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GUIDING SOLUTIONS IN THE NATURAL ENVIRONMENT

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Water Assessment and Water Body Report Nanticoke Solar

Prepared For:

Nanticoke Solar LP

Prepared By:

Beacon Environmental Limited and Arcadis

Date: *Project:*

October 2016 **214350**

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1. Introduction

Nanticoke Solar LP is proposing to design, build and operate a solar electricity generation facility on and near the existing OPG Nanticoke Generating Station (GS) site in Haldimand County, Ontario (**Figure 1**). The proposed project will be known as the Nanticoke Solar Project ("the Project") and will be owned as a partnership between Ontario Power Generation (OPG), SunEdison Canadian Construction LP and Six Nations Development Corporation. The proposed Project is classified under the O. Reg. 359/09 Renewable Energy Approval (REA) process as a Class 3 Solar Facility and will generate up to 44 megawatts alternating current (MW_{AC}). The facility will convert solar energy into electricity to be fed into the Hydro One transmission grid.

The Project will require approval under Ontario Regulation 359/09 – Renewable Energy Approval (REA) under Part V.0.1. of the Ontario Environmental Protection Act. Subject to receiving all approvals, the preliminary schedule anticipates that full commercial operation will be achieved by March 9, 2019. The Project has received a 20-year LRP contract from the IESO to generate electricity and deliver it to the Ontario electricity grid. As such, the project is anticipated to operate until at least 2039, at which time it may continue to generate electricity or be decommissioned.

Beacon Environmental Limited (Beacon) and ARCADIS have been retained to provide a Water Assessment and Waterbody Report for the Project. Beacon was responsible for all work related to the in-land drainage features; ARCADIS was responsible for the information provided for Lake Erie. A Water Assessment is a required component of a REA application. The Water Assessment includes a records review and a site investigation to determine the presence and the boundaries of waterbodies as defined by O.Reg. 359/09 and are within 120 metres (m) of the Project Location or within 300 m of the average annual high water mark of a Lake Trout lake that is at or above development capacity. If waterbodies are identified within 120 m of the Project Location, a Waterbody Report is required.

O. Reg 359/09 requires that all renewable energy projects prepare a Waterbody Report to assess potential negative effects and identify mitigation measures for any water bodies that have been identified within 120 m of the Project Location. This Water Body Report was completed to address the regulatory requirements outlined in O. Reg 359/09.

This report includes both a Water Assessment and a Water Body Report. This reports will be submitted to the Ministry of the Environment and Climate Change (MOECC) for review and comment, as required in O. Reg 359/09 and will provide for the protection of water bodies within and adjacent to the Project Location.

1.1 Project Location

The Project is located on four (4) parcels of property in Haldimand County, Ontario including the former Nanticoke G.S. site and three parcels of agricultural lands. The four parcels of the Project land are privately owned. Rights to use the lands have been acquired by Nanticoke Solar LP through lease agreements with private landowners.

The Project Location is generally bounded by Rainham Road to the north, Sandusk Road to the east and by South Coast Drive to the south (**Figure 2**). The defined project, is approximately 159.6 hectares

(ha) in area. The Project Location is not located within the Niagara Escarpment Plan, the Oak Ridges Moraine Conservation Plan Area or the Protected Countryside of the Greenbelt Plan.

The Project Location was defined early in the planning process for the proposed solar facility based on the approximate area required for the proposed project and connect to the electrical grid.

It has an approximate centroid at the following geographic coordinates (**Table 1**):

Table 1. UTM Coordinates (NAD 83, Zone 17T)

Easting	Northing
579506	4740514

The proposed Project Location and the 120 m from the edge of the Project Location are shown on **Figure 2**.

1.2 Summary of the Project Components

The Nanticoke Solar Project is a Class 3 Solar Facility and is proposed to have a name plate capacity of 44 MW_{AC}. The major components of the proposed project are as follows:

- Monocrystaline or polycrystalline solar photovoltaic (PV) modules;
- Combiner boxes and cabling;
- Support posts installed in the ground, and a fixed or single-axis mounting structure to hold the PV modules;
- Substation (located on the Nanticoke GS lands), including: a primary transformer; switchgear; PT's, CT's and metering, control and communication equipment and potentially a tower for communication if required by Hydro One;
- Integrated inverter/transformer units to convert electricity from direct current to alternating current, and to step-up the voltage;
- Interior access roads and turnaround areas; and,
- Temporary laydown/staging areas for deliveries of materials and equipment.

All components are within the Project Location (**Figure 2**).

1.3 Qualifications

The Records Review was undertaken by Cori Carveth from Beacon Environmental. The Site Investigation and EIS was undertaken by Lindsey Waterworth, with assistance from Rob Aitken from Beacon Environmental. The information about Lake Erie was provided by Brian Hindley from ARCADIS. Resumes for all staff are provided in **Appendix A**.

Site Location

Figure 1

OPG REA Application - Nanticoke Solar

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Web Mapping Service 2010

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Project Location

Figure 2

Nanticoke Solar

Legend

- Project Location
- Project Location Plus 120 m Setback
- Perimeter Fence
- Solar Panel
- Laydown Area - Primary
- Laydown Area - Secondary
- Access Road
- Transmission Line

LIO: 2015; Beacon Environmental: 2015.

UTM Zone 17 N, NAD 83

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2. Records Review

A records review was completed, consistent with Section 30 of O. Reg 359/09, for the Project Location using secondary source information. Applicants must determine whether the Project Location is:

- in a water body;
- 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;
- within 300 m of the average annual high water mark of a lake trout lake that
- is at or above development capacity;
- within 120 m of the average annual high water mark of a permanent or
- intermittent stream; or
- within 120 m of a seepage area.

2.1 Background Information Sources

Records reviewed for lands in or within 120 m of the Project Location included a review of the following resources:

- Fisheries and Oceans Canada (DFO) Distribution of Fish Species at Risk – Long Point Region Conservation Authority (LPRCA) (2016);
- Great Lakes Fisheries Commission. 2008. A Strategic Plan for the Rehabilitation of Lake Trout in Lake Erie, 2008-2020
- Haldimand County Official Plan (2009);
- Long Point Region Conservation Authority (LPRCA). Ontario Regulation 178/06 Limit Map. Accessed September 2012.
- Ministry of Natural Recourses and Forestry (MNRF) Make a Map: Natural Heritage Areas – Natural Heritage Information Centre (NHIC) Data (2016a);
- MNRF Land Information Ontario (LIO) data layers (2016b);
- MNRF Ontario Crown Land Use Policy Areas (2016);
- Ministry of Agriculture, Food and Rural Affairs (OMAFRA) on-line records;
- Nanticoke Generating Station Natural Areas Survey (Gregory 2005);
- Nanticoke Generating Station Marsh Monitoring Program and Reconnaissance Survey of Amphibian and Reptile Occurrences (Gregory 2007);
- Nanticoke Generating Station 2010 Marsh Monitoring Program and Reconnaissance Survey of Amphibians and Reptiles (Gregory 2010);
- Nanticoke Generating Station 2011 Marsh Monitoring Survey (Clemens 2011);
- Nanticoke Generating Station 2012 Marsh Monitoring Program Report (Beacon 2012);
- Nanticoke Generation Station 2012 Biological Survey (Beacon 2012);
- Nanticoke Generation Station 2013 Marsh Monitoring Program Report (Beacon 2013), and
- Nanticoke Fish Study. Various sources. Ministry of Natural Resources and Forestry (MNRF).

2.2 Agency Correspondence

Requests for natural heritage information for natural features and areas in or within 120 m of the Project Location were made to the applicable regulatory agencies. The details of these requests and any applicable responses are provided in **Table 2**.

Table 2. Summary of Records and Resources Consulted During Records Review

Source and Contact Information	Date Request Sent/Received	Records Requested/ Received
Ministry of Natural Resources and Forestry - Guelph District – Vineland Office	On February 26, 2015 Beacon submitted Records Review request for any relevant natural heritage records for lands in or within 120 metres of the Project Location.	On March 9, 2015 the Ministry of Natural Resources and Forestry sent a response which included the results of a species at risk screening.
Long Point Region Conservation Authority	On February 2, 2015 Beacon submitted request for relevant natural heritage information for the lands in or within 120 metres of the Project Location	On February 4, 2015 • LPRCA has no natural heritage information • Lake Erie shoreline may be habitat for Species at Risk • The shoreline of Lake Erie is located within the Regulation Limit of Ontario Regulation 178/06

2.3 Records Review Results

2.3.1 Waterbodies

2.3.1.1 Lakes

One lake, Lake Erie, was identified to be within 120 m of the Project Location. Lake Erie is located directly south of the Project Location.

A portion of the Project Location falls within 120 m of the Lake Erie shoreline and is also located within the Regulation Limit of O. Reg. 178/06 (*Conservation Authorities Act*).

The shoreline and nearshore of Lake Erie in the vicinity of the Project Location lies within the influence of Long Point and secondarily falls between two prominent points in the lake: Turkey Point to the west and Peacock Point to the east. These features play a dominant role in water circulation, erosion and sediment transport in this vicinity of the site. The reach of Lake Erie shoreline between Turkey Point and Peacock Point is characterized by a series of crescent beaches separated by hard points, of varying length and exposure to eastern Lake Erie. The nearshore substrates are generally sandy with coarser materials at the hardpoints and the backshore generally consists of bluffs of varying heights. The Project Location is located on one of these hardpoints with crescent beaches to the east stretching to Peacock Point and on the west (known as Hickory Beach) on the west stretching to Keadon Park. There are two minor tributary outlets to the easterly beach and one larger tributary outlet (Nanticoke Creek) to Hickory Beach. The Hickory Beach tributary is developed as a marina and contains a riverine wetland that is partly influenced by lake levels. The minor tributaries to the east show some evidence of riverine

wetlands and have barrier beaches at their mouths. There is evidence of protective works along the properties fronting on both beach systems, as well as the hardpoints indicating that these areas are subject to erosion. The shoreline at the Project Location has been largely protected by rock (armor stone and riprap).

The fish community adjacent to the Project Location is generally considered to be part of Long Point Bay in the western end of the eastern basin of Lake Erie. Comprehensive fisheries investigations completed by MNRF, since the mid 1970's in support of the Nanticoke GS and the Stelco Facility, identified that the fish community is predominantly a warmwater community composed of species including Yellow Perch, Smallmouth Bass, Largemouth Bass, White Sucker, Black Crappie, Alewife, Brown Bullhead, Gizzard Shad, Common Carp, Freshwater Drum, Rainbow Smelt and Northern Pike. These species utilize nearshore habitats along the entire length of Long Point Bay. Generally, fish populations use the more exposed shorelines of Long Point Bay, including the shoreline along the Project Location as foraging and adult habitat, with the more sheltered areas, near the base of Long Point, for spawning and nursery habitat. Fish tagging studies completed by the MNRF confirmed that a number of warmwater species actively migrated from the more exposed areas to sheltered areas for spawning. While the rivermouth habitat of Nanticoke Creek may also provide some sheltered habitat for warmwater fish species, the crescent beaches and hardpoints are generally only suitable as adult foraging habitat. Some species, such as Alewife, Gizzard Shad and Rainbow Smelt may also use the beach habitats for spawning. There is no information indicating that coolwater or coldwater species utilize the nearshore habitats in the vicinity of the Project Location.

2.3.1.2 Lake Trout Lakes

No Lake Trout Lakes were identified in or within 300 m of the Project Location during the records review.

Lake Erie is not considered to be a Lake Trout Lake as defined in the REA guidelines. While the guidelines generally apply to inland lakes there is also no naturally reproducing Lake Trout population in Lake Erie as outlined below.

