Barlow Solar Energy Centre Water Assessment and Water Body Report

FINAL DRAFT REPORT

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Sign-off Sheet

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Abbreviations

APRD	Approval and Permitting Requirements Document
CRA	Commercial, Recreational or Aboriginal
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
ha	hectare(s)
HWM	High Water Mark
Hydro One	Hydro One Networks Inc.
km	kilometre
kV	kilovolt
LIO	Land Information Ontario
MW	megawatt
MOECC	Ministry of the Environment and Climate Change
MNRF	Ministry of Natural Resources and Forestry
NHA	Natural Heritage Assessment
O. Reg.	Ontario Regulation
REA	Renewable Energy Approval
RRCA	Raisin Region Conservation Authority
Stantec	Stantec Consulting Ltd.
ZOI	Zone of Investigation

1.0 INTRODUCTION

Barlow Energy Centre Limited Partnership (the Proponent), is proposing the development of a 10 megawatt alternating current (MWac) solar energy generating facility, known as the Barlow Solar Energy Centre (the Project) approximately 10 kilometres (km) west of the city of Cornwall in the Township of South Stormont, United Counties of Stormont, Dundas and Glengarry, Ontario. The Point of Common Coupling will be located adjacent to the Project Location, in the City of Cornwall, Ontario. A map showing the location of the Project is provided in **Figure 1**, **Appendix A**. The Project will require a Renewable Energy Approval (REA) as per Ontario Regulation (O. Reg.) 359/09, under Part V.0.1 of the *Environmental Protection Act* (MOECC 2009, amended 2016).

The Proponent is proposing to develop, construct and operate the Project on 38 hectares (ha; 94 acres) of land in response to the Government of Ontario's Large Renewable Procurement (LRP) initiative to promote the development of renewable electricity in the province.

The Proponent has retained Stantec to prepare a REA application, as required under O. Reg. 359/09. The proposed solar PV distribution grid connected system would be considered a Class 3 Solar Facility under O. Reg. 359/09, s. 4.

1.1 STUDY AREA AND PROJECT LOCATION

The Project is located in the Township of South Stormont within the United Counties of Stormont, Dundas and Glengarry. The Point of Common Coupling is located on the boundary of the City of Cornwall and Township of South Stormont. The Project is being proposed on up to two parcels of privately-owned land, totaling approximately 38 ha on the north side of Cornwall Centre Road, west of Power Dam Drive. A Trans Northern Pipeline Inc. pipeline and Hydro One transmission line bisect the Project.

A Project Location, as defined by O. Reg. 359/09 is "*a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the Project [including] any air space…*". The current Project Location consists of the parcel boundary on which the solar facility will be located and the land associated with the connection line and Point of Common Coupling. As shown on **Figure 1 (Appendix A)**, the Project is not within the Oak Ridges Moraine Conservation Plan Area, the Protected Countryside of the Greenbelt Plan, the Niagara Escarpment Plan or the Lake Simcoe watershed.

For the purposes of the REA reports, the Zone of Investigation (ZOI) includes land, air and water within 120 m of the Project Location where site investigations are required.

This report identifies water bodies that are within the 120 m ZOI and assesses potential negative environmental effects on water bodies that may result from construction activities and operation

of the Project. Mitigation measures are identified to address potential negative environmental effects.

1.2 REPORT REQUIREMENTS

A Water Assessment includes a records review and site investigation to determine the presence and boundaries of water bodies (as defined in O. Reg. 359/09) within 120 m of the Project Location (assuming that no Lake Trout lakes that are at or above development capacity are identified within 300 m). If water bodies are identified within 120 m of the Project Location, a Water Body Report must be prepared to assess impacts of the proposed work within 120 m of the Project Location.

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

This Water Assessment and Water Body Report is intended to satisfy the requirements outlined within O. Reg. 359/09 (s. 39 and 40), and is to be submitted as one component of the REA application for the Project. The report was prepared in accordance with the *Technical Guide to Renewable Energy Approvals* (MOE 2013), and the *Approval and Permitting Requirements Document for Renewable Energy Projects* (APRD) (MNR 2009).

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

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

	Completed	Section Reference
A person who proposes to engage in a renewable energy project shall conduct a water assessment, consisting of the following:		
1. A records review conducted in accordance with section 30.	✓	2.2 and 2.3 and **Figure 2 (Appendix A)**
2. A site investigation conducted in accordance with section 31. As per section 31(3), this report includes:		
A summary of any corrections to the records review.	✓	2.3, and **Figure 3 (Appendix A)**
Information relating to each water body.	✓	3.0
A map showing boundaries, location/type and distances.	✓	**Figure 3 (Appendix A)**
A summary of methods used to make observations for the purposes of the site investigation.	✓	2.2
The name and qualifications of any person conducting the site investigation.	✓	2.2.3
The dates and times of the beginning and completion of the site investigation.	✓	2.2.2
The duration of the site investigation.	✓	2.2.2
The weather conditions during the site investigation	✓	2.2.2
Field notes kept by the person conducting the site investigation.	✓	**Appendix C**
If an alternative investigation of the site was conducted:		
The dates of the generation of the data used in the site investigation.		N/A
An explanation of why the person who conducted the alternative investigation determined that it was not reasonable to conduct the site investigation by visiting the site.		N/A
As per section 39(2), this report:		
1. Identifies and assesses any negative environmental effects of the project on a water body and on land within 30 metres of the water body.	✓	3.0, 4.0
2. Identifies mitigation measures in respect of any negative environmental effects.	✓	5.0
3. Describes how the environmental effects monitoring plan addresses any negative environmental effects.	✓	4.0, 5.0
4. Describes how the construction plan report addresses any negative environmental effects.	✓	4.0, 5.0

2.0 WATER ASSESSMENT

2.1 DEFINITION OF A WATER BODY

The presence or absence of water bodies within the Project's 120 m ZOI was assessed using the definition of a water body provided in O. Reg. 359/09, which is as follows:

> *'…a lake, a permanent stream, an intermittent stream and a seepage area but does not include, a) grassed waterways, b) temporary channels for surface drainage, such as furrows or shallow channels that can be tilled and driven through, c) rock chutes or spillways, d) roadside ditches that do not contain a permanent or intermittent stream, e) temporarily ponded areas that are normally farmed, f) dugout ponds, or g) artificial bodies of water intended for the storage, treatment or recirculation of runoff from farm animal yards, manure storage facilities and sites and outdoor confinement areas.'* (MOECC 2009, amended 2016)

2.2 METHODS

2.2.1 Records Review

A water records review was conducted according to Section 30(1) of O. Reg. 359/09. Data were gathered through agency requests and accessing the following online databases and sources:

- Ontario Ministry of Natural Resources and Forestry (MNRF)
  - Land Information Ontario (LIO) mapping database (MNRF 2016a)
  - Natural Heritage Information Centre (NHIC) online database (MNRF 2016b)
  - Constructed drains digital dataset (MNRF 2016c)
  - Background fisheries data requested from the Kemptville District office (reply received from Dom Ferland, Management Biologist) (MNRF 2016d)
- Aerial photo interpretation (MNRF 2014)

In addition to the above sources, the Raisin Region Conservation Authority (RRCA) was contacted to determine if areas regulated by the RRCA occur within the ZOI (Stantec 2016).

