/run/pool sequence with some flat areas. The water was slightly turbid and had slow flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks vary from stable to moderately unstable with large amounts of erosion in some areas. Substrate is dominated by sand, cobble, silt and clay, followed by gravel, boulders and muck. Canopy cover is high. Instream habitat cover is moderate and consists of aquatic vegetation and cobble followed by woody debris, undercut banks and boulders. No groundwater indicators were observed. A school of YOYs were observed in the forest section. Fish are present approximately 2.5 km downstream in the Ausable River.	Moderate

Watercourse Name	Sercombe Drain/From Sercombe Drain
DFO Drain Classification	C

	R2.131
MWW(m):	1.0
MBW(m):	1.35

	R2.131
MWD(m):	0.17
MBD(m):	0.6

Photos

Photograph 1. Site overview south of Jura Line ↑

Photograph 2. Channel overview in forest ↑

Photograph 3. Site overview east of Arkona Road ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.179*	• Collection Line Crossing	June 5, 2012	• The watercourse flows through corn fields into a residential property, crossing Birnam Line into more corn fields. Tile drain inputs that were not flowing were noted at time of investigation. Surrounding topography was slightly hilly. Riparian buffer consists of 8 m of meadow.	• The watercourse is a defined channelized feature. The watercourse is mostly flat with some pools. The water was clears and had slow flow at time of investigation. It is classified as an intermittent system by ABCA. Banks are slightly unstable with minor erosion and some slumping. Substrate is dominated by silt and sand, followed by grave, cobble and muck. Canopy cover is moderate and consists of grasses and shrubs. Instream habitat cover is high and consists of aquatic vegetation followed by cobble, boulders and undercut banks. Groundwater indicator water speedwell was observed. There is a perched culvert on the north side of Birnam Line creating a 0.25 m high barrier. Schools of Cyprinids were observed north and south of Birnam Line. Approximately 2.5 km downstream, fish species consist of baitfish community (ABCA, 2001).	Moderate

Watercourse Name	Roder Outlet Drain
DFO Drain Classification	F

	R2.179
MWW(m):	1.2
MBW(m):	2.3

	R2.179
MWD(m):	0.15
MBD(m):	0.6

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.186	• Collection Line Crossing and Buffer	May 29, 2012	• The watercourse is buried south of Jura Line. North of the Jura Line the watercourse flows through a deciduous forest (FOD5-8, FOD7-4, ELC Feature ID 149). Tile drain inputs that were not flowing were noted at time of investigation. Surrounding topography is slightly hilly. Riparian buffer is greater than 15 m.	• The watercourse is a defined natural feature. The watercourse is mostly flat with some riffles and pools. The water was clear and had no flow, only pooled areas during time of investigation. It is classified as tiled and unknown by ABCA. Banks are slightly unstable with evidence of erosion. Substrate is dominated by silt, clay and sand followed by cobble. Canopy cover is high and is dominated by trees. Instream habitat cover is moderate and consists of cobble and woody debris followed by aquatic vegetation. No groundwater indicators were noted. Fish are present approximately 700 m downstream in the Ausable River.	Moderate

Watercourse Name	Sercombe Drain Branches
DFO Drain Classification	T, U

	R2.186
MWW(m):	n/a
MBW(m):	1.0

	R2.186
MWD(m):	n/a
MBD(m):	0.5

Photos

Photograph 1. Channel overview ↑

Photograph 2. Site overview south of Jura Line ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.192*	• Collection Line Crossing	May 29, 2012	• The watercourse is buried to the south of Jura Line and opens up in the north flowing adjacent to a residential property, deciduous forest (classified as FOD7-4, ELC Feature ID 149) and agricultural fields. Tile drains that were not flowing were noted at time of investigation. Surrounding topography is flat. Riparian buffer is 1 to 15 m.	• The watercourse is a defined channelized feature. The watercourse consists of flats. It is classified as tiled and intermittent by ABCA. Banks are stable and well vegetated. Substrate consists of silt, clay and sand. Canopy cover is high and consists of trees and shrubs. Instream habitat cover is moderate and consists of aquatic vegetation and woody debris, followed by cobble. No groundwater indicators were noted. Fish are present approximately 1.2 km downstream in the Ausable River.	Moderate

Watercourse Name	From Sercombe Drain Trib
DFO Drain Classification	T, F

	R2.192
MWW(m):	n/a
MBW(m):	0.5

	R2.192
MWD(m):	n/a
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3-A*	• Collection Line Crossing and Buffer	May 23, 2012	• The watercourse runs through crop agricultural fields, crosses Northville Road running parallel to the road and through a corn field and residential property. No tile drain inputs were observed at time of investigation. Surrounding land topography is flat. Riparian vegetation is 1.5 m through the agricultural fields and 6 m through the residential property.	• The watercourse is a defined channelized feature. The watercourse has a straight flat channel. The water was clear and had very low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. The banks were stable and well vegetated. Substrate consists of sand, silt, clay and gravel. Canopy cover is low consisting of shrubs, trees and grasses. Instream habitat cover is moderate and consists of aquatic vegetation. Small mats of groundwater indicator water speedwell were noted along the roadside. Approximately 4.5 km downstream, fish species consist of baitfish community (ABCA, 2003).	Moderate

Watercourse Name	Trick Drain
DFO Drain Classification	C

	R3-A
MWW(m):	1.0
MBW(m):	1.4

	R3-A
MWD(m):	0.1
MBD(m):	0.5

Photos

Photograph 1. Site overview looking west ↑

Photograph 2. Site overview along Northville Road ↑

Photograph 3. Channel overview looking east ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3-B*	• Collection Line Crossing and Buffer • Transmission Line Crossing	May 11, 2012 June 7, 2012	• The watercourse flows through cultural meadow crossing Arkona Road into a deciduous forest and cultural meadow (FOD7-2, FOD7-4, CUM1-1, ELC Feature ID 377). The watercourse crosses Elginfield Road through deciduous forest and then into cultural woodland (classified as FOD7-4, CUW1n, ELC Feature ID 525 and 504) crossing Arkona Road. No tile drain inputs were noted at time of investigations. The watercourse is located in a small valley that slopes towards the watercourse. Riparian buffer ranges from greater than 10 m to 30 m.	• The watercourse is a defined natural feature. The watercourse follows a riffle/run/pool sequence with the majority of the reach consisting of flats. The water was clear for most of the reach, with some areas of turbidity along Elginfield Road. The flow was moderate during the first site visit and slow during the second site visit. It is classified as a permanent warmwater system by ABCA. Banks are stable to slightly unstable with some evidence of erosion. Substrate is dominated by sand, gravel, silt and clay followed by cobble and boulders. Canopy cover is high and is dominated by trees. Instream habitat cover ranges from low to moderate and consists of woody debris, aquatic vegetation, cobble, boulders and undercut banks. Small clumps of watercress, bittercress and water speedwell were noted throughout the reach, indicating potential groundwater inputs. Several schools of YOYs and adult Cyprinids were noted throughout the reach during the second site visit. Fish species at Elginfield Road consist of baitfish community and Pumpkinseed (ABCA, 2003).	Moderate

Watercourse Name	Decker Creek
DFO Drain Classification	C

	R3-B
MWW(m):	2.9
MBW(m):	4

	R3-B
MWD(m):	0.23
MBD(m):	0.82

Photos

Photograph 1. Overview in forest ↑

Photograph 2. Channel view in forest ↑

Photograph 3. Site overview at Elginfield Road↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3-C*	• Road Buffer	June 6, 2012	• The watercourse is located in a deciduous forest (classified as FOD7-4, ELC Feature ID 243). No tile drain inputs were observed at time of investigation. Surrounding topography is rolling hills. Riparian buffer is greater than 15 m.	• The watercourse is a defined natural feature. It follows a riffle/run/pool sequence with flat areas. The water was clear and had moderate flow during time of investigation. It is classified as a warmwater system by ABCA. Banks are slightly unstable with some erosion occurring. Substrate is dominated by silt and clay, followed by muck, cobble and boulder. Canopy cover is high and is dominated by trees. Instream habitat cover is low and consists of cobble followed by woody debris and boulders. No groundwater indicators were observed. Approximately 500 m downstream, fish species consist of baitfish community, Largemouth Bass and Green Sunfish (ABCA, 2001).	Moderate

Watercourse Name	Decker Creek
DFO Drain Classification	E

	R3-C
MWW(m):	3.5
MBW(m):	6.0

	R3-C
MWD(m):	0.3
MBD(m):	1.3

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3-D*	• Collection Line Crossing • Road Buffer	May 23, 2012	• The watercourse begins north of Bog Line between agricultural fields, then flows through fallow meadows into more agricultural fields. A pond (P3.29) is located to the west of the watercourse in an excavation area. Tile drain inputs were observed throughout the site with some flowing at time of investigation. Surrounding land topography is flat. Riparian buffer is 1.25 m of meadow.	• The watercourse is a defined channelized feature. The watercourse has a straight flat channel. The water was clear and had no visible flow at time of investigation. It is classified as a permanent warmwater system by ABCA. The banks were stable to slightly unstable with well vegetated sandy banks causing some slumping. Substrate is dominated by sand followed by gravel, silt and clay. Canopy cover is low with shrubs dominating. Instream habitat cover is high and consists of aquatic vegetation. Groundwater indicators water speedwell and watercress were observed. Dense mats of pondweed and watercress were present just south of Bog Line. Some areas of the channel were dry creating a low flow fish barrier. Approximately 1 km upstream, fish species consist of baitfish community, Largemouth Bass and Green Sunfish (ABCA, 2001).	Moderate

Watercourse Name	Nesbit Drain
DFO Drain Classification	E

	R3-D
MWW(m):	1.25
MBW(m):	2.0

	R3-D
MWD(m):	0.2
MBD(m):	0.4

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

Photograph 3. Dry channel ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.22*	• Collection Line Crossing • Road Crossing	May 16, 2012	• The watercourse flows through crop agricultural fields. A tile drain input was observed. Surrounding topography is flat. Riparian buffer is 5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse has a straight flat uniform channel. The water was clear and had low flow during the time of investigation. The system is classified as intermittent by ABCA. The banks are stable and well vegetated. Substrate consists of silt and muck. There is no canopy cover. Instream habitat cover is high contains only aquatic vegetation. Large mats of groundwater indicator watercress were observed throughout the watercourse.	Moderate

Watercourse Name	Elliot Drain
DFO Drain Classification	F

	R3.22
MWW(m):	1.5
MBW(m):	2.0

	R3.22
MWD(m)	0.2
MBD(m):	0.4

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

<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>R3.28*</td><td>• Collection Line Crossing and Buffer</td><td>May 31, 2012</td><td>• The watercourse is buried through a soybean field and opens up in a deciduous forest (classified as FOD7-2, FOD5-8, ELC Feature ID 233). Tile drain inputs were observed at time of investigation. Surrounding topography is flat in the soybean field and located in a valley in the deciduous forest. Riparian buffer is greater than 15 m.

<table>
<tr><td>Watercourse Name</td><td>Davidson Brothers Drain (Main)</td></tr>
<tr><td>DFO Drain Classification</td><td>U, T</td></tr>
</table>
</td><td>• The watercourse is a defined natural feature. The watercourse consists of flats. The water was clear and had no flow at time of investigation. It is classified as tiled through the soybean field and unknown in the forest by ABCA. Banks are slightly unstable with some areas of erosion. Substrate is dominated by clay, silt and muck, followed by cobble and boulders. Canopy cover is high and is dominated by trees. Instream habitat cover is moderate and consists of undercut banks, cobble and woody debris. No groundwater indicators were observed.

<table>
<tr><th></th><th>R3.28</th></tr>
<tr><td>MWW(m):</td><td>0.5</td></tr>
<tr><td>MBW(m):</td><td>1.0</td></tr>
</table>
<table>
<tr><th></th><th>R3.28</th></tr>
<tr><td>MWD(m):</td><td>0.15</td></tr>
<tr><td>MBD(m):</td><td>0.3</td></tr>
</table>
</td><td>Moderate</td></tr>
</table>

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.66	• Collection Line Crossing	May 14, 2012	• The watercourse is buried and ploughed over in a crop agricultural field and emerges through a tile drain into a mix of cultural plantation, cultural meadow and deciduous forest (classified as FOD6-1, CUP3-2, CUM1-1, ELC Feature ID 158) that is surrounded by wheat fields. The surrounding land topography is slightly hilly. Riparian buffer is between 5 to 20 m.	• The watercourse is a defined channelized feature that is beginning to naturalize. The watercourse is mostly flat with some riffle/run/pool sequences. The water was clear and had low flow at time of investigation. It is classified as tiled in the agricultural field and intermittent in the forest by ABCA. Banks are slightly unstable with evidence of erosion throughout the site. Substrate is dominated by sand, gravel and cobble followed by silt and clay. Canopy cover is high and consists of trees and shrubs. Instream habitat cover is moderate and consists of cobble, aquatic vegetation, woody debris and undercut banks. Groundwater indicator watercress was noted in small clumps and potential iron staining was observed. A raised culvert with a height of 0.2 m is present, blocking upstream fish passage. Approximately 1.6 km downstream, fish species consist of baitfish community and Pumpkinseed (ABCA, 2003).	Moderate

Watercourse Name	From Grey Drain
DFO Drain Classification	T, F

	R3.66		**R3.66**
MWW(m):	0.95	**MWD(m):**	0.12
MBW(m):	1.35	**MBD(m):**	0.48

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.53	• Collection Line Crossing • Transmission Line Crossing	May 14, 2012	• The watercourse is tile drain fed at Thomson Line and flows through section of deciduous forest (classified as FOD7-2, ELC Feature ID 236) surrounded by agricultural fields. Surrounding topography is flat. Riparian buffer is greater than 15 m.	• The watercourse is a defined channelized feature. The watercourse is all flat. The water was clear and had very low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with some erosion present. Substrate consists of muck, silt and sand. Canopy cover is high and is dominated by trees. Instream habitat cover is high and consists of aquatic vegetation followed by woody debris. Large mats of groundwater indicator watercress were observed. Two perched culverts of 0.5 m and 0.2 m creating a barrier to fish passage.	Moderate

Watercourse Name	McLean Drain (No 1) East
DFO Drain Classification	C

	R3.53
MWW(m):	2.0
MBW(m):	3.0

	R3.53
MWD(m):	0.2
MBD(m):	0.65

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.73*	• Collection Line Buffer	September 28, 2012	• The watercourse runs parallel to Ridge Road through a small deciduous swamp (classified as SWD3-4, ELC Feature ID 170) adjacent to agricultural fields. The watercourse potentially crosses Northville Road to a roadside ditch. No tile drain inputs were noted at time of investigation. Surrounding topography is flat. Riparian buffer is 5 to 8 m.	• The watercourse is defined channelized feature. It is unclassified by ABCA. Canopy cover is high and consists of trees and shrubs. No groundwater indicators were observed.	Moderate

Watercourse Name	Unmapped
DFO Drain Classification	Unclassified

	R3.73
MWW(m):	2.5
MBW(m):	n/a

	R3.73
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.74	• Collection Line Buffer	September 28, 2012	• The watercourse is located in a small ravine surrounded by meadow and then deciduous forest (classified as FOD7-4, ELC Feature 243). Tile drain inputs were observed at time of investigation. Surrounding topography is hilly. Riparian buffer is greater than 10 m.	• The watercourse may be a natural feature that has previously been dug out. The majority of the channel was dry with one stagnant pool at time of investigation. It is unclassified by ABCA. Banks are stable. Substrate is detritus, clay, silt and sand. Canopy cover is high and is dominated by trees. Instream habitat cover is high and consists of vegetation followed by woody debris. Small patches of groundwater indicator watercress were observed.	Moderate

Watercourse Name	Unmapped
DFO Drain Classification	Unclassified

	R3.74
MWW(m):	2.5
MBW(m):	n/a

	R3.74
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Channel view ↑

Photograph 2. Stagnant pool ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-B*	• Road Buffer • Turbine 71	May 23, 2012	• The watercourse flows through crop agricultural fields into a mix of cultural thicket and deciduous swamp (classified as CUT1-4, SWD3-3, ELC Feature ID 148) with agricultural field to the northeast and southwest. Flowing tile drains were observed at time of investigation. Surrounding land topography is flat. Riparian buffer is 5 m.	• The watercourse is a defined channelized feature. The watercourse is a straight flat uniform channel. The water was clear and had very low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Substrate is dominated by silt, clay and muck followed by gravel, sand and cobble. Canopy cover is low with a mix of trees, shrubs and grasses. Instream habitat cover is high and consists of aquatic vegetation followed by cobble. The channel is chocked with algae. No groundwater indicators were noted. Approximately 7 km downstream, fish species consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Moderate

Watercourse Name	Upper Mud Creek Drain No 5
DFO Drain Classification	C

	R4-B		**R4-B**
MWW(m):	1.4	**MWD(m):**	0.08
MBW(m):	2.0	**MBD(m):**	0.4

Photos

Photograph 1. Channel view ↑

Photograph 2. Channel view ↑

Photograph 3. Substrate ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-C*	• Collection Line Crossing and Buffer • Road Buffer	May 24, 2012	• The watercourse flows through agricultural row crops, crosses Gordon Road and flows through more agricultural row crops. Flowing tile drain inputs were noted at time of investigation. Surrounding land topography is flat. Riparian buffer is 1.25 m of grasses.	• The watercourse is a defined channelized feature. The watercourse is flat with some pools present. The water was clear and had low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Substrate consists of silt, clay and muck. Canopy cover is low with grasses followed by shrubs and trees. Instream habitat cover is high and consists of aquatic vegetation. The watercourse is algae choked. No groundwater indicators were observed. Approximately 6 km downstream, fish species consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Moderate

Watercourse Name	Upper Mud Creek Drain No 3
DFO Drain Classification	C

	R4-C
MWW(m):	1.5
MBW(m):	1.8

	R4-C
MWD(m):	0.15
MBD(m):	0.4

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-D*	• Collection Line Crossing • Road Crossing	June 12, 2012 September 17, 2012	• The watercourse is surrounded by wheat field and three residential properties and crosses Northville Road. Flowing tile drain inputs were observed at time of investigation. Surrounding topography is flat. Riparian buffer is 6 m consisting of meadow.	• The watercourse is a defined channelized feature. The watercourse is straight flat channel with a few pools. The water was clear and had slow flow during the time of first site visit and no flow during the second site visit. It is classified as a permanent warmwater system by ABCA. Banks are stable to slightly unstable with evidence of erosion. Substrate is dominated by muck, silt and clay followed by sand and cobble. Canopy cover is low and is dominated by trees. Instream habitat cover is high and is dominated by aquatic vegetation, followed by cobble, woody debris and undercut banks. The channel is algae choked. No groundwater indicators were observed. A few Cyprinids and a school of YOYs were observed at time of first site investigation. Approximately 4 km downstream, fish species consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Moderate

Watercourse Name	Upper Mud Creek Drain No 2
DFO Drain Classification	C

	R4-D
MWW(m):	1.5
MBW(m):	3.0

	R4-D
MWD(m):	0.1
MBD(m):	0.6

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-F	• Collection Line Crossing	June 6, 2012	• The watercourse flows through livestock pasture, crosses Jericho Road and flows through an agricultural field. Drainage ditches input into the watercourse. Surrounding topography is flat. Riparian buffer is greater than 15 m through the pasture and 2 m in the agricultural field.	• The watercourse is a defined channelized feature. The watercourse is mostly flat with some riffles present. The water was clear and had slow flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with evidence of erosion. Substrate is dominated by silt, sand and gravel, followed by clay, muck and cobble. Canopy cover is moderate and is dominated by shrubs. Instream habitat cover is moderate and consists of aquatic vegetation followed by cobble, woody debris and undercut banks. Small clumps of groundwater indicator watercress were observed. YOYs were observed under the culvert at time of investigation. Approximately 2.5 km downstream, fish species consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Moderate

Watercourse Name	Upper Mud Creek Drain No 2
DFO Drain Classification	C

	R4-F
MWW(m):	2.0
MBW(m):	3.0

	R4-F
MWD(m):	0.25
MBD(m):	0.7

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-G*	• Collection Line Crossing	June 6, 2012	• The watercourse crosses Thomson Line and flows through corn and wheat fields. Tile drain inputs with some flowing were noted at time of investigation. Surrounding topography is flat. Riparian buffer is 6 m of meadow.	• The watercourse is a defined natural feature. The watercourse is mostly flat with some riffles present. The water was clear and had slow flow at time of investigation. It is classified as a permanent warmwater feature. Banks are stable and well vegetated. Substrate is dominated by sand, silt, clay and gravel followed by cobble. Canopy cover is low and is dominated by shrubs. Instream habitat cover is moderate and consists of aquatic vegetation followed by small woody debris and cobble. No groundwater indicators were observed. Cyprinids were observed at time of investigation. Fish species at Thomson Line consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Moderate

Watercourse Name	Upper Mud Creek Drain No 1/Jericho Creek
DFO Drain Classification	C

	R4-G
MWW(m):	4.0
MBW(m):	6.0

	R4-G
MWD(m):	0.2
MBD(m):	0.8

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-H*	• Collection Line Crossing	May 28, 2012	• The watercourse is surrounded by a mix of cultural woodland and deciduous forest (classified as CUW1g, FOD7-2, ELC Feature ID 213 and 214). No tile drain inputs were noted at time of investigation. Surrounding land topography is sloped towards the watercourse. Riparian buffer is greater than 30 m.	• The watercourse is a defined natural feature. The watercourse follows a riffle/run/pool sequence. The water was turbid and had low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and vegetated. Substrate is dominated by silt and gravel followed by cobble. Canopy cover is moderate consisting mainly of trees. Instream habitat cover is low and consists of undercut banks, woody debris, boulders and cobble. No groundwater indicators were observed. Cyprinids were observed at time of investigation, as well as one dead adult White Sucker. Several old beaver dams and one new beaver dam are creating potential fish barriers with a height of 0.5 m. Approximately 2 km upstream, fish species consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Moderate

Watercourse Name	Jericho Creek
DFO Drain Classification	C

	R4-H		**R4-H**
MWW(m):	2.6	**MWD(m):**	0.76
MBW(m):	4.0	**MBD(m):**	1.2

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-I*	• Collection Line Buffer • Road Buffer • Turbine 13	May 9, 2012 May 15, 2012 May 31, 2012	• Watercourse flows through a deciduous forest and cultural thicket (classified as CUT1-5, FOD5-8, ELC Feature ID 214 and 293) surrounded by soybean fields and crosses under Bruce Scott Road. The watercourse flows through crop agricultural fields with a 5 m riparian buffer on the right bank and 5 m on the left bank of cultural thicket. Tile drain inputs are present north of Bruce Scott Road. Surrounding land topography is a valley in the forest and is sloping towards the watercourse in the agricultural fields. Riparian buffer in the forest area is greater than 30 m.	• The watercourse is a defined natural feature. The watercourse follows a riffle/run/pool sequence in the forest and is mostly run with some riffle areas in the agricultural field. The water was clear and had moderate flow in the forest during the time of investigations. The water was turbid and high flow during the time of investigation in the agricultural field. It is classified as a permanent warmwater system by ABCA. The banks were slightly to moderately unstable with signs of erosion. Substrate is dominated by sand, clay and silt followed by cobble and gravel. Canopy cover is moderate to high consisting of trees. Instream habitat cover is moderate and consists of boulders, aquatic vegetation, woody debris and cobble. Bank seepage was noted in the forest where drains historically joined the watercourse from the agricultural fields. Approximately 3 km upstream, fish species consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Moderate

Watercourse Name	Lower Mud Creek Drain No 2/Jericho Creek
DFO Drain Classification	C

	R4-I
MWW(m):	2.7
MBW(m):	4.4

	R4-I
MWD(m)	0.57
MBD(m):	0.93

Photos

Photograph 1. Site overview in the agricultural field ↑

Photograph 2. Site overview in the forest ↑

Photograph 3. Channel view in the forest ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.8-A	• Collection Line Crossing • Transmission Line Crossing	May 23, 2012	• Watercourse is surrounded by crop agricultural fields and crosses Thomson Line. Flowing tile drain inputs were noted at time of investigation. Surrounding land topography is flat. Riparian buffer is 5 m of grasses and meadow.	• The watercourse is a defined channelized feature. The watercourse is a straight flat uniform channel. The water was clear and had low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Substrate consists of silt, clay and muck. Canopy cover is low and consists of shrubs and grasses. Instream habitat cover is high and consists of aquatic vegetation followed by woody debris. No groundwater indicators were observed. Fish were observed at time of investigation. Fish species at Thomson Line consist of baitfish community (ABCA, 2001).	Moderate

Watercourse Name	Golden Creek Drain Branch East
DFO Drain Classification	C

	R4.8-A
MWW(m):	0.5
MBW(m):	1.0

	R4.8-A
MWD(m):	0.1
MBD(m):	0.3

Photos

Photograph 1. Site overview north of Thomson Line

Photograph 2. Site overview south of Thomson Line

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.8-B*	• Collection Line Buffer • Road Crossing and Buffer • Turbines 29 and 30 • Met Tower Buffer	May 22, 2012 July 30, 2012	• The watercourse is surrounded by crop agricultural fields and passes through active cattle pasture crossing Thomson Line into soybean and wheat fields. Tile drain inputs and channels for overland flow were noted. Surrounding land topography is flat. Riparian buffer is approximately 6 m in the agricultural fields.	• The watercourse is a defined channelized feature. The watercourse is flat with a few riffle/pool sequences. The water was clear and had slow flow at time of first site investigation. The water was slightly turbid and had no visible flow at time of second site investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with some erosion and slumping evident. Substrate is dominated by clay, silt, muck and sand followed by gravel and cobble. Canopy cover is moderate to low with trees and shrubs in the agricultural fields and some areas of overhanging vegetation. Canopy cover in the cattle pasture is low and consists of grasses. Instream habitat cover is high north of Thomson Line and low to the south. Instream habitat cover consists of aquatic vegetation followed by woody debris and cobble. Groundwater indicators watercress and water speedwell were present throughout the site. Cyprinids were observed at time of both investigations. Approximately 500 m upstream, fish species consist of baitfish community (ABCA, 2001).	Moderate

Watercourse Name	Golden Creek Drain Branch East
DFO Drain Classification	C

	R4.8-B
MWW(m):	1.0
MBW(m):	1.2

	R4.8-B
MWD(m):	0.17
MBD(m):	0.33

Photos

Photograph 1. Site overview in agricultural fields ↑

Photograph 2. Site overview in cattle pasture ↑

Photograph 3. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.8-D*	• Collection Line Crossing • Road Crossing • Turbine 20	May 30, 2012	• The watercourse flows through agricultural fields with a small section of cultural thicket and woodland (classified as CUW1m, CUT1-4, ELC Feature ID 219). No tile drain inputs were noted. Surrounding land topography is sloping towards the watercourse. Riparian buffer is 25 m.	• The watercourse is a defined natural feature to the north and becomes a channelized feature in the agricultural fields. The watercourse is mostly flat runs with a few pools and riffle present. The water was clear and had low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly to moderately unstable with undercutting and signs of erosion. Substrate is dominated by silt and clay followed by gravel and cobble. Canopy cover is moderate and consists of trees and shrubs. Instream habitat cover is low and consists of aquatic vegetation and woody debris followed by cobble. Groundwater indicator bittercress was observed. Approximately 3.7 km upstream, fish species consist of baitfish community (ABCA, 2001).	Moderate

Watercourse Name	Golden Creek Drain Branch East
DFO Drain Classification	C

	R4.8-D
MWW(m):	1.25
MBW(m):	3.0

	R4.8-D
MWD(m):	0.1
MBD(m):	1.0

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview in agricultural fields ↑

Photograph 3. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.8-E*	• Collection Line Buffer • Road Buffer	June 8, 2012	• The watercourse flows through agricultural fields and livestock pasture, crossing Elliot Road. Tile drain inputs that were not flowing were noted at time of investigation. Surrounding topography is slightly hilly. Riparian buffer is 7 m of cultural meadow along the pasture and 1 m along the agricultural fields.	• The watercourse is a natural feature to the south of Elliot Road and channelized to the north. The watercourse is mostly flat with some riffle/run/pool sequences. The water was slightly turbid and had slow flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with evidence of erosion and slumping. Substrate is dominated by gravel followed by sand, silt, clay and cobble. Canopy cover is moderate and is dominated by trees. Instream habitat cover is moderate and consists of aquatic vegetation and woody debris, followed by cobble and undercut banks. Groundwater indicator water speedwell was found sporadically along the reach. Adult and YOY Cyprinids were observed at time of investigation. Approximately 5 km upstream, fish species consist of baitfish community (ABCA, 2001).	Moderate