The Great Lakes Fishery Commission has a Lake Trout task force charged with the task of developing a strategic plan for rehabilitating Lake Trout in Lake Erie. The native population of Lake Trout were considered to be extirpated in Lake Erie by 1969. At the present time, there is no natural reproduction of Lake Trout in Lake Erie, nor has there been any for many years (Great Lakes Fishery Commission, 2008). The current population is wholly supported by stocking on the US side, with no stocking occurring by the Ontario Government. Current limitations to the recovery of Lake Trout in Lake Erie include the following:

- Lack of sufficient population size to support a self-sustaining population;
- Invasive species;
- Stocking limitations; and
- Habitat.

These limitations represent substantial impediments to rehabilitation, even in the long term. There is no known Lake Trout spawning habitat within the vicinity of the site, although habitat is thought to exist further offshore and to the east of the Project Location (at least one kilometer) (Gorman, et. al., 2010).

2.3.1.3 Permanent and/or Intermittent Streams

Based on a review of the background information eight watercourses were determined to be in or within 120 m of the Project Location. The watercourses were identified during the review of the MNRF LIO watercourse layer (2016b). A review of the MNRF NHIC data (2016a) indicated that Watercourses (WC) 1 through 7 are tributaries to Hickory Creek. Watercourse 8 flows west into Nanticoke Creek.

2.3.1.4 Seepage Areas

No seepage areas were identified in or within 120 m of the Project Location during the records review.

2.3.1.5 Other Water Bodies

Two other waterbodies (WB1 and WB2) were identified in or within 120 m of the Project Location. Two small waterbodies are located along the northern limit of the Project Location (**Figure 2**). The waterbodies were identified during the review of the MNRF LIO watercourse layer (2016b).

2.3.2 Aquatic Species at Risk

A review for species listed as endangered of threatened (Species at Risk) under the *Endangered Species Act*, 2007 will be addressed with the appropriate agency in a separate report consistent with the guidance provided by the MNRF. This reporting format meets the Natural Heritage requirements, as set out in O. Reg. 359/09, and is consistent with the direction provided by the MNRF.

2.3.3 Provincial Plan Areas

O. Reg. 359/09 states that if any part of the Project Location falls within a Provincial Plan area such as the Oak Ridges Moraine Plan Area, the Niagara Escarpment Plan Area, and / or the Greenbelt that it could be subject to a different set of criteria to evaluate natural features and set of prohibitions.

The Project Location is not within the Oak Ridges Moraine Plan Area, the Greenbelt or the Niagara Escarpment.

2.3.4 Official Plan Areas

The Haldimand County Official Plan was reviewed with respect to waterbodies. Schedule A .2 - Haldimand County Southwest Land Use Plan, illustrates “Land Use” for the Project Location and indicates that the majority of the Project Location is designated as: Major Industrial, Mineral Aggregate Resources Area, Riverine Hazard Lands and Lakeshore Hazard Lands. The Lake Erie shoreline is identified as Shoreline Hazard Lands regulated by Long Point Region Conservation Authority (LPRCA). Watercourse 2 (**Figure 3**) is identified as Riverine Hazard Land.

According to Section 4 of the Official Plan, development shall not be permitted in fish habitat except in accordance with Provincial and Federal requirements. All fish habitat, including those used seasonally

Records Review

Figure 3

Nanticoke Solar

Legend

- Project Location
- Project Location Plus 120 m Setback
- Watercourse
- Lot Fabric

LIO: 2016; Beacon Environmental: 2015.

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shall be protected. When development is proposed which may affect fish habitat, the Project will undergo a review of development alternatives to achieve no net loss of productive capacity and seek a net gain whenever possible.

Further, the minimum vegetative buffer for development is 15 m from a warmwater stream or Type 2 (i.e., moderately sensitive to development) and Type 3 (i.e., marginal or highly degraded) fish habitat and a minimum vegetative buffer and setback for development is 30 m from a cold water stream or Type 1 (i.e., rare or highly sensitive to development) fish habitat. Additional setbacks may be required as recommended by an Environmental Impact Statement (EIS). Portions of Mill Creek, within the Grand River Watershed, are the only coldwater stream locations identified within Haldimand County.

2.3.5 Regulated Area

LPRCA was consulted to determine whether any of the waterbodies identified in or within 120 m of the Project Location were regulated under the Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (O. Reg. 178/06 under the *Conservation Authorities Act*). The shoreline of Lake Erie is located within the Regulation Limit of O.Reg 178/06. Watercourse 2, Watercourse 6, and Watercourse 7 are located within the Regulation Limit of O.Reg 178/06.

2.3.6 Summary of Records Review

The information and mapping resources outlined above were assessed to determine the presence and location of water bodies in or within 120 m of the Project Location. A review of available mapping and background sources showed eight watercourses in or within 120 m of the Project Location (**Table 3**). Watercourses (WC) 1 through 7 are tributaries to Hickory Creek. Watercourse 8 flows west into Nanticoke Creek (**Figure 3**).

Table 3. Summary of Features Identified During the Records Review

Waterbody Name	Waterbody Type	Distance to Project Location	Project Components Identified within 120 m of Waterbody
WC1	Unknown	Within	• Perimeter fence • Solar panel • Primary laydown area
WC2	Watercourse	Minimum of 34 m	• Perimeter fence • Solar panel • Primary laydown area
WC3	Unknown	14 m	• Perimeter fence • Solar panel • Primary laydown area
WC4	Unknown	70 m	• Perimeter fence
WC5	Unknown	20 m	• Perimeter fence • Solar panel
WC6	Unknown	Within	• Perimeter fence • Solar panel • Primary laydown area
WC7	Watercourse	Within	• Perimeter fence

Waterbody Name	Waterbody Type	Distance to Project Location	Project Components Identified within 120 m of Waterbody
			• Solar panel • Primary laydown area • AC collection lines/wires
WC8	Unknown	Within	• AC collection lines/wires
WB1	Unknown	50 m	• Perimeter fence • Solar panel • Primary laydown area
WB2	Unknown	15 m	• Perimeter fence • Primary laydown area
Lake Erie	Lake	23 m	• Perimeter fence • Solar panel • Primary laydown area • AC collection lines/wires

Four (4) watercourses are identified as being within the Project Location (**Table 4**). All other watercourses are outside of the project location. Lake Erie is outside of the Project Location, and two "other" waterbodies are outside of the Project location but within 120 m. All features identified during the records review will be carried forward to the Site Investigation.

Table 4. Summary of Records Review

Feature	Description
In a water body	The Project Location is within four waterbodies
Within 120 metres of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity	The Project Location is within 120 m of Lake Erie
Within 300 metres of the average annual high water mark of a lake trout lake that is at or above development capacity	The Project Location is not within 300 metres of the average annual high water mark of a lake trout lake that is at or above development capacity
Within 120 metres of the average annual high water mark of a permanent or intermittent stream	Four watercourses were determined to be within 120 metres of the Project Location
Within 120 metres of a seepage area	The Project Location is not within 120 m of a known seepage area

All watercourses are subject to the requirements outlined in the Haldimand Official Plan. Watercourse 2, 6 and 7 as well as the shore of Lake Erie are subject to the requirements under O.Reg 178/06, which is administered by the LPRCA.

3. Site Investigation

Site visits to document inland surface water features on and within 120 m of the Project Location were undertaken on May 19, 2015 and June 16, 2016. Site assessments were carried out by Lindsey

Waterworth and Rob Aitken of Beacon Environmental. During the May 2015 assessment, general and detailed site conditions were evaluated including: an evaluation of substrates, in-stream cover, riparian vegetation, and channel form. Site-specific fish sampling was carried out following the conditions outlined as part of a Scientific Collectors Permit issued by MNRF. In June 2016 flow conditions within the inland surface water features were observed.

Photographic record of the site investigations are provided in **Appendix B** and a copy of the field data sheets are provided in **Appendix C**. **Table 5** summarizes the dates, times and weather conditions for the assessments carried out as part of the site investigation.

Table 5. Site Investigation Date, Time, Duration and Weather Conditions

Date	Investigator	Survey Duration	Weather Conditions
May 19, 2015	Lindsey Waterworth, Rob Aitken	9:00 – 16:00	20% - 100% cloud cover, Wind calm through morning and gusty in afternoon, Temperature 9 – 17°C, no precipitation
June 16, 2016	Lindsey Waterworth	12:00 – 15:30	100% Cloud Cover, Wind moderate to strong, Temperature 21°C humid, periods of light rain.

3.1 Waterbodies

Under O. Reg 359/09, a water body is described as:

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

The Records Review identified eight watercourses (WC 1 – 8: **Figure 3**), two waterbodies (WB1 and 2: **Figure 3**) and Lake Erie in or within 120 m of the Project Location. Preliminary site investigations determined that two of the eight watercourses (WC2 and WC7) and Lake Erie met the definition of waterbodies as specified in O. Reg. 359/09.

The remainder of the water features identified through the Records Review either could not be located during ground-truthing (as they were not present) or were features that did not meet the definition of a waterbody under O. Reg. 359/09. **Table 6** summarizes the features that were identified during the Records Review and were not carried forward to detailed site investigations based on a preliminary site review of the feature characteristics. These features are not discussed further in this report.

Table 6. Corrections to Records Review

Water Feature	Rationale for Not Advancing to Detailed Site Investigation
WC1	• Temporary channel within an agricultural field • Ploughed through at the time of the May 2015 site investigation
WC3	• Assessed from eastern property boundary • Vegetated swale present • Air photo review indicates characteristic of a grassed waterway
WC4	• Assessed from eastern property boundary • Temporary channel within an agricultural field • Upstream ploughed through at the time of the May 2015 site investigation
WC5	• Assessed from eastern property boundary • Temporary channel within an agricultural field • Upstream ploughed through at the time of the May 2015 site investigation
WC6	• Temporary channel within an agricultural field • Dry feature with portions ploughed and driven through in May 2015 and June 2016
WC8	• Part of the OPG Coal Pile and drainage ditch
WB1	• No waterbody present
WB2	• Assessed from Rainham Road Right of Way. • No waterbody present

Conditions consistent with a seepage area including: iron staining, upwelling, or watercress, were not observed during the site investigations. Furthermore, the Records Review did not identify any known seepage areas within the Project Location or 120 m setback. Seepage areas are not discussed further in this report.

3.1.1 Permanent Stream

A permanent stream is defined in the Technical Guide for REA (MOE 2013) as: "*a stream that continually flows in an average year*".

Within the Project Location and 120 m setback one watercourse (WC2) was determined to be a permanent stream (**Figure 4**). WC2 is an unnamed tributary of Hickory Creek. The watercourse originates approximately 2.2 km north of the Project Location and flows through a landscape dominated by agricultural and industrial uses prior to entering the Project Location *via* a culvert under Rainham Road. WC2 converges with the main channel of Hickory Creek approximately 0.3 km east of the Project Location. Throughout the Project Location area WC2 displays a meandering pattern with riffle/run/pool sequences. Substrates were predominately sand and silt with pockets of gravel. The riparian area is a mix of wetland communities and mature forest. Dominant riparian vegetation includes: White Ash, Beech (*Fagus grandifolia*), Red Oak (*Quercus rubra*), Shagbark Hickory (*Carya ovata*) and Sugar Maple (*Acer saccharum*). Some erosion and bank undercutting was noted through the upstream sections. The bank undercuts and overhanging riparian vegetation provided in-stream cover and the riparian forest community provides shading.

Fish sampling was completed at four stations along WC2 on May 19, 2015. Five species of fish were captured: Bluntnose Minnow (*Pimephales notatus*), Blacknose Dace (*Rhinichthys atratulus*), Creek

Site Investigation

Figure 4

Nanticoke Solar

Legend

- Project Location
- Project Location Plus 120 m Setback
- Waterbody Plus 30m Setback (Beacon, 2016)
- Lot Fabric (LIO, 2016)
- Watercourse (LIO, 2016)

LIO: 2015; Beacon Environmental: 2015.