Copies of correspondence related to the records review will be provided in the Record of Consultation which will be submitted as part of the complete REA application to the Ministry of the Environment and Climate Change (MOECC). Information obtained through the information requests/records review are presented in Section 2.3 and Section 3.1.

Watercourses and water bodies as mapped by the MNRF (**Figure 2, Appendix A**) might or might not meet the definition of a water body as per O. Reg. 359/09. Potential water bodies were

identified through a review of available maps (MNRF 2016a, MNRF 2016c) and the review of aerial photographs of the Project Location and ZOI.

2.2.2 Site Investigations

The purpose of the site investigations was to:

- ground truth the results of the records review to identify required corrections
- determine whether any additional water bodies exist, other than those identified during the records review
- identify the boundaries of water bodies located within 120 m of the Project Location.

Site investigations were carried out according to Section 31 of O. Reg. 359/09. The investigations were conducted on May 6, 2016 and August 11, 2016. The survey encompassed the mapped watercourse within the Project Location (MNRF 2016a) and the low lying areas along the north, east and south sides of the Project Location (**Figure 2**). Photographs were taken at numerous locations in and around the Project Location (**Appendix B**).

Within the ZOI, the field crews documented characteristics of the mapped watercourse and areas where water bodies might occur (based on air photo interpretation). Field staff also documented conditions around the perimeter of the Project. The information was screened using guidance provided in the *Technical Guide to Renewable Energy Approvals* (MOE 2013) to determine the locations and extents of water bodies within the ZOI.

Some marshes or portions of wetland features meet the definition of a water body as per the O. Reg. 359/09 definition. Wetlands identified within the Zone of Investigation that do not meet the definition of a water body under O. Reg. 359/09 are addressed in the Natural Heritage Assessment (NHA) Report for the project.

An aquatic habitat assessment was conducted on water bodies within the 120 m ZOI. The assessment documented habitat features such as wetted and bankfull widths, water depth, morphology, instream cover, bottom substrates, *in situ* water quality (temperature, dissolved oxygen, pH, conductivity), and barriers to fish passage.

Photographs and field notes from the site investigation are included in **Appendix B** and **Appendix C**, respectively.

2.2.3 Qualifications

The following Stantec personnel were responsible for the identification of water bodies and preparation of this *Water Assessment and Water Body Report*:

- Mark Pomeroy, B.Sc. – Fisheries Biologist (Records Review, Report Preparation)
- Nancy Harttrup, B.Sc. – Senior Fisheries Biologist (Report Preparation)
- Josh Mansell, Tech. Dipl. – Biologist (Site Investigation)

- Andres Rodriguez – M.Sc.E. – Water Resources Engineer (Site Investigation)
- Kathleen Todd, M.Sc. – Senior Aquatic Biologist (Quality and Independent Review)

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

2.3 RESULTS

2.3.1 Mapped Features

The records review identified a mapped watercourse (Station 5) across the south portion of the Project Location (MNRF 2014, MNRF 2016a) (**Figure 3**). The watercourse is an Unnamed Tributary to Abrams Drain (MNRF 2016a) and is a Type E municipal drain (MNRF 2016c). Type E drains have permanent flow, support sensitive fish species that spawn in the spring, and have not been cleaned out within the last 10 years (Mandrak and Bouvier 2014). Correspondence with the RRCA indicated that there are no regulated areas within the Project Location or ZOI; however, consultation with the RRCA is ongoing to confirm floodplain boundaries of the Raisin River (South Branch) and the potential need for design modifications (Stantec 2016). Photographs and field notes from the site investigations are provided in **Appendix B** and **Appendix C**, respectively.

As a result of the site investigation, it was determined that there is no water body across the Project Location at Station 5 where indicated in the records review (**Figure 3, Appendix A**). Station 5 was dry in May 2016 and there were no indicators of water flow within the area of the mapped watercourse. Station 5 was located in an active agricultural field. The mapped watercourse (Station 5) is not a lake, permanent or intermittent stream or seepage area; therefore, is not a water body under O. Reg. 359/09

In the northern portion of the Project, there is a potential water body visible in air photos (Station 6) (**Figure 3**). During Stantec's May 2016 site investigations, water flowed east toward the Project and then south along the west side of the Project. West of Station 3, Station 6 is an intermittent stream and is classified as a water body. Field staff did not have permission to enter private property; therefore, the assessment was limited to the area visible from the west side of the Project. East of Station 3 within the Project Location, there was no visible flow path to the east across the Project. East of Station 3, Station 6 was located in an active agricultural field. Within the Project Location, the visible feature associated with Station 6 is not a lake, permanent or intermittent stream or seepage area; therefore this portion of Station 6 (i.e., within the Project Location) is not a water body.

The records review also identified two small ponds within 120 m of the north side of the Project Location (MNRF 2016a; MNRF 2014) (**Figure 2**). Based on the characteristics observed during the site investigation and information documented in the NHA (Stantec 2016), both ponds are permanent, natural features (wetland ponds) and are classified as water bodies.

Interpretation of available maps and aerial photographs did not identify additional potential water bodies.

Based on a review of the document entitled *Inland Ontario Lakes Designated for Lake Trout Management* (MNRF 2015), there are no Lake Trout lakes that are at or above development capacity identified within 300 m of the Project Location.

2.3.2 Additional Water Bodies

During the site investigation, additional water bodies were identified around the perimeter of the site.

Station 1 is an intermittent stream that is a shallow, straight, trapezoidal channel located along the east side of the Project (**Figure 3**). At the time of the site investigation it contained water and was flowing south toward Cornwall Centre Road where it turned west (Station 4) at the southeast corner of the Project. The extent of the water body associated with Station 1 is illustrated in **Figure 3**.

Station 2 through Station 4 (inclusive) (**Figure 3**) is an intermittent stream that originates on the north side of the Project (**Figure 3**), flows south along the west side of the Project (Station 3), and then east along Cornwall Centre Road (Station 4). The water body crosses Cornwall Centre Road through a corrugated steel pipe culvert. The water body is a trapezoidal channel with no in-water vegetation except for Station 4, where algae, cattails, and *Phragmites* sp. were present at the time of the site investigation. On the south side of Cornwall Centre Road, Station 4 is a water body and follows the alignment indicated in **Figure 3**. Field staff did not have permission to enter private property; therefore, the assessment was limited to the reach that was visible from Cornwall Centre Road.

During the site investigations, there were no lakes or seepage areas identified within the ZOI.

Characteristics of the water bodies within 120 m of the Project Location are provided in Section 3.

2.3.3 Summary

Based on the results of site investigations and the records review, there are five water bodies within the ZOI:

- Station 1
- Station 2 to Station 4 (includes the south side of Cornwall Centre Road)
- Station 6 (west of the Project Location)
- Station 7 (two water bodies (ponds))

These five water bodies were carried forward to the impact assessment in Section 3 and are summarized by station in **Table 2.1**. A summary of water bodies and associated project components is presented in **Table 2.2**. Photographs and field notes from the site investigations

are provided in **Appendix B** and **Appendix C**, respectively. Physical characteristics of water bodies within the ZOI are provided in Section 3.1.