Watercourse Name	Golden Creek Drain
DFO Drain Classification	C

	R4.8-E
MWW(m):	2.2
MBW(m):	5.5

	R4.8-E
MWD(m):	0.25
MBD(m):	0.9

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.11-B*	• Collection Line Crossing • Road Buffer • Turbine 4 • MET Tower Buffer	May 9, 2012	• The watercourse flows through a crop agricultural field into a mix of cultural thicket and woodland (classified as CUW1h, CUT1-4, ELC Feature ID 290). Tile drain inputs were observed at time of investigation. The surrounding topography is flat. Riparian buffer of 5 m on the left bank.	• The watercourse is a defined channelized feature. The watercourse follows a riffle/run sequence. The water was clear and had moderate flow at time of investigation. It is classified as a permanent warmwater feature by ABCA. Banks are stable to slightly unstable with some signs of erosion. Substrate is dominated by sand and gravel followed by boulder and cobble. Canopy cover is moderate and dominated by shrubs. Instream habitat cover is high and consists of aquatic vegetation followed by cobble. Isolated patches of groundwater indicator watercress were observed.	Moderate

Watercourse Name	Campbell Jameson Drain
DFO Drain Classification	C

	R4.11-B
MWW(m):	1.03
MBW(m):	3.0

	R4.11-B
MWD(m):	0.3
MBD(m):	0.7

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.16-B	• Collection Line Crossing and Buffer • Road Crossing and Buffer • Turbine 25	May 10, 2012 May 15, 2012	• The watercourse flows through horse pasture into crop agricultural fields. Tile drain inputs were observed throughout the watercourse. The surrounding topography is flat with some sloping towards the watercourse. Riparian buffer is 5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse has a straight uniform channel with some riffles present. The water was clear and had low flow at time of investigation. It is classified as intermittent by ABCA. Banks are stable and well vegetated. Substrate is dominated by silt and sand followed by gravel. Canopy cover is low and consists of trees and shrubs. Instream habitat cover is high and consists of aquatic vegetation followed by woody debris and cobble. The channel was choked with algae. Isolated mats of groundwater indicator watercress were observed in the southern portion of the watercourse. A perched culvert was present at a laneway crossing, creating a 0.05 m high barrier to fish passage.	Moderate

Watercourse Name	Elliot McBryan Drain
DFO Drain Classification	F

	R4.16-B
MWW(m):	1.15
MBW(m):	2.3

	R4.16-B
MWD(m):	0.18
MBD(m):	0.85

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview in forest ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.16-C*	• Collection Line Buffer • Road Buffer • Turbine 19	May 9, 2012	• The watercourse is located in crop agricultural fields and crosses Kennedy Line. Tile drain inputs were observed throughout the watercourse. The surrounding land topography is gently sloped towards the watercourse. Riparian buffer is 5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse follows a riffle/run/pool sequence. The water was clear and moderately flowing at the time of investigation. It is classified as a permanent warmwater feature by ABCA. Banks are stable and well vegetated. Substrate is dominated by sand and clay followed by cobble, gravel and boulders. Canopy cover is low and consists of trees and shrubs. Instream habitat cover is moderate and consists of aquatic vegetation, followed by boulders and bedrock shale. Groundwater indicator watercress was observed as well as bank seepage and iron staining.	Moderate

Watercourse Name	Elliot McBryan Drain
DFO Drain Classification	C

	R4.16-C
MWW(m):	1.0
MBW(m):	2.6

	R4.16-C
MWD(m):	0.25
MBD(m):	0.7

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.25-A	• Collection Line Crossing and Buffer • Road Buffer • Transmission Line Crossing	May 10, 2012 May 16, 2012 July 25, 2012	• The watercourse flows through cattle pasture and residential properties and into crop agricultural fields. Roadside drainage inputs were observed at Northville Road, as well as tile drain inputs throughout the site. The surrounding land topography was gently sloped towards the watercourse. Riparian buffer is approximately 5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse has a straight run uniform channel. The water was turbid and had low flow during the first site investigation. The water was clear and had moderate flow at time of second investigation. The water was clear and there was no visible flow at time of third site investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable to slightly unstable with signs of erosion and some exposed roots, in the cattle pasture banks are moderately unstable. Substrate is dominated by clay and silt followed by sand and gravel. Canopy cover is low and consists of trees and shrubs. Instream habitat cover is low and consists of aquatic vegetation followed by cobble and undercut banks. Large mats of groundwater indicator watercress and water speedwell were observed. Brook Sticklebacks were observed at time of first investigation.	Moderate

Watercourse Name	Tuplin Drain
DFO Drain Classification	C

	R4.25-A		R.25-A
MWW(m):	1.0	**MWD(m):**	0.14
MBW(m):	1.7	**MBD(m):**	0.3

Photos

Photograph 1. Site overview in residential property ↑

Photograph 2. Site overview in agricultural fields ↑

Photograph 3. Channel view in cattle pasture ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.25-B*	• Collection Line Crossing and Buffer • Road Crossing	May 22, 2012	• The watercourse flows through corn field into cattle pasture and crosses Northville Road with wheat field and meadow on either side. Tile drains were present on both sides of the watercourse. Surrounding land topography is flat. Riparian buffer is 5 m along the agricultural fields, 10 m beside the meadow and 5 m in the cattle pasture.	• The watercourse is a defined channelized feature. The watercourse is mainly flat with some riffles present. The water was clear with some turbidity and had very low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with slumping and erosion present. Substrate is dominated by silt, clay and sand followed by muck. Canopy cover is low consisting mainly of grasses. Instream habitat cover is moderate and consists of aquatic vegetation followed by undercut banks, woody debris and cobble. The watercourse is grass choked in the cattle pasture area. Groundwater indicators watercress and water speedwell were noted throughout the watercourse. Fish were observed throughout the watercourse at time of investigation.	Moderate

Watercourse Name	Golden Creek Drain
DFO Drain Classification	C

	R4.25-B		**R4.25-B**
MWW(m):	1.8	**MWD(m):**	0.14
MBW(m):	1.1	**MBD(m):**	0.25

Photos

Photograph 1. Site overview west of Northville Road ↑

Photograph 2. Channel view in agricultural fields, east of Northville Road ↑

Photograph 3. Site overview in cattle pasture↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.25-C*	• Collection Line Buffer • Road Buffer • Turbine 20	May 30, 2012	• The watercourse is located in a mix of deciduous forest and cultural meadow (classified as FOD7-2, FOC5-2, CUM1-1, ELC Feature ID 217). Tile drain inputs were observed at time of investigation. The surrounding land topography is rolling hills. Riparian buffer is 50 m.	• The watercourse is a defined natural feature. The watercourse follows a riffle/run/pool sequence. The water was clear and had moderate flow at the time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with some erosion and undercutting. Substrate is dominated by silt followed by gravel, cobble and boulders. Canopy cover is moderate and consists of trees and shrubs. Instream habitat cover is low and consists of woody debris, boulders, cobble and undercut banks. No groundwater indicators were observed.	Moderate

Watercourse Name	Golden Creek Drain
DFO Drain Classification	C

	R4.25-C
MWW(m):	1.5
MBW(m):	2.5

	R4.25-C
MWD(m):	0.15
MBD(m):	0.45

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.31	• Collection Line Buffer • Road Buffer	May 10, 2012	• The watercourse runs through a corn field and converges with R4.16. Roadside drainage from Jericho Road enters west of the watercourse. The surrounding land topography is sloping towards the watercourse. Riparian buffer is 5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse is mostly run with a few riffles. The water was clear and had moderate flow during the time of investigation. It is classified as unknown by ABCA. Banks are stable and well vegetated. Substrate is dominated by silt and sand followed by gravel and cobble. Canopy cover is low and consists of trees and shrubs. Instream habitat cover is high and is dominated by aquatic vegetation followed by cobble. No groundwater indicators were observed.	Moderate

Watercourse Name	Anderson Drain
DFO Drain Classification	U

	R4.31
MWW(m):	1.5
MBW(m):	2.0

	R4.31
MWD(m):	0.2
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.33-A	• Collection Line Crossing • Transmission Line Crossing • Substation Buffer	May 16, 2012	• The watercourse originates as a tile drain at Thomson Line and flows through a crop agricultural field to the east and a mix of deciduous forest and cultural woodland (classified as FOD9-4, CUW1q, ELC Feature ID 215) with horse pasture to the west. The surrounding topography is flat with a slight slope on the forest. Riparian buffer is 3 m along the forest and less than 1 m along the agricultural fields.	• The watercourse is a defined channelized feature. The watercourse has a straight flat uniform channel. The water was clear and had low flow at time of investigation. It is classified as tiled by ABCA. Banks are stable and well vegetated. Substrate is dominated by silt and clay followed by detritus. Canopy cover is high and is a mix of shrubs and trees. Instream habitat cover is moderate and consists of aquatic vegetation followed by small woody debris. A few isolated pockets of groundwater indicator watercress were observed.	Moderate

Watercourse Name	Thompson Drain
DFO Drain Classification	T

	R4.33-A
MWW(m):	2.0
MBW(m):	2.2

	R4.33-A
MWD(m):	0.1
MBD(m):	0.15

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.33-B	• Collection Line Crossing and Buffer • Road Crossing and Buffer • Turbines 22 and 24	May 10, 2012 June 18, 2012 September 28, 2012	• The watercourse begins as a tile drain and flows through corn and wheat fields. Tile drain inputs were present but were not flowing during time of investigation. The surrounding topography is gently sloping towards the watercourse. Riparian buffer is 1.5 to 3 m of meadow.	• The watercourse is a defined channelized feature that appears to be naturalizing. The watercourse has a slight meander and is mostly flat runs. The water was clear and had moderate flow at time of first two investigations. The channel was dry during the last investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Substrate is dominated by sand and detritus followed by silt and clay. Canopy cover is high consisting of shrubs and trees. Instream habitat cover is moderate dominated by aquatic vegetation followed by detritus, undercut banks and woody debris. Mats of groundwater indicators watercress and water speedwell were observed.	Moderate

Watercourse Name	Thompson Drain
DFO Drain Classification	C

	R4.33-B
MWW(m):	0.75
MBW(m):	1.7

	R4.33-B
MWD(m):	0.07
MBD(m):	0.3

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.50	• Collection Line Crossing • Transmission Line Crossing	May 23, 2012	• Water course is surrounding by row crop agricultural fields. The watercourse is dry and then tile drain fed along Thomson Line. The surrounding land topography is flat. Riparian buffer is 5 m of meadow.	• The watercourse appears to be an intermittent channelized feature. The watercourse is all straight flat channel. The water was clear and had low flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable to slightly unstable with some evidence of slumping. Substrate consists of silt, clay and muck. Canopy cover is moderate and dominated by shrubs. Instream habitat cover is moderate and consists of aquatic vegetation. No groundwater indicators were observed. Fish species at Thomson Line consist of baitfish community (ABCA, 2001).	Moderate

Watercourse Name	Hilborn Drain Branch West
DFO Drain Classification	C

	R4.50
MWW(m):	0.5
MBW(m):	1.0

	R4.50
MWD(m):	0.1
MBD(m):	0.3

Photos

Photograph 1. Site overview, dry channel ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.59	• Road Buffer • Turbine 15	May 24, 2012	• The watercourse runs adjacent to deciduous swamp (classified as SWD2-2, ELC Feature 213) and corn fields. No tile drain inputs were noted at time of investigation. Surrounding topography is flat. Riparian buffer is 1.5 along the corn fields and greater than 30 m along the deciduous swamp.	• The watercourse is a defined channelized feature. The watercourse is all flat. There was very little water and no visible flow at time of investigation. The watercourse is not classified by ABCA. Banks are stable with no signs of erosion. Substrate consists of muck, clay and silt. Canopy cover is high and is dominated by trees. Instream habitat cover is moderate and consists of aquatic vegetation followed by small woody debris. Small mats of groundwater indicator watercress were observed.	Moderate

Watercourse Name	Unmapped
DFO Drain Classification	Unclassified

	R4.59
MWW(m):	1.5
MBW(m):	2.0

	R4.59
MWD(m):	0.1
MBD(m):	0.3

Photos

Photograph 1. Channel overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.61-B	• Collection Line Crossing • Road Crossing	May 10, 2012	• The watercourse is located in crop agricultural fields. Flowing tile drain inputs were noted at time of investigation. Surrounding topography is gently sloped towards the watercourse. Riparian buffer is less than 1 m of grasses.	• The watercourse is a defined channelized feature that is staring to naturalize. The watercourse is all run. The water was slightly turbid and had low flow at time of investigation. It is classified as a permanent warmwater system by SCRCA. Banks are stable and well vegetated. Substrate consists of sand and silt. Canopy cover is low and is provided by shrubs. Instream habitat cover is high and consists of only aquatic vegetation. Some large mats of groundwater indicator watercress were observed.	Moderate

Watercourse Name	10th Concession Drain
DFO Drain Classification	C

	R4.61-B
MWW(m):	2.0
MBW(m):	2.5

	R4.61-B
MWD(m):	0.2
MBD(m):	0.45

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.61-C*	• Collection Line Crossing and Buffer	May 10, 2012 July 30, 2012	• The watercourse is located in crop agricultural fields and passes by a small section of deciduous forest (classified as FOD5-6, ELC Feature ID 382) before crossing Army Camp Road into corn fields. The watercourse crosses Bruce Scott Road and flows through more agricultural fields and farm yards. Tile drain inputs and roadside ditches were observed. Surrounding topography is gently sloped towards the watercourse. Riparian is 5 m of grasses except at the forest area where it is 300 m.	• The watercourse is a defined channelized feature with some section starting to naturalize. The watercourse has a straight run uniform channel. The water was slightly turbid and had moderate flow during the first site investigation and no flow during the second site investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable to slightly unstable with some undercutting and erosion present. Substrate is dominated by silt, clay, sand and gravel followed by boulders, muck and cobble. Canopy cover is low and consists of trees and shrubs. Instream habitat cover is high and consists of aquatic vegetation followed by cobble, boulders, woody debris and undercut banks. Groundwater indicator watercress was observed throughout the watercourse. Cyprinids were observed on the west side of the culvert at Army Camp Road.	Moderate

Watercourse Name	10th Concession Drain
DFO Drain Classification	C

	R4.61-C
MWW(m):	0.7
MBW(m):	1.85

	R4.61-C
MWD(m):	0.2
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view west of Army Camp Road ↑

Photograph 3. Channel view north of Bruce Scott Road ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R5*	• Collection Line Crossing and Buffer	May 31, 2012	• The watercourse flows through a soy bean field, crosses Thomson Line and flows through corn fields and an adjacent mix of deciduous forest and swamp (classified as FOD9-4, SWD3-3, ELC Feature ID 193). A roadside culvert was present south of Thomson Line. Surrounding land topography is flat. Riparian buffer is 5 m consisting of grasses and shrubs.	• The watercourse is a defined channelized feature. The watercourse has a straight flat run uniform channel. Water was clear and had low flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable and well vegetated. Substrate is dominated by silt followed by cobble. Canopy cover is low consisting of trees and shrubs. Instream habitat cover is high and dominated by aquatic vegetation followed by cobble. Sections of the watercourse were cattail choked causing a potential low flow barrier. No groundwater indicators were observed. Cyprinids were observed during time of investigation. Fish species at Thomson Line consist of baitfish community, Black Crappie and Smallmouth Bass (MNR, 1979).	Moderate

Watercourse Name	Lusby Drain
DFO Drain Classification	F

	R5
MWW(m):	0.9
MBW(m):	1.25

	R5
MWD(m)	0.05
MBD(m):	0.45

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

Photograph 3. Cattail choked channel ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R5.8	• Collection Line Crossing • Road Crossing and Buffer • Turbine 1	May 24, 2012	• The watercourse flows through crop agricultural fields into a shallow marsh and then deciduous forest (classified as FOD, MAS2-1, ELC Feature ID 298). No tile drain inputs were observed during time of investigation. Surrounding topography is flat in the agricultural fields and sloping towards the watercourse in the forest. Riparian buffer is 5 m on the right bank and 30 m on the left bank of a mix of cultural meadow and thicket (classified as CUM1-1 and CUT1-1, ELC Feature ID 298).	• The watercourse is a defined channelized feature. The watercourse is all flat with some pools present. The water was turbid and had low flow at time of investigation. It is classified as a permanent warmwater system by SCRCA. Banks are stable and vegetated. Substrate consists of silt. Canopy cover is low. Instream habitat cover is high and consists only of aquatic vegetation. The channel is cattail choked causing a potential low flow barrier. Groundwater indicator water speedwell was noted throughout the channel. Cyprinids were observed at time of investigation. Approximately 2 km downstream, fish species consist of batifish community (MNR, 1979).0	Moderate

Watercourse Name	Walden Drain
DFO Drain Classification	C

	R5.8
MWW(m):	0.95
MBW(m):	1.3

	R5.8
MWD(m)	0.15
MBD(m):	0.45

Photos

Photograph 1. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6-B*	• Road Buffer • Turbine 35	July 31, 2012	• The watercourse is located in a deciduous forest (FOD6-5, ELC Feature ID 132). No tile drain inputs were noted at time of investigation. Surrounding land topography is flat. Riparian buffer is greater than 15 m.	• The watercourse is a defined channelized feature. The watercourse is mostly flat with some pools present. The water was clear and had no visible flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable with no signs of erosion. Substrate is dominated by sand and silt, followed by clay, gravel, cobble and boulders. Canopy cover is high and is dominated by trees. Instream habitat cover is moderate and consists of cobble, followed by woody debris and boulders. No groundwater indicators were observed. Approximately 5 km downstream fish species consists of baitfish community (MNR, 1976).	Moderate

Watercourse Name	Russell Drain
DFO Drain Classification	F

	R6-B
MWW(m):	2.0
MBW(m):	3.0

	R6-B
MWD(m):	0.12
MBD(m):	0.55

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6-C	• Collection Line Crossing and Buffer	May 31, 2012	• The watercourse flows through cultural meadow and woodland (classified as CUM1-1, CUW1f, ELC Feature ID 191), adjacent to soy bean and corn fields and becomes dammed as it crosses Kinard Road and then Thomson Line into soy bean and winter wheat fields. Tile drain inputs were noted during time of investigation. Surrounding topography is sloping towards the watercourse. Riparian buffer is 5 m of along the agricultural fields and greater than 25 m in the meadow and woodland areas.	• The watercourse is a defined natural feature. The watercourse follows a riffle/run sequence. The water was turbid and had low flow during the time of investigation. It is classified as a permanent warmwater system by SCRCA. Banks are stable and well vegetated. Substrate is dominated by silt followed by cobble and boulders. Canopy cover is low and consists of trees and shrubs. Instream habitat cover is low consisting of aquatic vegetation and boulders followed by cobble and undercut banks. No groundwater indicators were observed. Cyprinids were observed throughout the watercourse. A rock pile created to allow vehicle passage is causing a potential barrier to fish passage immediately upstream of the dammed area. Fish species at Thomson Line consist of baitfish community (MNR, 1976).	Moderate

Watercourse Name	Shashawandah Creek
DFO Drain Classification	C

	R6-C
MWW(m):	4.25
MBW(m):	7.0

	R6-C
MWD(m):	0.55
MBD(m):	1.2

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P6.3	• Collection Line Crossing and Buffer	May 31, 2012	• This is an on-line pond located in a livestock pasture and agricultural fields. The pond is 20 m wide and greater than 1 m deep. Riparian buffer of grasses and shrubs exist.	• The pond is permanent online feature. The pond is part of R6-C which has been dammed. Substrate is dominated by silt followed by cobble and boulders. *In-situ* cover is low and consists of boulders and aquatic vegetation. No groundwater indicators were observed. Cyprinids were observed at time of investigation.	Moderate

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6.18-B*	• Collection Line Crossing and Buffer • Road Crossing and Buffer • Turbines 49, 50 and 51	May 17, 2012 May 30, 2012	• The watercourse runs in-between deciduous forest (classified as FOD7-1, ELC Feature ID 113) and agricultural fields and crosses Jura Line into more agricultural fields and cultural thicket (classified as CUT1-4, ELC Feature ID 144). Flowing tile drain inputs were observed at time of first site investigation. Surrounding topography is flat with some gentle sloping towards the watercourse. Riparian buffer was approximately 5 m and greater than 15 m along the forest area.	• The watercourse is a defined channelized feature that is starting to naturalize to the north. The watercourse is mostly flat with some pools present. The water was clear and had moderate flow at time of investigations. It is classified as an intermittent system by SCRCA. Banks are stable with no signs of erosion. Substrate is muck, clay, sand and silt. Canopy cover is high and is dominated by trees. Instream habitat cover is moderate and consists of aquatic vegetation, small woody debris and vegetation debris. No groundwater indicators were observed. Approximately 5 km downstream, fish species consists of baitfish community (MNR, 1976).	Moderate

Watercourse Name	Shawana Drain
DFO Drain Classification	F

	R6.18-B
MWW(m):	2.0
MBW(m):	3.0

	R6.18-B
MWD(m):	0.17
MBD(m):	0.40

Photos

Photograph 1. Channel view in cultural thicket ↑

Photograph 2. Channel view in agricultural fields ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6.18-C*	• Collection Line Crossing	May 28, 2012	• The watercourse flows through corn fields and crosses Jericho Road. Flowing tile drain inputs were observed at time of investigation. Surrounding land topography is flat. Riparian buffer is 10 m of meadow.	• The watercourse is a defined channelized feature. The watercourse is mostly flat with some pools. The water was clear and had slow flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable and well vegetated. Substrate is dominated by muck, sand and silt, followed by clay. Canopy cover is moderate and is dominated by grasses. Instream habitat cover is moderate and consists of aquatic vegetation, corn debris and undercut banks. Small clumps of groundwater indicator watercress were observed throughout the channel. Approximately 5 km downstream, fish species consists of baitfish community (MNR, 1976).	Moderate

Watercourse Name	Shawana Drain
DFO Drain Classification	F

	R6.18-C
MWW(m):	1.2
MBW(m):	1.2

	R6.18-C
MWD(m):	0.21
MBD(m):	0.45

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6.18-D*	• Collection Line Crossing and Buffer • Road Crossing and Buffer	May 28, 2012 July 31, 2012	• The watercourse is surrounded by soybean and other crop fields. Tile drains were noted at time of investigation and some were flowing. Surrounding topography is flat. Riparian buffer varies from 5 m to 10 m of grasses and trees.	• The watercourse is a defined channelized feature. The watercourse is straight and consisted of 100% flat. The water was slightly turbid and had slow flow at time of investigation. It is classified as a permanent warmwater system by SCRCA. Banks are stable to slightly unstable with some erosion and undercutting observed. Substrate is dominated by silt and clay, followed by sand, cobble and gravel. Canopy cover is moderate and is dominated by grasses. Instream habitat cover was high and was dominated by aquatic vegetation, followed by cobble, woody debris and undercut banks. The channel was choked in some sections with vegetation. Sporadic clumps of groundwater indicator watercress were observed. Fish were observed during the first site investigation. Approximately 6 km downstream, fish species consist of baitfish community (MNR, 1976),	Moderate

Watercourse Name	Shawana Drain
DFO Drain Classification	F, C

	R6.18-D
MWW(m):	1.3
MBW(m):	2.0

	R6.18-D
MWD(m):	0.2
MBD(m):	0.7

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6.20-A	• Collection Line Buffer • Road Buffer	May 24, 2012	• The watercourse is located in a corn field. Flowing tile drain inputs were observed at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of meadow.	• The watercourse is a defined channelized feature. The watercourse is mostly flat with some pools present. The water was clear and had very slow flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable and well vegetated. Substrate is dominated by muck, silt and clay, followed by sand and gravel. Canopy cover is moderate and is dominated by shrubs. Instream habitat cover is high and consists of aquatic vegetation followed by small woody debris. The channel is algae choked. No groundwater indicators were observed. Approximately 8 km downstream, fish species consists of baitfish community (MNR, 1976).	Moderate

Watercourse Name	Sloan Russell Drain
DFO Drain Classification	F

	R6.20-A
MWW(m):	1.3
MBW(m):	2.3

	R6.20-A
MWD(m):	0.15
MBD(m):	0.35

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6.20-B*	• Collection Line Crossing and Buffer	June 6, 2012 July 31, 2012	• The watercourse flows through clover, alfalfa and soybean fields. Tile drain inputs that were not flowing were observed at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of meadow.	• The watercourse is a defined channelized feature. The watercourse is mostly flat with some riffles. The water was clear and had very slow flow at time of first site investigation and no visible flow during the second site investigation. It is classified as an intermittent system by SCRCA. Banks are stable to slightly unstable with some erosion observed. Substrate is dominated by silt and clay, followed by sand and muck. Canopy cover is high and is dominated by grasses. Instream habitat cover is high and consists of aquatic vegetation, followed by small woody debris and undercut banks. The channel is choked with grasses. No groundwater indicators were observed. Approximately 5 km downstream, fish species consists of baitfish community (MNR, 1976).	Moderate

Watercourse Name	Sloan Russell Drain
DFO Drain Classification	F

	R6.20-B
MWW(m):	0.55
MBW(m):	1.88

	R6.20-B
MWD(m):	0.1
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R8.12*	• Collection Line Crossing	May 24, 2012	• The does not exist through agricultural fields east of Warwick Village Road. The watercourse begins as a tile drain at Warwick Village Road and flows into a deciduous forest (classified as FOD7-2, ELC Feature ID 121). Surrounding topography is flat. Riparian buffer is greater than 20 m.	• The watercourse was historically channelized and is beginning to naturalize. The watercourse is mostly flat with a few riffles present. The water was clear and had slow flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable. Substrate is dominated by muck, silt and clay, followed by sand, cobble and boulders. Canopy cover is high and is dominated by trees. Instream habitat cover is moderate and consists of aquatic vegetation followed by cobble, woody debris and boulders. No groundwater indicators were observed. Cyprinids were observed in the forest at time of investigation.	Moderate

Watercourse Name	South Boundary Drain
DFO Drain Classification	F

	R8.12
MWW(m):	1.3
MBW(m):	1.5

	R8.12
MWD(m):	0.15
MBD(m):	0.25

Photos

Photograph 1. Site overview in forest ↑

Photograph 2. Channel view ↑

Photograph 3. Site overview east of Warwick Village Road ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9-B	• Road Buffer • Turbine 97	June 8, 2012	• The watercourse runs adjacent to a deciduous forest and a small patch of cultural thicket (classified as FOD6-5, CUT1-1, ELC Feature ID 63) and soybean fields. Flowing tile drain inputs were observed at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of grasses along the soybean fields and greater than 15 m along the forest.	• The watercourse is a defined channelized feature. The watercourse is mostly flat with one riffle present. The water is clear and had slow flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable with no signs of erosion. Substrate consists of silt, sand and clay. Canopy cover is low and is dominated by trees. Instream habitat cover is low and consists of aquatic vegetation, followed by cobble. No groundwater indicators were observed. Sticklebacks were observed at time of investigation. Approximately 3 km downstream, fish species consist of baitfish community, Black Bullhead and Green Sunfish (SCRCA, 2000).	Moderate

Watercourse Name	Graham Drain
DFO Drain Classification	F

	R9-B
MWW(m):	2.2
MBW(m):	3.5

	R9-B
MWD(m):	0.15
MBD(m):	0.7

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.29-A	• Collection Line Crossing and Buffer	June 18, 2012	• The watercourse is located in crop agricultural fields and runs along the roadside of Nauvoo Road. Flowing tile drain inputs were noted during time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of meadow.	• The watercourse is a defined channelized feature. The watercourse is straight flat uniform channel. The water was clear and was stagnant with sections of dry channel during the time of investigation. It is classified as intermittent system by SCRCA. Banks are stable and well vegetated. Substrate consists of silt and clay. Canopy cover is high dominated by grasses. Instream habitat cover is high and consists of only aquatic vegetation. The channel is grass choked. A few plants of groundwater indicator water speedwell were observed. Iron staining was present just south of Townsend Line. Fish were observed near a culvert at time of investigation. Approximately 8 km downstream, fish community consists of baitfish community, Black Bullhead and Green Sunfish (SCRCA, 2000).	Moderate

Watercourse Name	McPherson Drain 2005
DFO Drain Classification	F

	R9.29-A
MWW(m):	1.0
MBW(m):	2.5

	R9.29-A
MWD(m):	0.07
MBD(m):	0.6

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.29-B	• Collection Line Crossing	May 30, 2012	• The watercourse flows beside a deciduous forest (classified as FOD5-1, FOD6-5, ELC Feature ID 103), crossing Northville Road and into soybean and corn fields. Flowing tile drain inputs were noted at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of meadow in the agricultural fields and greater than 30 m on the south side along the forest.	• The watercourse is a defined channelized feature. The watercourse is all straight flats. The water was clear and had slow flow at time of investigation. It is unclassified by SCRCA. Banks are stable to slightly unstable with some evidence of erosion. Substrate is dominated by silt, clay and muck followed by sand and cobble. Canopy cover is moderate and is a mix of shrubs, trees and grasses. Instream habitat cover is moderate and consists of aquatic vegetation followed by woody debris, undercut banks and cobble. Small clumps of groundwater indicator water speedwell were present throughout the reach. Young-of-the-year (YOY) and adults Cyprinids were observed at time of investigation. Approximately 7.5 km downstream, fish species consist of baitfish community, Black Bullhead and Green Sunfish (SCRCA, 2000).	Moderate