UTM Zone 17 N, NAD 83

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Chub (*Semotilus atromaculatus*), White Sucker (*Catostomus commersonii*) and Banded Killifish (*Fundulus diaphanus*). The species captured are characteristic of a cool/warmwater assemblage that is tolerant to moderately tolerant of low dissolved oxygen and turbidity. American Toad (*Bufo americanus*) tadpoles were observed in WC2 and Northern Leopard Frog (*Lithobates pipiens*) and Green Frog (*Rana clamitans*) were noted within the riparian area.

3.1.2 Intermittent Stream

An intermittent stream is defined in the Technical Guide for REA (MOE 2013) as: "*a natural or artificial channel, other than a dam, that carries water intermittently and does not establish vegetation within the bed of the channel, expect vegetation dominated by plant communities that require or prefer the continuous presence of water or continuously saturated soils for their survival.*"

Within the Project Location and 120 m setback one watercourse (WC7) was determined to be an intermittent stream (**Figure 4**). WC7 is an unnamed tributary of Hickory Creek. WC7 originates within the vicinity of the Imperial Oil Pipeline and converges with Hickory Creek within 200 m east of the Project Location.

This watercourse is characterized as a mix of braided channels and vegetated swales. No flow was observed during the May 2015 or June 2016 investigations and shallow, isolated pockets of standing water were noted in May 2015. The watercourse traverses an area that is dominated by swamp and marsh communities throughout the feature and riparian area. Wetland vegetation is present throughout the feature, some species that were noted growing within and directly adjacent to WC7 include: Sugar Maple, Green Ash (*Fraxinus pennsylvanica*), Eastern Cottonwood (*Populus deltoids*), Tartarian Honeysuckle (*Lonicera tatarica*), Tall Goldenrod (*Solidago altissima*), New-England Aster (*Symphyotrichum novae-angliae*) and Lance-leaved Aster (*Symphyotrichum lanceolatum*), *Carex spicata* as well as a variety of grass species and sedges (*Carex* spp.).

Site specific fish sampling was not possible in WC7 due to a lack of water within the feature at the time of the investigation. It is likely, based on the channel form and flows, that WC7 supports indirect fish habitat through the conveyance of seasonal flows to downstream reaches. Northern Leopard Frog and American Toad were observed within the riparian area.

3.1.3 Lakes

The site investigation confirmed that portions of the Project are located within 120 m of the Lake Erie shoreline and, in the case of the solar panel field to the south of the existing coal pile, encroached on the 30 m buffer adjacent to the hardened shoreline. Some encroachment within the 30 m buffer adjacent to the discharge channel of the Naticoke GS, however this is considered part of the existing facility. Because of the extensive background information available for Lake Erie, no additional site investigations were required.

3.2 Site Investigation Conclusions

The waterbody site investigation was undertaken to satisfy the conditions of O. Reg. 359/09 noted above, and to note any additional natural or hydrological features in or within 120 m of the Project

Location. The water features (excluding Lake Erie) identified as part of the Records Review were surveyed during the site investigation.

Site investigations determined that six watercourses (WC1, WC3, WC4, WC5, WC6 and WC8) and two waterbodies (WB1 and WB2) identified during the Records Review were either not present or did not meet the definition of a waterbody under O. Reg. 359/09 (**Table 7**). Two watercourses (WC2 and WC7) were determined to be permanent and intermittent streams and are located within 120m of the Project Location. Additionally, Lake Erie is within 120 m of the Project Location and in one area the project location falls within the 30 m buffer adjacent to Lake Erie.

Table 7. Site Investigation Findings

Feature	Present within Project Location or 120 m Setback	Description
In a water body	No	The Project Location is not within a waterbody
Within 120 metres of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity	Yes	The Project Location is within 120 metres of Lake Erie
Within 300 metres of the average annual high water mark of a lake trout lake that is at or above development capacity	No	The Project Location is not within 300 metres of the average annual high water mark of a Lake Trout lake that is at or above development capacity
Within 120 metres of the average annual high water mark of a permanent or intermittent stream	Yes	Two watercourses (WC2 and WC7) were determined to be within 120 metres of the Project Location
Within 120 metres of a seepage area	No	The Project Location is not within 120 metres of a known seepage area

An Environmental Impact Study (EIS) is required to assess the potential for negative impacts to WC2, WC7 and Lake Erie. A summary of each of these three feature is provided in **Table 8**. These three features will be carried forward to the EIS.

Table 8. Summary of Features Advanced to EIS

Waterbody	Waterbody Type	Distance to Project Location	Function
WC2	Permanent Stream	Minimum of 34 m	• Permanent watercourse • Direct fish habitat Warm/coolwater fish community • Amphibian breeding habitat • Marsh, Meadow and Forest riparian area
WC7	Intermittent Stream	Minimum of 30 m	• Intermittent watercourse • Indirect fish habitat • Marsh and Swamp riparian area
Lake Erie	Permanent waterbody; regulated shoreline	Minimum of 23 m	• Shoreline erosion hazard potential • Nearshore (adult) fish habitat – beaches, armored headland – warmwater fish community

4. Environmental Impact Study

As stated in Sections 37 and 38 of O.Reg 359/09, an Environmental Impact Study (EIS) must be prepared for all significant natural heritage features and water features in or within 120 m of the Project Location. A Natural Heritage Assessment (NHA) EIS Report has been prepared for Nanticoke Solar (Beacon 2016). Within the NHA EIS report, an assessment of potential impacts to wetland areas, significant woodlands and significant wildlife habitat within 120 m of the Project Location is provided along with recommendations for mitigation during all phases of the project.

The focus of this section is to provide an assessment of the potential for negative impacts to waterbodies and make recommendations for mitigative measures to avoid, eliminate or reduce effects associated with the project on waterbodies. As identified through the records review and site investigation a permanent stream (WC2), an intermittent stream (WC7) and Lake Erie are within 120 m of the Project Location.

4.1 Assessment of Potential Effects and Mitigation Measures

According to the requirements outlined within O. Reg 359/09, Section 38, an EIS assessment is required prior to approval of a REA project. This assessment has been completed to address the requirements for the development of the proposed Nanticoke Solar Project within 120 m of a permanent stream (WC2), an intermittent stream (WC7) and Lake Erie.

During the construction, operation and decommissioning phases, negative effects have the potential to occur due to vegetation removal, grading and operation of equipment, and result in changes to surface water drainage and increased sedimentation and erosion.

Potential negative effects to water features associated with the construction, operation, and decommissioning phases of the Project are outlined in detail within **Table 9** along with mitigation measures. Detailed descriptions of works to be completed during these phases is provided in the

Project Description Report (Arcadis 2016a), Construction Plan Report (Arcadis 2016b) and the Operation and Design Report (Arcadis 2016c). Details regarding the Conceptual Stormwater Plan are provided in Arcadis 2016d.

Table 9. Potential Effects and Standard Mitigation Measures

Activity	Potential Physical Effects	Potential Effects on Waterbody Form or Function	Potential Mitigation Measures
Construction Phase			
• Surveying and Geotechnical Activities	• No physical impacts with the potential for adverse effects are anticipated	• No adverse effects on waterbody features are anticipated	• No mitigation required
• Roads and Civil Site Preparation • Construction Assembly and Laydown Area • Site Preparation and Inverter Station Installation	• Increased erosion and sedimentation potential • Change in nutrient concentrations • Change in surface water drainage • Change in soil compaction • Removal of vegetation • Surface water and groundwater contamination due to fuel and/or chemical spills	• Decreased bank/shoreline stability • Alteration to surface water quality • Alteration to surface water quantity • Habitat impairment • Loss of food organisms • Alteration of fish community species composition • Lethal or sub-lethal toxic effects on aquatic species	• Prohibit access to waterbodies and riparian area • Maintain a minimum 30 m vegetated buffer from waterbodies • Design and implement erosion and sediment controls • Stabilize and/or re-vegetate all areas of disturbed soils which drain into watercourse • Design drainage system to avoid diversion of, or otherwise minimize changes in drainage • Incorporate a designated area for equipment maintenance and fueling • Storage of fuel should only occur in permitted areas • Maintain an emergency spill kit on-site in case of emergency • Develop a spill response plan • Confirm erosion hazard setback limit for any physical structures

Activity	Potential Physical Effects	Potential Effects on Waterbody Form or Function	Potential Mitigation Measures
• Delivery of Equipment • Installation of Racking System • Solar Panel Assembly and Installation • Electrical Collector System • Substation • Clean-up and Reclamation	• Contamination due to fuel and/or chemical spills	• Lethal or sub-lethal toxic effects on aquatic, wetland and terrestrial biota • Changes in fish species composition and aquatic and riparian plant communities	• Incorporate a designated area for equipment maintenance and fueling • Storage of fuel should only occur in permitted areas • Maintain an emergency spill kit on-site in case of emergency • Develop a spill response plan • Confirm erosion hazard setback limit for any physical structures • Stabilize any areas impacted within erosion hazard limits
Operation Phase			
• General Operation	• Increased area of impervious or less pervious surfaces	• Alteration to surface water quality • Alteration to surface water quantity • Habitat impairment • Loss of food organisms • Change in thermal regime • Alteration of fish species community composition	• Control post-development flow rates from the site outlets to maintain the pre-development levels in consultation with the Conservation Authority (See Arcadis 2016d for Stormwater Plan)
• Routine maintenance activities	• Surface water and groundwater contamination due to fuel and/or chemical spills	• Lethal or sub-lethal toxic effects on aquatic, wetland and terrestrial biota • Alteration of fish species community composition	• Incorporate a designated area for equipment maintenance and fueling • Store fuel only occur designated areas • Maintain an emergency spill kit on-site in case of emergency • Develop a spill response plan

Activity	Potential Physical Effects	Potential Effects on Waterbody Form or Function	Potential Mitigation Measures
Decommissioning Phase			
• Dismantling	• Surface water and Groundwater contamination due to fuel and/or chemical spills	• Lethal or sub-lethal toxic effects on aquatic, wetland and terrestrial biota • Changes in fish species composition and aquatic and riparian plant communities	• Incorporate a designated area for equipment maintenance and fuelling • Storage of fuel should only occur in permitted areas • Maintain an emergency spill kit on-site in case of emergency • Develop a spill response plan • Stabilize any areas impacted within erosion hazard limits
• Land Restoration Activities	• Increased erosion and sedimentation potential • Change in nutrient concentrations • Change in surface water drainage • Change in soil compaction • Removal of vegetation • Surface water and groundwater contamination due to fuel and/or chemical spills	• Decreased bank stability • Alteration to surface water quality • Alteration to surface water quantity • Habitat impairment • Loss of food organisms • Alteration of fish community species composition • Lethal or sub-lethal toxic effects on aquatic species	• Prohibit access to waterbodies and riparian area • Maintain a minimum 30 m vegetated buffer from waterbodies • Design and implement erosion and sediment controls • Stabilize and/or re-vegetate all areas of disturbed soils which drain into watercourse • Design drainage system to avoid diversion of, or otherwise minimize changes in drainage • Incorporate a designated area for equipment maintenance and fuelling • storage of fuel should only occur in permitted areas • maintain an emergency spill kit on-site in case of emergency

Activity	Potential Physical Effects	Potential Effects on Waterbody Form or Function	Potential Mitigation Measures
			• Develop a spill response plan • Stabilize/restore any areas impacted within erosion hazard limits

In addition to the general mitigation measures identified in **Table 9** the following detailed mitigation measures are recommended to maintain the form and function of waterbodies during the proposed development.

- A naturally vegetated buffer should be established or maintained between the proposed development and the water features to reduce or eliminate increased turbidity due to the transport of sediments, nutrients and contaminants into these surface water features. Minimum vegetated buffers of 30 m are recommended to minimize changes to surface water run-off, and overall productivity of these water features. Existing vegetation types may be used as a vegetated buffer, or planted vegetation may function as a buffer in conjunction with existing habitat.