Table 2.1: Water Body Assessment Summary; Barlow Solar Energy Centre

Station Number	Watercourse Name	Figure Number	Water Body	No Surface Feature Present	Water Body Exclusion Criteria[b]						Comments
					Grassed Swale	Temporary Channel for Surface Drainage	Roadside Ditch	Temporarily Ponded Area Normally Farmed	Dugout Pond	Rock Chute	
1	Unnamed Tributary to Abrams Drain	2, 3	✓								See Table 2.2 and Table 3.1
2[a]	Unnamed Tributary to Abrams Drain	2, 3	✓								See Table 2.2 and Table 3.1
3[a]	Unnamed Tributary to Abrams Drain	2, 3									See Table 2.2 and Table 3.1
4[a]	Unnamed Tributary to Abrams Drain	2, 3									See Table 2.2 and Table 3.1; includes the area south of Cornwall Center Road
5	Unnamed Tributary to Abrams Drain	2, 3		✓							Dry in May 2016. There was no evidence of surface water flow or characteristics of a permanent or intermittent stream (MOE 2013).
6 (east of Station 3)	Unnamed	2, 3		✓							Dry in May 2016; no evidence of surface water flow or characteristics of a permanent or intermittent stream (MOE 2013).
6 (west of Station 3)	Unnamed	2, 3	✓								Water body west of Station 3.
7	Unnamed Wetland (two ponds)	2, 3	✓✓								Wetland Ponds (2) – also characterized in the NHA

[a] Station 2, 3 and 4 are locations along one continuous water body
[b] as per REA Definition O. Reg. 359/09

Table 2.2: Summary of Water Bodies and Project Components; Barlow Solar Energy Centre

Station Number	Water Body Crossing		Water Body within 120 m	
	Access Road	Connection Line	Solar Panels	Access Road
1			✓	
2			✓	
3			✓	
4	✓	✓[a]	✓	
6 (west of Station 3)			✓	
7			✓	

[a] Point of Common Coupling near Cornwall Centre Road (pole required)

3.0 EXISTING CONDITIONS AND PREDICTED IMPACTS

3.1 EXISTING CONDITIONS

During site investigations on May 6, 2016, the air temperature ranged from 17°C to 19°C. No precipitation was recorded in the 24 hours prior to the site investigation (Environment Canada and Climate Change (ECCC) 2016.) The site investigation took place between 1:00 PM and 3:30 PM.

During site investigations on August 11, 2016 the weather was sunny with an air temperature of 35°C and 2.4 mm of precipitation (ECCC 2016); no precipitation was recorded in the 10-day period preceding the site investigation. The site investigation took place between12:30 PM and 3:00 PM.

The Project is located within the South Raisin River subwatershed which drains an area of approximately 103 km^2 (Crysler and Latham Ltd.1979). Land use within the subwatershed is a mix of rural, urban, commercial/ industrial, and natural heritage features (MNRF 2014).

The water bodies associated with Stations 1 to 4 and the upper portion of Station 6 convey intermittent flow. Water flows around the perimeter of the Project and then south to Abrams Drain. The confluence with Abrams Drain is approximately 420 m downstream of the culvert at Cornwall Centre Road. Abrams Drain enters South Raisin River, approximately 2 km downstream (southeast) of Cornwall Centre Road. A pump outlet in the southwest corner of the Project provides additional surface water flow to Station 4; the pump conveys water from drainage tiles in the area.

The MNRF provided a fish species list for the South Raisin River. The list included Largemouth Bass, Northern Pike, Common Carp, Yellow Perch, and a diversity of baitfish species. There were no fisheries data provided specifically for Abrams Drain; however, the MNRF indicated it provides warmwater habitat (MNRF 2016d). During the spring site investigation, small-bodied fish species were observed at Station 1, Station 2, Station 3 and the west portion of Station 4. These water bodies provide fish habitat on a seasonal basis and contribute flow and nutrients to habitats located further downstream.

The wetland ponds at Station 7 are permanent ponds. They are isolated from other surface waters; therefore, the ponds do not contribute to downstream fish habitat. The characteristics of the ponds and surrounding wetlands are addressed in the NHA.

Physical characteristics and habitat information for the five water bodies within the ZOI (**Figure 3**) are provided in **Table 3.1**.

3.2 PREDICTED IMPACTS

Distances from solar panels to water bodies are provided in **Table 3.1**. There are no solar panels within 30 m of water bodies.

The proposed access road and secondary access road cross the water body that parallels Cornwall Centre Road (Station 4) (**Figure 3**). The primary site access will be located at the existing culvert used to access the property (i.e., the existing culvert parallel to Cornwall Centre Road). During construction, a secondary access road requires a culvert west of the primary access road (**Figure 3**). The roads and culverts are necessary to access the Project during construction and operation.

The Point of Common Coupling is located on the north side of Cornwall Centre Road, approximately 1.6 m from the water body associated with Station 4, and is the point at which Hydro One will connect the Project. The electrical cable will likely cross the water body via overhead electrical lines.

Potential effects of the project on water bodies are identified in **Table 3.1**. Mitigation measures are referenced and included in Section 5. It was concluded that with the implementation of mitigation measures, the project will have no net effect on water bodies. The conclusions assume that the potential negative effects presented in Section 4.0 (associated with solar panel installation, access road construction and Point of Common Coupling) can be mitigated through the application of measures presented in Section 5.0 or set out as conditions of approval in permitting processes outside REA (e.g., Fisheries Act, Conservation Authority regulated areas permitting, if required).

Table 3.1: Summary of Water Body Characteristics within the 120 m Zone of Investigation for the Barlow Solar Energy Centre

Reach/ Station No.	Site Description[a]	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
1	East side of Project Location May 6, 2016: Wetted width: 1.0 m Water depth (mean): 20 cm Maximum pool depth: 25 cm Small-bodied fish observed August 11, 2016 Dry Flow Regime: Intermittent Bankfull width: 1.5 m Substrate: Clay Aquatic vegetation: Algae Riparian vegetation: Shrubs and trees on east side Trapezoidal channel	Solar panels to be located within 120 m of a water body. Distance from water body to solar panels: 31 m	Construction activities associated with installing the solar panels may affect the water body beyond the constructible area (e.g., temporary increase in surface water turbidity due to runoff during construction). (see Section 4.1).	Design and implement erosion and sediment control measures and measures to reduce the risk of the entry of deleterious substances into surface waters (see Section 5.1).	None anticipated
2	West end of North side of the Project Location May 6, 2016: Wetted width: 1.5 m Water depth (mean): 30 cm Maximum pool depth: 40 cm Small-bodied fish observed August 11, 2016 Dry Flow Regime: Intermittent Bankfull width: 2.0 m Substrate: Clay Aquatic vegetation: None Riparian vegetation: Woodlot on north side Trapezoidal channel	Solar panels to be located within 120 m of a water body. Distance from water body to solar panels: 32 m	Construction activities associated with installing the solar panels may affect the water body beyond the constructible area (e.g., temporary increase in surface water turbidity due to runoff during construction). (see Section 4.1).	Design and implement erosion and sediment control measures and measures to reduce the risk of the entry of deleterious substances into surface waters (see Section 5.1).	None anticipated
3	West side of the Project Location May 6, 2016: Wetted width: 1 m Water depth (mean): 30 cm Maximum pool depth: 40 cm Small-bodied fish observed August 11, 2016 Dry Flow Regime: Intermittent Bankfull width: 2.5 m Substrate: Clay Aquatic vegetation: None Riparian vegetation: Wooded area on west side Trapezoidal channel	Solar panels to be located within 120 m of a water body. Distance from water body to solar panels: 32 m	Construction activities associated with installing the solar panels may affect the water body beyond the constructible area (e.g., temporary increase in surface water turbidity due to runoff during construction). (see Section 4.1).	Design and implement erosion and sediment control measures and measures to reduce the risk of the entry of deleterious substances into surface waters (see Section 5.1).	None anticipated