Watercourse Name	McPherson Drain 2005
DFO Drain Classification	Unclassified

	R9.29-B
MWW(m):	1.5
MBW(m):	2.0

	R9.29-B
MWD(m):	0.08
MBD(m):	0.4

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

Photograph 3. Substrate ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.29-C*	• Road Crossing	May 29, 2012	• The watercourse is located in corn and soybean fields. Tile drain inputs were observed at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of grasses and shrubs.	• The watercourse is a defined channelized feature. The watercourse is a straight uniform channel with flats. The water was clear and had low flow at time of investigation. It is unclassified by SCRCA. Banks are stable and well vegetated. Substrate is dominated by silt followed by muck. Canopy cover is low and consists of grasses. Instream habitat cover is moderate and consists of grasses and aquatic vegetation. No groundwater indicators were observed. Approximately 6 km downstream, fish species consist of baitfish community, Green Sunfish and Black Bullhead (SCRCA, 2000).	Moderate

Watercourse Name	McPherson Drain 2005
DFO Drain Classification	Unclassified

	R9.29-C
MWW(m):	1.8
MBW(m):	3.0

	R9.29-C
MWD(m):	0.25
MBD(m):	0.45

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.29-D*	• Collection Line Crossing and Buffer • Road Crossing and Buffer • Turbine 92	May 29, 2012	• The watercourse is surrounded by soybean fields and crosses Hickory Creek. Flowing tile drain inputs were observed at time of investigation. Surrounding topography is very slightly rolling hills. Riparian buffer is 5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse is all flats. The water was clear and had slow flow at time of investigation. It is classified as intermittent by SCRCA. Banks are stable and well vegetated. Substrate is dominated by clay followed by sand, silt, gravel and cobble. Canopy cover is low and is dominated by grasses. Instream cover is high and is dominated by aquatic vegetation, followed by cobble, undercut banks, woody debris and vegetation debris. No groundwater indicators were observed. Approximately 25 adult and 10 YOY Cyprinids were observed at time of investigation. Approximately 4 km downstream, fish species consist of baitfish community, Green Sunfish and Black Bullhead (SCRCA, 2000).	Moderate

Watercourse Name	McPherson Drain 2005
DFO Drain Classification	F

	R9.29-D
MWW(m):	0.8
MBW(m):	1.2

	R9.29-D
MWD(m):	0.2
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.29-F	• Collection Line Crossing • Road Crossing	May 29, 2012 June 18, 2012	• The watercourse is located in soybean fields. Flowing tile drain inputs were present during the first site investigation and not flowing during the second. Surrounding topography is flat. Riparian buffer is 5 m of meadow.	• The watercourse is a defined channelized feature. The watercourse is straight flat channel with some pools and one riffle present. The water was turbid and had moderate flow during the first visit and was clear and had slow flow during the time of second site investigation. It is classified as a permanent warmwater system by SCRCA. Banks are slightly unstable with signs of erosion and little vegetation. Substrate consists of a hard packed clay bottom with muck, silt, gravel, cobble and sand. Canopy cover is low and is dominated by grasses. Instream habitat cover is moderate and consists of aquatic vegetation followed by cobble, undercut banks and boulders. No groundwater indicators were observed. Approximately 10 Cyprinids were observed during first site visits and Cyprinids and schools of YOYs were observed at time of second site investigation. There is a perched culvert creating a barrier of 0.3 m, however fish were observed both upstream and downstream. Approximately 2.5 km downstream, fish community consists of baitfish community, Black Bullhead and Green Sunfish (SCRCA, 2000).	Moderate

Watercourse Name	McPherson Drain 2005
DFO Drain Classification	C

	R9.29-F
MWW(m):	2.0
MBW(m):	3.2

	R9.29-F
MWD(m):	0.1
MBD(m):	0.6

Photos

Photograph 1. Site overview ↑

Photograph 2. Perched culvert ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R12.54-A*	• Collection Line Crossing and Buffer	June 4, 2012	• The watercourse is surrounded by soybean and corn fields and crosses Nauvoo Road. Tile drain inputs that were not flowing were observed at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of grasses and trees.	• The watercourse is a defined channelized feature. The watercourse is 100% flat. The water was clear and had no visible flow at time of investigation. It is classified as a permanent warmwater system by SCRCA. Banks are stable and well vegetated. Substrate consists of silt and muck. Canopy cover is moderate and is dominated by trees. Instream habitat cover is moderate and consists of aquatic vegetation followed by small woody debris. No groundwater indicators were observed. Cyprinids were observed at time of investigation. Approximately 2.5 km downstream, fish species consists of baitfish community, Rock Bass and Largemouth Bass (SCRCA, 2002).	Moderate

Watercourse Name	Zavitz Drain
DFO Drain Classification	C

	R12.54-A
MWW(m):	2.4
MBW(m):	3.4

	R12.54-A
MWD(m):	0.18
MBD(m):	1.0

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R1.37*	• Transmission Line Crossing	May 24, 2012	• The watercourse is buried south of Elginfield Road and emerges from a tile drain. The watercourse crosses Elginfield Road into a corn field. No tile drain inputs were noted at time of investigation. Surrounding topography is flat. Riparian buffer is 3 m of grasses	• The watercourse is a defined channelized feature. It is classified as tiled and intermittent by ABCA. Banks are stable and well vegetated. Canopy cover is low and dominated by grasses. No groundwater indicators were observed. Approximately 5 km downstream, fish species consist of baitfish community and Yellow Bullhead (MNR, 1974).	Low

Watercourse Name	Dixon Drainage Works
DFO Drain Classification	T, F

	R1.37
MWW(m):	n/a
MBW(m):	n/a

	R1.37
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview north of Elginfield Road

Photograph 2. Site overview south of Elginfield Road

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.28*	• Collection Line Crossing	July 25, 2012	• The watercourse is buried to the west of Arkona Road and opens up east of Arkona Road flowing through deciduous forest (classified as FOD7-4, ELC Feature ID 90) and livestock pasture. No tile drain inputs were noted at time of investigation. Surrounding topography is a small valley. Riparian buffer is 10 m.	• The watercourse is channelized in some portion and natural in others. There was no water, except for one pool area at time of investigation. It is classified as tiled and unknown by ABCA. Banks are slightly unstable with some erosion present. Substrate is dominated by clay followed by sand, silt, gravel and cobble. Canopy cover is high and is dominated by trees. Instream habitat cover is low and consists of cobble, debris, woody debris and undercut banks. No groundwater indicators were observed. Fish are present approximately 4.6 km downstream in the Ausable River.	Low

Watercourse Name	Hayter Struyft Drain
DFO Drain Classification	T, U

	R2.28
MWW(m):	0.8
MBW(m):	1.0

	R2.28
MWD(m):	n/a
MBD(m):	0.4

Photos

Photograph 1. Channel view in forest ↑

Photograph 2. Site overview west of Arkona Road ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.34*	• Collection Line Crossing	July 25, 2012	• The watercourse is buried in a soybean field before flowing into cultural plantation and deciduous forest (classified as CUP3-2, FOD7-4, ELC Feature ID 90), crossing Arkona Road into a residential property. No tile drain inputs were noted at time of investigation. Surrounding topography a valley. Riparian buffer is greater than 5 m to the west of Arkona Road.	• The watercourse is an intermittent feature. It is classified as tiled and unknown by ABCA. Banks are stable and well vegetated on the east side of Arkona Road. Canopy cover is moderate and is dominated by trees. No groundwater indicators were observed. Fish are present approximately 3. 2 km downstream in the Ausable River.	Low

Watercourse Name	Borthwicke Drain Trib B
DFO Drain Classification	T, U

	R2.34
MWW(m):	n/a
MBW(m):	n/a

	R2.34
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview in soybean field ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.30*	• Collection Line Buffer	October 5, 2012	• The pond is located in a residential property adjacent to a cultural plantation (classified as CUP3-2, ELC Feature ID 90). The pond is approximately 5 m by 10 m. Riparian buffer is greater than 1 m of grasses and trees.	• The pond is an online feature and connected to R2.34.	Low

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.142*	• Collection Line Buffer	October 5, 2012	• The pond is located in a residential/farming property. The pond is surrounded by deciduous forest (classified as FOD7-4, ELC Feature ID 90). The pond is irregular horseshoe shape and over 300 m in length. Riparian buffer is greater than 2 m.	• The pond is an online feature that is connected to R2.34.	Low

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.38*	• Transmission Line Crossing	June 1, 2012	• The feature is located in a shallow marsh (classified as MAS2-1, ELC Feature ID 90).	• There was no channel present. Surrounding area is shallow marsh. It is classified as unknown by ABCA.	Low

Watercourse Name	Ausable River Trib
DFO Drain Classification	U

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.46	• Transmission Line Crossing	June 1, 2012	• The feature is located in a swamp thicket and deciduous swamp (classified as SWD3-3, SWT2-5, ELC Feature ID 90).	• There was no defined channel. The surrounding area was wet forest with vernal pools. It is classified as unknown by ABCA. This feature will be discussed in further detail in the Jericho Natural Heritage Assessment document.	Low

Watercourse Name	Ausable River Trib
DFO Drain Classification	U

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.58	• Transmission Line Crossing	June 1, 2012	• The feature is located in a wet forest in a deep valley of swamp thicket and shallow marsh (classified as SWT2-5, MAS2-1, ELC Feature ID 90).	• There was no defined channel, however there was evidence of ephemeral water and likely provides surface water conveyance during the spring months. According to the mapping, the feature converges with R2.51 and R2.38 downstream. It is classified as unknown by ABCA.	Low

Watercourse Name	Ausable River Trib
DFO Drain Classification	U

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.140-B*	• Collection Line Crossing	July 30, 2012	• The watercourse crosses Arkona Road and is surrounded by cultural plantation and woodland (classified as CUP3-2, CUW1a, ELC Feature ID 99). No tile drain inputs were noted at time of investigation. Surrounding topography is a small valley. Riparian buffer is 25 m.	• The watercourse is channelized at the road but a natural feature beyond Arkona Road. The watercourse consists of 100% flat. The water was turbid and no flow was observed at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with some erosion observed. Canopy cover is high and consists of trees and grasses. Instream habitat cover is low and consists of only aquatic vegetation. No groundwater indicators were observed. Fish are present approximately 3 km downstream in the Ausable River.	Low

Watercourse Name	From Lamoman Drain
DFO Drain Classification	C

	R2.140-B		R2.140-B
MWW(m):	0.7	**MWD(m):**	n/a
MBW(m):	1.2	**MBD(m):**	n/a

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.281*	• Collection Line Crossing and Buffer	May 9, 2012 May 23, 2012	• The watercourse runs parallel along Birnam Line through a crop agricultural field and crosses the road north into another agricultural field. Flowing tile drain inputs were noted through the site. The surrounding land topography is flat with hills on the north side. Riparian buffer is 4 m of grasses.	• The watercourse is a channelized feature and is a straight uniform channel. The water was slightly turbid and had low flow at time of investigations. It is classified as intermittent by ABCA. Banks are stable and well vegetated. Canopy cover is low consisting of grasses, shrubs, herbaceous vegetation and trees. Instream habitat cover is high and consists only of aquatic vegetation. The channel is algae choked. No groundwater indicators were observed. Two rock structures and accumulation of large woody debris create potential for additional low flow barriers north of Birnam Line.	Low

Watercourse Name	Hobbs-McKenzie Drain
DFO Drain Classification	F

	R2.281
MWW(m):	1.75
MBW(m):	2.55

	R2.281
MWD(m):	0.2
MBD(m):	0.68

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.38	• Collection Line Crossing • Transmission Line Crossing	May 14, 2012 November 22, 2012	• The watercourse is located in a corn field and originates at Thompson Line. Flowing tile drain inputs were observed at time of investigation. The surrounding land topography is flat. Riparian buffer is 0.5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse has a straight run and uniform channel morphology. The water was slowly flowing at time of investigation, and is classified as intermittent by ABCA. Banks are stable and well vegetated. Substrate consists of cobble, clay and silt. Canopy cover is low with a mix of grasses and shrubs. Instream habitat cover is moderate with a mix of cobble and aquatic vegetation. No groundwater indicators were observed. Two perched culverts are creating a barrier to fish at the roadside; one is 0.5 m high and the other 0.2 m. Approximately 3.5 km downstream, fish species consist of baitfish community, Largemouth Bass and Green Sunfish (ABCA, 2001).	Low

Watercourse Name	Robinson Monkhouse Drain
DFO Drain Classification	F

	R3.38
MWW(m):	0.6
MBW(m):	0.9

	R3.38
MWD(m):	0.15
MBD(m):	0.45

Photos

Photograph 1. Site overview ↑

Photograph 2. Perched culverts ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P3.44	• Collection Line Buffer • Road Buffer • Turbine 8	May 16, 2012	• The pond is dugout and located in an agricultural field adjacent to a forest area. The pond is 10 m by 40 m and greater than 2 m deep. A riparian buffer of shrubs and trees exists.	• The pond is man made with an outflow culvert into R3.40. The water was clear at time of investigation. The substrate is silt and sand. *In-situ* cover is moderate and consists of aquatic vegetation and woody debris.	Low

Photos

Photograph 1. Pond overview ↑

Photograph 2. Pond view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.46*	• Collection Line Crossing • Transmission Line Crossing	May 14, 2012	• The watercourse is tile drain fed and flows through a deciduous forest and swamp (classified as SWD3-3, FOD9-3, ELC Feature ID 235) and into agricultural fields. Surrounding topography is flat. Riparian buffer is greater than 15 m.	• The watercourse is a defined channelized feature. The watercourse is all flat. There was flow out of the culvert but no flow downstream. It is classified as a permanent warmwater system by ABCA. Banks are stable. Canopy cover is high and is dominated by trees. Instream habitat cover is moderate and consists of only aquatic vegetation. No groundwater indicators were observed. A perched culvert along Thomson Line creates a 0.15 m fish barrier. Approximately 4 km downstream, fish species consist of baitfish community, Largemouth Bass and Green Sunfish (ABCA, 2001).	Low

Watercourse Name	McLean Drain (No 2) West
DFO Drain Classification	C

	R3.46
MWW(m):	2.0
MBW(m):	2.5

	R3.46
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Channel view ↑

Photograph 2. Site overview south of Thomson Line ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.51	• Collection Line Crossing • Road Buffer • Turbine 21	May 31, 2012	• The feature is located in a corn field and a small section of deciduous forest (classified as FOD7-2, FOD5-8, ELC Feature ID 233). **Watercourse Name**: Davidson Brothers Drain (Main) **DFO Drain Classification**: T ***No photos available.***	• A small section of watercourse is present in the deciduous forest. There was no defined channel in the agricultural field, the feature was ploughed through. It is classified as tiled by ABCA.	Low

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.64	• Collection Line Buffer	May 14, 2012 June 7, 2012	• The watercourse begins as a tile drain emerging from a hay field into a defined channel. Surrounding topography is rolling hills. Riparian buffer is greater than 10 m. **Watercourse Name**: Trick Drain Trib B **DFO Drain Classification**: T, U	• The watercourse has been tiled and is a defined natural feature after the tile drain. There was no water at time of investigation. It is classified as tiled and unknown by ABCA. Banks are stable and well vegetated. Substrate consists of silt. Canopy cover is high and consists of trees and shrubs. There is no instream habitat cover. No groundwater indicators were observed. Approximately 500 m downstream, fish species consist of baitfish community and Pumpkinseeds (ABCA, 2003).	Low

Photos

Photograph 1. Site overview in hay field ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.70	• Collection Line Crossing and Buffer • Road Crossing	September 17, 2012	• The section of watercourse running parallel to Gordon Road does not exist. The watercourse begins a Gordon Road and flows through corn and soybean fields. Tile drain inputs that were not flowing were observed at time of investigation. Surrounding topography is slightly hilly. Riparian buffer is 4 m of meadow.	• The watercourse is a defined natural feature. The watercourse is mostly flat with some pools present. The water was clear and had no flow with some dry areas during time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable with evidence of erosion. Substrate is dominated by silt and muck followed by sand, clay and gravel. Canopy cover is low and consisted of grasses. Instream habitat cover is high and consists only of aquatic vegetation. The channel was mainly choked with grasses. No groundwater indicators were observed. Approximately 4.5 km downstream, fish species consists of baitfish community (ABCA, 2003).	Low

Watercourse Name	Sutherland Drain
DFO Drain Classification	C

	R3.70
MWW(m):	1.0
MBW(m):	2.0

	R3.70
MWD(m):	0.05
MBD(m):	0.65

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-A	• Collection Line Crossing	May 17, 2012	• The watercourse flows through row agricultural fields. Flowing tile drain inputs were noted at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse has a straight flat uniform channel. The water was clear and had low flow with some stagnant areas at time of investigation. It is classified as a permanent warmwater system by ABCA. The banks are stable and well vegetated. Substrate is dominated by sand and silt followed by clay. There is no canopy cover. Instream habitat cover is high and is dominated by aquatic vegetation followed by cobble. No groundwater indicators were observed. A perched culvert is present halfway through the site for farm vehicle access. The culvert is perched 0.2 m on the west and 0.02 on the east side creating a barrier to fish passage. Approximately 7 km downstream, fish species consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Low

Watercourse Name	Upper Mud Creek Drain No 5
DFO Drain Classification	C

	R4-A
MWW(m):	1.0
MBW(m):	1.2

	R4-A
MWD(m):	0.1
MBD(m):	0.15

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Perched culvert ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4-E	• Collection Line Buffer • Road Buffer • Turbine 46	May 2, 2012	• The site is located in an agricultural field that has flat topography. The west bank has been recently cleared. One flowing tile drain input was noted within the site. The riparian buffer is less than 0.5 m of grasses.	• The watercourse is a defined channelized feature. The watercourse is a straight flat channel. The water was clear and had slow flow at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are slightly unstable and are becoming re-vegetated. Substrate consists of silt. Canopy cover is low and consists of grasses. Instream habitat cover is high and dominated by aquatic vegetation. No groundwater indicators were observed. Approximately 5 km downstream, fish species consist of baitfish community, Black Bullhead and Pumpkinseed (ABCA, 2001).	Low

Watercourse Name	Upper Mud Creek Drain No 2
DFO Drain Classification	C

	R4-E
MWW(m):	1.7
MBW(m):	3.0

	R4-E
MWD(m)	0.22
MBD(m):	0.7

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

Photograph 3. Cleared area ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.8-C	• Collection Line Crossing	July 25, 2012	• The watercourse flows through soybean fields, crosses Northvillle Road into cultural woodland (10 m riparian buffer) then cultural meadow (1 to 2 m riparian buffer) (classified as CUM1, CUW1, ELC Feature ID 220) and more soybean fields. Tile drain inputs that were not flowing were observed at time of investigation. Surrounding topography is flat.	• The watercourse is a defined channelized feature that is starting to naturalize. The watercourse was dry at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Substrate consists of bedrock and clay, followed by gravel, sand and silt. Canopy cover is moderate and is a mix of trees, shrubs, grasses and herbaceous vegetation. Instream habitat cover is moderate and consists of cobble and aquatic vegetation, followed by boulders and woody debris. No groundwater indicators were observed. Approximately 2.7 km upstream, fish species consist of baitfish community (ABCA, 2001).	Low

Watercourse Name	Golden Creek Drain Branch East
DFO Drain Classification	C

	R4.8-C
MWW(m):	1.5
MBW(m):	2.5

	R4.8-C
MWD(m):	n/a
MBD(m):	0.4

Photos

Photograph 1. Site overview in soybean fields ↑

Photograph 2. Site overview in forest ↑

Photograph 3. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.16-A	• Collection Line Crossing and Buffer • Road Crossing • Turbine 26 • Substation Buffer	May 29, 2012	• The watercourse begins in a deciduous forest (classified as FOD7-1, ELC Feature 172) and becomes tile drained through agricultural fields and emerges 0.5 km north through a tile drain. Surrounding area is flat and sloped towards the watercourse. Riparian buffer is 8 to 10 m of grasses and shrubs.	• The watercourse is a defined channelized feature. The watercourse has a straight flat run uniform channel. The water was clear and had low flow at time of investigation. The watercourse was dry in the forest area. It is classified as tiled and intermittent by ABCA. Banks are stable and vegetated. Substrate consists of silt. Canopy cover is high and consists of trees, herbaceous vegetation and grasses. Instream habitat cover is high and consists of aquatic vegetation followed by woody debris. No groundwater indictors were observed.	Low

Watercourse Name	Elliot McBryan Drain
DFO Drain Classification	T, F

	R4.16-A		**R4.16-A**
MWW(m):	1.2	**MWD(m):**	0.1
MBW(m):	2.0	**MBD(m):**	0.5

Photos

Photograph 1. Site overview in agricultural field ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.22*	• Collection Line Buffer • Road Buffer	May 28, 2012	• The watercourse is located in the road Right-of-Way and is bordered by crop agricultural field to the west and Jericho Road to the east. A culvert inputs to the stream from the south. The surrounding topography is flat. Riparian buffer is 2 m of grasses.	• The watercourse is a defined channelized feature. The watercourse has a straight flat uniform channel. The channel was dry during time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and vegetated. Substrate is dominated by silt followed by detritus. Canopy cover is low and consists of trees and grasses. Instream habitat cover is high and consists of aquatic vegetation. The channel is choked with grasses and cattails. No groundwater indicators were observed.	Low

Watercourse Name	8th Concession Drain
DFO Drain Classification	C

	R4.22
MWW(m):	n/a
MBW(m):	1.5

	R4.22
MWD(m):	n/a
MBD(m):	0.4

Photos

Photograph 1. Site overview looking south ↑

Photograph 2. Site overview looking north ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.27*	• Collection Line Buffer	July 30, 2012	• The watercourse is located in a soybean field. No tile drain inputs were noted at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of meadow.	• The watercourse is a defined channelized feature. The channel was dry except for one pool of water at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Substrate consists of sand, clay and silt. Canopy cover is low and is dominated by grasses. Instream habitat cover is low and consists of aquatic vegetation followed by cobble. No groundwater indicators were observed. Approximately 3.5 km downstream, fish species consists of baitfish community (MNR, 1976).	Low

Watercourse Name	Sullivan Drain
DFO Drain Classification	C

	R4.27
MWW(m):	0.7
MBW(m):	2.5

	R4.27
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.36*	• Collection Line Crossing and Buffer • Road Crossing and Buffer • Turbine 20	May 30, 2012	• The watercourse is possibly tiled for 50 m emerging in crop agricultural fields and running behind a residential property. The watercourse crosses Northville Road and flows through more agricultural fields. Tile drain inputs were observed at time of investigation. The surrounding topography is flat and sloped towards the watercourse. Riparian buffer is 1 to 5 m of grasses and shrubs with some areas of manicured lawn.	• The watercourse is a defined channelized feature. The watercourse has a straight run uniform channel. The water was clear and had low flow during the time of investigation. It is classified as unknown by ABCA. Banks are stable and vegetated. Substrate consists of silt. Canopy cover is very low with some shrubs present. Instream habitat cover is moderate and is dominated by aquatic vegetation. Channel is choked with vegetation creating a potential low flow barrier. No groundwater indicators were noted.	Low

Watercourse Name	Bice Drain
DFO Drain Classification	U

	R4.36
MWW(m):	1.15
MBW(m):	2.0

	R4.36
MWD(m):	0.15
MBD(m):	0.6

Photos

Photograph 1. Site overview in agricultural fields↑

Photograph 2. Site overview behind residential property ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.47*	• Collection Line Buffer	October 5, 2012	• The pond is located in cultural meadow (CUM1-1) surrounded by agricultural fields and cultural plantation (classified as CUP3-8, ELC Feature ID 465). The pond is irregular in shape and is approximately 25 m by 10 m. Riparian buffer is greater than 5 m.	• The pond may be an online feature that feeds into R4.36 through a 50 m buried section.	Low

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.51*	• Collection Line Buffer • Road Buffer	May 24, 2012 November 22, 2012	• The feature is located in a corn field along Gordon Road. Downstream the feature is connected to R4-C.	• The feature begins as a roadside ditch which was dry at time of investigation and is ploughed through in the corn field. It is classified as permanent warmwater system by ABCA.	Low

Watercourse Name	Gordon Unknown Tile Drain
DFO Drain Classification	C

Photos

Photograph 1. Site overview ↑

Photograph 1. Roadside ditch ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.58	• Collection Line Crossing • Road Crossing	July 30, 2012	• The watercourse flows parallel to Arkona Road through corn fields and flows into R4. A culvert was observed to the east connecting to R4-A. Surrounding land topography is flat. Riparian buffer is 5 m of grasses.	• The watercourse is intermittent channelized feature. There was no water at time of investigation. It is classified as a permanent warmwater system by ABCA. Banks are stable and well vegetated. Substrate consists of clay, sand and silt. Canopy cover is low and is dominated by grasses. Instream habitat cover is low and consists of aquatic vegetation. No groundwater indicators were observed. Approximately 7 km downstream, fish species consists of a baitfish community, Pumpkinseed and Black Bullhead (ABCA, 2001).	Low

Watercourse Name	Roadside Ditch
DFO Drain Classification	C

	R4.58
MWW(m):	0.5
MBW(m):	0.75

	R4.58
MWD(m):	n/a
MBD(m):	n/a

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.60	• Collection Line Buffer	May 29, 2012	• The watercourse is located in a mix of deciduous forest, cultural thicket and swamp thicket (classified as FOD7-2, CUT1-1, SWT2-2, ELC Feature ID 172). No tile drain inputs were noted at time of investigation. Surrounding land topography is rolling hills. Riparian buffer is greater than 20 m.	• The watercourse is an intermittent channelized feature. The watercourse has a straight flat uniform channel. There was no water at time of investigation. It is not mapped by ABCA. Banks are stable and vegetated. Substrate is dominated by silt followed by muck. Canopy cover is high and dominated by trees. Instream habitat cover is low and consists of woody debris. No groundwater indicators were observed.	Low

Watercourse Name	unmapped
DFO Drain Classification	Unmapped

	R4.60
MWW(m):	n/a
MBW(m):	1.1

	R4.60
MWD(m):	n/a
MBD(m):	0.3

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.61-A*	• Collection Line Crossing and Buffer	May 11, 2012 May 28, 2012 May 30, 2012 July 31, 2012	• The watercourse is located in a crop agricultural fields running parallel to Thomson Line and crossing the road to run parallel with Army Camp Road. The watercourse runs parallel to Army Camp Road for 1.8 km through agricultural fields and crosses Army Camp Road into a cattle pasture and crosses Ravenswood Line into more agricultural fields. Tile drain inputs were observed. Surrounding topography is flat with a small slope towards the watercourse. Riparian buffer ranges from 1 to 4 m of grasses.	• The watercourse is a defined channelized feature. The section adjacent to Thomson Line was recently excavated. The watercourse has a straight run uniform channel. The water was turbid and had very low flow along Thomson Line. Parallel to Army Camp Road the channel was dry with some pools present. After crossing Army Camp Road the water was clear and had moderate to low flow. The system is classified as intermittent by SCRCA. Banks are stable and vegetated. Substrate is dominated by silt and clay followed by sand, gravel and muck. Canopy cover is low with some trees. Instream habitat increases from none to moderate as the water flows downstream and consists of aquatic vegetation and cobble. Groundwater indicator watercress was observed along Army Camp Road and Ravenswood Line. There was one potential fish barrier present along Ravenswood Line caused by snagged plant debris. Cyprinids were observed in the cattle pasture along Army Camp Road during the third site investigation.	Low

Watercourse Name	10th Concession Drain
DFO Drain Classification	F

	R4.61-A
MWW(m):	2.0
MBW(m):	4.0

	R4.61-A
MWD(m):	0.35
MBD(m):	1.0

Photos

Photograph 1. Site overview along Thomson Line↑

Photograph 2. Site overview along Army Camp Rd ↑

Photograph 3. Site overview in cattle pasture ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.62*	• Collection Line Crossing and Buffer	July 31, 2012	• The watercourse runs parallel to Army Camp Road adjacent to agricultural fields. Surrounding topography is flat. Riparian buffer is greater than 1 m of meadow.	• The watercourse is a defined channelized feature. Most of the reach was dry at time of investigation. It is unmapped by ABCA. Banks are stable and well vegetated. Canopy cover is high and dominated by grasses and herbaceous vegetation. No groundwater indicators were observed.	Low

Watercourse Name	Unmapped
DFO Drain Classification	Unclassified

	R4.62
MWW(m):	dry
MBW(m):	n/a

	R4.62
MWD(m):	dry
MBD(m):	n/a

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R5.10*	• Collection Line Crossing and Buffer	May 31, 2012	• The watercourse begins in a corn field and crosses Thomson Line into soy bean fields. No tile drain inputs were observed at time of investigation. Surrounding land topography is flat. Riparian buffer is 5 m consisting of grasses and shrubs.	• The watercourse is a defined channelized feature. The watercourse has a straight flat run uniform channel. Water was clear and had moderate flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable and well vegetated. Substrate is dominated by silt followed by cobble. Canopy cover is low consisting of trees and shrubs. Instream habitat cover is low and consists of cobble. No groundwater indicators were observed. Many Cyprinids were observed during time of investigation. Approximately 2.5 km downstream, fish species consist of baitfish community (MNR, 1979).	Low