Watercourse WC2 and WC7 are separated from the Project Location by a minimum of 34 m and 30 m buffers

A buffer of at least 30 m exists between each watercourse and the Project Location boundary. The 30 m buffer is consistent with the buffer recommendations of the MNRF Natural Heritage Reference Manual and the Haldimand County Official Plan for the protection of sensitive aquatic systems or Type 1 Fish Habitat (OMNR 2010 and Haldimand County 2009). LPRCA Regulation Limit Reference Manual does not speak to buffer requirements for protection of ecological function of aquatic features.

The following general best management practices are recommended to further protect the waterbody features.

- A comprehensive erosion and sediment control plan should be developed and implemented during the construction and decommissioning phases of the project to reduce or eliminate the transport of sediments, nutrients, contaminants, and increased turbidity within these features (see Conceptual Stormwater Management Plan Report, Arcadis 2016). Siltation and erosion controls should be installed before any work on the Project Location begins, and removed after the threat of siltation and erosion effects has ceased. The siltation erosion measures should be checked regularly during the construction and decommissioning phases to ensure it remains in good condition. Any deficiencies in the measures should be repaired.

- Grading activities should aim to minimize changes in natural drainage in order to reduce the potential for changes to hydrological patterns.

- All equipment should be maintained in good working order and be free of material that could contribute deleterious substances to waterbodies. Fuelling areas and storage should be kept at least 30 m from all watercourses and waterbodies. Emergency spill kits should be maintained on-site and a spill response plan developed in case of emergency.

4.1.1 Setback Encroachments

In **Figure 2**, the proposed Site Plan shows two possible AC collection line/wire alternatives that would connect the West, Central and East Parcels to the project located on the coal yard. The AC collection lines/wires may be overhead or buried. Alternative A shows the northern option that runs east-west across or under South Coast Drive and then north-south on either the Nanticoke GS property or the Haldimand Country Right-of-Way. Alternative B or the southern option has the AC collection lines/wires running south, crossing Wetland 08 and Watercourse 07 (no internal construction) but east of the IOL pipeline and then turning approximately ninety degrees and crossing South Coast Drive toward the Nanticoke GS. As there would be no construction within the watercourse the environmental, cultural and socio-economic differences between the two alternatives would be negligible. The two route alternatives show the most likely alignments at this point but these alignments may shift slightly (i.e. up to twenty meters) based on final design. However, Alternative A would be on the west side of the north – south stretch of South Coast Drive and Alternative B would be on the north side of the west east stretch of South Coast Drive.

Should Alternative B be determined to be the preferred alternative, the AC collection lines/wires would cross the upstream extent of WC7, an intermittent stream. Development of facility components, including AC collection lines/wires, within a waterbody or 30 m setback is allowed under Section 39 of O.Reg 359/09 so long as activity specific mitigation is implemented. Potential effects from installation of the AC collection lines/wires along the Alternative B route could include: vegetation removal, grading and operation of equipment, and result in changes to surface water drainage and increased sedimentation and erosion. A portion of the AC collection lines/wires run adjacent to the Lake Erie shoreline and has potential for similar impacts as noted above. In addition, the location of the erosion hazard setback limit should be confirmed to ensure that any physical structures are adequately protected. Stabilize/restore any areas impacted within erosion hazard limits

Fisheries and Oceans Canada (DFO) had developed an Operational Statement (OS) for overhead line construction that outlines measures to protect fish and fish habitat. While that Operational Statement is no longer maintained by DFO it does provide some useful guidance for transmission line construction dependent on the type of transmission line and subject lands. The following mitigation measures are outlined by the DFO OS and are recommended to be implemented, where applicable, to reduce the potential for negative effects related to the transmission line crossing of WC7.

- Installing overhead lines under frozen conditions is preferable in situations on wet terrains.

- If spans are significant, design and construct approaches so that they are perpendicular to the watercourse wherever possible to minimize loss or disturbance to riparian vegetation.

- Wherever possible, locate all temporary or permanent structures, such as poles, sufficiently above the High Water Mark to prevent erosion.

- The removal of riparian vegetation should be kept to a minimum and within the road or utility right-of-way.

- Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use.
    - If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
    - Grading of the stream banks for the approaches should not occur.
    - If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
    - Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows
    - Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

- Operate machinery on land and in a manner that minimizes disturbance to the banks of the watercourse.
    - Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
    - Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water.
    - Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
    - Restore banks to original condition if any disturbance occurs.

- Install effective sediment and erosion control measures before starting work. Inspect them regularly and make all necessary repairs if any damage occurs.
    - Avoid work during wet, rainy conditions or use alternative techniques such as aerial methods (i.e., helicopter) to install overhead lines.

- Stabilize any waste materials removed from the work site to prevent them from entering the watercourse.

- Vegetate any disturbed areas by planting and seeding preferably with native plants. If there is insufficient time remaining in the growing season, the site should be stabilized and vegetated the following spring.
    - Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

The southern portion of the Project Location encroaches within the 30 m setback from the Lake Erie shoreline. The REA guidelines outline specific requirements to be met where such encroachment occur, as follows:

"In accordance with subsections 39 (2) and 40 (2), applicants are required to prepare a supplementary report or section added to the Water Assessment Report above that includes:

a) Identification and assessment of negative environmental effects of the project that will or are likely to occur on the water body identified in the water assessment and land within 30 meters of the water body.
b) Mitigation measures of any effects mentioned in (a).
c) Description of how the EEMP addresses the effects mentioned in (a).
d) *Description* of how the Construction Plan Report addresses the effects mentioned in (a)."

The location described above is within the decommissioned NGS coal storage facility that is protected from Lake Erie by a berm/perimeter road and armor stone/riprap revetment. Stormwater runoff from the former coal storage area is managed by an onsite treatment system to prevent any contaminated runoff from reaching Lake Erie. The storage facility has been rehabilitated and the stormwater management system will remain in place as outlined in the Conceptual Stormwater Management Report (Arcadis 2016d). The specific location where the encroachment occurs is in a portion of the coal storage area that also encroaches within this limit (the berm/perimeter road is modified at this location to allow for the encroachment, while still protecting the area from Lake Erie).

The Potential Project Effects and Standard Mitigation Measures Table 8 of the Draft Design and Operation Report (Arcadis 2016c) will apply to this area of encroachment of the project within the 30 m setback limit. In addition, an erosion and sediment control plan and a revegetation plan for the former storage area will be implemented as outlined in the Conceptual Stormwater Management Report. These measures will stabilize the work undertaken in the Project Location and avoid any negative effects to the Lake Erie shoreline.

4.2 Environmental Effects Monitoring Plan Overview

The Draft Design and Operations Report (Arcadis 2016c) outlines the mitigation measures and environmental monitoring associated with potential negative effects of the proposed development. Following O.Reg 359/09, this Environmental Effects Monitoring Plan identifies:

- performance objectives in respect of negative environmental effects;
- mitigation measures to assist in achieving the performance objectives;
- a program for monitoring negative environmental effects for the duration of the project; and
- a contingency plan in the event specified mitigation measures fail.

The Environmental Effects Monitoring Plan (EEMP) outlined within the Draft Design and Operations Report (Arcadis 2016b) addresses potential environmental concerns that may arise during Construction, Operation and Decommissioning of the Project including:

- Construction staging;
- Erosion and sediment control;
- Vegetation and wildlife during construction;
- Soil quality and agricultural capacity;
- Waste management;

- Noise, air and dust during construction;
- Inspections;
- Post-construction noise emission monitoring.

The Environmental Effects Monitoring Plan was developed in consultation with this report. It allows for the identification of problems with the existing mitigation measures, should they arise, and measures the effectiveness of the mitigation in meeting the specified performance objectives. In the event that routine monitoring indicates performance objectives are not being met, the contingency measures will be adopted to ensure actions are taken to meet the performance objectives.

4.3 Construction Plan Report Overview

O. Reg 359/09 requires proponents of Class 3 solar projects to prepare a Construction Plan Report which outlines the following:

- details of the construction and installation activities;
- the location and timing of any construction or installation activities;
- any negative environmental effects that may result from the construction or installation activities; and
- mitigation measures in respect of any negative environmental effects.

A Draft Construction Plan Report has been prepared by Arcadis (2016b). Mitigation measures outlined within the Construction Plan Report are consistent with those discussed within this EIS. The Construction Plan Report and all EIS documents should be read in conjunction with each other to ensure that necessary measures are taken to reduce impacts to water bodies, and other natural heritage features considerations not discussed within this report.

5. Conclusions and Recommendations

This Water Assessment and Water Body Report has been prepared to satisfy the requirements outlined in O.Reg 359/09. The report provides the results of the Records Review and Site Investigation along the EIS detailing potential negative effects and appropriate mitigation measures. The following conclusions and recommendations are provided based on the findings presented in this report:

- The Records Review indicated that there are eight watercourses (WC 1-8), two waterbodies (WB1 & 2) and Lake Erie in or within 120 m of the Project Location.

- Site Investigation showed that two watercourses are permanent/intermittent streams (WC2 and WC7) and were advanced to the EIS. All other water features identified during the records review were determined not to meet the definition of a waterbody as defined in O Reg 359/09.
    - WC2 is a permanent stream located at minimum 34 m from the Project Location boundary

  - WC7 is an intermittent stream located at minimum 30 m from the Project Location boundary

- Based on the review of available information and the proposed mitigation measures, there are no aquatic environmental constraints to the project associated with the nearshore or shoreline of Lake Erie within 120 m of the site. The exception to this is to ensure that any physical structures are located outside of the erosion hazard limit along the Lake Erie shoreline or appropriately protected, in consultation with LPRCA.

- Lake Erie is not considered to be a Lake Trout Lake as defined in the REA guidelines. While the guidelines generally apply to inland lakes there is also no naturally reproducing Lake Trout population in Lake Erie, nor is there potential within the life cycle of the proposed facility. Therefore, there are no constraints with respect to Lake Trout for this project.

- If mitigation measures are not implemented negative effects have the potential to occur due to vegetation removal, grading and operation of equipment, and result in changes to surface water drainage as well as increased sedimentation and erosion.

- Mitigation measures identified within Section 4.1 this report should be reviewed and appropriately implemented to reduce or eliminate the potential for negative effects to watercourses and waterbodies.

Report prepared by:
Beacon Environmental Limited

DRAFT

Lindsey Waterworth
Aquatic Ecologist

Report prepared by:
Beacon Environmental Limited

DRAFT

Cori Carveth, M.Sc.
Senior Ecologist/ Project Manager

Report reviewed by:
Beacon Environmental Limited

DRAFT

Brian Henshaw
Senior Ecologist, Principal

Report prepared by:
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Brian Hindley
Senior Aquatic Ecologist

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Appendix A

CV's

Brian E. Henshaw
Senior Ecologist - Principal

Profile

2005–Present	Principal, Senior Ecologist, Beacon Environmental Limited
1999–2005	Senior Ecologist, Gartner Lee Limited
1989–1999	Consulting Ecologist
1989–1994	Co-publisher and editor of *Birders Journal*, a Canadian semi-technical ornithological journal
1988–1988	Proprietor of natural history retail business
1978–1987	Managing Director of two businesses in England
1976–1978	Completed Ordinary and Advanced Level courses (County Grammar School, England)

Expertise

Mr. Henshaw is an accomplished project manager. Over 25 years, he has accrued a broad range of experience related to the monitoring, inventory, analysis and evaluation of natural systems, with special expertise in wildlife and in wetlands. Project types which he has managed include: functional habitat analyses, Natural Heritage System development, Environmental Assessments (natural environment component), Environmental Impact Studies, and development and execution of various monitoring protocols. He has also undertaken strategic analyses of natural heritage issues, undertaken ecological risk assessments, integrated information from multi-disciplinary consulting teams, negotiated with agencies, and managed other project components. In addition, he has expertise in addressing nuisance wildlife issues, wildlife air traffic hazard and risk assessments, nuisance wildlife management (gulls, geese and others), trail planning, restoration activities, qualitative and quantitative bird studies, and inventories of mammals, herpetofauna, insects and vegetation.