Table 3.1: Summary of Water Body Characteristics within the 120 m Zone of Investigation for the Barlow Solar Energy Centre

Reach/ Station No.	Site Description[a]	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
4	South side of the Project Location May 6, 2016: Wetted width: 1.5 m Water depth (mean): 20 cm Maximum pool depth: 30 cm Small-bodied fish observed west of Cornwall Centre Road culvert August 11, 2016 Dry Flow Regime: Intermittent Bankfull width: 3.5 m – 4 m Substrate: Clay Aquatic vegetation: Cattails, algae Riparian vegetation: Trees on south bank at west end. Grasses in reach immediately adjacent to Cornwall Centre Road Trapezoidal channel During the spring or during periods of precipitation, this water body contributes flow to Abrams Drain which is a tributary of the South Raisin River. Abrams Drain and the South Raisin River support warmwater fish communities (MNRF 2016b). The fish community the Raisin River includes the following species: Largemouth Bass, Northern Pike, Yellow Perch, Pumpkinseed, Common Carp, White Sucker, and cyprinids (MNRF 2016). Within the Project limits, the water body provides habitat for baitfish species during periods of high water.	1) Solar panels to be located within 120 m of a water body. Distance from water body to solar panels: 32 m to 33 m 2) Two culverts (access roads) crossing a water body. 3) Collector line crossing a water body. Point of Common Coupling (hydro pole) to be located within 120 m of a water body (north side of Cornwall Centre Road). Distance from water body to Point of Common Coupling: 1.6 m	1) Construction activities associated with installing the solar panels may affect the water body beyond the constructible area (e.g., temporary increase in surface water turbidity due to runoff during construction) (see Section 4.1). 2) Potential effects of culvert crossings on the water body include disturbance to aquatic biota and habitat during installation, permanent enclosure of portions of a water body and fish passage issues (also see Section 4.2). 3) If construction occurs under flowing water conditions, there is the potential for increased turbidity due to loss of vegetation.	1) Design and implement erosion and sediment control measures and measures to reduce the risk of the entry of deleterious substances into surface waters (see Section 5.1). 2) Design and install culverts to maintain fish passage and downstream flows and to protect fish during construction (Section 5.2). Design and implement erosion and sediment control measures (Section 5.1) 3) Construct during dry conditions. Design and implement erosion and sediment control measures (Section 5.1) and additional measures for electrical line crossing (Section 5.3).	None anticipated None anticipated None anticipated
6 (West of Station 3)	Private property (observations from property line) May 6, 2016 Contributing flow to Station 3 August 11, 2016 Dry Flow Regime: Intermittent Bankfull width: 1 to 2 m Aquatic vegetation: None visible Riparian vegetation: Wooded area	Solar panels to be located within 120 m of a water body. Distance from water body to solar panels: 32 m	Since this water body is located upgradient of the constructible area, potential impacts on surface water turbidity are not anticipated.	None required.	None anticipated

Table 3.1: Summary of Water Body Characteristics within the 120 m Zone of Investigation for the Barlow Solar Energy Centre

Reach/ Station No.	Site Description[a]	Proposed Works	Potential Impacts	Mitigation	Net Effects[b]
7	Two ponds immediately north of the Project Location May 6, 2016 **Northwest pond** Wetted area: 70 m x 30 m Water depth: 0.1 m to 1.0 m (deeper at north end) Substrate: muck, clay Riparian vegetation: The pond is part of a deciduous swamp with Silver Maple Bigtooth Aspen as the predominant woody species (Stantec 2016). Other species include Dogwood and Common Buckthorn. **Southeast pond** Wetted area: 25 m x 30 m Water depth: 1.0 m to 2.0 m (deeper at west end) Substrate: muck, detritus Riparian vegetation: The pond is in a forested area that is dominated by White Pine and Green Ash. Other species include Virginia Creeper, Common Buckthorn and Riverbank Grape,	Solar panels to be located within 120 m of a water body. Distance from water body to solar panels: ≥ 30 m	Construction activities associated with installing the solar panels may affect the reach outside the constructible area (e.g. Temporary increase in surface water turbidity due to runoff during construction). (see Section 4.1).	Design and implement erosion and sediment control measures and measures to reduce the risk of the entry of deleterious substances into surface waters (see Section 5.1).	None anticipated

[a] Stations 02 to 04 are survey locations along the same water body
[b] assumes all mitigation measures are implemented and successful

3.3 ADDITIONAL APPROVALS

The *Fisheries Act* prohibits causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada (DFO). This applies to work being conducted in or near water bodies that support fish that are part of or that support a commercial, recreational or Aboriginal (CRA) fishery. Since November 25, 2013, proponents must take the responsibility to determine whether or not their projects meet the DFO requirements under the Self-Assessment process. If serious harm cannot be avoided, proponents should contact DFO for a formal review and/or approval under the *Fisheries Act*.

Based on the current Project layout, it may be necessary to submit a Request for Review form to DFO due to the need to upgrade an existing culvert and install a new culvert across the water body along Cornwall Centre Road.

Permits for the proposed work are not likely required under the RRCA's O. Reg. 179/06 as there are no regulated areas within the Project Location (Stantec 2016). Consultation with the RRCA is ongoing to confirm if further requirements are necessary for development within the floodplain of the south branch of the Raisin River.

4.0 POTENTIAL IMPACTS

In addition to the following potential impacts, Sections 3.3 and Sections 5 (Environmental Effects Monitoring Plan [EEMP]) of the Construction Plan Report (CPR) for the Project discuss potential Project-related impacts.

4.1 GENERAL CONSTRUCTION-RELATED IMPACTS

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

- short-term increase in turbidity from runoff and soil erosion during construction
- loss of shade
- reduced bank stability
- reduction in inputs of organic matter, nutrients and other material originating from the terrestrial environment
- water quality and habitat disturbance effects to aquatic habitat
- water quality and habitat effects due to entry of deleterious substances into surface water

4.2 CULVERTS AND ACCESS ROADS

Potential impacts related to the installation and maintenance of culvert crossings in addition to the general impacts listed above may include:

- disturbance to aquatic biota and habitat during installation
- permanent enclosure of portions of a water body
- loss of bed material within the length of the culvert
- changes to riparian vegetation within road allowance
- changes to fish passage

4.3 ELECTRICAL LINES

4.3.1 Overhead

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

4.3.2 Underground

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

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

5.0 STANDARD MITIGATION MEASURES FOR WORKING NEAR WATER

Standard mitigation measures used for working in and around water are summarized below. Details of the mitigation measures should be determined through consultations with the local municipality, the RRCA, and DFO and are also dependent on project details such as technical requirements, construction methods and schedule.