Watercourse Name	Duffus Drain
DFO Drain Classification	F

	R5.10
MWW(m):	1.25
MBW(m):	2.5

	R5.10
MWD(m)	0.2
MBD(m):	0.9

Photos

Photograph 1. Site overview looking north↑

Photograph 1. Site overview looking south ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6.18-A*	• Collection Line Buffer	May 23, 2012	• The watercourse is located in a wheat field and runs parallel to a driveway. Roadside ditch inputs from Northville Road were present. The surrounding land topography was flat. Riparian buffer is 5 m of grasses and herbaceous vegetation.	• The watercourse is a straightened, uniform channelized feature. There was very low flow at time if investigation. It is classified as intermittent by SCRCA. Banks are stable and well vegetated. There is no canopy cover. The channel is choked with emergent grasses and cattails. No groundwater indicators were observed. Approximately 6 km downstream, fish species consist of baitfish community (MNR, 1976).	Low

Watercourse Name	Shawana Drain
DFO Drain Classification	F

	R6.18-A
MWW(m):	0.5
MBW(m):	1.0

	R6.18-A
MWD(m):	0.1
MBD(m):	0.8

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R8.10*	• Collection Line Crossing and Buffer • Road Crossing and Buffer • Turbine 37	May 29, 2012	• The watercourse flows through soy bean and winter wheat fields, passing a deciduous forest (classified as FOD6-5, ELC Feature ID 131) and crosses over Kinnard Road into more agricultural fields. No tile drain inputs were observed at time of investigation. Surrounding topography is flat. Riparian buffer is 5 m of grasses and shrubs.	• The watercourse is a defined channelized feature. The watercourse is all run morphology. The water was clear and had very low flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable and well vegetated. Substrate consists of silt. Canopy cover is moderate and consists of trees, shrubs and grasses. Instream habitat cover is moderate and consists of grasses, with some section of the channel choked by grasses. No groundwater indicators were observed.	Low

Watercourse Name	Malley Drain
DFO Drain Classification	F

	R8.10
MWW(m):	1.15
MBW(m):	2.25

	R8.10
MWD(m):	0.1
MBD(m):	0.55

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.29-E*	• Collection Line Buffer	May 29, 2012	• The watercourse is located in corn and soybean fields. No tile drain inputs were observed at time of investigation. Surrounding topography is slightly hilly. Riparian buffer is 5 m of meadow.	• The watercourse is a defined channelized feature. The watercourse is all straight with flats. The water was clear and had very slow flow at time of investigation. It is classified as an intermittent system by SCRCA. Banks are stable and well vegetated. Substrate consists of clay, sand, silt and gravel. Canopy cover is low and consists of grasses. Instream habitat cover is high and consists only of aquatic vegetation. No groundwater indicators were observed. Approximately 4 km downstream, fish community consists of baitfish community, Black Bullhead and Green Sunfish (SCRCA, 2000).	Low

Watercourse Name	McPherson Drain 2005
DFO Drain Classification	F

	R9.29-E
MWW(m):	0.8
MBW(m):	1.0

	R9.29-E
MWD(m):	0.2
MBD(m):	0.5

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P12.22*	• Collection Line Buffer	June 7, 2012	• The pond is surrounded by deciduous forest and cultural meadow (classified as CUM1-1, FOD6-5, ELC Feature ID 42). The pond is 100 m by 200 m.	• The pond is dugout feature with emergent grasses around the edges. Appears to be an online feature.	Low

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R12.54-B*	• Collection Line Crossing	June 7, 2012	• The watercourse runs adjacent to agricultural fields and deciduous forest (classified as FOD7-4, ELC Feature ID 42), crossing Birnam Line. No tile drain inputs were noted at time of investigation. Surrounding topography is flat. Riparian buffer is less than 2 m of grasses along the agricultural field and greater than 15 m along the forest.	• The watercourse is a defined channelized feature. The watercourse is all flat. The water was clear and did not have visible flow at time of investigation. It is classified as a permanent warmwater system by SCRCA. Banks are stable with no signs of erosion. Substrate is dominated by muck, silt and clay, followed by sand. Canopy cover is moderate and is dominated by shrubs. Instream habitat cover is low and consists only of aquatic vegetation. No groundwater indicators were observed. Cyprinids were observed during time of investigation. Approximately 3 km downstream, fish species consists of baitfish community, Rock Bass and Largemouth Bass (SCRCA, 2002).	Low

Watercourse Name	Zavitz Drain
DFO Drain Classification	C

	R12.54-B
MWW(m):	2.5
MBW(m):	3.5

	R12.54-B
MWD(m):	0.25
MBD(m):	0.85

Photos

Photograph 1. Site overview ↑

Photograph 2. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.23	• Transmission Line Buffer	May 24, 2012	• The pond is located along Elginfield Road, surrounded by a corn field. The pond is 20 by 15 m. Riparian buffer is greater than 1 m of grasses and shrubs.	• The pond is offline pond that may be natural. The pond was dry at time of investigation. The pond was choked with common reed. No groundwater indicators were observed.	non-REA

Photos

Photograph 1. Site overview ↑

Photograph 2. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.24*	• Transmission Line Buffer	May 24, 2012	• The pond is surrounded by trees located in an old corn field.	• The pond could not be assessed because access was not granted.	non-REA

Photos

Photograph 1. Site overview ↑

Photograph 2. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.27*	• Transmission Line Buffer	June 18, 2012	• The pond is located in cattle pasture. The pond is 15 by 7 m. Riparian buffer is less than 1 m of cultural meadow (classified as CUM1-1, ELC Feature ID 351).	• The pond is a dugout offline feature. Cattle have access to the pond.	non-REA

Photos

Photograph 1. Site overview ↑

Photograph 2. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.31*	• Transmission Line Buffer	June 12, 2012	• The pond is located in a cultural plantation (classified as CUP3-2, ELC Feature ID 342).	• The pond could not be assessed as access was not granted.	non-REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.32*	• Transmission Line Buffer	June 12, 2012	• The pond is located along Elginfield Road, surrounded by corn and wheat fields. The pond is 20 by 10 m. Riparian buffer is 3 m of grasses and some cattails.	• The pond is a dugout offline feature. The water was turbid at time of investigation. *In-situ* cover consists of submergent vegetation, floating algae and cattails. No groundwater indictors were observed.	non-REA

Photos

Photograph 1. Site overview ↑

Photograph 2. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.33*	• Transmission Line Buffer	June 18, 2012	• The feature is located in a residential property.	• The pond does not exist, there was no water observed during site investigation. This may be a temporarily ponded area depending on farming practices.	non-REA

Photos

Photograph 1. Site overview ↑

Photograph 2. Feature overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.45*	• Transmission Line Buffer	June 12, 2012	• The pond is located in livestock pasture in a valley. Riparian buffer consists of grasses.	• The pond had some floating algae present around the edges. The pond could not be fully assessed because no access was granted.	non-REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P1.46*	• Transmission Line Buffer	October 5, 2012	• The pond is located adjacent to a deciduous forest (classified as FOD7-4, ELC Feature ID 344). The pond is approximately 20 m by 12 m.	• The pond is an offline feature.	non-REA

***No photos available*.**

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.10-A*	• Collection Line Crossing • Road Crossing • Turbine 34	May 16, 2012	• The feature is located in crop agricultural fields and crosses a laneway.	• There is a grassy swale that goes into a trench that was dry and then goes underground. The feature appears to be tiled. There is no surface feature north of the laneway. It is classified as unknown by ABCA.	non-REA

Watercourse Name	Tedball Marter Drain No 1
DFO Drain Classification	U

Photos

Photograph 1. Site overview ↑

Photograph 2. Trenched area ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.32	• Transmission Line Buffer	July 31, 2012	• The feature is located in deciduous forest (classified as FOD7-4, ELC Feature ID 90) and corn fields.	• No channel was observed, only a small area with common reed. It is classified as unknown by ABCA.	non-REA

Watercourse Name	Boothill Creek Trib
DFO Drain Classification	U

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.33	• Transmission Line Crossing	June 12, 2012	• The feature is located in a mix of cultural meadow, deciduous forest, swamp thicket and shallow marsh (classified as CUM1-1, FOD5-3, FOD7-4, SWT2-5, MAS2-1, ELC Feature ID 90).	• The feature is classified as a wetland and is not a pond or REA Water Body. The feature will be discussed in the Natural Heritage Assessment Report for Jericho.	non-REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.52*	• Transmission Line Buffer	October 5, 2012	• The pond is located in a deciduous forest (classified as FOD7-4, ELC Feature ID90). The pond is approximately 30 m by 30 m. Riparian buffer is greater than 15 m.	• The pond appears to be offline.	Non-REA

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.87*	• Collection Line Crossing • Road Crossing • Turbine 80	May 15, 2012	• The feature is located in a wheat field and pasture. **Watercourse Name**: Wight Drain Branch **DFO Drain Classification**: T	• The feature has been ploughed through. It is classified as tiled by ABCA.	non-REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.93*	• Collection Line Buffer • Road Buffer • Turbine 80	May 15, 2012	• The feature is located in a wheat field and pasture. **Watercourse Name**: Wight Drain Branch **DFO Drain Classification**: T	• The feature has been ploughed through. It is classified as tiled by ABCA.	non-REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.94*	• Collection Line Crossing and Buffer	May 24, 2012 November 22, 2012	• The feature is located in an old corn field.	• The channel does not is tiled in the agricultural fields. Along the roadside it is a ditch that was dry and may convey surface water during rain events and the spring freshette. It is classified as unknown by ABCA.	non-REA

Watercourse Name	Glenn Drain
DFO Drain Classification	U

Photos

Photograph 1. ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.111	• Collection Line Crossing and Buffer • Road Crossing and Buffer	May 2, 2012	• Located in a crop agricultural field along Arkona Road, south of Cedar Point Line. The feature may be connected to the tiled portion of R2101.	• The feature is a temporary channel for surface drainage that has been tilled or driven through. It is classified as tiled by ABCA.	non-REA

Watercourse Name	Glenn Drain Trib B
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

Photograph 2. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.114*	• Collection Line Buffer • Road Buffer • Turbine 56	May 23, 2012	• The pond is located in an agricultural field.	• There is a small depression in the field that may hold water. The pond was dry at time of investigation. No groundwater indicators were observed.	non-REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.115	• Collection Line Buffer	May 23, 2012	• The pond is located in an agricultural field and appears to have a fence around it.	• The pond appears to be man-made and used for agricultural purposes.	non-REA

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.131	• Collection Line Buffer • Road Buffer	May 31, 2012	• The pond is located in a hay field. The pond is 30 m by 20 m and too deep to wade. Riparian buffer is 5 m of trees and shrubs.	• The pond is a dugout offline feature. The water was turbid at time of investigation. Substrate is muck, sand and silt. *In-situ* cover is high and consists of pondweed and algae. No groundwater indicators were observed.	non-REA

***No photos available.**

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.140-A	• Collection Line Crossing • Road Crossing • Turbine 73 and 74	May 3, 2012	• The feature is located in an agricultural crop field. Surrounding topography is slightly rolling.	• There was no surface water feature present. The watercourse is buried. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Lamoman Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.140	• Collection Line Buffer • Road Buffer • Turbine 73	June 18, 2012	• The pond is surrounded by a small forest and hay field in cattle pasture. The pond is 10 m by 15 m and is surrounded by a fence. Riparian buffer is 0.5 m of meadow and trees.	• The pond is a dugout offline feature. The water was turbid at time of investigation. Substrate is clay and silt. *In-situ* cover is low and consists of aquatic vegetation and woody debris. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Site overview ↑

Photograph 2. Pond view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.141*	• Collection Line Buffer	May 24, 2012	• The feature is located in a corn field.	• The channel does not exist. The watercourse has been buried. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Ausable River Trib
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.143	• Collection Line Buffer	May 24, 2012	• The pond is surrounded by agricultural fields near a mixed forest (classified as FOM6-2, ELC Feature ID 90). The pond is approximately 25 by 40 m and 1 to 2 m in depth. Riparian buffer is newly planted and appears to be a restoration project.	• The pond is a dugout offline feature. Emergent vegetation is very low.	non -REA

Photos

Photograph 1. Pond overview ↑

Photograph 2. Pond view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P2.144*	• Transmission Line Buffer	May 16, 2012	• The pond is located in a deciduous forest (classified as FOD, ELC Feature ID 90). The pond is 10 by 5 m. Riparian buffer consists of grasses and some shrubs.	• The pond appears to be a natural feature that may be online. *In-situ* cover is moderate and consists of emergent vegetation.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.193	• Collection Line Crossing • Road Crossing	May 24, 2012	• The feature is located in a corn field.	• The channel does not exist. The field has been tiled and only a small depression exists. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Hobbs-McKenzie Trib
DFO Drain Classification	T

Photos

Photograph 1. Channel overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.199*	• Collection Line Buffer • Road Buffer	October 5, 2012	• The feature is located in an agricultural field and farming property. **Watercourse Name**: Hobbs-McKenzie Trib **DFO Drain Classification**: T	• The feature is buried for approximately 200 m and appears to emerge in a small stand of trees. It is classified as tiled by ABCA.	non -REA

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.239*	• Collection Line Buffer • Road Buffer	May 23, 2012	• The feature is located in an old corn field.	• There was no surface feature present, only a slight depression. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Curtis-Townline Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.302*	• Collection Line Crossing	June 5, 2012	• The feature is located in a soybean field.	• There was no feature present. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Roder Outlet Drain Trib
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.310*	• Collection Line Buffer	June 4, 2012	• The feature is located in a soybean field.	• There is not feature present, it has been ploughed through. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Roder Drain Ext
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.311- A/B	• Collection Line Crossing • Road Crossing • Turbine 82	May 15, 2012	• The feature is located in an agricultural field. There are two swale features present.	• No channel was found, however some low lying areas exist that may provide seasonal surface water conveyance. The swales outflow into an unmapped watercourse.	non -REA

Watercourse Name	Unmapped
DFO Drain Classification	Unclassified

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R2.312	• Collection Line Buffer • Road Buffer • Turbine 80	May 15, 2012	• The feature is located in an agricultural field. **Watercourse Name**: Unmapped **DFO Drain Classification**: Unclassified	• The feature is a grassed waterway that can carry overland flow. It is unclassified by ABCA.	non -REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P3.29	• Collection Line Buffer • Road Buffer	May 23, 2012	• Pond is located within an industrial area. The pond is approximately 300 m by 100 m. Riparian buffer is approximately 5 m to 15 m of meadow.	• The pond is a dugout offline feature. However, there is an overflow channel that exists into R3. Substrate consists of silt, gravel, sand and clay. *In-situ* cover is high and consists of aquatic vegetation. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

Photograph 2. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P3.56*	• Collection Line Buffer	October 5, 2012	• The pond is located in a cultural meadow (CUM1-1) surrounded by agricultural fields and a residential property. The pond is approximately 10 m by 25 m. Riparian buffer is approximately 5 m.	• The pond is an offline feature.	non -REA

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.58*	• Road Buffer • Turbine 27	May 31, 2012	• The feature is located in an agricultural field.	• There was no surface feature present, it has been ploughed through. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Davidson Brothers Drain (Main)
DFO Drain Classification	T

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P3.61*	• Collection Line Buffer • Transmission Line Buffer	October 5, 2012	• The pond is located in a deciduous forest (classified as FOD7-4, ELC Feature ID 377). The pond is approximately 18 m by 10 m. Riparian buffer is greater than 10 m.	• The pond appears to be an offline feature.	non -REA

***No photos available*.**

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.62	• Collection Line Crossing • Road Crossing • Turbine 77 and 78	May 11, 2012	• The feature is located in an agricultural field. **Watercourse Name**: Trick Drain Trib C **DFO Drain Classification**: T	• There was no channel. The feature has been ploughed through. It is classified as tiled by ABCA.	non -REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P3.62*	• Collection Line Buffer	October 5, 2012	• The pond is located in a deciduous forest (classified as FOD7-2, ELC Feature ID 243). The pond is approximately 15 m by 20 m. Riparian buffer is greater than 20 m.	• The pond appears to be an offline feature.	non -REA

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R3.68	• Collection Line Crossing • Road Crossing and Buffer • Turbine 66 and 67	May 23, 2012	• The feature is located in a crop agricultural field. **Watercourse Name**: Rombouts Drain **DFO Drain Classification**: T	• The feature has been ploughed through. It is classified as tiled by ABCA.	non -REA

Photos

Photograph 1. Site overview north of Farmers Line ↑

Photograph 2. Site overview south of Farmers Line ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.11-A	• Collection Line Crossing • Road Crossing • Turbine 17	May 10, 2012	• The feature is located in crop agricultural fields.	• There was no surface feature present. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Hamilton-Fischer-Anderson Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.28*	• Collection Line Buffer	June 12, 2012	• The pond is located in a mix of cultural meadow, cultural thicket and deciduous forest (classified as CUM1-1, CUT1-b, FOD, ELC Feature IDS 221) surrounded by wheat field.	• The pond is an offline feature. The pond could not be assessed as access was not granted.	non -REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.29	• Collection Line Crossing and Buffer • Road Crossing and Buffer • Turbine 14	May 23, 2012	• The feature is located in crop agricultural fields. **Watercourse Name**: Hamilton Drain **DFO Drain Classification**: T	• The feature has been ploughed through. It is classified as tiled by ABCA.	non -REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.29	• Collection Line Buffer • Road Buffer	May 23, 2012	• Pond is located within a deciduous forest (classified as FOD6-5, ELC Feature ID 213) adjacent to agricultural field and Ravenswood Line. The pond is approximately 100 m by 20 m and greater than 2 m deep. Riparian buffer is greater than 30 m to the south and west, 6 m to the north and 3 m to the east.	• The pond is an offline dugout feature. The water was turbid at time of investigation. Substrate consists of silt and sand. *In-situ* cover is low and consists of submergent aquatic vegetation. Several Cyprinids and catfish were observed at time of investigation.	non -REA

Photos

Photograph 1. Pond overview ↑

Photograph 2. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.30	• Collection Line Buffer • Road Buffer • Turbine 15	May 24, 2012	• The pond is located in a deciduous swamp, surrounded by cultural meadow (classified as CUM1-1, SWD2-2, ELC Feature ID 213). The pond is 70 by 70 m and too deep to wade. Riparian buffer is greater than 3 m of common reed.	• The pond is a dugout offline feature. The water was turbid at time of investigation. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

Photograph 2. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.36*	• Collection Line Buffer • Road Buffer	May 23, 2012	• Pond is located in a corn field. Pond is approximately 30 m by 15 m. Riparian buffer is 1 m of cattails. Surrounding land topography is flat.	• The pond is defined as a dugout pond that appears to be used for agricultural purposes.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.37	• Collection Line Crossing and Buffer • Road Buffer	June 12, 2012	• The feature is located in a corn field.	• The watercourse has been buried. An outlet/inlet pipe was observed at the road. It is classified as unknown by ABCA.	non -REA

Watercourse Name	Mud Creek Trib
DFO Drain Classification	U

Photos

Photograph 1. Site overview ↑

Photograph 2. Inlet/outlet pipe ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.37	• Road Buffer	May 22, 2012	• The pond is located in corn fields beside R4.8. The pond is 7 m by 7 m. Riparian buffer is 2 m of meadow and shrubs.	• Pond is an offline dugout feature. Substrate consists of silt, clay and sand. *In-situ* cover is moderate and consists of algae and emergent vegetation. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.39	• Road Buffer • Turbine 22	June 18, 2012 September 28, 2012	• The feature is located in wheat and corn fields. A small section is located in a deciduous forest (classified as FOD5-2, ELC Feature ID 216).	• The feature has been ploughed through. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Thomson Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.39	• Collection Line Buffer • Road Buffer • Turbine 71	May 23, 2012	• The pond is located in an agricultural field. The pond is 30 m by 30 m and too deep to wade. Riparian buffer is 3 m of grasses and shrubs.	• The pond is a dugout offline feature. The water column was clear at time of investigation. The pond was completely covered in duckweed. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Site overview ↑

Photograph 2. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.40	• Collection Line Buffer	May 29, 2012	• The pond is located in a forest area. The pond is 20 m by 60 m and 0.5 m deep. Riparian buffer is 20 m of trees, shrubs and grasses.	• The pond is a natural feature. The water was clear at time of investigation. Substrate consists of silt. *In-situ* cover is low and consists of aquatic vegetation. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.41	• Collection Line Crossing • Road Crossing • Turbine 24	May 10, 2012 June 18, 2012 September 28, 2012	• The feature is located in corn and wheat fields. **Watercourse Name**: Golden Creek Drain **DFO Drain Classification**: T	• The feature does not exist and has been ploughed through. It is classified as tiled by ABCA.	non -REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.43	• Road Crossing	May 22, 2012	• The feature is located in fallow fields.	• The watercourse appears to be buried. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Smejkal Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.43	• Collection Line Buffer • Road Buffer	June 12, 2012	• The pond is surrounded by a residential property and corn fields. The pond is 20 m by 10 m and greater than 0.5 m deep. Riparian buffer is 1.5 m of grasses and shrubs.	• The pond is a dugout feature and appears to be offline, however there was a possible outlet pipe into R4 which could not be confirmed. The water was turbid at time of investigation. Algae were present around the edge of the pond. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

Photograph 2. Possible outflow pipe ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.44	• Collection Line Buffer	July 25, 2012	• The pond is located in a soybean field. The pond is 15 by 10 m and approximately 1 m deep. Riparian buffer is 4 m of grasses	• The pond is a dugout offline feature. The water was clear at time of investigation. Substrate is dominated by clay followed by silt and sand. *In-situ* cover is high and consists of pondweed, algae and cattails. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.45	• Collection Line Crossing • Road Crossing	May 17, 2012	• The feature is located in an agricultural field.	• There was no watercourse present. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Gordon Van Engelen Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.45	• Collection Line Buffer • Road Buffer	September 28, 2012	• The pond is located in corn fields behind a residential property. The pond is 50 m by 15 m and is too deep to wade. Riparian buffer consists of trees and shrubs.	• The pond is a dugout offline feature that is most likely used for farming. The water was slightly turbid at time of investigation. Substrate is soft. *In-situ* cover is moderate and consists of algae, duckweed and emergent grasses. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

Photograph 2. Pond view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.46	• Collection Line Crossing	May 17, 2012	• The pond is surrounded by a mix of cultural woodland and deciduous forest (classified as CUW1, FOD3-1, ELC Feature ID 176). The pond is approximately 4 m by 3 m and greater than 0.6 m deep. Riparian buffer is greater than 10 m.	• The pond is a dugout offline feature and was recently dug out. Substrate consists of gravel and sand. There was no emergent vegetation present. No groundwater indicators were observed.	non -REA

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.48	• Collection Line Crossing • Road Crossing	May 10, 2012 September 28, 2012	• The feature is located in corn and hay fields.	• There was no channel or water present. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Golden Creek Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.48	• Collection Line Buffer	July 25, 2012	• The pond is located in a residential property. The pond is approximately 25 m by 40 m and greater than 2 m in depth.	• The pond is a dugout offline feature. The pond is for aesthetic purposes. The edges of the pond were covered in cobble. *In-situ* cover is low and consists of cattails. No groundwater indicators were observed. Fish were observed in the pond at time of investigation.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.49*	• Collection Line Buffer	July 25, 2012	• The pond is surrounded by cultural meadow (CUM1-1) in agricultural fields. The pond is irregular in shape and approximately 75 by 25 m.	• The pond is an offline feature.	non -REA

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P4.50	• Collection Line Buffer	May 30, 2012	• The pond is located in a residential property. The pond is 25 m by 25 m. There is no riparian buffer, with the grasses mowed right up to the edges of the pond.	• The pond is dugout and appears to be for aesthetic purposes only. Substrate and *in-situ* cover could not be assessed. Cobble surrounds the edges of the pond. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R4.54	• Collection Line Crossing • Road Crossing	May 10, 2012	• The feature is located in an agricultural field.	• There is no surface feature. It is classified as tiled by ABCA.	non -REA

Watercourse Name	Golden Creek Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6-A	• Road Buffer • Turbine 44	May 17, 2012	• The feature is located in crop agricultural fields.	• The feature has been ploughed though. No surface feature is present. It is classified as an intermittent system by SCRCA.	non -REA

Watercourse Name	Russell Drain
DFO Drain Classification	F

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P6.6	• Road Buffer • Turbine 41	May 3, 2012	• The pond is located in a mix of deciduous forest and swamp (classified as FOD6-5, SWD3-3, ELC Feature ID 139) with an agricultural field along the east side. The pond is 30 m by 35 m and too deep to wade. Directly adjacent to the pond is a riparian buffer of 1 m consisting of grasses and greater than 40 m to the north, west and south.	• The pond is a dugout offline feature. The water column was clear at time of investigation. The pond was completely covered in duckweed. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

Photograph 2. Duckweed ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P6.8*	• Collection Line Buffer	October 5, 2012	• The pond is located in a residential property adjacent to agricultural fields. The pond is approximately 15 m by 20 m. Riparian buffer is greater than 2 m.	• The pond is an offline feature that appears to be dug based on its shape.	non -REA

***No photos available*.**

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R6.16*	• Collection Line Crossing and Buffer	May 29, 2012	• The feature is located in a soybean field.	• There was no water present, only a slight depression. The feature has been ploughed through. It is classified as tiled by SCRCA.	non -REA

Watercourse Name	Davidson Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P8.7	• Turbine 88	May 22, 2012	• The pond is located in a deciduous forest (classified as FOD?-1, FOD5-2, ELC Feature ID 120). The pond is approximately 20 m by 5 m and 1.5 m deep. Riparian buffer is greater than 5 m.	• The pond is a dugout offline feature. *In-situ* cover is high and consists of algae blooms and emergent grasses. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9-A	• Collection Line Crossing	May 29, 2012	• The feature is located in winter wheat and corn fields.	• There was no feature present. The feature has been ploughed though. It is classified as tiled by SCRCA.	non -REA

Watercourse Name	Sitter Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.33-A	• Road Buffer • Turbine 91	May 29, 2012	• The feature is located in a soybean field.	• There was no water present. The feature has been likely tiled. It is classified as tiled by SCRCA.	non -REA

Watercourse Name	Mellon Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.33-B	• Collection Line Crossing • Road Crossing	May 29, 2012	• The feature is located in a wheat field.	• The feature does not exist, it has been ploughed through. It is classified as tiled by SCRCA.	non -REA

Watercourse Name	Mellon Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R9.33-C	• Collection Line Crossing and Buffer • Road Buffer	May 29, 2012	• The feature is located in cattle pasture and agricultural fields, crossing Hickory Creek Line.	• There is no feature present. The pasture is grassed and the agricultural field is ploughed through. It is classified as tiled by SCRCA.	non -REA

Watercourse Name	Mellon Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview in pasture ↑

Photograph 2. Site overview in agricultural field ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R12.2	• Collection Line Buffer • Road Buffer • Turbine 105	July 31, 2012	• The feature is located in wheat fields.	• The feature has been filled in. It is classified as tiled by SCRCA.	non -REA

Watercourse Name	Unknown Drain
DFO Drain Classification	T

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P12.14*	• Collection Line Buffer	June 7, 2012	• The pond is located in cultural meadow (classified as CUM1-1, ELC Feature 508) and surrounded by agricultural fields. The pond is 180 m by 60 m. Riparian buffer is greater than 30 m to the south.	• The pond is a natural offline feature. The pond could not be assessed because access was not granted.	non -REA

Photos

Photograph 1. Site overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P12.15*	• Collection Line Buffer	June 7, 2012	• Pond is surrounded by cultural meadow (classified as CUM1-1, ELC Feature ID 508). The pond is irregular in shape and approximately 40 by 70 m.	• The pond could not be assessed because access was not granted.	non -REA

No photos available.

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P12.30*	• Collection Line Buffer	June 4, 2012	• The pond is located on a residential property. The pond is 12 m by 12 m. There is no riparian buffer as the grass is mowed to the edges of the pond.	• The pond is a dugout offline feature. Substrate consists of silt. *In-situ* cover is low and consists of cattails. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P12.31	• Collection Line Buffer	June 4, 2012	• The pond is located in a residential property. The pond is 10 m by 20 m and too deep to wade. There is no riparian buffer, the grass is mowed up to the edges of the pond.	• The pond is a dugout offline feature that is for aesthetic purposes. The water was turbid and green in colour at time of investigation. Cobble lines the edges of the pond. *In-situ* cover is low and consists of cattails. No groundwater indicators were observed.	non -REA

Photos

Photograph 1. Pond overview ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
P12.32	• Collection Line Buffer • Road Buffer	September 18, 2012	• The pond is located in a deciduous forest (classified as FOD9-4, FOD7-2, ELC Feature ID 7). The pond is approximately 25 m by 30 m and greater than 1 m deep. Riparian buffer is greater than 25 m.	• The pond is a dugout offline feature. There was no emergent vegetation present. No groundwater indicators were observed.	non REA

Photos

Photograph 1. Pond overview ↑

Photograph 2. Pond view ↑

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R12.82*	• Collection Line Crossing and Buffer • Road Crossing and Buffer • Turbine 103	May 31, 2012	• The feature is located in corn and wheat fields. **Watercourse Name**: Hagle Drain Improvements **DFO Drain Classification**: T ***No photos available**.	• There was no surface feature present, it has been ploughed through. It is classified as tiled by SCRCA.	non -REA

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

Table 4-2 Site Investigations

Feature ID	Project Component	Investigation Date	Description of Site	Feature Description	Feature Sensitivity
R12.123*	• Collection Line Buffer	June 25, 2012	• The feature is located in a wheat field.	• The feature does not exist, it has been ploughed through. It is classified as a natural channel by SCRCA.	non -REA

Watercourse Name	Bear Creek Trib
DFO Drain Classification	N

Photos

Photograph 1. Site overview ↑

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

A total of 194 features were assessed during the water body assessment. Of these, there were a total of 116 features that were determined to be REA water bodies, classified as High, Moderate and Low sensitivity and will be carried forward to the Effects Assessment. The remaining 78 features were classified as non-REA water bodies and were not carried forward to the Effects Assessment. The majority of features classified as non-REA were found to be tiled or buried watercourses and ponds that were dugout and/or man-made. Of the 78 non-REA features, 36 are tiled, grassed waterways, or temporarily channels for surface drainage, 22 of which will be crossed by collection lines and 17 that will be crossed by access roads.