Projects managed frequently include the identification of locally, provincially and nationally significant species, identification of habitats and ecological/development constraints and opportunities, buffer, attribute and landscape connectivity assessments, and recommendations for mitigative measures. Research undertaken by Mr. Henshaw has included the use of breeding habitat by waterfowl, the use of small mammals as bio-indicators, urban effects on forest birds, interactions between roads and wildlife, and landscape restoration targets.

Mr. Henshaw was a lead instructor for the Ontario Ministry of Natural Resources' Ontario Wetland Evaluation System course for 12 years and also assisted in the instruction of the Ecological Land Classification course. He has undertaken various peer review projects and has provided expert testimony on several occasions to the Ontario Municipal Board and at Expropriation Hearings on behalf of clients.

Selected Project Experience

Mr. Henshaw has managed or participated in over 300 projects in a wide range of assignments including:

Renewable Energy

- *REA Applications for Solar, 2014 – 2016:*
  Managing the natural environment portions and multiple reporting requirements for three major REA applications for industrial-level solar power sites in southern Ontario.
- *Peer Review of REA Projects, 2012 – present:*
  Providing peer review on behalf of First Nations relative to several *Renewable Energy Act* projects in Ontario.
- *Species at Risk Surveys for a REA project in Durham Region, 2011:*
  Undertook surveys and analysis for a proposed wind farm.
- *Environmental Assessment for REA project in Prince Edward County, 2004:*
  Collaborated on the EA process for a multi-unit wind farm and associated wildlife related issues.

- *Strategic Advice, Pickering Wind Turbine, Ontario Power Generation Inc., 2000:*
  Provided advice to Ontario Power Generation Inc. on bird issues and monitoring protocols related to a proposed wind turbine installation in Pickering, Ontario.

Species at Risk Investigations and Permits

- *Various projects, 2008 - present*
  Prepared, managed and/or undertaken field surveys for species subject to provincial or federal Species at Risk legislation. Prepared Information Gathering and Avoidance forms, prepared overall benefit permit applications, negotiated with MNR and Conservation Authorities, Worked with legal experts to resolve ESA issues. Provided connections to NGOs to arrange for overall benefit projects. Species directly addressed have included: Redside Dace, Butternut, Bobolink, Eastern Meadowlark, Chimney Swift, Blanding`s Turtle.

Environmental Impact Studies

- *Various projects, 1995 – present:*
  Managed and led projects (including in Toronto, King City, Oakville, Wasaga, Aurora, Brooklin, Ajax, Uxbridge, Vaughan, Brampton, Klienburg, Pickering, Oshawa, Meaford, Tottenham, Orillia, Bowmanville, Kendall, Innisfil, Niagara) investigating a wide range of potential impacts on attributes and functions, analysed and integrated multidisciplinary data, determined development limits and appropriate mitigation.

Natural Heritage System Planning

- Managed or assisted in a number of projects associated with the development or identification of Natural Heritage System components within the Town of Brooklin, the Town of East Gwillimbury, the Lake Simcoe Basin, the Regional Municipality of Hamilton-Wentworth and Farwell Creek sub watershed.

Research

- Managed or assisted in 19 research projects working with a variety of agencies evaluating a wide variety of topics including watershed development, environmental buffers, Conservation Authority regulations, Birds, Climate Change, Habitat Thresholds, Road Effects on Wildlife and Prescribed Burns.

Selected Courses

- CEAA Screenings (three days, Ottawa 2004)
- Project Management Training (two one day sessions, 2004)
- Introduction to the CEAA (three half days, spring 2002)
- Temperate Wetlands Restoration Course (six days, September, 2000)
- OMNR Introductory Soils Course (three days, July 2000)
- OMNR ELC course for instructors (1999)
- Ecosystems and Predictive Engineering Geology Terrain Models (semester course September - December 1997; refresher course December 2000)
- OMNR Environmental Impact Study Training Session (two days, July 1995)
- Ontario Ministry of Natural Resources Wetland Evaluation Course (five days, summer 1994)

Other Assignments

- Course Director (Faculty), Environmental Planning Graduate Semester Course, York University, 2015
- Primary instructor for the Ontario Ministry of Natural Resources' Wetland Evaluation System full courses and refresher courses, 1998 – 2010
- Assistant instructor for the Ontario Ministry of Natural Resources' Ecological Land Classification courses, 2000 – 2001

Cori Carveth, M.Sc.
Senior Aquatic Ecologist/Project Manager

Profile

2014 – Present	Senior Aquatic Ecologist/Project Manager, Beacon Environmental
2008 – 2014	Aquatic Ecologist, Golder Associates Ltd.
2007 – 2008	Species at Risk Biologist, Ontario Ministry of Natural Resources
2005 – 2005	Native Fish Specialist, Arizona Game and Fish Department
2000 – 2002	Fisheries and Wildlife Biologist, Ontario Ministry of Natural Resources

Education

2000 Hon. B.Sc., Biology and Environmental Science, Trent University
2005 M.Sc., Fisheries and Wildlife Science, University of Arizona

Expertise

Cori Carveth is an aquatic ecologist with 16 years of experience in assessing and managing potential impacts of human activities on ecosystems, through the development of environmental impact assessments. She has managed numerous baseline and monitoring assessments for evaluating and managing effects of proposed oil and gas, mining, land development and transportation infrastructure on aquatic environments. Cori has been the technical lead on numerous projects in Canada and internationally. Her expertise includes leading on the ground investigations of aquatic communities including collection and reporting of field investigations as well as navigating the regulatory framework and preparing environmental impact assessments required for development activities. She has experience preparing environmental monitoring plans, and developing mitigation and fish habitat compensation programs to meet client and regulatory needs.

Selected Project Experience

Project Management/Environmental Assessment/Permit Approvals

- *Confidential Client, Proposed Mine West Africa*
  Aquatics task lead for an aquatics baseline survey in a remote part of West Africa. Scope of work included fisheries, benthic invertebrates, periphyton and fish habitat assessments including wetlands. Coordinated field program including the use of local experts for field work and species identification. Responsible for baseline reporting and impact assessment including the application of the International Finance Corporation Performance Standard 6.

- *Eagleson Landvill, Ontario, Canada*
  Development of an Canadian Environmental Assessment Act screening report and Fish Habitat Compensation Plan for the remediation of a historical landfill near Cobourg, Ontario. Provided input for the remediation of the stream.

- *Ontario Ministry of the Environment, Ontario, Canada*
  Lead the biological assessment pre and post construction of the clay cap at the Deloro Mine Site including environmental monitoring during construction. Responsible for onsite assessments, environmental compliance and annual reporting. Responsible for developing a mitigation plan to reduce environmental impacts during construction.

- *Confidential Client, Ontario, Canada*
  Lead review for a stream remediation project which involved diverting a stream and developing a new channel in order to cleanup a major chemical spill into a waterway. Was hired as a third party reviewer to oversee the cleanup and to lead the environmental compliance.

- *Enbridge Pipelines (various pipelines), Fort McMurray, Alberta, Canada*
  Numerous projects. Lead the development of a watercourse report which evaluates fish habitat potential along the proposed pipeline route. Planned field surveys. Conducted aerial surveys to assess fish habitat potential. Lead the preparation of regulatory documents for both federal and provincial governments. Developed sediment and erosion plan to be used during construction.

- *OPG Sir Adam Beck Reservoir, Ontario, Canada*
  Task lead for complete removal and relocation of fish species from the Sir Adam Beck Reservoir, Niagara Falls, Ontario. Approximately 5000 native fish were successfully captured and relocated to the Niagara River over a seven week period.

- *Various, Ontario, Canada*
  Lead the environmental assessment for numerous land development projects across Ontario which describe the local environment, identify environmental pertinent regulation, identify environmental constraints and assist with developing or modifying the site plan.

- *Endangered Species Act Policy Development, Ontario, Canada*
  Project Manager. Co-led the development of habitat policy for the Ontario Endangered Species Act which came into force on June 30, 2008. Led a team in the development of the landowner engagement policy. Worked to integrate these policies with other sections of the ESA and other existing legislation.

Typical Projects

- **Lucky Jack Molybdenum Mine Environmental Impact Assessment.** Technical lead for aquatic baseline program in 2008 for a molybdenum mine located in the Rocky Mountains, Colorado, United States.

- **Copper Mine, Aquatic Baseline.** Technical lead for aquatic baseline surveys in 2007 at a copper mine in Arizona, United States.

- **Oil and Gas Development Biological Evaluations.** Technical lead for aquatic baseline surveys in 2009 - 2010 for oil and gas development in Texas, United States.

- **Oil and Gas Development Biological Evaluations.** Technical lead for aquatic baseline surveys in 2009 - 2010 for oil and gas development in Alberta, Canada.

- **Globestar Lithium Mine Baseline Assessment**. Technical lead for aquatic baseline assessment in 2011-2012 in Northern Quebec.

- **Deloro Mine Cleanup Biological Assessment and Monitoring**. Technical lead for ecological monitoring required for the mine cleanup from 2010 – 2013 in Southern.

- **Nimba Iron Ore Mine Baseline Assessment and Impact Assessment.** Technical lead for aquatic baseline assessment in 2011-2013 in Guinea, West Africa.

Certifications and Skills Development

- Applied Fluvial Geomorphology – Rosgen Level 1, 2010
- Level 2 Electrofishing Certification, 2000 & 2009
- WHMIS, 2008
- Transportation of Dangerous Goods, 2008
- Standard First Aid – Level A CPR, 2008
- Wilderness First Aid Training, 2007
- Biomark PIT Tag Training, 2007
- Handling and Transport of Native and Threatened Endangered Species, 2007
- Developing a Biological Assessment – NCTC Training, 2006
- Interagency Consultation for Endangered Species (Section 7 Consultation) NCTC Training, 2006
- Languages – English and French (fluent)

Lindsey Waterworth, B.Sc.
Aquatic Ecologist

Profile

2008 - Present Ecologist, Beacon Environmental
2007 - 2008 Research Assistant, Aquatic Ecology Laboratory, Trent University
2005 & 2006 Research Assistant, Department of Fisheries and Oceans, GLLFAS, Sault Ste. Marie

Academic Qualifications

2008 B.Sc. (Honours), Biology - Trent University, Peterborough, Ontario
2006 Fish and Wildlife Technologist Diploma - Sir Sandford Fleming College, Lindsay, Ontario
2005 Fish and Wildlife Technician Diploma - Sir Sandford Fleming College, Lindsay, Ontario

Expertise

Ms. Waterworth is an Aquatic Ecologist with Beacon Environmental with over nine years' experience in environmental consulting and ecological research. Her consulting and research background allows her to develop applicable approaches to project execution including thorough background review, study design, team coordination, ecological field investigations, and data analysis, utilizing current and recognized methodologies. She has a strong background in collecting field data through conducting fisheries assessments and aquatic surveys as well as completing data analysis. Lindsey has played a key role in a number of Environmental Impact Studies and Environmental Assessments in support of land development, power generation projects and linear infrastructure. As well, she has undertaken biological monitoring studies, in both aquatic and terrestrial environments, with responsibility for project management, study design, field work, data analysis and reporting.