In addition to the measures provided below, the Construction Plan Report (CPR) (Sections 4.0, and 5.0) and the EEMP within the Design & Operations Report (Sections 6) for the Project provide mitigation and monitoring commitments that are intended to reduce the risk of negative effects resulting from Project-related activities.

5.1 GENERAL MITIGATION MEASURES

General mitigation measures for construction activities near water bodies in the ZOI include:

- Complete in-water work within MNRF timing windows to protect local fish populations during their spawning and egg incubation periods. The Kemptville District MNRF provided the following in-water construction timing window for warmwater watercourses in the District: July 16 to March 14 (i.e., no in-water work between March 15 and July 15) (MNRF 2016d).
- Operate and store materials and equipment used for the purpose of site preparation and Project construction in a manner that reduces the risk of the entry of deleterious substances (e.g., petroleum products, silt, etc.) into surface waters:
  - store and stabilize stockpiled materials away from the water
  - refuel and maintain construction equipment at least 30 m from water bodies
  - report spills to the MOECC Spills Action Centre
  - any part of equipment entering the water shall be free of fluid leaks and externally cleaned/degreased to prevent deleterious substances from entering the water
  - only clean material, free of fine particulate matter shall be placed in the water
  - For the duration of the work, keep on-site and readily accessible, all material and equipment needed to contain and clean-up releases of sediment-laden water and other deleterious substances.
- Implement erosion and sediment control measures prior to construction and maintain measures during the construction phase to reduce the risk of the entry of sediment into the water:
  - silt fencing and/or barriers shall be used along construction areas adjacent to water bodies
  - no equipment shall be permitted to enter areas beyond the silt fencing during construction

  - all sediment and erosion control measures shall be inspected at least weekly and during and immediately following rainfall events to ensure that they are functioning properly and are maintained and/or upgraded as required
  - topsoil stockpiles shall be sufficiently distant from water bodies to preclude sediment inputs due to erosion of stored soil materials
  - all disturbed areas of the construction site shall be stabilized and re-vegetated as soon as conditions allow
  - sediment and erosion control measures should be left in place until the construction site has been stabilized with vegetation.
- Develop a response plan to be implemented in the event of a sediment release or spill of a deleterious substance.

5.2 NEW CULVERT CROSSINGS

5.2.1 Design

Culverts should be sized according to hydrologic requirements that will be determined during the detailed design / permit application stage. Other technical requirements may influence culvert size and materials.

Where fish that are part of or support a CRA fishery are present, culverts must be installed such that fish passage is maintained. Where a water body indirectly contributes to reaches downstream that support fish that are part of, or support a CRA fishery, the culvert must continue to convey flow to downstream areas.

Culverts shall be designed and installed to reduce the risk of:

- restriction of flows through the culvert resulting in upstream pooling
- erosion at the culvert inlets and outlets
- barriers to fish passage to upstream environments

5.2.2 Construction

Under flowing water conditions, water must be pumped or flumed around the work area to install a culvert. In-water timing windows are applicable when water is present. The following measures are applicable to isolation of in-water work:

- Coffer dams (e.g., aqua-dams, sand bags, concrete blocks, steel or wood wall, clean rip-rap, sheet pile or other appropriate designs) can be used to isolate the in-water work area from flowing water.
- If rip rap or pea gravel bags are used for coffer dams, clean, washed material should be used to build the berm. The berm face should consist of clean, washed granular material that is adequately sized (i.e., moderate sized rip rap - no sand or gravel) to hold the berm in place during construction.

- Coffer dams should be designed to accommodate expected high flows of the water body during the construction period.
- Before starting construction, fish should be rescued from behind the coffer dam and returned to an area outside of the isolated area.
- Accumulated sediment should be removed (ensuring that the original bed of the water body is not excavated) from behind the coffer dam before its removal.
- The original channel bottom gradient and substrate should be restored after coffer dam removal.
- Coffer dams should be removed in a downstream to upstream sequence to allow gradual re-introduction of water to the dewatered area and prevent excessive suspension of silt or other bed material.
- Pump intakes should be sized and adequately screened to prevent debris blockage and fish mortality (refer to the DFO *Freshwater Intake End-of-Pipe Fish Screen Guidelines*).
- The pumping system should be sized to accommodate expected high flows of the water body during the construction period. Back-up pumps should be kept on site in case of pump failure.
- The pump should be discharged to a grassed area to allow water to re-enter the water body only after it has been filtered through vegetation to prevent silt deposition. If no suitable areas exist, a filter bag should be place on the outlet to filter the water prior to re-entry into the water body.
- Work should not be completed during flood stage flows or during times when heavy precipitation is occurring or is expected.

5.3 ELECTRICAL LINES

5.3.1 Overhead

Although construction of overhead electrical lines (if required) would not require in-water works, it is the riparian habitat that is most sensitive to disturbance from overhead line construction. There is often riparian vegetation adjacent to water bodies, which contributes to fish habitat by providing shade, cover, and spawning and food production areas.

The following mitigation measures apply to installation of overhead electrical lines:

- do not construct and/or place temporary or permanent structures (e.g., islands, poles, crib works, etc.) below the ordinary high water mark (i.e., active channel/bankfull area) of a water body
- install overhead lines under frozen (or dry) conditions where possible
- implement standard erosion and sediment controls listed above (Section 5.1)

5.3.2 Underground

There are several options with respect to construction methods of a buried electrical line at a water body crossing. The four possible options are: 1) punch or bore, 2) high pressure directional drilling, 3) dry open-cut crossing and 4) isolated open-cut crossing. Mitigation measures for these methods vary slightly and are provided below.

Punch and Bore

In addition to the measures provided in Section 5.1, the following additional measures are recommended:

- A punch or bore crossing can be conducted at any time of the year provided there is not a high risk of failure and it does not require in-water activities such as machinery fording.
- Design the punch or bore path for an appropriate depth below the water body to reduce the risk of exposure due to natural scouring of the stream bed.
- The removal of select plants may be necessary to access the construction site and to excavate the bell holes. This removal shall be reduced to the extent possible and kept within the utility road allowance.
- Excavate bell holes beyond the high water mark (HWM), far enough away from any water body to allow containment of sediment or deleterious substances above the HWM:
  - When dewatering bell holes, remove suspended solids by diverting water into a vegetated area or settling basin, and reduce the risk of entry of sediment and other deleterious substances into the water body.
  - Stabilize waste materials removed from the work site (including bell holes) to prevent them from entering the water body. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
  - After suitably backfilling and packing the bell holes, vegetate disturbed areas.
  - If the excavation bell holes cannot be located as indicated above, consultation should occur with the RRCA and DFO to confirm if additional mitigation measures may be required.
- Monitor the water body to observe signs of malfunction during all phases of work.