4.4.3 Alternative Site Investigations

Alternative site investigations were conducted for 104 features, with physical site investigations being conducted at 89 locations (access to roadside or adjacent properties), and 15 site assessments using air photo interpretation. These Alternative Site Investigations were completed as land access to all or partial number of land parcels required to complete the full water body assessment was not granted. **Appendix F** provides a summary of the Alternative Site Investigations conducted for the Jericho Wind Energy Centre.

4.4.4 Seepage Areas

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

Of the 116 REA water bodies, 40 locations contained seepage indicators including the presence of watercress, water speedwell, bittercress, skunk cabbage, iron staining and bank seepage.

4.5 Corrections to Records Review

Appendix J summarizes any corrections that were made to the Records Review based on the findings from the Site Investigations. The table outlines un-mapped features that were identified and changes to mapped features confirmed through site investigations.

Features that were identified as watercourses during the records review process and found to be either tiled or buried after the site investigations, were compared against the drainage mapping provided by the Conservation Authorities and the OMAFRA Agriculture Information Atlas. Based on this information, 36 watercourses were found to be either tiled or buried and 16 watercourses were partially tiled or buried within the Project Study Area. This was confirmed by the drainage mapping. A total of 32 new features were identified after site investigations, of these 27 were pond features and 5 were new watercourses. Several pond features were determined to be vernal pools and wetland features during the site investigations. These features are classified as non-REA water bodies and are further discussed in the Natural Heritage Assessment (AECOM, 2012).

4.6 Number of Confirmed Water Bodies in Project Study Area

A total of 162 potential water bodies (26 ponds, 136 watercourses) were identified in the vicinity of the Project Location during the Records Review and carried forward to Site Investigations. During site investigations, 32 additional features were found identified and assessed for a total of 194 features.

Of the 194 features investigated:

- 78 were identified as non-REA water bodies because they did not fit the REA definition of a water body as outlined in Section 1.3 of this report.
- A total of 116 features were carried forward to the Effects Assessment. This is summarized below in Table 4-3.

Table 4-3 Summary of Water Bodies in the Project Study Area Confirmed through Site Investigations and Carried Forward to Effects Assessment

Process Stage	Number of Water Bodies
Features identified through Records Review	162
Additional features identified through site investigations	32
Total sites visited for field investigations	=194
Features identified as non-REA water bodies	(79)
Features identified as REA water bodies carried forward to Effects Assessment	=116

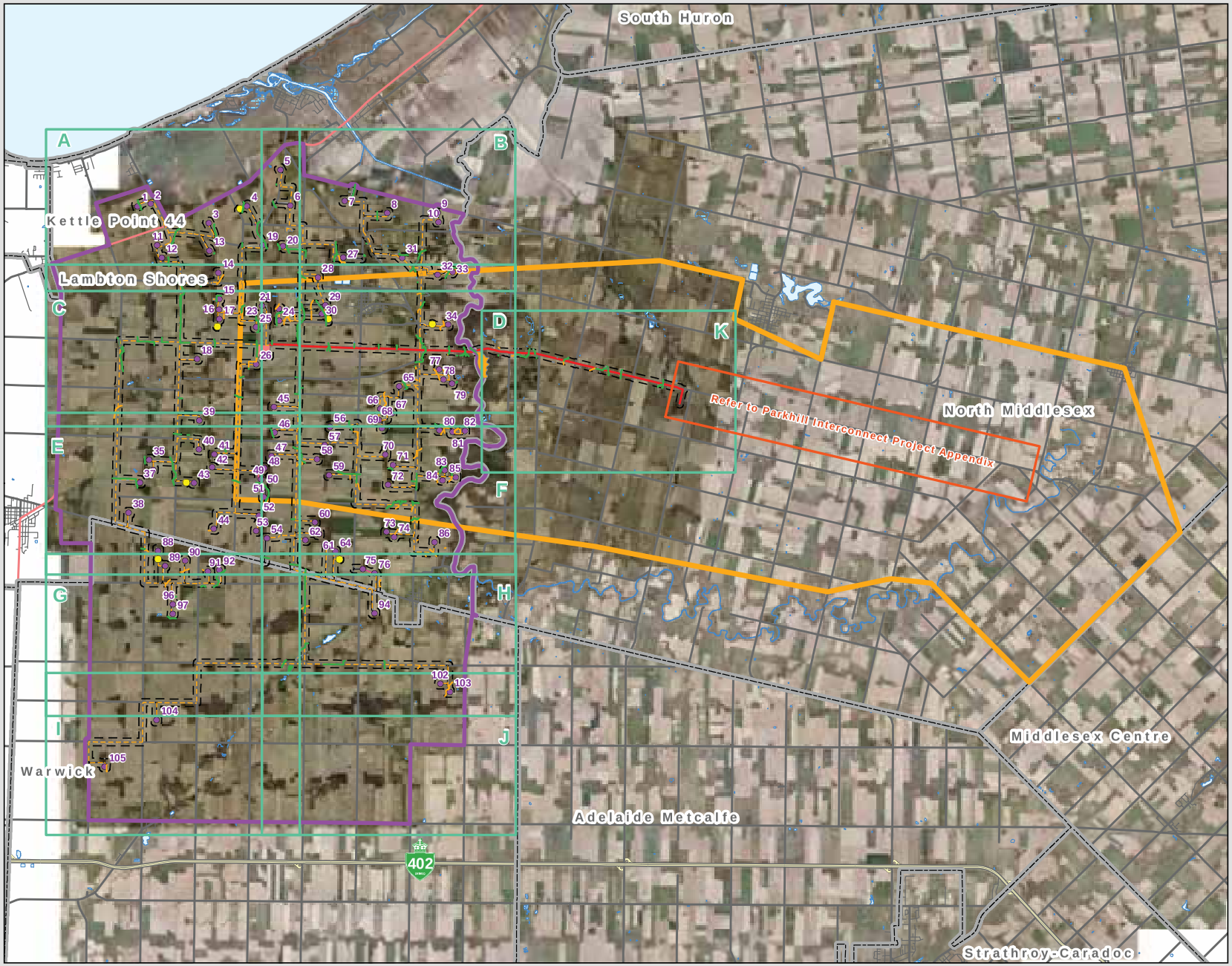
With regard to the location of the Project Components in relation to the 116 REA water bodies:

- 25 are located within 120 m of a wind turbine;
- 62 are crossed by a collection line, with an additional 25 located within 120 m of a collection line;
- 19 are crossed by an access road, with an additional 24 located within 120 m of an access road;
- 17 are crossed by overhead wires for a transmission line and 10 are located within 120 m of the transmission line;
- 2 are located within 120 m of the substation and laydown area; and,
- 2 are located within 120 m of meteorological towers

Please note that many of the 116 water bodies intersect more than one Project Component.

Appendix K provides a summary of the REA water bodies and land within 30 m investigated in the Project Study Area and describes the Project Component associated with the water body and the shortest distance (m) to the Project Component.

Each of the effects and mitigation measures associated with each of the Project Components are discussed further in Section 5.



Legend

- Wind Energy Centre Study Area
- Transmission Line Study Area
- 120m Area of Investigation
- Municipal Division
- Map Coverage

Project Location

- GE Turbine
- Permanent Meterological Tower
- Access Road
- Collection Line
- Crane Path
- Transmission Line
- Substation & Laydown Area
- Waterbody
- Cartographic Wetland

Watercourses

- Non-REA
- REA

Waterbodies

- Non-REA
- REA
- Unknown

N
W E
S

Kilometers
0 0.75 1.5 3 4.5 6

1:125,000

UTM Zone 17N, NAD 83

Jericho Wind Energy Centre
Water Assessment and Water Body Report

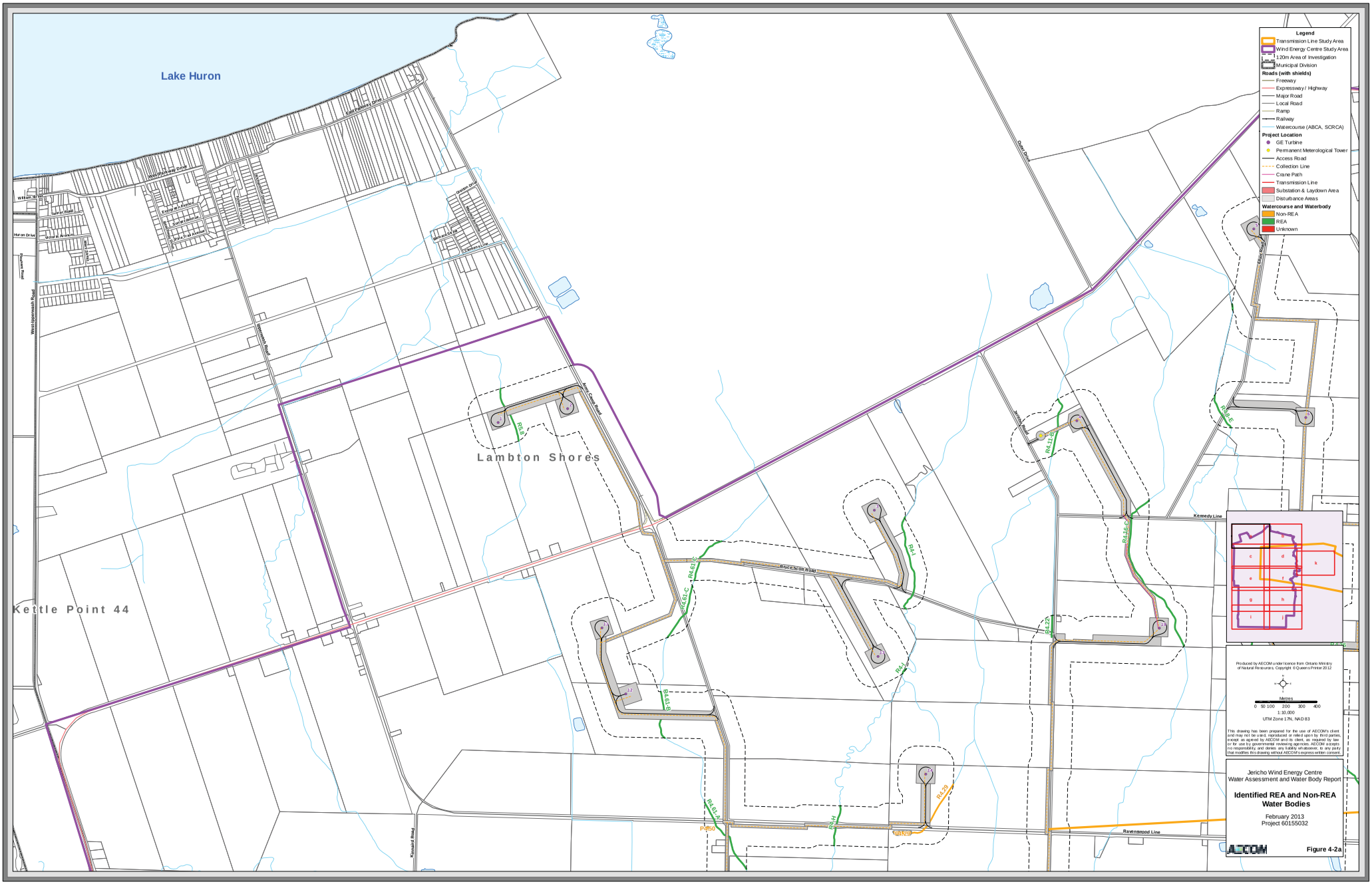
Identified REA and Non-REA Water Bodies

February 2013
Project 60155032

AECOM

Figure 4-2

Path: N:\0-aecom\60155032\010\Final\GIS\Spatial\MXDs\Report\MXDs\WaterBodies\Jericho\60155032_JER_REA_Keymap.mxd


Lake Huron
Lambton Shores
Kettle Point 44
Legend
Transmission Line Study Area
Wind Energy Centre Study Area
120m Area of Investigation
Municipal Division
Roads (with shields)
Freeway
Expressway / Highway
Major Road
Local Road
Ramp
Railway
Watercourse (ABCA, SCRCA)
Project Location
GE Turbine
Permanent Meterological Tower
Access Road
Collection Line
Crane Path
Transmission Line
Substation & Laydown Area
Disturbance Areas
Watercourse and Waterbody
Non-REA
REA
Unknown
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Metres
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UTM Zone 17N, NAD 83
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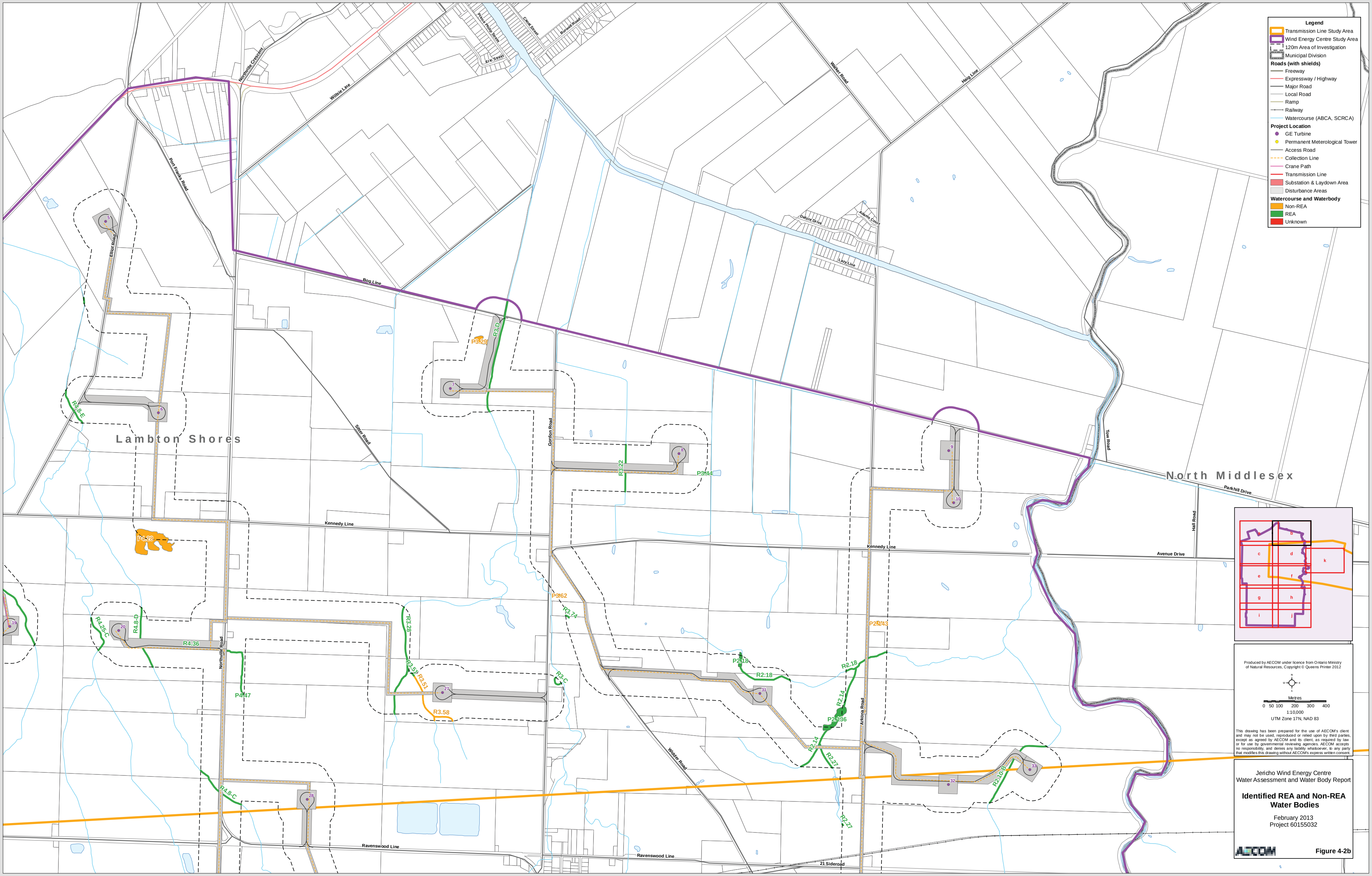
Jericho Wind Energy Centre
Water Assessment and Water Body Report
Identified REA and Non-REA Water Bodies
February 2013
Project 60155032
AECOM
Figure 4-2a



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Jericho Wind Energy Centre
Water Assessment and Water Body Report

Identified REA and Non-REA Water Bodies

February 2013
Project 60155032

AECOM

Figure 4-2b

Map Document: (N:\0-aecom\60155032\2010\Final\GIS\Spatial\MXDs\Report\MXDs\WaterBodies\Jericho\60155032_Jericho_REA.mxd)
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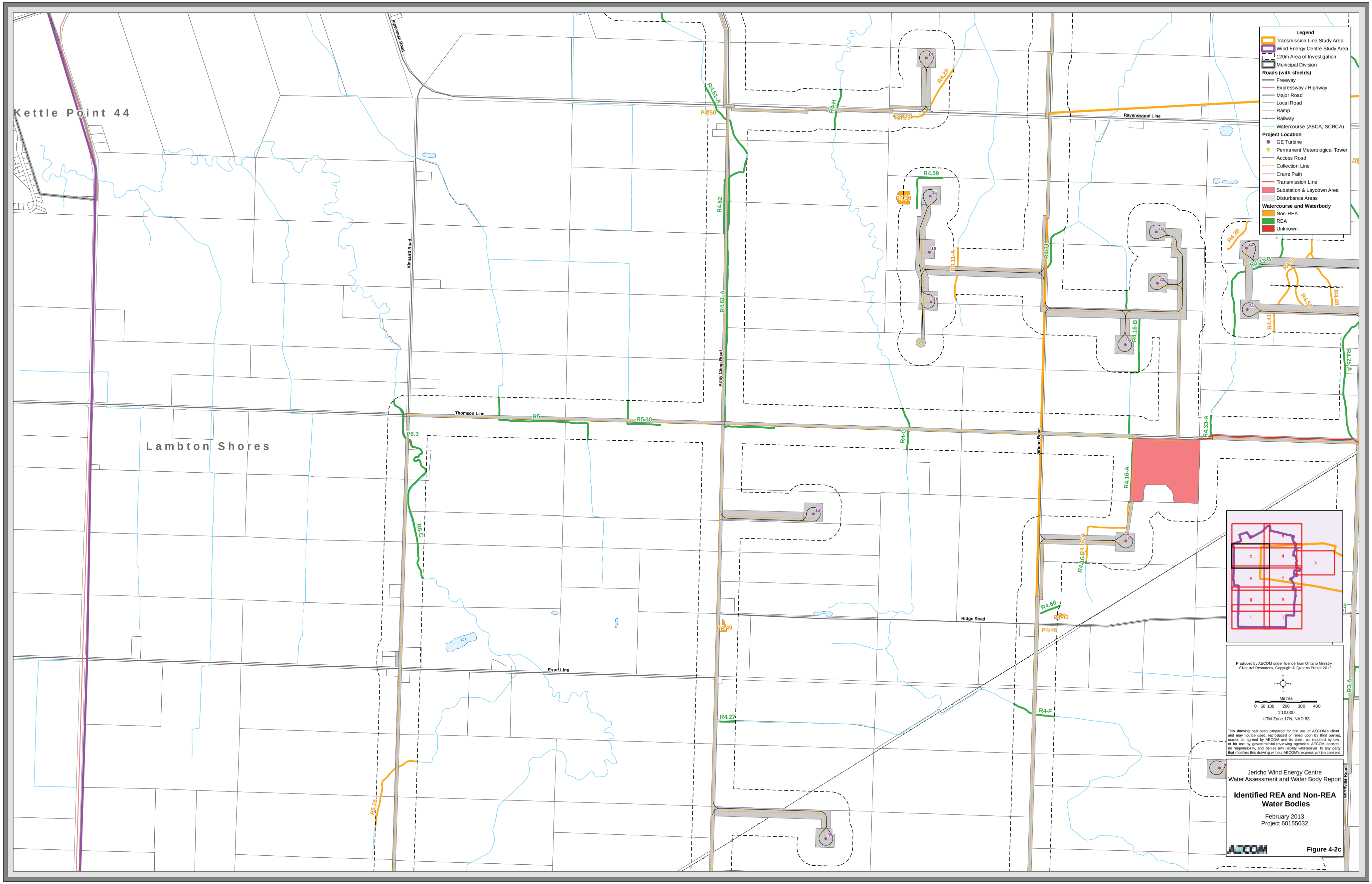

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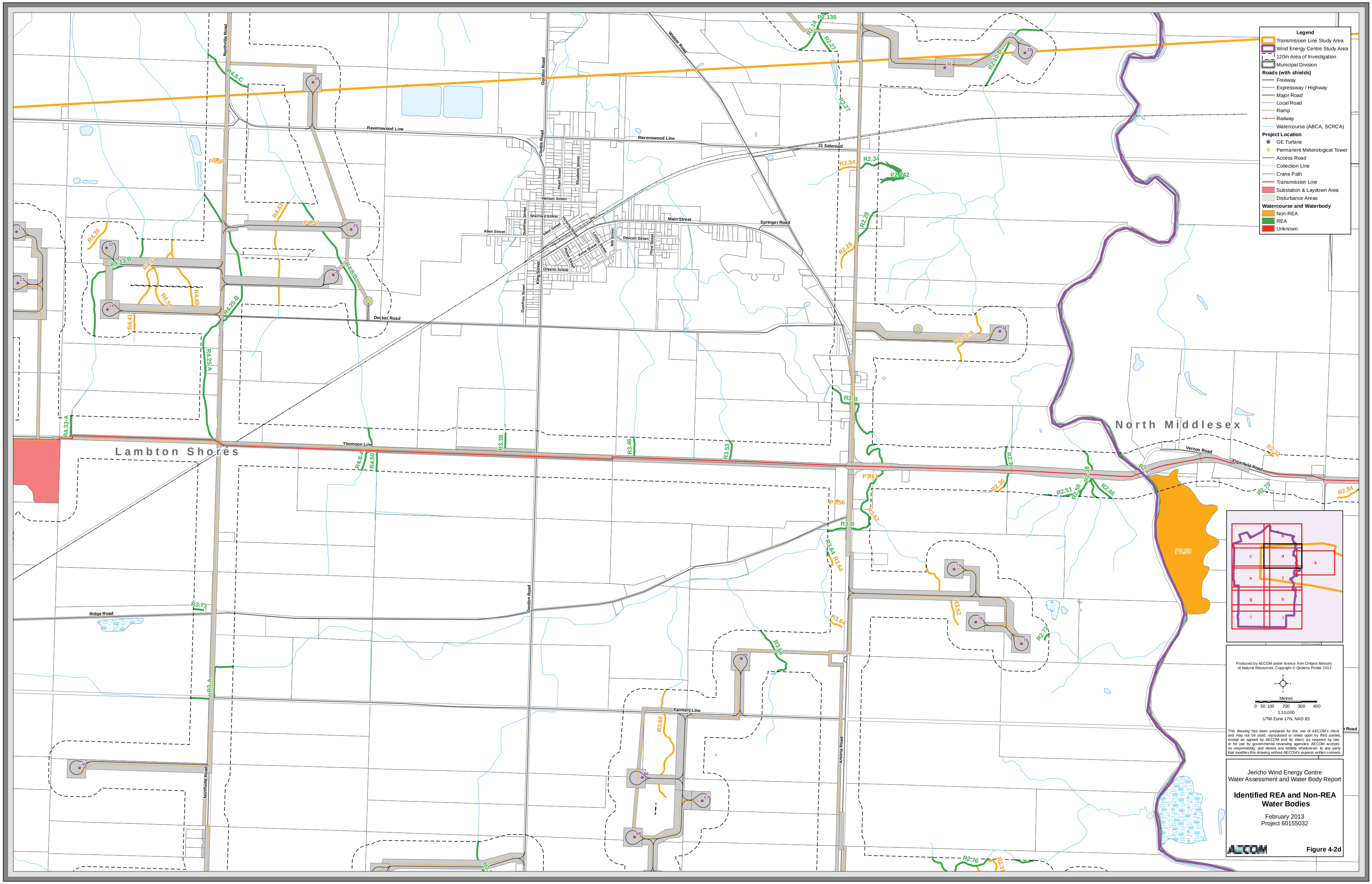

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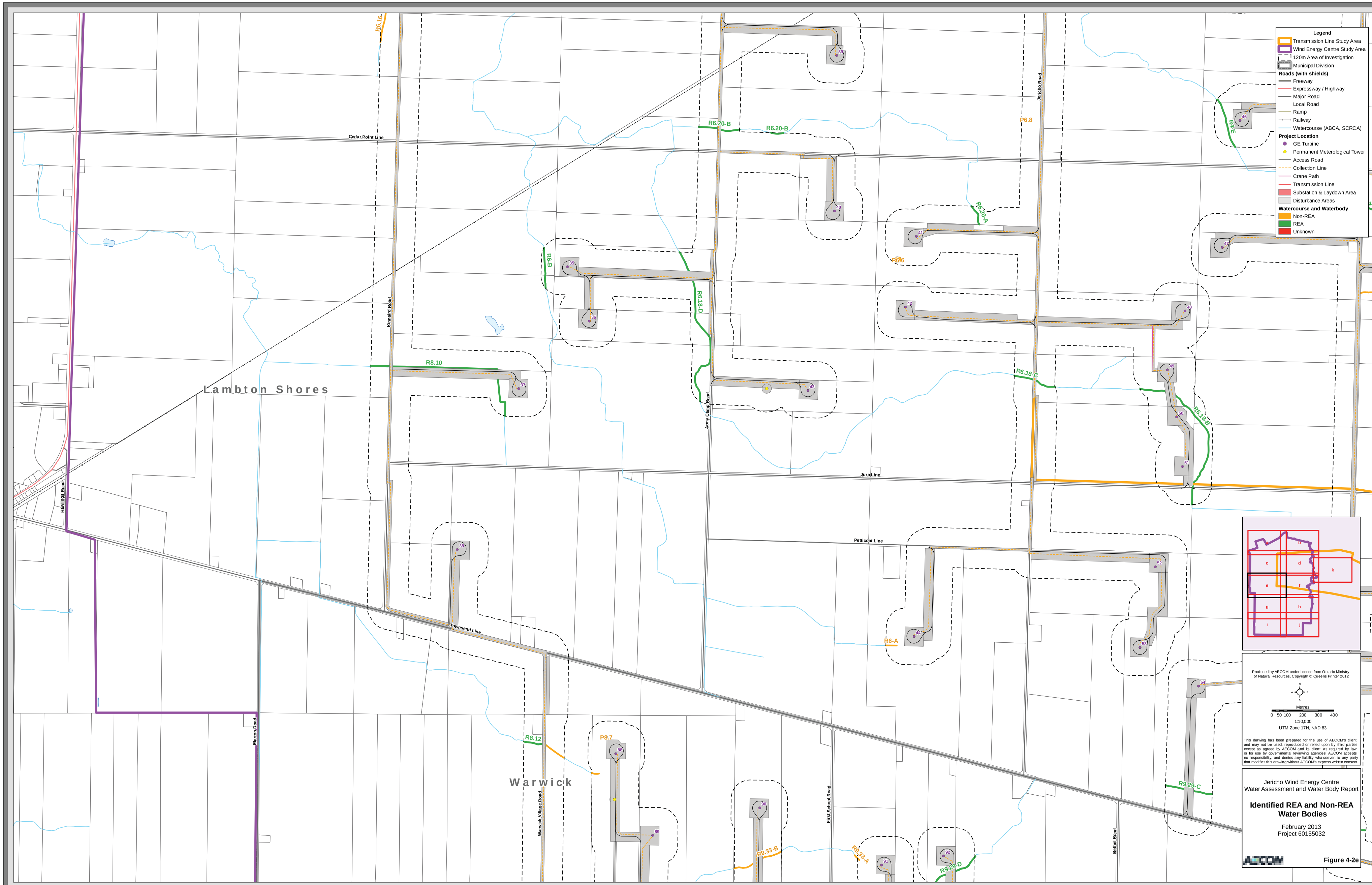

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Jericho Wind Energy Centre
Water Assessment and Water Body Report