She has extensive experience in fish population evaluations, aquatic habitat assessments, benthic macro-invertebrate sampling, water quality monitoring and is skilled in a variety of assessment and monitoring techniques for both small and large aquatic systems. Lindsey can identify both common and rare aquatic species and is knowledgeable in their life processes and habitat requirements. She is familiar with provincial and federal environmental regulatory procedures and is capable of identifying opportunities and constraints consistent with applicable policies and legislations as they apply to aquatic systems and surrounding natural environments. Lindsey has used this knowledge to assist in the successful negotiation of *Conservation Authorities Act* permits, *Fisheries Act* Authorizations and *Endangered Species Act* permits. Lindsey has the ability to assess potential impacts to the aquatic environment and adjacent features and identify appropriate mitigative options.

Selected Experience

Environmental Assessments

- *Replacement of Six Bridges Highway 11 and 583, Hearst, Ministry of Transportation*
  Responsible for the assessment of fish habitat, the development of mitigation measures and fish habitat compensation plans as well as construction mitigation measures.

- *Darlington Nuclear Generating Station Refurbishment Federal EA*
  Undertook terrestrial field investigations to document existing natural conditions at the Darlington Nuclear Site and co-ordinated and completed aquatic and terrestrial sampling as part of an Ecological Risk Assessment.

- *New Nuclear – Darlington Environmental Assessment Federal EA*
  Investigated and reported existing natural conditions at the Darlington Nuclear Site. Identified effects of development on the aquatic and terrestrial environment and developed mitigative option to reduce impacts

- *Steeles Avenue/ Finch Avenue Class EA, Region of Peel*
  Assisted in completing the natural environment component of a Class EA. Collected and summarized relevant secondary source natural environment information as well as reported on existing aquatic conditions.

Environmental Monitoring

- *Stone Castle Redside Dace Monitoring, City of Brampton*
  Developed and carried out a monitoring program in conjunction with the Ministry of Natural Resource to assess potential impacts to Redside Dace habitat as a result of dewatering.

- *Bank Swallow Monitoring Program, Ontario Power Generation*
  Developed and implemented the Bank Swallow Monitoring Program, Responsible for data collection, analysis and preparation of technical reports for the program.

- *Clarkway Tributary Monitoring Program, City of Brampton*
  Developed and implemented a terrestrial and aquatic monitoring program consistent with Natural Channel Design Monitoring Program Protocols.

- *Bathurst Street and Langstaff Road Monitoring Program, City of Vaughan*
  Conducted benthic invertebrate sampling to analyze the severity of organic pollution as part of an Environmental Monitoring Plan in support of a Permit to Take Water.

Environmental Impact and Natural Heritage Studies

Participated as a member of multidisciplinary project teams conducting Environmental Impact and Natural Heritage Studies in support of development applications.

- *Water Street, City of Peterborough*
- *Duffins Village, Town of Ajax*
- *Seaton Neighbourhood, City of Pickering*
- *Angus Glen Bridge and Sanitary Sewer Extension, Town of Markham*
- *Gull Lake Natural Environment Screening, Town of Gravenhurst*
- *Markham Centre Warden Avenue and Highway 7, Town of Markham*

Certifications and Skills Development

- DFO Species at Risk Workshop – 2015
- Certified Inspector of Erosion and Sediment Control Training – 2015
- MNR Bat and Bat Habitat Training – 2012
- Class I Electrofishing – 2011
- MTO/DFO/MNR Fisheries Specialist Certification Course – 2011
- Mussel Identification Workshop - 2009
- Ontario Stream Assessment Protocol – 2008
- Class II Backpack Electrofishing – 2005 (re-certification – 2008)

Robert Aitken, B.Sc. (Hons.)
Ecologist

Profile

2014 – Present	Ecologist, Beacon Environmental
2012 - 2014	Ecologist, AECOM
2010 - 2012	Ecologist, Aboud & Associates
2008 - 2010	Environmental Scientist, Conestoga Rovers & Associates
Summer 2007	Conservation Intern, Nature Conservancy of Canada
Summer 2006	Field Technician, Watershed Science Centre – Trent University
Summer 2005	Greening Co-op Student, York Region Forestry Department
Summer 2004	Environmental Technician, Conservation Halton

Education

2008	Honours B.Sc. Environmental Resource Science & Biology, Trent University
2006	Environmental Technologist Diploma, Sir Sandford Fleming College
2004	Natural Resources Law Enforcement Certificate, Sir Sandford Fleming College
2003	Ecosystem Management Technician Diploma, Sir Sandford Fleming College

Expertise

Mr. Aitken is a Terrestrial Ecologist with over seven years of experience in the environmental field. He has participated in a variety of environmental studies in both terrestrial and aquatic ecosystems including environmental impact studies, environmental assessments, sub-watershed studies, natural heritage studies for renewable energy applications, and tree inventory and management plans. His areas of expertise include: breeding bird surveys, terrestrial species at risk surveys, habitat assessments, wildlife tracking, botanical inventories, ecological land classification (ELC), wetland delineation and evaluation, and tree assessments. He has also provided support for electrofishing surveys, aquatic invertebrate surveys, hydraulic stream flow monitoring, and water quality monitoring. Mr. Aitken regularly compiles background research, conducts data analyses, contributes to report writing and provides GIS mapping for ecological studies of various scales throughout Ontario.

Selected Experience

Transportation Infrastructure

Participated in a number of provincial and municipal transportation projects for existing and proposed roadways and rail facilities. Key tasks included breeding bird surveys, nest clearance surveys, species at risk surveys, botanical inventories, ELC surveys, wetland delineation using OWES and fish rescues. Select projects include:

- *Glen Lawson Road/ 3rd Line Class Environmental Assessment, Acton, 2015*
- *Green Lane Sanitary Sewer, Newmarket, 2014*
- *Albert Street Bridge Replacement, Strathroy, 2013 - 2014*
- *Highway 401 Bridge Repair/Enhancement, Milton, 2013 - 2014*
- *Peterborough Parkway, Peterborough, 2013*
- *Highway 17 Environmental Assessment, Bonfield, 2013*
- *East Gwillimbury Transit Corridor, East Gwillimbury, 2013*
- *Bracebridge Transit Corridor, Bracebridge, 2012*
- *Rare species surveys for 407 extension, Durham, 2011*
- *Windsor Essex Parkway – Species at Risk surveys & Botanical Inventories, Windsor, 2011*

Renewable Energy Infrastructure

Participated in several aspects of the natural heritage assessments and species at risk studies for renewable energy infrastructure projects. Key tasks included breeding bird surveys, winter raptor surveys, waterfowl surveys, species at risk surveys, botanical inventories, amphibian and reptile surveys, ELC surveys and wetland delineation and evaluation using OWES. Select projects include:

- *Bluewater/Goshen/Jericho Wind Energy Centre, Grand Bend, NextEra Energy Canada, 2012-2014*
- *Summerhaven Wind Energy Centre, Nanticoke, NextEra Energy Canada, 2013-2014*
- *Biogas Facility Natural Heritage Assessment, Elora, ENS Poultry, 2011*

Aggregates and Mining

Participated in multiple studies for proposed mining and aggregate projects and for proposed expansions of existing aggregate operations. Key tasks included breeding bird surveys, species at risk surveys, botanical inventories, ELC surveys, wildlife surveys, amphibian and reptile surveys and wetland delineation and evaluation using OWES. Select projects include:

- *Tri-County Pit, Orangeville, 2014*
- *Borden Lake Environmental Baseline Survey, Chapleau, 2013 - 2014*
- *Butler Pit Expansion Environmental Monitoring, Cambridge, 2013*
- *Mill Creek Pit Expansion ELC & Breeding Bird Survey, Aberfoyle, 2012*

Residential and Municipal Development

Participated in a variety of studies for a variety of residential and municipal developments. Key tasks included conducting breeding bird surveys nest surveys, amphibian and reptile surveys, botanical inventories, tree inventories and management plans and ELC surveys. Select projects include:

- *Big Bay Point, Innisfill, 2014*
- *Block 27, Vaughan, 2014*
- *Riverbend Subdivision Housing Development, London, 2013*
- *Kitchener Waste Water Treatment Plant, Kitchener, 2013*
- *Kiwanis Trail Extension, London, 2013*
- *Summit Park Breeding Bird, Snake and Snake Hibernacula Surveys, Hamilton, 2011*
- *Mill Pond Park Botanical Inventory, ELC Assessment & Breeding Bird Surveys, Richmond Hill, 2011*
- *Lackner Boulevard Tree Management Plan, Kitchener, 2011*
- *Jefferson Forest Edge Management & Tree Preservation Plan, Richmond Hill, 2011*
- *Block 12 Large Restore Buffer Vegetation Monitoring, Vaughan, 2010 – 2011*

Certifications and Training

2015 Butternut Health Assessment
2014 MNR/ON Reptile and Amphibian Field Survey Training Course
2013 Dragonflies and Damselflies Identification Workshop, University of Guelph Arboretum
2013 Warbler Identification Workshop, University of Guelph Arboretum
2013 Animal Tracking Workshop, University of Guelph Arboretum
2013 Owl Identification Workshop, University of Guelph Arboretum
2011 Natural Heritage Information Centre Data Sensitivity Training
2011 Class 2 Backpack Electro Fishing Certification
2011 Ontario Stream Assessment Protocol Certification
2011 MTO/DFO/MNR Protocol for Protecting Fish Habitat Workshop
2010 MNR Ecological Land Classification for Southern Ontario Certification
2010 Asters/Goldenrod Identification Workshop
2009 MNR Ontario Wetland Evaluation System Certification
2009 OSAP Level 1 Fish Identification Certification

ARCADIS Design & Consultancy for natural and built assets

Education

M.Sc., Environmental Biology York University. Assessment of early mortality sources to lake trout and lake whitefish in Lake Simcoe, Ontario

Hon. B.Sc, Fisheries and Wildlife Biology, University of Guelph

Professional Affiliations and Certifications

Past President of the Southern Ontario Chapter of the American Fisheries Society

Advanced courses in Fluvial Geomorphology – David Rosgen and Robert Newbury

Years of Experience

Total – 36

Brian Hindley, M.Sc.

Senior Biologist/Habitat Specialist

With over 20 years of management/specialist experience, Brian is a highly skilled, senior consultant with extensive expertise in environmental assessment, environmental policy, planning and permitting and strong interdisciplinary skills focused on providing cost effective, practical, innovative solutions to complex problems in a variety of market sectors including mining, manufacturing, land development, municipal infrastructure, restoration planning. A skilled project manager and mentor with strong technical proposal writing and business development skills, Brian is a true team player; he has strong company and client loyalty and is dedicated to producing a quality product. Brian has a wide network of contacts and is well respected among his peers in consulting, industry, and government.

His expertise includes both terrestrial and aquatic ecology and environmental management, having worked extensively on projects with multiple impacts in both the aquatic and terrestrial environments.

Employment History

Arcadis Canada Inc. June 2016-Present:

Matrix Solutions Inc., Senior Environmental Studies Specialist/Fisheries Biologist, June 2014 to 2016

Golder Associates Ltd., Environmental Studies Specialist/Fisheries Biologist/Discipline Lead, 2010 to 2014

Aquafor Beech Limited, Senior Environmental Specialist/Fisheries Biologist, 2003 to 2010

Beak International Incorporated, Principal/Watershed Studies Specialist, 1993 to 2002

Project Experience / Professional Experience

CURRENT PROJECT EXAMPLES

Nottawasauga Valley Conservation Authority
Development of instream flow requirements to protect fish communities in Innisfil Creek from water taking impacts.

City of London
Sifton Bog and City-wide environmental monitoring programs to assess urban impacts on the water budget of a PSW and on receiving waters within the City of London.

Trans Canada Pipelines
Kings North Connection Project. Environmental studies in support of a NEB application for connecting pipeline in Vaughan/Caledon/Brampton.

City of Hamilton/Hamilton Conservation Authority
An assessment of the effects of climate change on infrastructure and environmental features in the Spencer Creek Watershed.

Ontario Ministry of Natural Resources and Forestry
Environmental level and flow guidelines for Ontario Streams.