High Pressure Directional Drill

In addition to the measures provided in Section 5.1, the following additional measures are recommended:

- Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.
- Design the drill path to an appropriate depth below the water body to minimize the risk of frac-out and to a depth to prevent the line from becoming exposed due to natural scouring of the stream bed. The drill entry and exit points are far enough from the banks of the water body to have minimal impact on these areas.
- The removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the road or utility road allowance.

- Construct a dugout/settling basin at the drilling exit site to contain drilling mud to reduce the risk of sediment and other deleterious substances from entering the water body. If this cannot be achieved, use silt fences or other effective sediment and erosion control measures to prevent drilling mud from entering the water body. Inspect these measures regularly during the course of construction and make necessary repairs if damage occurs.
  - Dispose of excess drilling mud, cuttings and other waste materials at an adequately sized disposal facility located away from the water to prevent it from entering the water body.
- Monitor the water body to observe signs of surface migration (inadvertent release/frac-out) of drilling mud during phases of construction.
- Prepare an Emergency Frac-out Response and Contingency Plan

Dry Open-Cut

Mitigation measures to employ for dry open-cut crossings (dry water body) include:

- crossings should be undertaken on days when precipitation is not expected
- the tracked excavator should be working in the dry when excavating a trench
- topsoil stockpiles should be reasonably distant from water bodies to preclude sediment inputs due to erosion of stored soil materials
- water bodies should be backfilled with substrate material that is consistent with the existing substrate size and texture and should remain in/under the crossing
- the water body bed and bank areas should be rehabilitated to pre-excavation condition
- materials such as sand bags, straw bales, geotextile filters, and/or pumps should be readily available on-site so that the crossing can be completed in the dry in case of unexpected stream flow

Isolated Open-Cut (Dam and Pump Crossings)

Where an open cut crossing is not possible, in-water work should be completed in the dry by de-watering the work area and diverting and/or pumping flows around cofferdams placed at the limits of the work area.

In addition to measures provided in Section 5.1 and Section 5.2 (Construction), the following measures are recommended during construction of an isolate open-cut crossing of a water body:

- crossings should be undertaken on days when precipitation is not expected
- topsoil stockpiles should be reasonably distant from water bodies to preclude sediment inputs due to erosion of stored soil materials
- water bodies should be backfilled with substrate material that is consistent with the existing substrate size and texture and should remain in/under the crossing
- the water body bed and bank areas should be rehabilitated to pre-excavation condition
- materials such as sand bags, straw bales, geotextile filters, and backup pumps should be readily available on-site in case of an unexpected increase stream flow.

6.0 CONCLUSIONS

The Barlow Solar Energy Centre *Water Assessment and Water Body Report* was prepared by Stantec for Barlow Energy Centre Limited Partnership in accordance with O. Reg. 359/09. This report is one component of the REA application for the Project.

The identification of water bodies within the ZOI was conducted by qualified staff using available background information, field conditions and the definition of water body provided in O. Reg. 359/09. The characteristics of five water bodies were provided and potential impacts of the Project were identified. Based on the current Project layout and proposed environmental mitigation measures, no net effects to water bodies are expected to occur as a result of the Project.

Once culvert size and construction methods are finalized, DFO review under the *Fisheries Act* may be required due to work associated with the access roads (i.e., culvert installation or upgrading); however, a *Fisheries Act* Authorization will not likely be required.

7.0 REFERENCES

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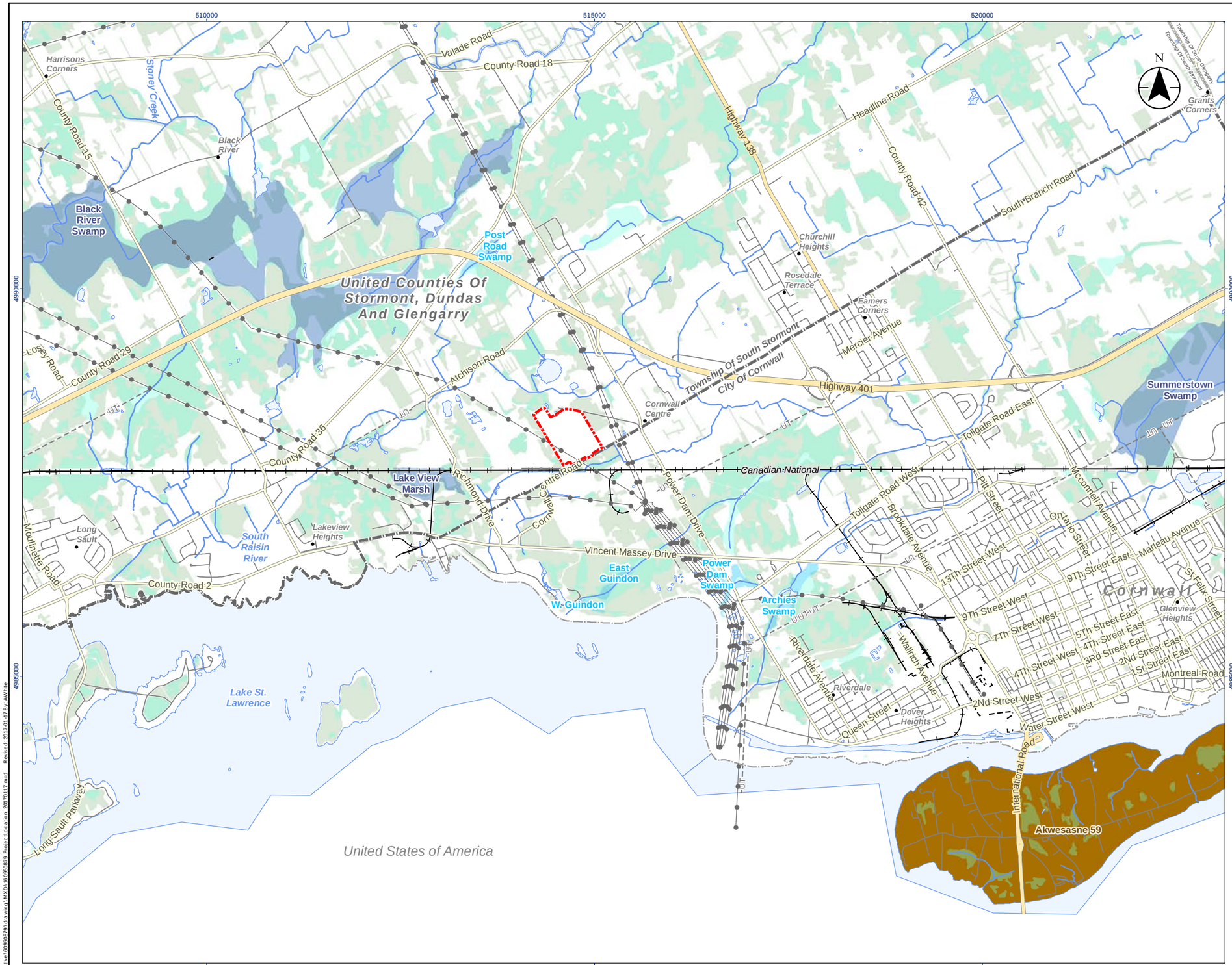
APPENDIX A: FIGURES



Stantec

BARLOW solar energy centre

Legend

- Project Location
- Highway
- Major Road
- Minor Road
- Railway
- Hydro One Transmission Line
- Unknown Pipeline
- Unknown Transmission Line
- Watercourse (Intermittent)
- Watercourse (Permanent)
- Municipal Boundary, Upper
- Municipal Boundary, Lower
- Waterbody
- Wetland, Provincially Significant
- Wetland, Other Evaluated
- Wetland, Not evaluated per OWES
- Wooded Area
- First Nation Reserve

0 1 2 Kilometres

1:50,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 18N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2016.
3. Waterbody and watercourse mapping within 120 m of the Project Location has been updated based on field studies completed as part of the REA process under O. Reg. 359/09. See the Water Assessment and Water Body Report for details.