Identified REA and Non-REA Water Bodies

February 2013
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AECOM

Figure 4-2e

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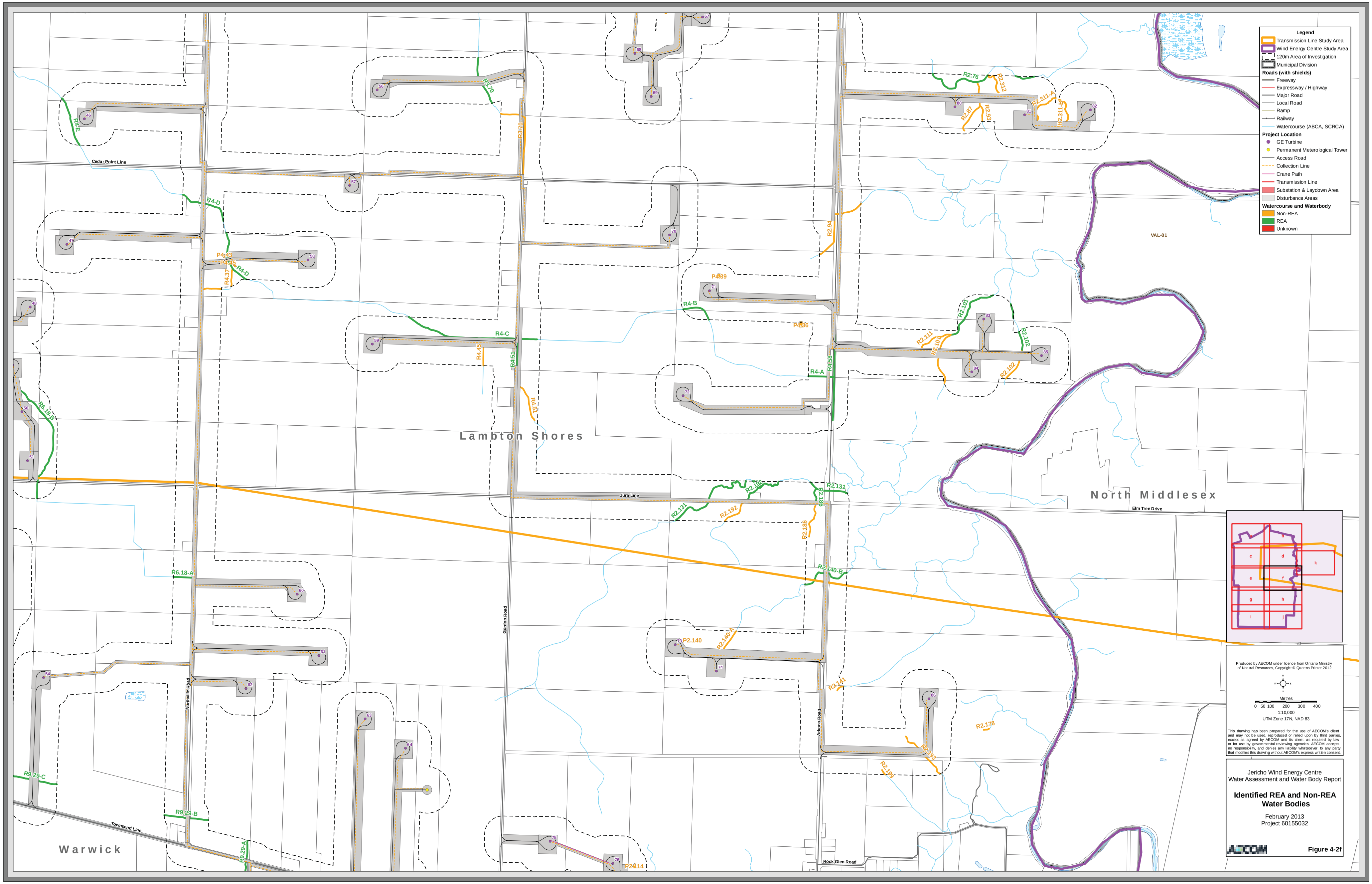

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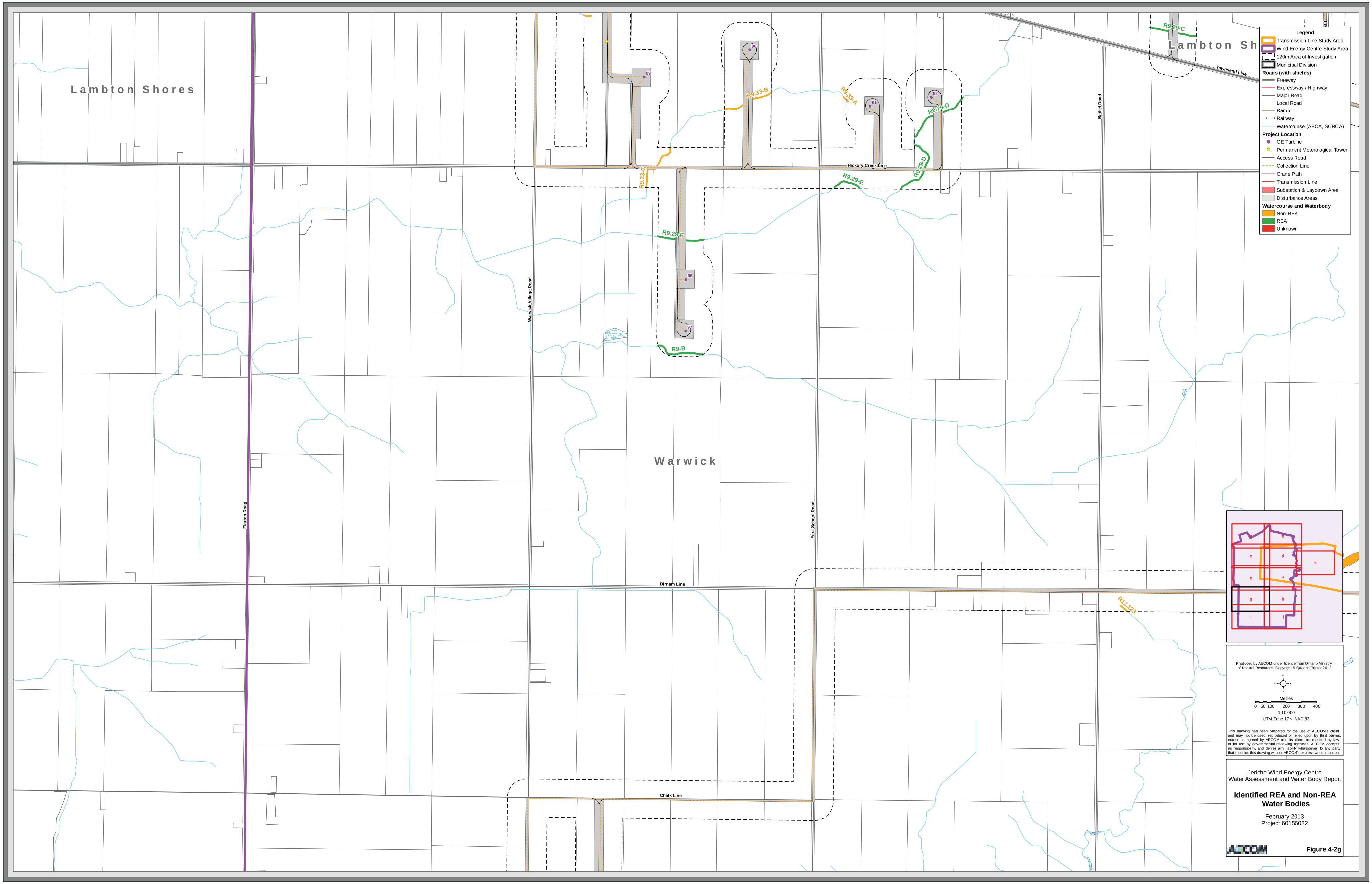
Lambton Shores
Lambton Sh
Warwick
Elarton Road
Warwick Village Road
First School Road
Bethel Road
Hickory Creek Line
Birnam Line
Chalk Line
Townsend Line
R9.29-C
R9.33-B
R9.33-A
R9.29-D
R9.33-C
R9.29-E
R9.29-F
R9-B
R12.123
89
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91
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96
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Legend
Transmission Line Study Area
Wind Energy Centre Study Area
120m Area of Investigation
Municipal Division
Roads (with shields)
Freeway
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REA
Unknown
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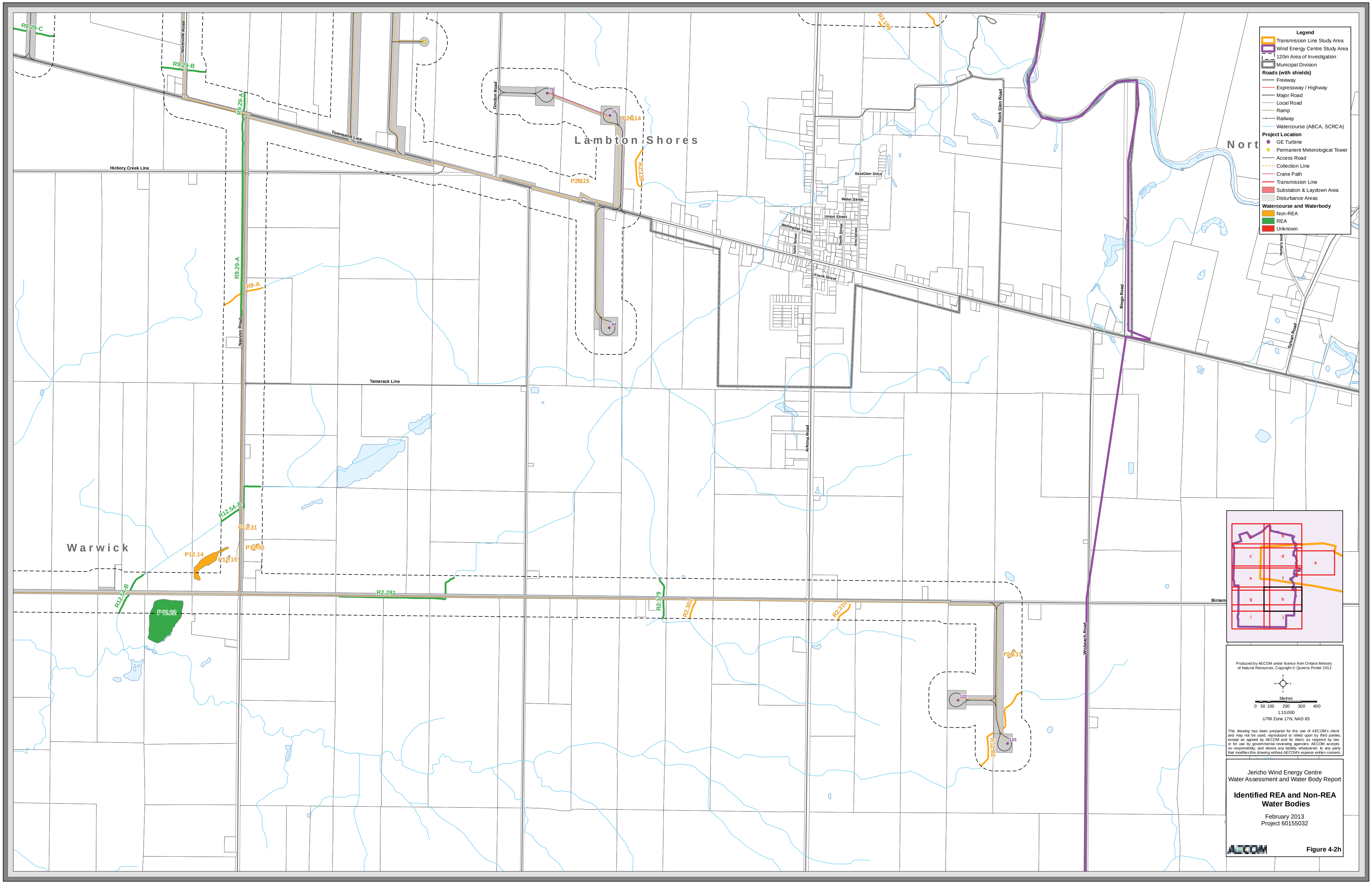
Jericho Wind Energy Centre
Water Assessment and Water Body Report
Identified REA and Non-REA Water Bodies
February 2013
Project 60155032
AECOM
Figure 4-2g


Legend
Transmission Line Study Area
Wind Energy Centre Study Area
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Disturbance Areas
Watercourse and Waterbody
Non-REA
REA
Unknown
Lambton Shores
Warwick
Townsend Line
Hickory Creek Line
Northville Road
Gordon Road
Tamarack Line
Naivoo Road
Arkona Road
Rock Glen Road
Bingo Road
Wisbeach Road
Sylvan Road
EastGlen Drive
Water Street
Union Street
Wellington Street
Smith Street
Ann Street
John Street
Frank Street
Birnam
R9.29-C
R9.29-B
R9.29-A
R9-A
R2.199
R2.239
P2.114
P2.115
R12.54-A
R12.54-B
P12.31
P12.30
P12.14
P12.15
P12.22
R2.281
R2.179
R2.302
R2.310
P2.131
R12.82
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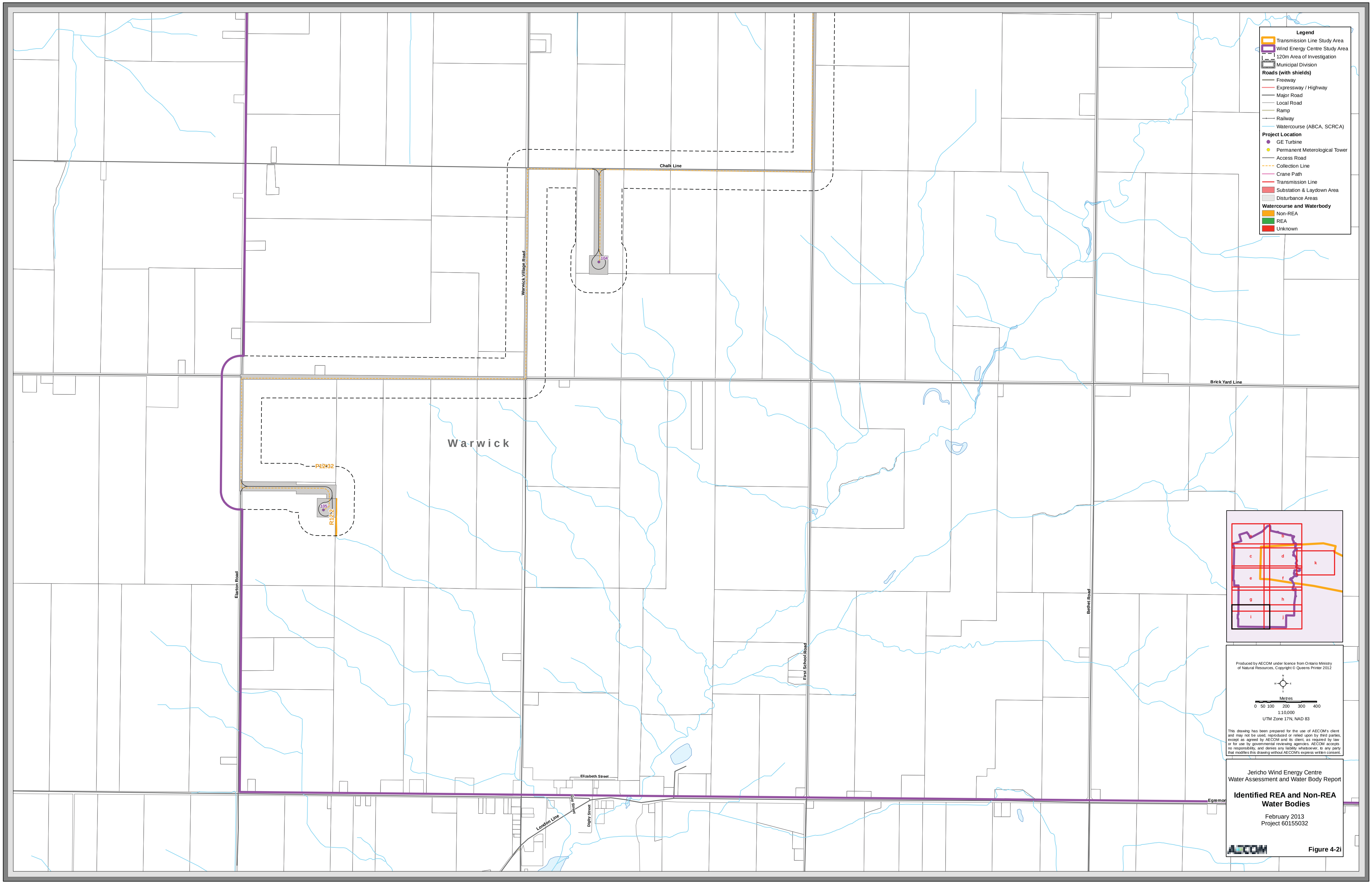
Jericho Wind Energy Centre
Water Assessment and Water Body Report
Identified REA and Non-REA Water Bodies
February 2013
Project 60155032
Figure 4-2h



Jericho Wind Energy Centre
Water Assessment and Water Body Report

Identified REA and Non-REA Water Bodies

February 2013
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Figure 4-2i

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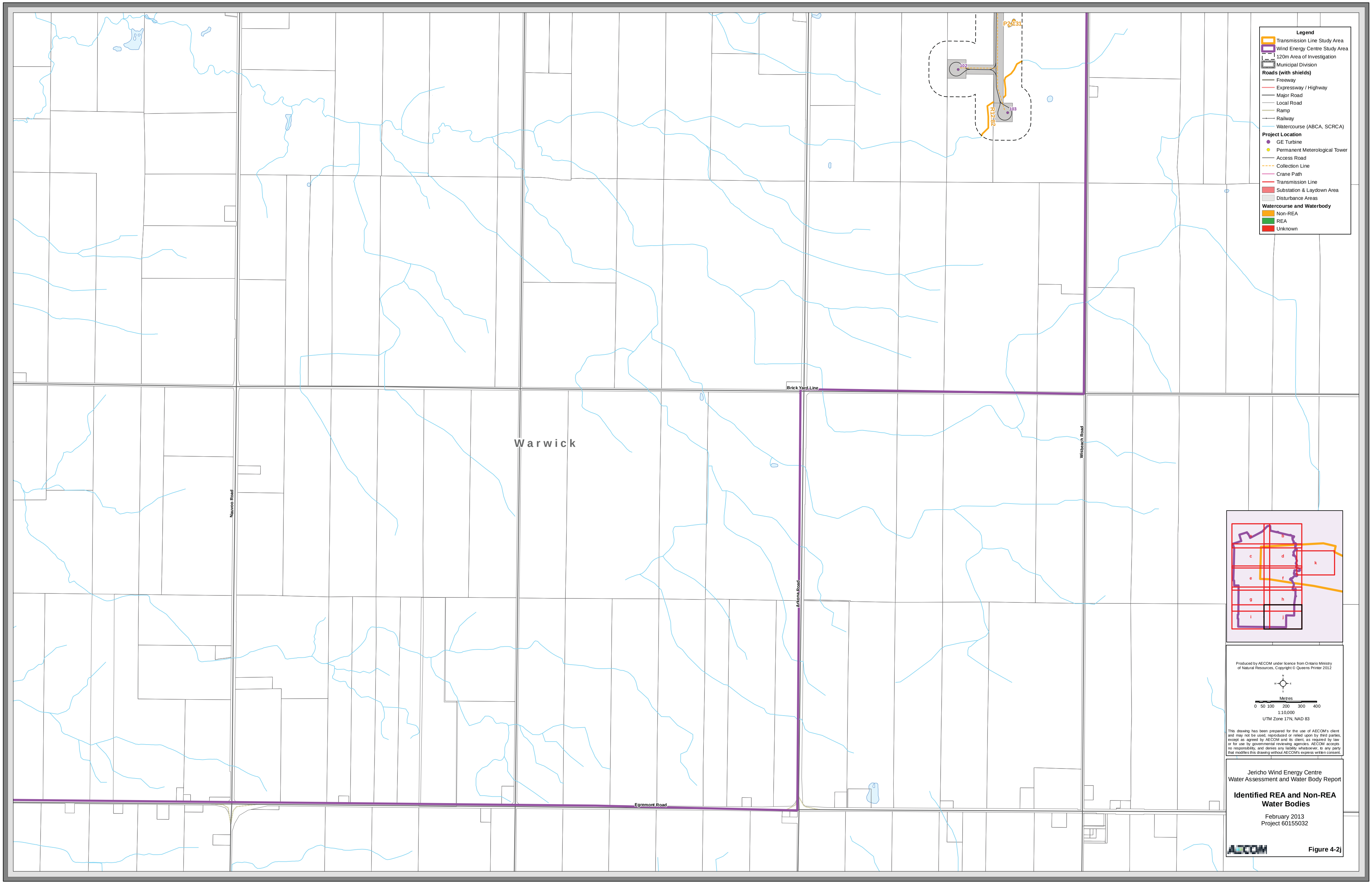

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Jericho Wind Energy Centre
Water Assessment and Water Body Report

Identified REA and Non-REA Water Bodies

February 2013
Project 60155032

AECOM

Figure 4-2j

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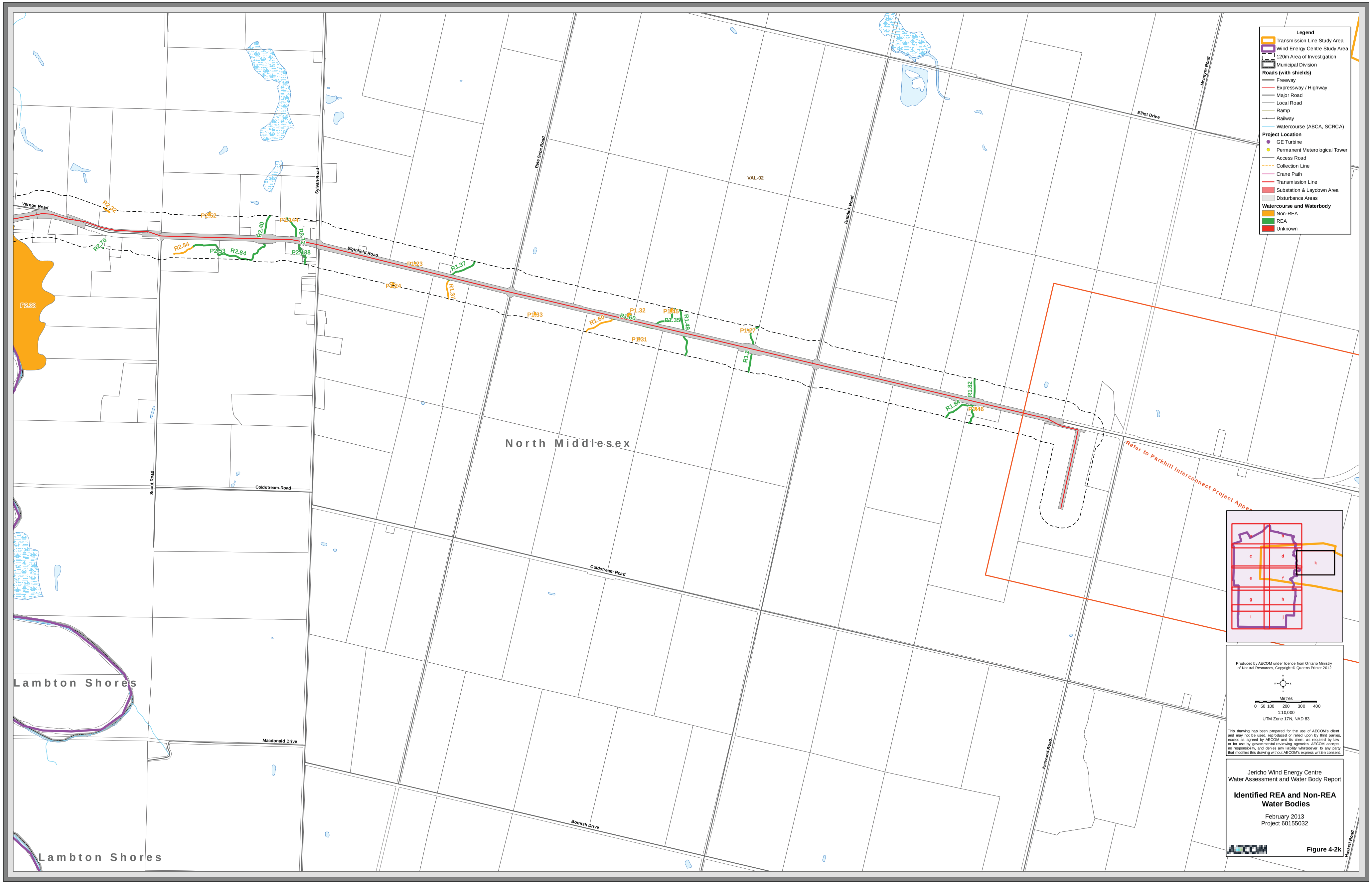
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Non-REA
REA
Unknown
North Middlesex
Lambton Shores
Lambton Shores
Vernon Road
Sylvan Road
Elginfield Road
Pete Sebe Road
Roddick Road
Mcintyre Road
Elliot Drive
Scout Road
Coldstream Road
Coldstream Road
Macdonald Drive
Bornish Drive
Kerwood Road
Haskett Road
VAL-02
Refer to Parkhill Interconnect Project Appen
R2.40
R2.84
P2.53
R2.84
P2.38
R1.37
R1.37
R1.60
R1.60
R1.35
R1.49
R1.82
R1.84
P1.32
P1.33
P1.31
P1.27
P2.33
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Jericho Wind Energy Centre
Water Assessment and Water Body Report
Identified REA and Non-REA Water Bodies
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Figure 4-2k

5. Description of Environmental Effects

5.1 REA Requirements

This section presents potential negative effects of the Project on the identified water bodies and the area within 30 m of the water body as outlined in *Renewable Energy Approval Act* Section 40(2)(c). 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 Project Description Report (PDR) (AECOM, 2012).

5.2 Description of Project Components and Potential Effects

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

5.2.1 Turbines

With a total nameplate capacity of up to 150 MW, the Project is categorized as a Class 4 wind facility under O. Reg. 359/09. Although Jericho Wind, Inc. is seeking an REA for up to 97 turbine locations, approximately 92 turbines are proposed to be constructed for the Project.

The wind turbine technology proposed for this Project is the GE 1.6-100 Wind Turbine. The turbines are 3-bladed, upwind, horizontal-axis wind turbines that are state of the art technology. The turbines have a 100 m rotor diameter with a swept area of 7,854 m; each blade is connected to the main shaft via the hub. The turbine is mounted on an 80 m tubular steel tower which contains an internal ladder provided for maintenance access. The turbine will be constructed on a foundation that is approximately 400 m^2. The foundation consists of poured concrete and steel rebar to provide added strength.

The nacelle houses the main components of the wind turbine such as the rotor shaft, gear box, couplings, control panel, bearing brackets and the generator. The nacelle is equipped with sound-proofing, is ventilated and the interior is illuminated with electric lights. Some of the wind turbines will have external lighting in accordance with the requirements of Transport Canada (TC).

An approximately 122 m by 122 m square around each wind turbine will be established for the laydown and assembly of the wind turbine components. The construction offices will receive electrical power through a temporary electrical service line connected to the local distribution line.

Prior to construction, the construction area will be cleared and grubbed. In order to provide sufficient area for the laydown of the wind turbine components and its assembly, an approximately 122 m by 122 m square around the wind turbine must be cleared, levelled, and be accessible during the construction phase. The topsoil is typically removed and some soil stabilizing material (i.e. crushed gravel or clean back fill) may need to be added depending upon site specific geotechnical conditions. Where the site laydown areas are close to watercourses, erosion control measures will be implemented.

Crane pads will be constructed at the same time as the road and will be located adjacent to the turbine locations. The crane pads will typically be 15 m by 35 m in area. The topsoil at the crane pad will be removed and approximately 600 mm of clean compacted crushed gravel will be imported as needed. The excavated topsoil will be re-used on site as feasible. The construction crew is anticipated to require four to six people and construction activities are expected to last for approximately one to two days per turbine site.

Equipment will include, at a minimum, trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

A backhoe will be used to excavate an area approximately 3 m deep x 20 m x 20 m with the material being stockpiled for future backfilling. Stockpiled material will have topsoil and subsoil separated out and surplus excavated material will be removed from the site for disposal in an approved manner. The foundation, with an approximate footprint of 400 m^2, will be constructed of poured concrete and reinforced with steel rebar to provide strength. The construction timeframe for turbine foundations is approximately three to four days, excluding curing time. After construction the foundation will be backfilled and the surface will be landscaped for drainage. The only surface evidence of the foundation will be a small protrusion of concrete to which the tower is attached; as such, land can be cultivated to within a few metres of the turbine. Any wood-waste generated will be removed from the site and recycled unless the landowner otherwise directs. Spent welding roads will be disposed of as hazardous waste by a licensed contractor.