Ontario Power Generation
Assessment of the performance of a constructed walleye spawning shoal at the Atikoken PGS.

Private Sector Client
Completion of an ARA Natural Heritage Assessment / Environmental Impact Statement for an Aggregate Extraction operation in Ottawa.

Cliffs Natural Resources
Completion of over 100 Natural Heritage Level 1 / 2 reports in support of ARA licenses for aggregate and quarry sites along the proposed access road.

Magna International
Participating in a negotiated settlement for a an upcoming OMB of a proposed development in Milton, Ontario that proposed a creek realignment as a redside dace habitat overall benefit plan and ESA permit application.

Holcim Canada
Environmental permitting for a water intake and heated water effluent into lake Ontario for an energy from waste heat cogeneration facility.

Hopewell Developments
EIS study and Environmental permitting to address 4 species at risk (barn swallow, bobolink, meadowlark, redside dace) associated with an industrial development in Caledon, Ont.

Private Sector Client
Environmental Permitting, Fish Compensation Plan and Environmental Monitoring program for a residential development in northwest Brampton in the Levi Creek subwatershed of the Credit River.

Ontario Power Generation
Fisheries investigations, environmental permitting and fish rescue for the proposed renovation of the Sir Adam Beck Pumped Storage Reservoir.

Region of Peel
Class EA for WPCP facility and outfall for the village of Alton. Discharge location sited to minimize impacts on Credit River Brook trout populations.

Osiko Hammond Reef Gold Ltd
Senior Discipline Lead for the Aquatic Technical Support Document of the Environmental Assessment for the Hammond Reef Gold Project.

ENERGY

Abitibi
Evaluation of Atlantic salmon passage facilities on the Exploits River, Newfoundland.

Northland Power
Fisheries habitat assessment and evaluations of heated water discharge effects on Lake Whitefish in the Abitibi-River.

Lower Churchill Development Corp
Baseline fisheries studies for the Lower Churchill-Gull Island hydroelectric project.

Newfoundland and Labrador Hydro
Fisheries impact assessment and Atlantic salmon population studies for the Upper Salmon Hydroelectric project.

Hydro Quebec
Baseline fisheries study of the Chamouchuane River hydroelectric project.

Ontario Power Generation, Saskatchewan Power Corporation, Newfoundland and Labrador Hydro
Baseline and environmental effects studies to identify siting constraints for a number of hydroelectric, thermal and nuclear generating stations in Ontario, Saskatchewan and Newfoundland, including Q'Appelle, Little Jackfish, Bruce/Pickering/Darlington GS, Upper Salmon, Hinds Lake, Lower Churchill Fisheries investigations to assess alternative sites for a thermal generating station in Lake Diefenbaker.

Ontario Power Generation (Ontario Hydro)
Ontario Environmental Assessment and EARP Screening Reports for 7 small hydroelectric redevelopment projects. Bruce Nuclear Power Development Ecological Effects Review Report. Fish Habitat and Hydro Power Working Group. Effects of Once-Through Thermal Discharges on the Ecology of the Nearshore of Lake Ontario at Pickering NGS.

MINING

INMET Mining Inc.
Completion of an environmental assessment of impacts from the Winston Lake mine on the Whitesand River watershed, Schreiber, Ontario.

BHP Diamonds
Completion of comprehensive environmental baseline studies of two arctic lakes containing Kimberlite deposits, NWT.

Rio Algom Ltd
Development of an Environmental Manual for complying with Fisheries Act Authorization for Mine Closure activities at the Stanleigh Mine, Elliot Lake. Completion/Implementation of Fish Habitat Compensation Plans for several water control structure removal plans at the Stanleigh Mine, Elliot Lake.

Heath Steele Mines
Atlantic salmon population studies to evaluate the effect of base metal mining activities in the Northwest Miramichi watershed.

Hemlo Gold Corp
Fisheries and benthic invertebrate community investigations of tailings pond impacts in the Lightning River watershed.

Kinross Gold Corp
Receiving water and aquatic habitat assessment, North Porcupine River tributaries.

HABITAT ASSESSMENT/RESTORATION

City of London
Comprehensive aquatic resources studies in support of the City of London Subwatershed studies.

City of Toronto
Participation in the preparation of a restoration plan for Terraview Park/Taylor Creek.

Rondeau Bay Watershed Steering Committee
Participation in a coastal wetland rehabilitation plan for Rondeau Bay.

Town of Markham
Development of aquatic habitat restoration plans for TooGood Pond.

Northwest Sandalwood Landowners Group
Completion of a Habitat Restoration Plan and Habitat Compensation Plan for Upper Fletchers Creek.

Rio Algom Ltd
Completion/Implementation of Fish Habitat Compensation Plans for several water control structure removal plans at the Stanleigh Mine, Elliot Lake.

Region of Halton
Fish habitat assessment and Fisheries Act Authorization for new outfall for the expansion of the Mid Halton WWFP.

City of Kitchener
Fish habitat enhancement, barrier mitigation for the Wards and Brigadoon Pond Design and Construction Project.

City of Toronto
Fish habitat assessment, barrier mitigation, habitat enhancement for the Highland Creek Emergency Works Project, Stream Restoration Design and Construction, Spring Creek. High Park, Toronto, Ontario.

Various Clients
Fish barrier mitigation design input for a range of stream restoration projects in the GTA. Completion of several fisheries impact assessments and design input for stream erosion control projects on Tuck Creek, Redhill Creek, Rouge River, Snake Creek, Fletcher's Creek, Wilket Creek.

Government

Toronto Region Conservation Authority
TRCA Waterfront Lakefill Park Environmental Monitoring Program. Developed and implemented environmental monitoring programs and a handbook of good design and construction practices for conservation authority undertakings. Designed and developed an urban fishing program for Metropolitan Toronto.

Ontario Ministry of Environment/Toronto Region Conservation Authority
Humber Watershed Rural Water Quality Study. Toronto Area Watershed Management Strategy.
TRCA Rural Beaches Study.

Ontario Ministry of Natural Resources
MNR draft discussion paper on ecosystem planning on a watershed basis. Prepared a draft discussion paper for a Provincial Water Conservation Strategy. Updating the Planning Act Provincial Policy Statements Implementation Guidelines (2005).

Conservation Ontario
Prepared amended conservation authorities' class environmental assessment to serve pending preparation of new class EA.

Town of Markham
Development of aquatic/terrestrial criteria and preparation of a sensitivity map for the lands within the Rouge Park North Park Master Plan.

City of Toronto
Class Environmental Assessment for the Brimley Road stormwater management facility - application of the Dunkers flow balancing system to treat stormwater. This EA involved developing a fish habitat compensation package for Fisheries Act authorization and creation of a wetland.

Waterfront Regeneration Trust
Review of Lake Ontario coastal shoreline treatment measures, their effects on fish communities and opportunities to provide habitat mitigation and enhancement.

Hamilton Harbor Remedial Action Plan
Preparation of two federal EA screening reports for restoration projects in Hamilton Harbour/Cootes Paradise.

Niagara Escarpment Commission
Assessment of the current and cumulative effects of ponds, water taking and diversions on the water resources of the Niagara Escarpment Plan area.

Ontario Ministry of Transportation
Preparation of a fisheries mitigation and compensation measures manual providing guidance on provincial highway construction projects.

Ontario Ministry of the Environment
Environmental Flow Requirements for watercourses MOE/Conservation Ontario Watershed-Based Fisheries Management Guidelines. Establishing Environmental Thresholds to meet instream flow needs.

Peer Reviews/Expert Witness

Confidential Client
Expert witness testimony at OMB hearing in support of an application to convert a portion of the Castlemore Golf and Country Club into residential development, Brampton, Ont.

ICI Canada Ltd
Expert witness testimony at consolidated hearing to address fisheries and environmental planning issues associated with an industrial discharge to the St. Clair River.

Local Citizens Committee
Peer review of a Class EA for a sewage treatment facility expansion in Alliston.

Nova Scotia Power
Peer review of fisheries/hydrologic investigations to assess the effects of a release flow in the Jordon River to accommodate sports fishing interests.

Town of Markham
Review of the Interim Waste Authorities environmental studies and site selection process leading to the selection of the M6 site in Markham.

Municipality of Clarington
Peer Review of a proposed wood waste management facility.

Environmental Assessment

City of Richmond Hill
Pioneer Park Stormwater Management & Regeneration Project.

City of Toronto
Wilket – Milne Creek Regeneration Concept Plan.

City of Mississauga
Credit River Adaptive Management Study.

City of Hamilton
City of Hamilton Stormwater Master Plan.

Region of Peel
Region of Peel Class EA for the Bovaird Road Widening – Mississauga Road to MacLaughlin Road.

City of Toronto
City of Toronto Brimley Road Stormwater Management Project (Dunkers Flow Balancing System).

Central Lake Ontario Conservation Authority
Class EA for the Van Stone Mill/Bowmanville Creek Restoration.

Ontario Ministry of Natural Resources
Ministry of Natural Resources Class EA for the Thornbury Dam Ministry of Natural Resources Class EA's for Tasso, Wood, Muldrew, Matamagasi, and Three Narrows Dams.

Watershed Studies

City of Toronto
City of Toronto Wet Weather Flow Management Strategy.

Rideau Valley Conservation Authority/City of Ottawa
Duffins Watershed and Seaton Lands Study.

Grand River Conservation Authority
Eramosa-Blue Springs Watershed Study.

City of Brampton
West Humber Subwatershed Study.

West Humber Subwatershed Study.
Dingman Creek Subwatershed Study. Kettle-Dodd Creek Subwatershed Study. Thames Valley areas Subwatershed Study.

Toronto Region Conservation Authority
Rouge River Watershed Management Strategy.

City of Hamilton
City of Hamilton Stormwater Master Plan.

Credit Valley Conservation Authority
Subwatershed 19 Study in the Credit headwaters.

City of Ottawa/Rideau Valley Conservation Authority
Carp Watershed Study.

Municipality of Clarington
Brookhill Subwatershed Study.

Niagara Peninsula Conservation Authority
One Mile Creek Watershed Study Niagara On The Lake Watershed Study.

Hamilton Harbour RAP
Cootes Paradise Phosphorus Loading Model.

Credit Valley Conservation
Credit River Watershed Strategy Update Study.

City of Toronto
Highland Creek Geomorphic Systems Master Plan.

City of Hamilton
Hamilton Airport Employment Growth District Subwatershed and Stormwater Management Plan.

Appendix B

Field Notes and Photo Log

Water Bodies Assessment Field Collection Form

BEACON ENVIRONMENTAL

General Information

Study Area: Nantyroke | Land Parcel#: — | Site ID: WC2-A

Date: 05/19/15 | Start time: 9:30 | End Time: 10:30

Weather Conditions: 20% Cloud, Temp 10°C Wind-1, No Precip. | Field Crew: LW/RA

Field Notes By: LW

Site Location

Watercourse 2 within forested area -> west of ag crossing

UTM Co-ordinates (continue on page 3 if necessary)

Easting:	0579680	Northing:	4740687	Description:	WC2-A
Easting:	—	Northing:	—	Description:	—
Easting:	—	Northing:	—	Description:	—
Easting:	—	Northing:	—	Description:	—

Surrounding Landuse

Residential	☐	Meadow	☐
Agriculture	☒	Wetland	☐
Forest	☒	Livestock	☐
Other			

Description: —

Type of Watercourse

Intermittent	☐	Channelized	☐
Permanent	☒	Natural Channel	☒
Ephemeral	☐		☐

Description: —

Notes: (include any inputs into the system i.e. tile drainage, seepages, overland flow)

No seepage or tile drainage obs.