Project Location
Municipality of United Counties Of Stormont, Dundas And Glengarry

160950879 REVC
Prepared by AW on 2017-01-17

Client/Project
BARLOW ENERGY CENTRE LP
BARLOW SOLAR ENERGY CENTRE

Figure No.
1

Title
Site Location

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Stantec BARLOW solar energy centre

Legend

Aquatic Features

- Flow Direction
- Type D Drain (DFO Drain Classification)
- Type E Drain (DFO Drain Classification)
- Watercourse (as per MNRF mapping)
- Zone of Investigation (120 m from Project Location)
- Water Body (as per MNRF mapping)

Proposed Project Components

- Culvert
- Project Location

Existing Features

- Major Road
- Minor Road
- Culvert
- Hydro One Transmission Line
- Pipeline
- Railway

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 18N
2. Base features and aerial imagery produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2016.
3. Imagery Source: DRAPE 2014

Project Location
United Counties of Stormont, Dundas and Glengarry

160950879 REVF
Prepared by AMW on 2017-01-17
Technical Review by KT on 2016-11-10
Independent Review by RN on 2017-01-02

Client/Project
BARLOW ENERGY CENTRE LIMITED PARTNERSHIP
BARLOW SOLAR ENERGY CENTRE

Figure No.
2

Title
Background Information

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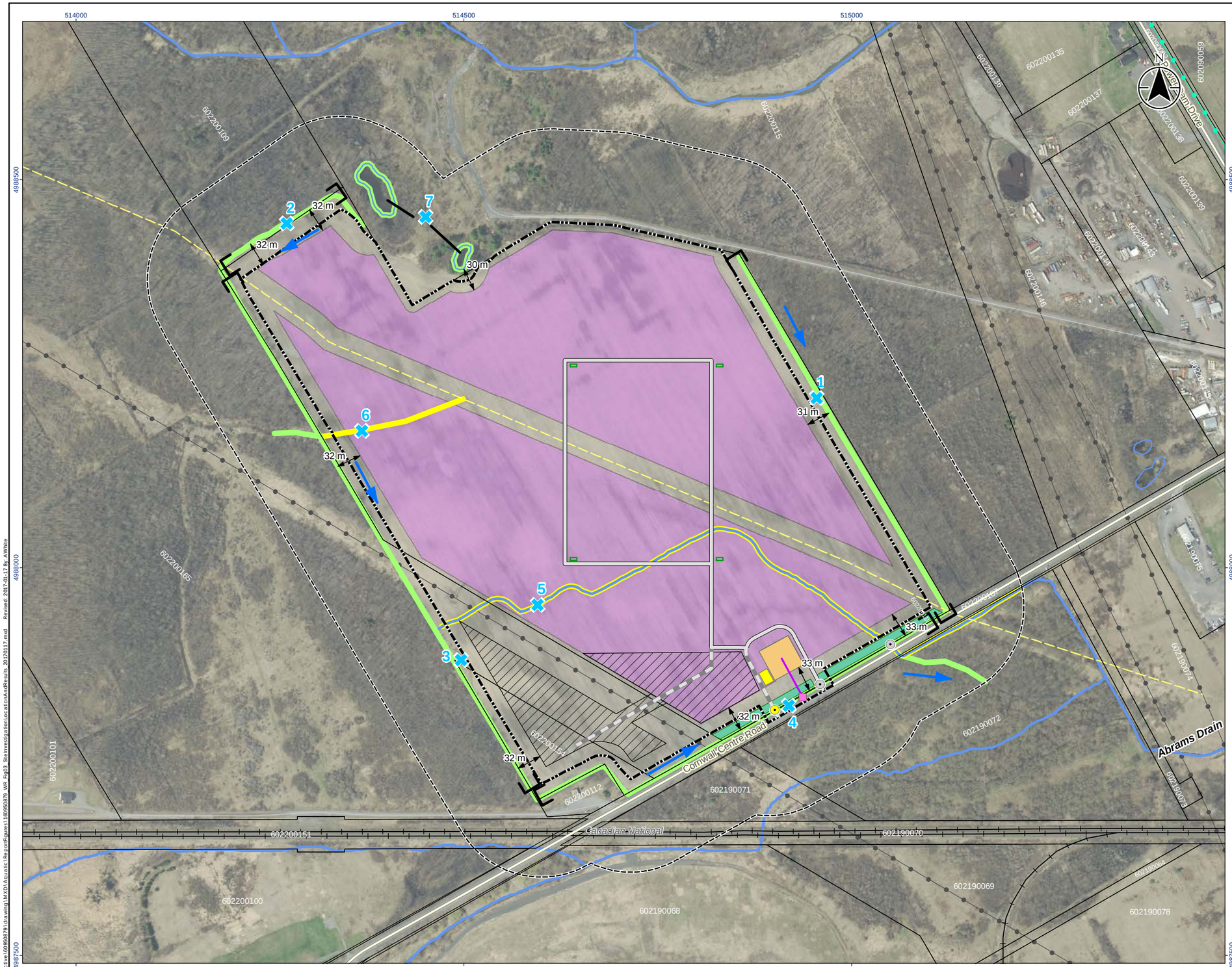

Stantec BARLOW solar energy centre

Legend

Aquatic Features

- Reach and Station
- Flow Direction
- Water Body (as per O.Reg. 359/09)
- Not a Water Body (as per O.Reg. 359/09)
- Distance between Water Body and Project Component
- Zone of Investigation (120 m from Project Location)

Proposed Project Components

- Point of Common Coupling
- Culvert (proposed)
- Connection Line
- Inverter Step-up Transformer and Inverter
- Permanent Access
- Temporary Access During Construction
- Temporary Construction Laydown and Parking Area
- Operations & Maintenance Storage Area
- Project Location
- Solar Panel Area
- Substation
- Tree Planting Area

Existing Features

- Major Road
- Minor Road
- Culvert (existing)
- Distribution Line (Hydro One)
- Hydro One Transmission Line
- Pipeline
- Railway
- Watercourse (as per MNRF mapping)
- Property Boundary and PIN
- Waterbody (as per MNRF mapping)

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 18N
2. Base features and aerial imagery produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2016.
3. Imagery Source: DRAPE 2014

Project Location
United Counties of Stormont, Dundas and Glengarry

160950879 REVE
Prepared by AMW on 2017-01-17
Technical Review by KT on 2016-11-10
Independent Review by RN on 2017-01-02

Client/Project
BARLOW ENERGY CENTRE LIMITED PARTNERSHIP
BARLOW SOLAR ENERGY CENTRE

Figure No.
3

Title
Site Investigation Locations and Results

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APPENDIX B: PHOTOGRAPHIC RECORD

STATION 1

(SOUTH TO NORTH)

Station 1: Facing upstream (north).