Typical construction equipment, on a per turbine basis, will include:

- Excavator for removing material;
- Flatbed trucks (four to six) for delivery of rebar, turbine mounting assembly and forms;
- Truck mounted crane or rough terrain forklift for unloading and placement of rebar and forms;
- Concrete trucks for delivery of concrete (30-40 loads);
- Construction trucks (three to four vehicles with multiple visits); and,
- Dozer, loader and trucks to backfill and compact foundation and remove surplus excavated materials.

The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

The discussion of effects arising from turbines assumes a 122 m x 122 m area in which construction activities will occur and turbine components may be stored. The turbines will be installed within this area, and this therefore represents the full extent of potential physical disturbance associated with turbine construction.

There are 25 water bodies located within 120 m of the Project Location for turbines (measured from the tip of blades (see Section 1.2 for further details)). Although these turbines have been located the recommended 30 m setback from water bodies, site preparation, grading and construction activities within 120 m of water bodies may still result in a variety of potential negative effects. These effects include, but are 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 in the Jericho Study Area 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. The potential effects associated with the construction, operation and decommissioning of turbines are presented in Table 5-2 along with mitigation measures and residual effects.

5.2.2 Access Roads and Culverts

On-site access roads to each turbine will be constructed to provide an access point to the properties for equipment transport during the construction phase and for maintenance activities during operation. Typically the access roads will be between 10 m and 20 m wide during the construction phase to accommodate the large cranes (with an additional clearance on each side for travel).

Access roads will be constructed to transport equipment to the construction sites and for maintenance activities during operation. There will be an approximately 60 m wide area of potential disturbance associated with the construction of the access roads. The access road will be sited within this area of disturbance in consultation with the landowner and taking into consideration potential environmental effects. Typically the access roads will be between 10 m and 20 m wide during the construction phase to accommodate the large cranes (with an additional clearance on each side for travel).

The construction of the access road will typically require clearing and grubbing of any vegetation, excavation of the topsoil layer and adding a layer of compacted material to a typical thickness of 300 mm to 600 mm, depending upon site specific geotechnical conditions. Clean granular material (typically “A” or “B” gravel) will be brought to the site as needed and will not be stockpiled onsite. The topsoil will be kept and re-used on site. The access road to each turbine will typically require one to three days of construction time. Depending on the length of the access roads, construction may require approximately 25 trucks of gravel.

New culverts may be required to maintain drainage in ditches at junctions with roadways and these will be constructed to support the construction equipment and delivery trucks. The exact details of culverts and their installation in addition to erosion control measures will be determined in conjunction with the Ausable Bayfield Conservation Authority (ABCA) and the St. Clair Region Conservation Authority (SCRCA) as part of their permitting process. The culverts are proposed to be open bottom and left in place following the operation phase.

Equipment will include, at a minimum, trucks, graders, and bulldozers. Municipal and provincial roads will also be used for transporting equipment. Any road damages associated with the Project will be repaired prior to the completion of the construction phase. A Road Use Agreement will be developed in consultation with the municipalities. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

The potential effects associated with access roads are related primarily to the footprint during the construction/ decommissioning and operations phases. In addition, there will be effects associated with the construction of roads and the installation of culverts at watercourse and drainage crossings, which are needed to transport construction equipment. Consequently, changes in hydrology, temporary disruption to fish habitat and fish passage and minor riparian vegetation removal will be avoided or minimized through the application of mitigation measures described in this report.

Access roads 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 19 water bodies that will require a watercourse crossing through installation of a culvert. There are 25 water bodies located within the 120 m buffer of an access road (Figure 4-2).

Site preparation, grading and construction activities within 120 m of water bodies may result in a variety of potential 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 that will be avoided or minimized through the application of mitigation measures. The exact culvert details, installation details and erosion control measures will be determined in conjunction with the relevant Conservation Authority (in this case ABCA and SCRCA) or DFO and MNR as part of their permitting process.

Decommissioning of access roads includes removing the granular base and distributing it to landowners if desired, or removing it from the site and disposing of it in an approved and appropriate manner. The disturbed area will have the topsoil replaced from stockpiled material and will be reseeded in consultation with the landowner. It is proposed to leave culverts in place during the decommissioning phase and will be done so in consultation with the landowners. The potential effects associated with the construction, operation and decommissioning of access roads are presented in Table 5-3 along with mitigation measures and residual effects.

5.2.3 Collection Lines

The system that connects each turbine to the transformer substation will consist of 34.5 kV electrical collection lines that will be buried approximately 1 m below grade on private property or within the municipal road right-of-way. There may be occasional locations where the collection lines are placed above ground on wood, concrete or steel poles for technical reasons. Above-ground electrical junction boxes will be used to connect sections of collection lines.

The electrical collector system will consist of pad mounted transformers and underground collection lines. These components are described below.

- Pad Mount Transformers: A concrete transformer pad, approximately 2.2 m by 2.5 m in size, will be installed adjacent to each turbine at the same time as the turbine base installation. The construction will consist of excavation, soil storage, installation of the buried electrical grounding grid, installation of the concrete pad, installation of the transformer, and electrical connections. Transformer installation and cabling between the turbine and transformer is expected to take three days per turbine. Equipment will include flatbed trucks to transport the equipment to site, and a truck-mounted crane for the installation. These activities will likely require four to six trucks, a work force of approximately two people per vehicle per day, and is expected to last between four to six days per turbine use.
- Collection Lines: Cables and fibre optics lines (for communications) from each turbine to the transformer substation will be buried and will be located on private property or within municipal road right-of-ways. There may be occasional locations where the collection lines are placed above ground on wood, concrete or steel poles. Above ground junction boxes will be installed to connect sections of underground cabling. There will be an approximately 20 m wide area for construction of the collection lines. The collection lines will be sited within this area of disturbance in consultation with the landowner and taking into consideration potential environmental effects. The excavated soil will be stored temporarily and then reused as backfill. Power conductors will be approximately 0.9 m below grade and the location will be marked. Equipment will include trenchers or diggers (depending on soil type) and construction will require a crew of six people. The construction timeframe is dependent upon the required length of the lines.
- Horizontal Directional Drilling: Electrical cables may need to be installed using horizontal directional drilling to minimize effects to woodlots or watercourses. Erosion control devices will be installed at the drill location and drill cuttings will be collected and removed from the site for disposal in an approved and appropriate manner. An entrance and exit pit will be excavated on either side of the feature to be bored under. The directional drilling equipment will be set up at the entrance pit and a drill bit attached to rod segments is advanced 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. Once the drill bit has reached the exit pit the drill bit will be removed and a “reamer” attached and pulled back through the hole to enlarge the bore. The electrical cable will then be installed through the hole. Equipment will include a directional drilling rig and two to three support trucks to carry drilling rods, drilling supplies and cable.

The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment, and the polymer used for directional drilling.

Collection lines will be buried and will be located adjacent to the turbine access roads, where feasible. Most of the effects associated with collection lines are related to instances where the collection lines must pass under a water body. In these instances horizontal directional drilling under watercourses and other water bodies is required.

Entrance and exit pits area will be excavated on either side of the feature. The directional drilling equipment will be set up at the entrance pit and a drill bit attached to rod segments. This is advanced until it reaches the exit pit on the other side of the water body. A slurry of bentonite and/or polymer mixed with water is injected into the hole during 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 62 locations where collection lines will be installed via horizontal directional drilling underneath water bodies. There are 26 additional water bodies located within the 120 m of collection lines (Figure 4-2). No direct effects are anticipated to water bodies located within 120 m of the construction of the collection lines, however there may be indirect effects from the construction of the entry and exit pits. The potential effects associated with the construction, operation and decommissioning of collection lines are presented in Table 5-4 along with mitigation measures and residual effects.

5.2.4 Transmission Line

A 115 kV transmission line from the Project's transformer substation to the Point of Common Coupling (PCC) on Hydro One's 500 kV transmission line is proposed to be located on private property and within existing road rights-of-way. The proposed transmission line will pass through the Bornish switchyard located in the Transmission Line Study Area where the electricity from the proposed Adelaide and Bornish Wind Energy Centres will converge. From this point, the proposed 115 kV line will carry electricity generated by all three projects to the PCC on the existing Hydro One 500 kV transmission line. A separate report has been prepared to describe the section of the transmission line between the Bornish switchyard and the PCC and is appended to this report (refer to the appendix entitled Parkhill Interconnect Project).

It is anticipated that the transmission line will be overhead and mounted on new transmission line poles. There may be occasional places where the line is placed underground for technical reasons. The poles are proposed to be constructed of wood, concrete or steel and typically will be between 18 m and 30 m tall.

The interconnection plan for a wind energy centre is subject to study, design and engineering by: (a) the Independent Electricity System Operator which manages the province's electricity grid; (b) Hydro One; and (c) the Ontario Energy Board, which regulates the industry through the Transmission System Code and the Distribution System Code.

Holes for new transmission line poles are typically augured in the ground using a truck mounted auger device. The poles will then be inserted using special cranes to a typical depth of 2 m to 3 m below grade. The poles are typically "dressed" (made ready to accept conductors) on the ground prior to installation. In locations where the transmission line makes a turn, guy wires may be used to anchor the corner pole in place. At times, when guy wires cannot be used at corner poles, the steel poles may be mounted on concrete pier foundations. Typically, one crew will install the poles and one crew will dress them. Approximately six construction vehicles (including trucks and a pole loader) and a crew of approximately 12 to 15 people are anticipated for construction of the transmission lines. Typically, twelve to sixteen poles can be installed and dressed in one day. Once the poles are in place and dressed, cables will be strung in place using boom trucks and special cable reel trucks. Finally, any pre-existing poles that are no longer in use will be removed.

Some packing-material waste may be generated from construction. All recyclable materials will be separated from non-recyclable materials and both streams will be removed from the site and disposed of at an approved and licenced facility.

Equipment will include, at a minimum, a truck mounted crane, a drill rig, flatbed trailers and a truck mounted auger. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. A lubricant is likely to be used when the cables are pulled in through the conduit.

Transmission lines can be installed within the water body or within the 30 m setbacks as outlined in Section 39(2) of O.Reg. 359/09. There are 19 water body crossings associated with the installation of the overhead transmission line and 8 additional water bodies located within 120 m of the transmission line (Figure 4-2).

There are no direct effects expected to water bodies as a result of the overhead transmission line during construction/decommissioning, as there are no in-water works proposed. Site preparation, grading and construction activities within 120 m of water bodies may result in a variety of potential effects including but not limited to the loss of riparian habitat, increased erosion and sediment and damage to stream banks that will be avoided or minimized through the application of mitigation measures.

During operation, vegetation control will be required around the transmission line to prevent any damage to the line and ensure safe operation. Any vegetation that has the potential to grow to more than 4.3 m above grade is cleared. The vegetation is typically cleared by mechanized equipment (e.g., chain saw / hydro axe). No effects to water bodies are expected during operation. During the decommissioning phase, overhead cables and transmission poles will be removed or sold to an acceptable Transmission/Distribution Operator. Transmission pole holes will be filled with clean fill and disturbed areas will be reseeded with native vegetation, where required. Overhead lines will be removed and recycled, reused, or disposed of in accordance with regulatory requirements at the time of decommissioning.

The potential effects associated with the construction, operation and decommissioning of transmission lines are presented in Table 5-5 along with mitigation measures and residual effects.

5.2.5 Substation and Laydown Area

A temporary laydown and storage area will be constructed on privately owned land for the purpose of staging and storing equipment during the construction phase. A temporary electrical service line will be connected to the local distribution line for the purpose of providing electrical power to the construction offices. Activities on this site will include materials storage, equipment refuelling, and construction offices. The area will be approximately 4 hectares (10 acres) in area.

Approximately two to three hectares in size, the Jericho transformer substation will be located on privately held lands through a lease agreement or on land purchased by Jericho Wind, Inc. The electricity collected via the 34.5 kV collection lines will converge at the transformer substation where the electricity will be “stepped-up” to 115 kV for transmission. The substation equipment is expected to include an isolation switch, a circuit breaker, a step-up transformer, transmission switch gear, control housing, instrument transformers, grounding and metering equipment. All substation grounding equipment will meet the Ontario Electrical Safety Code. The substation will be connected to the existing electrical distribution line to supply power for the control housing lighting and equipment.

An approximately 4 hectare (10 acre) site will be constructed for the temporary storage of construction material and as a site for the construction office trailers. Following clearing and grubbing of any vegetation, the topsoil at the temporary laydown area will be removed and approximately 600 mm of clean compacted crushed gravel will be imported as needed. The excavated topsoil will be re-used on site as feasible. A temporary electrical service line will be connected to the existing distribution line for the purpose of providing power to the construction office trailers. Construction activities are expected to last approximately one week and will require approximately 100 loads of gravel, and a crew of six people. Following the construction phase, the gravel will be removed from the site or re-used, to be determined in consultation with the landowner. The temporary electrical service line and poles will be removed. The stockpiled topsoil will then be redistributed throughout the temporary laydown area.

Equipment will include, at a minimum, trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

During construction of the substation, topsoil and subsoils will be stripped and stockpiled separately. Stripped topsoil and subsoil will be placed in the temporary storage facility area and topsoil stripped from the substation area will be distributed on other Project properties. An electrical service line will connect to the existing distribution line adjacent to the substation for the purpose of providing house service power to the substation control building. The construction crew will consist of approximately 25 to 40 people and construction is expected to last for about four months. Some packing-material waste may be generated. All recyclable materials will be separated from non-recyclable materials and both streams will be removed from the site and disposed of at an approved and licensed facility.

Construction equipment will include small trenchers, a small crane, a backhoe, forklifts, concrete trucks, an auger truck and a bulldozer. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment and transformer oil.

Site preparation, grading and construction activities within 120 m of significant natural features may result in a variety of potential effects that will be avoided or minimized through the application of mitigation measures. 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. An electrical service line of approximately 9 m and associated poles will be connected to the existing distribution line adjacent to the substation for the purpose of providing house service power to the substation control building. The temporary electrical service line and pole will be removed during the decommissioning phase. Construction equipment will include small trenchers, a small crane, a backhoe, forklifts, concrete trucks and a bulldozer.

A minimum 30 m setback from water bodies has been implemented and measured from the outer limit of the Area of Disturbance. There are two water bodies located within 120 m of the substation and laydown area. Site preparation, grading and construction/decommissioning activities within 120 m of a water body may result in a variety of potential effects, including but not limited to increased sedimentation and erosion from clearing and grubbing and increased turbidity in water bodies, that will be avoided or minimized through the application of mitigation measures. The potential effects associated with the construction, operation and decommissioning of the substation and laydown area are presented in Table 5-6 along with mitigation measures and residual effects.

5.2.6 Operation and Maintenance Building

An operations and maintenance building, approximately 30 m by 15 m in size, is scheduled to be constructed on privately held lands (on or near the same parcel as the substation for the Project) for the purpose of monitoring the day-to-day operations of the wind energy centre and supporting maintenance efforts. A small parking lot will be constructed to accommodate vehicles. Prior to the construction phase, a Stormwater Pollution Prevention Study will be conducted to address any potential effects associated with stormwater runoff.

Potable water will be supplied by a well or through the municipal water system and a septic bed will be constructed for the disposal of sewage. The septic bed will be constructed to the minimum size required for the size of the operation and maintenance building. It is the Project owner's responsibility to ensure proper maintenance of the septic system. The operations and maintenance building, septic system and water supply will be constructed in accordance with applicable municipal and provincial standards.

Site preparation, grading and construction activities within 120 m of significant natural features may result in a variety of potential effects. During construction of the Operations and Maintenance Building, 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, a backhoe, forklifts, concrete trucks and a bulldozer.

A minimum 30 m setback from water bodies has been implemented and measured from the outer limit of the Area of Disturbance. There are two water bodies located within 120 m of the Operations and Maintenance Building. Site preparation, grading and construction/decommissioning activities within 120 m of a water body may result in a variety of potential effects, including but not limited to increased sedimentation and erosion from clearing and grubbing and increased turbidity in water bodies, that will be avoided or minimized through the application of mitigation measures. The potential effects associated with the construction, operation and decommissioning of the Operations and Maintenance building are presented in Table 5-6 along with mitigation measures and residual effects.

5.2.7 Permanent Meteorological Towers

Permanent meteorological towers are an operational requirement of the Independent Electricity System Operator (IESO) as an electricity market participant (this includes all generators of electricity) and allow the IESO to operate the system reliably and safely.

Permanent meteorological towers will be installed at the Project. These are typically up to 80 m in height. No significant soil or vegetation disturbance is anticipated. The use of meteorological data is key to the safe and efficient operation of a wind energy centre. Some operational decisions made using meteorological data include:

- Cut-in wind speed;
- Cut-out wind speed;
- Turbine shut down during potential icing conditions; and,
- Turbine shut down during extreme weather events.

The towers will be erected using winches and secured with guy wires tied off to anchors or a monopole foundation. No significant soil or vegetation disturbance is anticipated. Construction of each meteorological tower will take approximately two days and require a crew of six people.

No significant soil or vegetation disturbance is anticipated for the construction and operation of the towers. A minimum 30 m setback from any water bodies has been implemented. There are two water bodies located within 120 m of the meteorological towers. The construction and decommissioning activities within 120 m of a water body may result in a variety of potential effects, including but not limited to increased sedimentation and erosion from clearing and grubbing and increased turbidity in water bodies, that will be avoided or minimized through the application of mitigation measures. The potential effects associated with the construction, operation and decommissioning of meteorological towers are presented in Table 5-7 along with mitigation measures and residual effects.

5.3 Mitigation Measures

Mitigation techniques are proposed to offset possible effects of the construction, decommissioning and operation activities of the Jericho 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 as guidelines to avoid conditions that may harmfully alter aquatic habitat. These DFO operational plans are being used in conjunction with standard mitigation measures that are implemented to protect surface water quality and the aquatic ecosystem.

The following 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 and if possible out of the regulated floodplain to limit risk of impacts to aquatic habitat and surface water quality from accidental spills.
- Keep vegetation removal to a minimum.

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.
- 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. Extra erosion and sediment control materials will be kept on site (*e.g.*, heavy duty silt fencing, strawbales).
- Check that erosion control tools are in good repair and properly functioning prior to conducting daily work and re-install or repair as required prior to commencing daily construction activities.
- Keep sediment and erosion control measures in place until disturbed areas have been stabilized (i.e., re-vegetated).
- To avoid sedimentation in wetlands and watercourses, schedule grading within 30 m of a watercourse or wetland to avoid times of high runoff volumes, wherever possible. Temporarily suspend work if high runoff volume is noted or excessive flows of sediment discharges occur until contingency measures are in place.
- Re-vegetate temporary roads to pre-construction conditions as soon as possible after construction activities are complete using species native to the area in naturally vegetated areas.

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 at least 30 m away from a wetland, woodland or water body. Develop a spill response plan and train staff on associated procedures.
- 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. Any grading of lands adjacent to water body features should match existing grades at the identified set-back, or buffer from the features.

Construction Timing Windows

- Schedule construction activities that occur within 30 m of watercourses to avoid periods of critical habitat use (i.e., spawning) 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). There are generic restricted in-water work timing windows established by the DFO.
- Specific timing windows for this project may be developed in consultation with ABCA and SCRCA.

Isolated Crossing

- In-water works for permanent water bodies must occur in the dry and via the dam and pump method to maintain fish passage during in-water works. For intermittent water bodies, work is preferred to be completed in the dry and carried out during seasonally dry times 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.

Culvert Design

- Design and install culverts to prevent creation of barriers to fish movement and maintain bankfull channel functions.
- Install open bottom crossing structures where possible.
- Design culverts to accommodate high flows of the watercourse by undertaking hydraulic engineering studies.
- 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.
- Regularly maintain culverts to ensure no debris build-up is impeding stream flow.

Water Quality

- Develop a spill response plan and train construction staff on associated procedures.
- Maintain emergency spill kits on construction 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.

Dewatering Activities (if necessary)

- Confirm the zone of influence of required dewatering activities prior to construction.
- For turbines within the sand and/or gravel deposits, schedule dewatering activities to take place during a seasonally dry time of year where possible.
- Limit duration of dewatering to as short a time frame as possible
- Implement groundwater cut-offs as required to limit water taking quantities.
- Limit dewatering where turbines are constructed within the sand and/ or gravel deposits to less than 40,000 L/day.

Water Management

- Control rate and timing of water pumping; pump from deep wells to infiltration galleries adjacent to water bodies or wetlands.
- Control rate and timing of water pumping from surface water features.
- Control quantity and quality of stormwater discharge using best management practices (e.g., use of a permeable surface for access roads, complete Stormwater Pollution Prevention Study to address any potential effects associated with stormwater runoff for the Operations and Maintenance Building prior to construction).
- Restrict taking groundwater and surface water during drought conditions.
- Regulate the discharge of water-taking (if required) to ensure that there is no flooding in the downstream area and no soil erosion, or stream channel scouring is caused at the point of discharge. A discharge diffuser or other energy dissipation device will be used, if necessary, to mitigate flows which physically alter the stream channel or banks.
- Install siltation control measures that are sufficient for the volumes pumped at both the taking location upstream of the construction site and (if necessary) the discharge site. All measures will be taken to properly maintain these control devices throughout the construction period.
- Maintain vegetative buffers around water bodies.

Horizontal 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.
- Complete geotechnical study to ensure site is suitable for this construction method.
- Implement a “Frac-Out” Contingency Plan in the event of a “frac-out”, which will include but is not limited to the following:

    1. Immediately stop all work, including the recycling of drilling mud / lubricant.
    2. Isolate affected watercourse or area using a temporary dam and install by-pass pump system (if required) to maintain continuous flow downstream of the site;
    3. Insert rigid in-water/soil containment unit or underwater boom into the “frac-out” source area in order to contain any sediments and/or deleterious materials originating from the “frac-out”.

4. No captured material will be left on-site. The captured material should be extracted by vacuum truck, if available, or pumped into a containment unit or area for off-site disposal;
5. Monitor "frac-out" for four 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, maintain isolation/containment unit in place and continue pumping captured material to a containment unit or area until drilling mud congeals or stops flowing.
6. Notify the Ministry of the Environment's (MOE) Spills Action Centre (1-800-268- 6060) of the "frac-out" event and the response taken to contain the spill. This step should be completed during the 4 hour "frac-out" monitoring period.
7. Engage a spill response team to contain and clean up excess drilling mud in the water.
8. Monitor clean-up procedures to ensure they do not result in greater damage than leaving the mud in-place.
9. If the spill affects an area that is vegetated, the area will be seeded and/or replanted using the same species to those in the adjacent area, or allowed to re-grow from existing vegetation. Re-vegetated areas will be monitored once per growing season for two years subsequent to "frac-out" to confirm re-vegetation is successful.
10. 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.

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 & maintain vegetative buffers around water bodies including within the temporary construction areas.
- Add suitable stream substrates (e.g., gravel or rip rap) to stabilize sediment and provide cover.

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 degree of impact from proposed project component. Proposed mitigation measures are the same for all REA water bodies, regardless of the feature sensitivities. Where there are highly sensitive sites or potential cumulative effects, additional monitoring may be required by an Environmental Monitor during the construction phase.

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 effects evaluation associated with the construction, operation and decommissioning, of turbines as they relate to water bodies and the 30 m area surrounding the water body.

Effects during the construction and decommissioning phase are primarily related to uncontrolled sediment release or hardening of the soils. No turbines and laydown areas are within 30 m of water bodies, and with adherence to effective sediment and erosion control measures, no residual effects are anticipated to the water body in the medium (months) or long term (years). Mitigation measures for water bodies within 120 m have been proposed and will be implemented based on a site specific conditions and potential for impacts to the surrounding water bodies.

There are no anticipated residual effects on water bodies from the operation of turbines provided that BMPs are adhered to 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 as they relate to water bodies and the 30 m area surrounding the water body.

There are limited residual effects associated with construction of access roads. Potential effects of lateral flows will be mitigated by properly designing and installing an appropriately sized culvert that is 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, not accessing the works from the streambed and rehabilitating stream banks following construction.

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 and in some cases may improve local connectivity and habitat availability to the fish.

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 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.

There are several access roads that will be constructed within 30 m of a water body and will require implementation of the mitigation measures outlined in Section 5.3 and Table 5-3. Mitigation measures for water bodies within 120 m have been proposed and will be implemented based on site specific conditions and potential for impacts to the surrounding water bodies.

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.

Effects from construction can be mitigated through adherence to best management practices. There are anticipated to be minimal residual effects associated with the changes in groundwater flow patterns due to the directional drilling and installation of collection lines. There are anticipated low residual effects associated with the potential release of pressurized drilling fluids ('frac-out') during the horizontal directional drilling for the collection lines. An emergency 'frac-out' response plan will be developed for water bodies where installation of a collection line results in significant changes in baseflow, as described in the Environmental Monitoring Plan in Table 5-8.

There are several areas where collection lines will be constructed within 30 m of a water body and will require implementation of the mitigation measures outlined in Section 5.3 and Table 5-4. Mitigation measures for water bodies within 120 m have been proposed and will be implemented based on site specific conditions and potential for impacts to the surrounding water bodies.