Is any portion of the water body underground or not as mapped? Y / (N)

If Yes describe: —

GPS Coordinate: Easting - — Northing - — Description- —

Description of Land Topography Surrounding Water Body (rolling hills, sloping towards water body)

hilly landscape generally sloping South to L. Erie

In-Situ Water Quality

WT (°C):	—	AT(°C):	—
pH:	—	Cond (s/cm):	—
D.O. (mg/L)	—		

Water Clarity: Clear ☐ Turbid ☒

Water Colour: Brown

Notes: —

Ground Water and Seepage Indicators

Watercress	☐	Bank Seepage	☐
Iron Staining	☐	None	☒
Bubbling	☐		☐
Other	☐		

Details:

No Seepage obs.

Water Bodies Assessment Field Collection Form

Stream Morphology

Site Length (m): ~ 40 m

Channel Dimensions

Mean Wetted Width (m):	3.02	Mean Wetted Depth (m):	0.32
Mean Bankfull Width (m):	3.28	Mean Bankfull Depth (m):	0.67
Mean Top of Bank Width (m):	—	Mean Top of Bank Depth (m):	—

Bank Stability:

	Stable	Slightly unstable	Moderately unstable	Unstable
Left Bank	☒	☐	☐	☐
Right Bank	☒	☐	☐	☐

Description: —

Flow Description: (high or low flow conditions, stagnant, etc)

low flow

Habitat

Substrate (< = >)

Bo - Boulder
Co - Cobble
Gr - Gravel
Sa - Sand
Si - Silt
Cl - Clay
MK-Muck
DT-Detritus

Description: Si 60 - Sa 25 - Gr 15

Morphological Structure (%)

Pool	Riffle	Run	Flat
—	—	—	100

Notes: —

Instream Cover (%)

Other	Woody Debris	Boulders	Cobble	Aquatic Vegetation*	None	Undercut Banks
—	5	—	—	—	—	Average Depth: (% Cover) N/A

Note: Low = 0 - 30% ; Moderate = 30 - 75%; High = 75 - 100%

*Aquatic Vegetation Species Present (algae, submergent, emergent etc.)

No Aquatic Veg Present

Canopy Cover (% closed cover):

100-90%	☒	30-1%	☐
90-60%	☐	0%	☐
60-30%	☐		

Types of Cover (% cover)

Trees 100% Shrubs — Man-made structures —

Grasses — Herbaceous — Other —

Note: Low = 0 - 30%; Moderate = 30 - 60%; High = 60 - 100%

Notes: (vegetation species, types of structures)

—

Riparian Vegetation

Width and Description of riparian vegetation: LB - Forest Community RB - Forest Community

Hi. Ash. Beech. Oak S. Maple →

Overhanging Vegetation Present Y / N

Description of Overhanging Vegetation: —

% Overhanging Vegetation: —

Obstructions to Fish Passage

None Observed ☒ Man-Made ☐ Natural ☐ Low Flow Barrier ☐

Description of Barrier: —

Height of Barrier (m) —

GPS Coordinates: —

Water Bodies Assessment Field Collection Form

BEACON ENVIRONMENTAL

General Information

Study Area: Nanticoke **Land Parcel#** — **Site ID:** WC2-B

Date: 05/19/15 **Start time:** 10:45 **End Time:** 11:15

Weather Conditions: 20% Cloud, Temp 10C Wind 1 - No precip

Field Crew: LW / RA

Field Notes By: LW

Site Location

Watercourse 2 within Meadow/Marsh

UTM Co-ordinates (continue on page 3 if necessary)

Easting	Northing	Description
0579196	4740638	WC 2-B
—	—	—
—	—	—
—	—	—

Surrounding Landuse

- Residential ☐
- Agriculture ☐
- Forest ☐
- Other
- Meadow ☒
- Wetland ☒
- Livestock ☐

Description: Band of wetland meadow [illegible] meadows

Type of Watercourse

- Intermittent ☐
- Permanent ☒
- Ephemeral ☐
- Channelized ☐
- Natural Channel ☒
- ________ ☐

Description: WC 2-B

Notes: (include any inputs into the system i.e. tile drainage, seepages, overland flow)

No seeps or tile draining obs

Is any portion of the water body underground or not as mapped? Y / (N)

If Yes describe:

N/A

GPS Coordinate: Easting - — **Northing -** — **Description-** —

Description of Land Topography Surrounding Water Body (rolling hills, sloping towards water body)

hilly landscape - generally sloping south to L. Erie

In-Situ Water Quality

WT (°C): —	AT(°C): —
pH: —	Cond (s/cm): —
D.O. (mg/L)	

Water Clarity: Clear ☐ Turbid ☒

Water Colour: Brown

Notes: —

Ground Water and Seepage Indicators

- Watercress ☐
- Iron Staining ☐
- Bubbling ☐
- Other ☐
- Bank Seepage ☐
- None ☒
- ________ ☐

Details: —

Water Bodies Assessment Field Collection Form

Stream Morphology

Site Length (m): ~40m

Channel Dimensions

Mean Wetted Width (m):	2.29	Mean Wetted Depth (m):	0.27
Mean Bankfull Width (m):	2.68	Mean Bankfull Depth (m):	0.67
Mean Top of Bank Width (m):	—	Mean Top of Bank Depth (m):	—

Bank Stability:

	Stable	Slightly unstable	Moderately unstable	Unstable
Left Bank	☐	☒	☐	☐
Right Bank	☐	☒	☐	☐

Description: Some undercut erosion

Flow Description: (high or low flow conditions, stagnant, etc)

low flow

Habitat

Substrate (< = >)

Bo - Boulder
Co - Cobble
Gr - Gravel
Sa - Sand
Si - Silt
Cl - Clay
MK-Muck
DT-Detritus

Description: Si 70 / Sa 30

Notes: —

Morphological Structure (%)			
Pool	Riffle	Run	Flat
—	—	—	100

Instream Cover (%)

Other	Woody Debris	Boulders	Cobble	Aquatic Vegetation*	None	Undercut Banks
—	—	—	—	—	100	Average Depth: 12 cm both banks (% Cover)

Note: Low = 0 - 30% ; Moderate = 30 - 75%; High = 75 - 100%

*Aquatic Vegetation Species Present (algae, submergent, emergent etc.)

N/A

Canopy Cover (% closed cover):

100-90%	☐	30-1%	☒
90-60%	☐	0%	☐
60-30%	☐		

Types of Cover (% cover)

Trees — Shrubs — Man-made structures —
Grasses 20+ Herbaceous — Other —

Note: Low = 0 - 30%; Moderate = 30 - 60%; High = 60 - 100%

Notes: (vegetation species, types of structures)

overhanging terrestrial grasses

Riparian Vegetation

Width and Description of riparian vegetation:

LB - Wetland 5-10m → Meadow

RB - Wetland 5-10m → Meadow

Overhanging Vegetation Present (Y) N

% Overhanging Vegetation:

Description of Overhanging Vegetation:

overhanging terrestrial grasses

Obstructions to Fish Passage

None Observed ☒ Man-Made ☐ Natural ☐ Low Flow Barrier ☐

Description of Barrier: —

Height of Barrier (m)

GPS Coordinates: —

Water Bodies Assessment Field Collection Form

BEACON ENVIRONMENTAL

General Information

Study Area: Nantcoke Land Parcel# Site ID: WC 7 - A

Date: 05/19/16 Start time: 14:00 End Time: 15:00

Weather Conditions: 100% Cloud Temp 17°C Wind-3 No precip

Field Crew: LW / RA

Field Notes By: LW

Site Location

Watercourse 7 - South portion of Ag fields

UTM Co-ordinates (continue on page 3 if necessary)

Easting:	0579434	Northing:	4740025	Description:	WC 7 - A
Easting:	—	Northing:	—	Description:	—
Easting:	—	Northing:	—	Description:	—
Easting:	—	Northing:	—	Description:	—

Surrounding Landuse

Residential	☐	Meadow	☒
Agriculture	☒	Wetland	☒
Forest	☐	Livestock	☐
Other			

Description: —

Type of Watercourse

Intermittent	☒	Channelized	☐
Permanent	☐	Natural Channel	☒
Ephemeral	☐	—	☐

Description: —

Notes: (include any inputs into the system i.e. tile drainage, seepages, overland flow)

No inputs obs.

Is any portion of the water body underground or not as mapped? Y / (N)

If Yes describe: —

GPS Coordinate: Easting - — Northing - — Description- —

Description of Land Topography Surrounding Water Body (rolling hills, sloping towards water body)

Hilly landscape generally sloping towards L. Erie

In-Situ Water Quality

WT (°C):	AT(°C):
pH:	Cond (µs/cm):
D.O. (mg/L)	

Water Clarity: Clear ☐ Turbid ☐

Water Colour:

Notes: — No water in WC 7

Ground Water and Seepage Indicators

Watercress	☐	Bank Seepage	☐
Iron Staining	☐	None	☒
Bubbling	☐	—	☐
Other	☐		

Details: —

Water Bodies Assessment Field Collection Form

Stream Morphology

Site Length (m): ~ 50m

Channel Dimensions: Braided / Swale Channel

Mean Wetted Width (m):		Mean Wetted Depth (m):	
Mean Bankfull Width (m):		Mean Bankfull Depth (m):	
Mean Top of Bank Width (m):		Mean Top of Bank Depth (m):	

Bank Stability:

	Stable	Slightly unstable	Moderately unstable	Unstable
Left Bank	☐	☐	☐	☐
Right Bank	☐	☐	☐	☐

Description: Braided / Swale Channel

Flow Description: (high or low flow conditions, stagnant, etc)

Habitat

Substrate (< = >)

Bo - Boulder
Co - Cobble
Gr - Gravel
Sa - Sand
Si - Silt
Cl - Clay
MK-Muck
DT-Detritus

Description: N/A

Morphological Structure (%)			
Pool	Riffle	Run	Flat
—	—	—	—

Notes: N/A

Instream Cover (%)

Other	Woody Debris	Boulders	Cobble	Aquatic Vegetation*	None	Undercut Banks
0	0	0	0	0	100	Average Depth: (% Cover) N/A

Note: Low = 0 - 30% ; Moderate = 30 - 75%; High = 75 - 100%

*Aquatic Vegetation Species Present (algae, submergent, emergent etc.)

—

Canopy Cover (% closed cover):

100-90%	☐	30-1%	☐
90-60%	☒	0%	☐
60-30%	☐		

Types of Cover (% cover)

Trees		Shrubs		Man-made structures	
Grasses	X	Herbaceous	X	Other	

Note: Low = 0 - 30%; Moderate = 30 - 60%; High = 60 - 100%

Notes: (vegetation species, types of structures)

Braided channel / Vegetated Swale

Riparian-Vegetation

Width and Description of riparian vegetation:

LB - ~~meadow/wetland~~ 5m Thicket / Woodland

RB - meadow/wetland 5-10m -> Ag-field

Overhanging Vegetation Present Y / N

% Overhanging Vegetation:

Description of Overhanging Vegetation:

—

Obstructions to Fish Passage

None Observed ☒ Man-Made ☐ Natural ☐ Low Flow Barrier ☐

Description of Barrier: —

Height of Barrier (m) —

GPS Coordinates: —

Photo 1.
WC1 – Temporary Channel in Active Agricultural Field – Ploughed Through - May 2015

Photo 2.
WC2 – Permanent Stream – Upstream Reach – May 2015

Photo 3.
WC2 – Permanent Stream – Reach within Meadow/Marsh Community – May 2015

Photo 4.
WC2 – Permanent Stream – Reach within Forest community – May 2015

Photo 5.
WC6 – Dry Channel Driven and Ploughed Through - May 2015

Photo 6.
WC7 – Intermittent Stream – Dry Channel with Wetland Vegetation – May 2015

Photo 7.
WC7 – Intermittent Stream - Dry Channel with Moist Soils - May 2015

Photo 8.
WC8 – OPG Coal Pile and Drainage Ditch- May 2015