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** – R2.101, R2.18, R2.73 • **Moderate Sensitivity** – R2.102, R2.10-B, R2.76, R4-B, R4-I, R4.11-B, R4.16-B, R4.16-C, R4.25-C, R4.33-B, R4.59, R4.8-B, R4.8-D, R5.8, R6-B, R6.18-B, R9-B, R9.29-D • **Low Sensitivity** – R4-E, R4.36, R8.10, P3.44	• Increase to surface water temperature from reduced groundwater contribution if dewatering activities are required for excavation of turbine foundations	• 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**
			• Increase to streamflows in watercourses that receive temporary groundwater dewatering discharge (if required). Groundwater discharge has 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 area (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 in watercourse from clearing and grubbing for on adjacent lands for construction of turbines, pads and 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 mitigation measures implemented as outlined in Section 5.3, no change expected from the baseline condition.	**No residual effects**
			• Release / discharge of runoff from the construction area, which has the potential to transport sediment and nutrients 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**
			• Soil/water contamination by oils, grease and other materials from accidental spills and release of contaminants from construction equipment.	• Equipment Use • Material Stockpiling and Handling • Water Quality	• Spatial Extent – localized effect • Frequency – construction and decommissioning period • Duration – short term (hours) • Magnitude – no change expected to baseline conditions	**No residual effects**
			• Increase in impervious surfaces from presence of turbine foundation and access roads, resulting in increased water temperatures, increased surface runoff and stream peak flows, and reduced infiltration, base flows and upwelling	• Water Management	• Spatial Extent – localized effect • Frequency – during operation of turbine • Duration – during operation of turbine • Magnitude – no change expected to baseline conditions	**No residual effects**
Operations	**Turbine**	• **High Sensitivity** – R2.101, R2.18, R2.73 • **Moderate Sensitivity** – R2.102, R2.10-B, R2.76, R4-B, R4-I, R4.11-B, R4.16-B, R4.16-C, R4.25-C, R4.33-B, R4.59, R4.8-B, R4.8-D, R5.8, R6-B, R6.18-B, R9-B, R9.29-D • **Low Sensitivity** – R4-E, R4.36, R8.10, P3.44	• Soil/water contamination by oils, grease and other materials from accidental spills and release of contaminants from maintenance vehicles.	• Equipment Use • Material Stockpiling and Handling • Water Quality	• Spatial Extent – localized effect • Frequency – ongoing throughout operation period • Duration – short term (hours) • Magnitude – no change expected to baseline conditions	**No residual effects**

Table 5-3 Effects Associated with Access Roads

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** – R2.10-B, R3.22, R4-D, R4.16-B, R4.33-B, R4.8-B, R4.8-D, R4.25-B, R4.61-B, R5.8, R6.18-B, R6.18-D, R9.29-C, R9.29-D, R9.29-F • **Low Sensitivity** – R3.70, R4.36, R4.58, R8.10	• Obstruction of lateral flows in watercourses from water crossings.	• Culvert Design • 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**
			• Temporary disruption of substrates/habitat at locations where in-water work is required (culvert installations).	• 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**
			• Degradation of fish habitat from culvert installation.	• Culvert Design • Isolated crossing • Erosion and sediment control • Rehabilitation	• 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**
	Access Road and Associated Buffer	**Road Crossing** • **Moderate Sensitivity** – R2.10-B, R3.22, R4-D, R4.16-B, R4.33-B, R4.8-B, R4.8-D, R4.25-B, R4.61-B, R5.8, R6.18-B, R6.18-D, R9.29-C, R9.29-D, R9.29-F • **Low Sensitivity** – R3.70, R4.36, R4.58, R8.10 **Within 120 m of an access road** • **High Sensitivity** – R2.18, R2.73, P2.18 • **Moderate Sensitivity** – R2.102, R2.76, R3-C, R3-D, R4-B, R4-C, R4-I, R4.11-B, R4.16-C, R4.25-A, R4.25-C, R4.31, R4.59, R4.8-E, R6-B, R6.20-A, R9-B • **Low** – R4-E, R4.22, R4.51, P3.44	• Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of access roads.	• 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**
			• Release / discharge of runoff from the construction area, which has the potential to transport sediment and nutrients 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**
			• Reduction of streamflow due to the withdrawal of surface water for construction activities such as dust suppression, equipment washing and land reclamation (e.g., hydroseeding)	• Erosion and sediment control • Water Management	• Spatial Extent – isolated to area of disturbance • Frequency – N/A • Duration – short term • Magnitude – N/A	**No residual effects**
			• Increase in impervious surfaces from presence of turbine foundation and access roads, resulting in increased water temperatures, increased surface runoff and stream peak flows, and reduced infiltration, base flows and upwelling.	• Water Management	• Spatial Extent – localized effect • Frequency – during operation of turbine • Duration – during operation of turbine • Magnitude – no change expected to baseline conditions	**No residual effects**
Operations	**Road Crossing**	• **Moderate Sensitivity** – R2.10-B, R3.22, R4-D, R4.16-B, R4.33-B, R4.8-B, R4.8-D, R4.25-B, R4.61-B, R5.8, R6.18-B, R6.18-D, R9.29-C, R9.29-D, R9.29-F • **Low Sensitivity** – R3.70, R4.36, R4.58, R8.10	• 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 – short term (hours) • Magnitude – no change expected to baseline conditions	**Low residual effects**
			• Obstruction of lateral flows in watercourses and other water bodies due to design of culverts and debris build-up at water crossings.	• Culvert Design	• Spatial Extent – isolated to area of disturbance • Frequency – ongoing • Duration – short term (hours) • Magnitude – N/A	**Low residual effects**

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**	• **High Sensitivity** – R2.14 • **Moderate Sensitivity** – R2.10-B, R2.131, R2.179, R2.186, R2.192, R2.27, R3-A, R3-B, R3-D, R3.28, R3.53, R3.22, R3.66, R4-C, R4-D, R4-F, R4-G, R4-H, R4.25-A, R4.25-B, R4.11-B, R4.16-B, R4.33-A, R4.33-B, R4.50, R4.8-A, R4.8-B, R4.8-D, R4.61-B, R4.61-C, R5, R5.8, R6.18-B, R6.18-C, R6.18-D, R6.20-B, R6-C, R8.12, R9.29-A, R9.29-B, R9.29-D, R9.29-F, R12.54-A, P6.3 • **Low Sensitivity** – R2.140-B, R2.28, R2.281, R2.34, R3.38, R3.46, R3.70, R4-A, R4.36, R4.58, R4.61-A, R4.62, R4.8-C, R5.10, R8.10, R12.54-B	• Release of pressurized drilling fluids into watercourses from fractures in substrate (also known as a 'frac-out').	• Directional Drilling • Water Quality	• Spatial Extent – potential to impact channel reach or entire watercourse • Frequency – one-time installation • Duration – short term (days to weeks) • Magnitude – potential for change to baseline conditions	**Low residual effects**
			• Change to groundwater flow patterns which may affect groundwater discharge to watercourses.	• Water management	• Spatial Extent – Localized - isolated to area of disturbance • Frequency – during construction period • Duration – short term (days) • Magnitude – no change to baseline conditions	**No residual effects**
	Collection Line Crossing and Associated Buffer	**Collection Line Crossing** • **High Sensitivity** – R2.14 • **Moderate Sensitivity** – R2.10-B, R2.131, R2.179, R2.186, R2.192, R2.27, R3-A, R3-B, R3-D, R3.28, R3.53, R3.22, R3.66, R4-C, R4-D, R4-F, R4-G, R4-H, R4.25-A, R4.25-B, R4.11-B, R4.16-B, R4.33-A, R4.33-B, R4.50, R4.8-A, R4.8-B, R4.8-D, R4.61-B, R4.61-C, R5, R5.8, R6.18-B, R6.18-C, R6.18-D, R6.20-B, R6-C, R8.12, R9.29-A, R9.29-B, R9.29-D, R9.29-F, R12.54-A, P6.3 • **Low Sensitivity** – R2.140-B, R2.28, R2.281, R2.34, R3.38, R3.46, R3.70, R4-A, R4.36, R4.58, R4.61-A, R4.62, R4.8-C, R5.10, R8.10, R12.54-B **Within 120 m of construction of a collection line** • **High Sensitivity** – R2.18, P2.136, P2.18 • **Moderate Sensitivity** –R2.76, R3.73, R3.74, R4-I, R4.16-C, R4.25-C, R4.31, R4.8-E, R6.20-A, • **Low Sensitivity** –R3.64, R4-E, R4.27, R4.22, R4.51, R4.60, R6.18-A, R9.29-E, P2.142, P2.30, P3.44, P4.47, P12.22	• Increase in erosion and sedimentation from the entry and exit drill holes required for the directional drilling activities. This will require clearing and grubbing of the land and removal of substrates from the drill hole.	• Erosion and sediment control • Water management	• Spatial Extent – Localized - isolated to area of disturbance • Frequency – during construction period • Duration – short term (days) • Magnitude – no change to baseline conditions	**No residual effects**
			• Soil / water contamination by oils, gasoline, grease and other materials from accidental spills and release of contaminants from equipment.	• 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**
			• Release / discharge of runoff from the construction area, which has the potential to transport sediment and nutrients 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**

5.4.4 Effects Associated with the Transmission Line

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

There are limited residual effects associated with the construction of the transmission line. These 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, as well as improving surface water quality by trapping sediments and contaminants. Potential effects associated with the minor and temporary loss of riparian vegetation include erosion and sedimentation resulting from bank disturbance and loss of plant root systems. These potential effects can be reduced by stabilizing the work area, keeping heavy machinery away from stream banks and creating and implementing a restoration plan.

There are several areas where the transmission line will be constructed within 30 m of a water body and will require the implementation of mitigation measures outlined in Section 5.3 and Table 5-5. Mitigation measures for water bodies within 120 m have been proposed and will be implemented based on site specific conditions and potential for impacts to the surrounding water bodies.

5.4.5 Effects Associated with Substation and Laydown areas

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

There are minimal effects associated with the substation, as there are two water bodies nearby. There are limited residual effects associated with the construction and decommissioning of the substation and laydown area. These residual effects result from clearing and grubbing of the land for construction. Potential effects associated with the clearing and grubbing include streambed and bank erosion and downstream sedimentation. These potential effects can be reduced by stabilizing the work area, implementing erosion and sediment control measures and reducing any changes to land contours.

5.4.6 Effects Associated with the Operations and Maintenance building

Table 5-6 describes the water body location and sensitivity, potential effects, mitigation measures, residual effect evaluation and residual effects associated with the Operations and Maintenance building as they relate to water bodies and the 30 m land surrounding the water body.

There are minimal effects associated with the Operation and Maintenance building, as there are two water bodies nearby. There are limited residual effects associated with the construction and decommissioning of the Operations and Maintenance building. These residual effects result from clearing and grubbing of the land for construction. Potential effects associated with the clearing and grubbing include streambed and bank erosion and downstream sedimentation. These potential effects can be reduced by stabilizing the work area, implementing erosion and sediment control measures and reducing any changes to land contours.

5.4.7 Effects Associated with Meteorological Towers

Table 5-7 describes the water body location and sensitivity, potential effects, mitigation measures, residual effect evaluation and residual effects associated with the permanent meteorological towers as they relate to water bodies and the 30 m land surrounding the water body.

There are limited residual effects associated with the construction, operation and decommissioning of the meteorological towers, which result from clearing and grubbing of the land. Potential effects associated with the clearing and grubbing include 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 5-5 Effects Associated with Overhead Transmission Line

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	**Overhead Transmission Line**	**Transmission Line Crossing** • **High Sensitivity** – R2.2 • **Moderate Sensitivity** – R1.2, R1.49, R1.60, R1.82, R1.84, R2.30, R2.40, R2.72, R3-B, R3.53, R4.25-B, R4.33-A, R4.8-A • **Low Sensitivity** –R1.37, R2.38, R3.46, R3.38 **Within 120 m of construction of a transmission line** • **High Sensitivity –** R2.51, R2.70 • **Moderate Sensitivity** – P1.35, R2.138, R2.84 • **Low Sensitivity** – R2.46, R2.58, P2.53	• Loss of riparian habitat adjacent to watercourses for installation of transmission line poles.	• Rehabilitation • Erosion and Sediment Control	• 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**
			• Release / discharge of runoff from the construction area, which has the potential to transport sediment and nutrients 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	**Overhead Transmission Line**	• **High Sensitivity** – R2.2 • **Moderate Sensitivity –** R1.2, R1.49, R1.60, R1.82, R1.84, R2.30, R2.40, R2.72, R3-B, R3.53, R4.25-B, R4.33-A, R4.8-A • **Low Sensitivity –**R1.37, R2.38, R3.46, R3.38	• 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, Laydown Areas and Operations and Maintenance Building

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	**Substation, Laydown Areas and Operations and Maintenance Building**	• **Moderate Sensitivity** – R4.33-A • **Low Sensitivity** – R4.16-A	• Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of breaker switch station 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 accidental spills and release of contaminants from construction equipment.	• 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**
			• Release / discharge of runoff from the construction area, which has the potential to transport sediment and nutrients 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, Laydown Areas and Operations and Maintenance Building**	• **Moderate Sensitivity** – R4.33-A • **Low Sensitivity** – R4.16-A	• Soil/water contamination by oils, grease and other materials from accidental spills and release of contaminants 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**

Table 5-7 Effects Associated with Meteorological Towers

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	**Meteorological Tower**	• **Moderate Sensitivity** – R4.11-B, R4.8-B	• Increased erosion, sedimentation and turbidity from clearing and grubbing for construction of meteorological towers.	• 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 accidental spills and release of contaminants from construction equipment.	• 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**
			• Release / discharge of runoff from the construction area, which has the potential to transport sediment and nutrients 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	**Meteorological Tower**	• **Moderate Sensitivity** – R4.11-B, R4.8-B	• Soil/water contamination by oils, grease and other materials from accidental spills and release of contaminants 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, meteorological towers, transmission line, substation, laydown area and Operation and Maintenance building in the Jericho Wind Energy Centre.

Adherence to timing windows will ensure that spawning behaviours are not affected during construction of road crossings and will therefore avoid impacts to the fish community in the long-term and at a population level.

Implementation of recommended mitigation measures and review of local soils will ensure that all appropriate mitigation measures are put in place, and there are expected to be no effects from the horizontal directional drilling. An emergency 'frac-out' response plan and contingency crossing plan will be developed prior to any construction activity to mitigate effects to water quality and aquatic habitat in the event of a 'frac-out'. This will outline the protocol to monitor, contain and cleanup a potential 'frac-out' and an alternative method for carrying out the crossing.

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 will ensure no impact to water quality or downstream reaches and therefore no residual effects.

Features given a 'Non-REA' ranking are not considered water bodies as outlined in Section 1.1 of this report. These features were identified as dugout, off-line or agricultural ponds, tiled/buried or ploughed through channels, grassed 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 and will be determined on a site specific basis.

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).

Each river system (see Section 4.2.2 and Figure 4-1 for further details) was assessed for potential cumulative effects from the construction; operation and decommissioning of Project Components. Professional judgement was used to define cumulative effects based on the size of drainage feature; the number of REA waterbodies; the number of project components; the type and variety of project components; distances between project components and the residual risk after implementation of the mitigation measures as outlined in Section 5.4.

Ptsebe Creek (R1)

No cumulative effects are anticipated in R1 as it is located in the transmission line study area and different water bodies are each crossed only once by overhead wires (Figure 4-2).

Ausable River (R2)

The Ausable River is the main waterbody in this river system and all tributaries within R2 drain to this river (Figure 4-2X). R2.131 and tributaries R2.192 and R2.186 are crossed by a collection line 3 times within in short distance (less than 1 kilometer). A 'frac-out' emergency response plan will be in place, and considering the assessed sensitivities of these water bodies, and the fact that sections of the tributaries are buried or tiled, no cumulative effects to the water bodies or the Ausable River itself are considered likely from these proposed works.

Nesbit Drain, Decker Creek and Trick Drain (R3)

These three drainage systems are hydraulically connected, as Trick Drain flows into Decker Creek which then flows into Nesbit Drain. Within Trick Drain, R3.70 is proposed to be crossed by 1 new road and 1 collection line crossing within the same vicinity. R3-D is crossed twice by a collection line and once by a transmission line. A road is proposed to run alongside R3-B for approximately 0.5 km. This tributary drains into Ausable River Cut. Although there will be no watercourse crossing, and no likely effects from construction, there remains low residual risk from surface water runoff or spills during the operations phase of this road. Additional mitigation measures are recommended in the form of a vegetated buffer that is setback from the top of bank.

Mud Creek (R4)

The Mud Creek river system occupies a large drainage area and all projects components are proposed within this river system. There are some instances where potential cumulative effects can occur where more than one project component occurs on the same water body. R4.D is crossed by a road and two collection lines in the same vicinity. A road is proposed to run alongside R4-C and R4.36 for approximately 0.5 km and a vegetated buffer is recommended that is set back from the water body. R4.8 is crossed by three collection lines, two roads, one transmission line, three turbines and one meteorological tower. R4.25B is crossed by two collection lines and two roads R4.33B is crossed by one collection line and two roads and in the vicinity of two turbines. R4.16 is crossed by a collection time three times, and two new road crossings. R4.61 is crossed by a collection time four times, one new road crossings, and in 120 m of one turbine.

Duffus Creek (R5)

No cumulative effects are anticipated in R5 as there are only a few water bodies in R5 that overlap with a total of five Project Components that are spatially separated.

Shashawanah Creek (R6)

The Shashawanah Creek system is relatively small in area and drains into Lake Huron. There is only one tributary with more than one project component. Reach 6.18 contains 2 new road crossings, 4 collection line crossings and is within 120 m of 3 turbines. No cumulative effects are anticipated.

Wood Creek (R8)

No cumulative effects are anticipated in R8 as there are only a few areas in R8 that overlap with Project Components that are spatially separated. There is one road that is proposed to run parallel to R8.10 for an approximate distance of 0.6 km.

McPherson Drain, Hickory Creek (R9)

Both of these systems drain into Lake Huron. There is only one tributary within R9 with the potential for cumulative effects on the watercourse itself. There are 3 new road crossings and 5 collection line crossings proposed on Reach 9.29 and it is within 120 m of 1 turbine.

Bear Creek (R12)

This R12 system contains only the headwaters to the Bear Creek system. There are no more than one proposed Project Components at each water body and therefore no likely cumulative effects.

For all river systems where cumulative effects have been identified, the potential residual effects will be low through the implementation of recommended mitigation measures and BMPs (Section 5.3). In these systems the Environmental Monitors (EMs) will be aware of construction schedules for all sites, and inspect the water body for potential effects from construction-related activities upstream. Where any cumulative effects are identified by the EMs, additional mitigation measures will be implemented to mitigate for these effects where feasible (e.g. additional sediment and erosion control). Cumulative effects are only likely during construction and are not anticipated any during the operations of this wind energy centre.

5.6 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 regulatory agencies MOE, MNR, ABCA, SCRCA, and DFO as applicable.

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);
- Receiving stream temperature; and
- Stream erosion and sedimentation.

The potential 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.

5.6.1 Mitigation Measures, Residual Effects and Monitoring Plan

Table 5-8 provides mitigation measures, residual effects and the monitoring plan for each potential effect identified above.

Table 5-8 Mitigation Measures, Residual Effects and Monitoring Plan

Potential Effect	Performance Objectives	Mitigation Strategy (Refer to Section 5.3 for Mitigation Measures)	Residual Effects	Monitoring Plan and Contingency Measures
Increase to surface water temperature from reduced groundwater contribution if dewatering activities are required for excavation of turbine foundations.	• 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. • Restrict taking groundwater and surface water during drought conditions. • Regulate the discharge of water-taking (if required) to ensure that there is no flooding in the downstream area and no soil erosion, or stream channel scouring at the point of discharge. Use a discharge diffuser or other energy dissipation device will be used, if necessary, to mitigate flows which physically alter the stream channel or banks. • Install siltation control measures that are sufficient for the volumes pumped at both the taking location upstream of the construction site and (if necessary) the discharge site. All measures will be taken to properly maintain these control devices throughout the construction period. **Timing Windows** • Schedule construction activities that occur within 30 m of watercourses to avoid periods of critical habitat use (i.e., spawning) to the extent possible. There are generic restricted in-water work timing windows established by DFO. • Specific timing windows for this project may be developed in consultation with ABCA and SCRCA. **Dewatering Activities** • Confirm the zone of influence of required dewatering activities prior to construction. • For turbines within the sand and/or gravel deposits, schedule dewatering activities to take place during a seasonally dry time of year where possible. • Limit duration of dewatering to as short a time frame as possible period Implement groundwater cut-offs as required to limit water taking quantities. • Limit dewatering where turbines are constructed within the sand and/or gravel deposits to less than 400,00 L/day.	• 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).	• Where known groundwater dewatering is required, install staff gauges to monitor stream levels • Monitor water level at these locations to monitor watercourse depth and estimated flow before, during and after dewatering activities. **Contingency Measures:** • Control rate and timing of water pumping. • In the event of a decrease in surface water levels, of which it can be attributed to the dewatering activities, stop dewatering until appropriate site specific mitigation plan has been developed.
Increase to streamflows in watercourses that receive temporary groundwater dewatering discharge (if required). Groundwater discharge has potential to cause streambed and/or bank erosion and downstream sedimentation if not managed properly.	• 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. • 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). • Check that erosion control tools are in good repair and properly functioning prior to conducting daily work and re-install or repair as required prior to commencing daily construction activities. • Keep sediment and erosion control measures in place until disturbed areas have been stabilized (i.e., re-vegetated). **Water Management – See above** **Timing Windows** • Schedule construction activities that occur within 30 m of watercourses to avoid periods of critical habitat use (i.e., spawning) to the extent possible. There are generic restricted in-water work timing windows established by DFO. • Specific timing windows for this project may be developed in consultation with ABCA & SCRCA.	• 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 short term dewatering (if required).	• Monitor erosion and sedimentation of receiving watercourse before and during dewatering events • Monitor water level and stream flow at these locations to test watercourse depth and flow before and during construction. • Collect surface water samples from discharge locations before, during and after construction. Analyze for general chemistry (e.g., temperature, pH, dissolved oxygen, and conductivity), suspended solids, total phosphorus and total metals (e.g., copper, iron, zinc and aluminum). These data will be used to determine background watercourse water quality at discharge locations. The findings of the monitoring program will be reported back to MOE following the completion of dewatering activities. **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 on adjacent lands for construction of turbines, pads/turnaround areas, and access roads 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. Any grading of lands adjacent to water body features should match existing grades at the identified set-back, or buffer from the features. **Equipment Use** • 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. • Limit speed of vehicles near watercourse crossings.	• 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 mm 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 / flooding occurs, report the details of the event 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 (e.g., installation of extra erosion and sediment control materials kept on site, such as silt fencing, straw bales etc.)
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.	• 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 mm 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. **Contingency Measures:** • Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place.

Table 5-8 Mitigation Measures, Residual Effects and Monitoring Plan

Potential Effect	Performance Objectives	Mitigation Strategy (Refer to Section 5.3 for Mitigation Measures)	Residual Effects	Monitoring Plan and Contingency Measures
Release / discharge of runoff from the construction area, which has the potential to transport sediment and nutrients into the watercourse.	• 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 mm 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, report the details of the event 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.
Obstruction of lateral flows in watercourses from water crossings	• Minimize obstruction of lateral flows in watercourses.	**Culvert Design** • Design and install culverts to prevent creation of barriers to fish movement and maintain bankfull channel functions. • Install open bottom crossing structures where possible. • Design culverts to accommodate high flows of the watercourse by undertaking hydraulic engineering studies. • 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, where possible. 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. • Regularly maintain culverts to ensure no debris build-up is impeding stream flow. **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. • 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.	• Obstruction of lateral flows in watercourses avoided through application of mitigation measures. • No likelihood of effect occurring.	• Monitor on-site conditions at all water body crossings (i.e., culverts are installed properly and embedded below the streambed.): prior to, during and after the installation of the culvert to ensure lateral flows have been maintained. **Contingency Measures:** • In the event the culvert creates issues relating to lateral flow and fish barriers, steps will be required to fix issues which may involve re-installing the culvert and ensuring it is properly installed and embedded within the streambed.
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 once per week or throughout duration of in-water construction to identify any minor or major disturbances caused by construction activities by undertaking the following: ▪ 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. • Report the findings of the monitoring program to MOE following the completion of in-water construction activities. **Contingency Measures:** • Mitigate or compensate for any disturbance to fish habitat according to Department of Fisheries and Oceans Canada (DFO) authorization and in consultation with ABCA and SCRCA.
Degradation of fish habitat from culvert installation.	• Minimize degradation of fish habitat.	**Culvert Design – See above** **Timing Windows – 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 disturbance to fish habitat according to Department of Fisheries and Oceans Canada (DFO) authorization and in consultation with ABCA and UTRCA.

Table 5-8 Mitigation Measures, Residual Effects and Monitoring Plan

Potential Effect	Performance Objectives	Mitigation Strategy (Refer to Section 5.3 for Mitigation Measures)	Residual Effects	Monitoring Plan and Contingency Measures
Soil/water contamination by oils, grease and other materials from accidental spills and release of contaminants from construction equipment.	• Minimize soil/water contamination.	**Equipment Use – See above and mitigation below:** ▪ Install a spill collection pad for refuelling and maintenance. **Material Stockpiling and Handling** • Store any stockpiled materials at least 30 m away from water body to prevent deleterious substances from inadvertently discharging to the environment. • Develop a spill response plan and train staff on associated procedures. • 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.	• Contractor to conduct routine inspections of construction equipment for leaks / spills • Develop an emergency spills plan. **Contingency Measures** : ▪ Immediately stop all work until the spill is cleaned up. ▪ Notify MOE's Spills Action Centre of any leaks or spills. ▪ If a spill enters a water body, collect and analyze water samples for appropriate parameters. ▪ Monitor daily until cleanup is completed.
Soil/water contamination from the release of pressurized drilling fluids into watercourses from fractures in substrate (also known as a 'frac-out').	• 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'. • Develop 'Frac-out' plan (Section 5.3) **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 release of pressurized drilling fluids into a water body could affect both water quality and aquatic habitat.	• Monitor directional drilling for the duration of such activities to ensure that "frac-out" does not occur, and if it does, to ensure that effects are minimized on surface or groundwater. **Contingency Measures:** • In the event of a "frac-out", immediately stop all work, including the recycling of drilling mud / lubricant and implement 'frac-out' contingency plan. • Implement 'Frac-out' plan (Section 5.3).
Reduction of streamflow due to the withdrawal of surface water for construction activities such as dust suppression, equipment washing and land reclamation (e.g., hydroseeding).	• Minimize effects to surface water and fish habitat.	**Erosion and Sediment Control – see above** **Water Management** • Restrict taking groundwater and surface water during drought conditions • Control rate and timing of water pumping from surface water features • Regulate the discharge of water-taking to ensure there is no soil erosion, or stream channel scouring is caused by the point of discharge.	• Low likelihood and limited magnitude of effects on surface water as a result.	• Monitor all surface water-taking activities to ensure no damage to watercourse and fish habitat occurs, including drops in water levels and damage to stream banks and bed from discharge. **Contingency Measures:** • In the event of decreased water levels and damage to stream banks and bed, suspend work until mitigation measures are in place.
Loss of riparian habitat adjacent to watercourses for installation of culverts and transmission line poles.	• Minimize loss of riparian habitat adjacent to watercourses.	**Rehabilitation** • Keep vegetation removal to a minimum • Restore and maintain vegetative buffers around water bodies including within the temporary construction areas **Erosion and Sediment Control – see above**	• Loss of riparian habitat adjacent to watercourses minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects riparian cover and adjacent watercourse.	• Monitor site during riparian vegetation removal. • Monitor on-site conditions (i.e., erosion and sediment control, 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 mm 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. **Contingency Measures:** • Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place. • Restabilize banks with plantings as works are complete to ensure no further damage to stream banks.
Damage to stream banks from the use of heavy machinery.	• Minimize damage to stream banks.	**Work Area** • Stabilize banks where necessary, minimizing 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 • Locate staging areas away from watercourses and if possible out of the regulated floodplain to limit risk of impacts to aquatic habitat and surface water quality from accidental spills. **Erosion and Sediment Control – see above** **Rehabilitation** • Restore and maintain vegetative buffers around water bodies including within the temporary construction areas	• Damage to stream banks minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects on surface water and groundwater as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, 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 mm 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. **Contingency Measures:** • Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place. • Restabilize banks with appropriate measures as soon as works are complete to ensure no further damage to stream banks.

Table 5-8 Mitigation Measures, Residual Effects and Monitoring Plan

Potential Effect	Performance Objectives	Mitigation Strategy (Refer to Section 5.3 for Mitigation Measures)	Residual Effects	Monitoring Plan and Contingency Measures
Obstruction of lateral flows in watercourses and other water bodies due to design of culverts and debris build-up at water crossings.	• No obstructions of lateral flows.	**Culvert Design** • Design and install culverts to prevent creation of barriers to fish movement and maintain bankfull channel functions. • Install open bottom crossing structures where possible. • Design culverts to accommodate high flows of the watercourse by undertaking hydraulic engineering studies. • 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. • Regularly maintain culverts to ensure no debris build-up is impeding stream flow. **Isolated Crossing – See above**	• Obstruction of lateral flows in watercourses will be avoided through culvert design and maintenance activities. • No likelihood of effect occurring.	• No monitoring or contingency measures required.
Increase in impervious surfaces from presence of turbine foundation and access roads, resulting in increased water temperatures, increased surface runoff and stream peak flows, and reduced infiltration, base flows and upwelling.	• No changes to surface water quality or quantity.	• Adhere to all setback requirements from watercourses. • Control quantity and quality of stormwater discharge using best management practices, and implement infiltration techniques to the extent possible (e.g., use of a permeable surface for access roads).	• Increase in impervious surfaces and subsequent changes to surface water quality or quantity minimized due to setback requirements and through application of mitigation measures. • Low likelihood and limited magnitude of effect due to small increase in impervious surfaces within entire Project Study Area.	• No monitoring or contingency measures required.
Changes in surface water drainage patterns to water bodies.	• Minimize changes in surface water drainage patterns and obstruction of lateral flows in surface water to water bodies.	• Minimize changes in land contours and natural drainage; maintain timing and quantity of flows. • Match any grading of lands adjacent to natural features to existing grades at the identified set-back, or buffer from the features.	• Changes in surface water drainage patterns and obstruction of lateral flows avoided through mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Inspect locations within 30 m of wetlands following completion of access roads by an Environmental Monitor to ensure no grade changes. **Contingency Measures:** • If surface water drainage alterations are detected, undertake corrective measures to restore drainage pattern.

6. Summary and Conclusions

This water assessment of the Jericho 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 116 REA water bodies were identified in the Jericho Project Study Area.

To aid in the assessment of water bodies and to focus mitigation measures, water quality, flow observations, aquatic habitat and riparian features information was collected during site investigations. This information was also used to provide an understanding of the system's resiliency. The majority of the water bodies were found to be fairly resilient to environmental perturbations. This is supported by background data collated from Conservation Authorities and other agencies. Generally, coldwater habitat is more sensitive to environmental change than warmwater habitat. Water bodies in the Lower Ausable, Lower Parkhill, Mud Creek, Bear Creek Headwaters, Lambton Shores Tributaries and Plympton Shoreline Tributaries subwatersheds consist of warmwater baitfish communities, that are generally common, demonstrably secure on a global, national and local level and respond well to changing environmental conditions, and whose habitat preferences are wide-ranging. The Lower Ausable, Lower Parkhill and Bear Creek Headwaters are known to contain a variety of Species at Risk that are listed both provincially under the ESA, 2007 and Federally protected under the *Species at Risk Act* (SARA, 2002). These are dealt with under separate cover.

In general, water quality throughout the Project Study Area is heavily influenced by agriculture, as evidenced by tile drain runoff, low water clarity and abundant algal growth in most of the watercourses. No effects 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 the use of best management practices and sediment fencing and erosion control measures. Although a large number of water bodies in the Project Study Area are 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 river systems where more than one project component is proposed in the vicinity of the same water body, 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 details 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 important 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 Jericho 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) and St. Clair River Conservation Authority (SCRCA) 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 (147/06) and SCRCA (171/06) local Ontario Regulation. The proposed development application will therefore, require review by the ABCA and SCRCA 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 work will require review under the *Fisheries Act* to determine any impacts on Fish and 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". Both ABCA and SCRCA have 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 (ESA, 2007) and Species at Risk Act (SARA)

A permit may be required from MNR or DFO in the event that a Species at Risk is encountered or the proposed works are located in 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 and DFO.

6.1.4 Municipal Drainage Act, 1990

Any work proposed on, through, over, under, or next to a municipal drain may need to be approved by the corresponding municipality's Drainage Engineer.

6.1.5 Navigable Waters Protection Act, 1985

The *Navigable Waters Protection Act* (NWPA) provides a legislative mechanism for the protection of the public right of marine navigation on all navigable waters in Canada. This is done through the permitting of works built or place over, through or across navigable waters. The NWPA is administered through Transport Canada. A permit may be required for any in-water works if the water bodies do not meet the criteria outlined in the *Minor Works and Waters Order,* available at http://www.tc.gc.ca/eng/marinesafety/oep-nwpp-minorworks-menu-1743.htm.

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