Station 1: Substrate at previous photo location (Photo IMG_0722).

Station 1: Facing upstream (northwest).

Station 1: Substrate at previous photo location (Photo IMG_0727).

tation 1: Facing upstream (northwest).

Station 1: Facing upstream (northwest) near north end of station.

Station 1: Facing northwest (at north end of station).

STATION 2

(EAST TO WEST)

Station 2: Facing northwest.

Station 2: Facing downstream (west).

Station 2: Facing downstream (west).

Station 2: Facing downstream (west).

STATION 3

(NORTH TO SOUTH)

Station 3: Facing downstream (southeast).

Station 3: Facing downstream (southeast).

Station 3: Facing downstream (south), at confluence with Station 6.

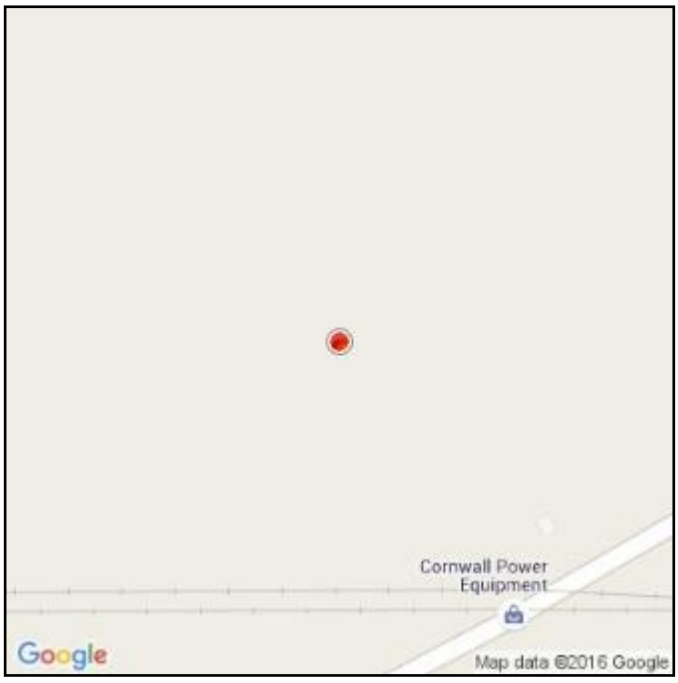
Station 3: Facing northwest toward Station 6.

Station 3: Facing downstream (southeast).

Station 3: Facing downstream (southeast).

Station 3: Facing downstream (southeast).

Station 3: Facing downstream (southeast).



Station 3: Facing downstream (southeast) at corner.

Station 3: Facing downstream (northeast) past 90° bend.

STATION 4

(WEST TO EAST)

Station 4: Facing downstream (east) at corner.

Station 4: Facing downstream (south).

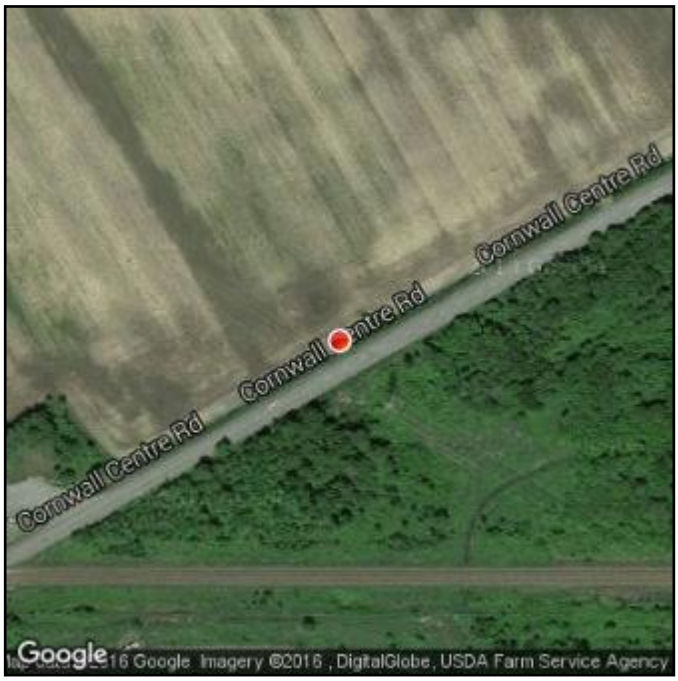
Station 4: Facing west towards pump.

Station 4: Facing downstream (southeast).

Station 4: Pump outlet.

Station 4: Facing downstream (east).

Station 4: Facing downstream (east).



Station 4: Facing downstream (east).

Station 4: Facing downstream (east).

Station 4: Substrate at Photo IMG_0781 (see below).

Station 4: Facing downstream (east).

Station 4: Facing downstream (south).

Station 4: Facing downstream (east).

STATION 7

Station 7: Southeast Pond, facing west.

Station 7: Southeast Pond, facing north.

Station 7: Northwest Pond facing north-northeast (June 7, 2016)

Station 7: Northwest Pond facing northeast (June 7, 2016)

Station 7: Northwest Pond facing east (June 7, 2016)

APPENDIX C: FIELD NOTES

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph ON N1G 4P5

Waterbody Rapid Assessment Form

Project Number:
Project Name: Barlow
Date: 06/May/2016
Field Personnel: J. Mansell A. Rodriguez
Weather Conditions: (current) TEMP (°C): 17 | PRECIPITATION: 0 mm
Weather Conditions: (previous 24-hrs) TEMP (°C): 4 - 17 | PRECIPITATION: 0 mm
Station No.: 01
Watercourse Name: Unnamed
UTM Coordinates: Zone 18T Easting E 515071 Northing N 4988034
Datum: NAD 83
Start Time: 12:58
End Time: 13:10
Photos:
Descriptive Location: Drainage channel on eastern boundary of property

Water Quality

Dissolved Oxygen: 10.25 mg/L
pH: 7.54
Conductivity: 456 µS/cm
Water Temperature: 17.12 °C
Air Temperature: 17 °C
Time in situ measurements taken: 13:08

Watercourse Dimensions & Morphology

Mean Wetted Width: 1.0 (m)
Maximum Pool Depth: 25 (cm)
Mean Bankfull Width: 1.5 (m)
Mean Water Depth: 20 (cm)
Riffle: 0 %
Pool: 100 %
Run: 0 %
Flat: 100 %
Evidence of Eroding Banks: None
Comments on Bank Stability: Banks are formed by excavated material and seem stable

Substrate (percent cover)

Bedrock: % Cobble: % Sand: % Silt: % Muck: %
Boulder: % Gravel: % Clay: 100 % Marl: % Detritus: %

In-water Cover (check cover types present)

☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☑ Aquatic Vegetation
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other:

Riparian Zone

Riparian Cover: 25% shaded, schrubs and trees, mature on east side, clear on property side
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: Wooded area to the east, agricultural (site) to the west

Fish Habitat Potential

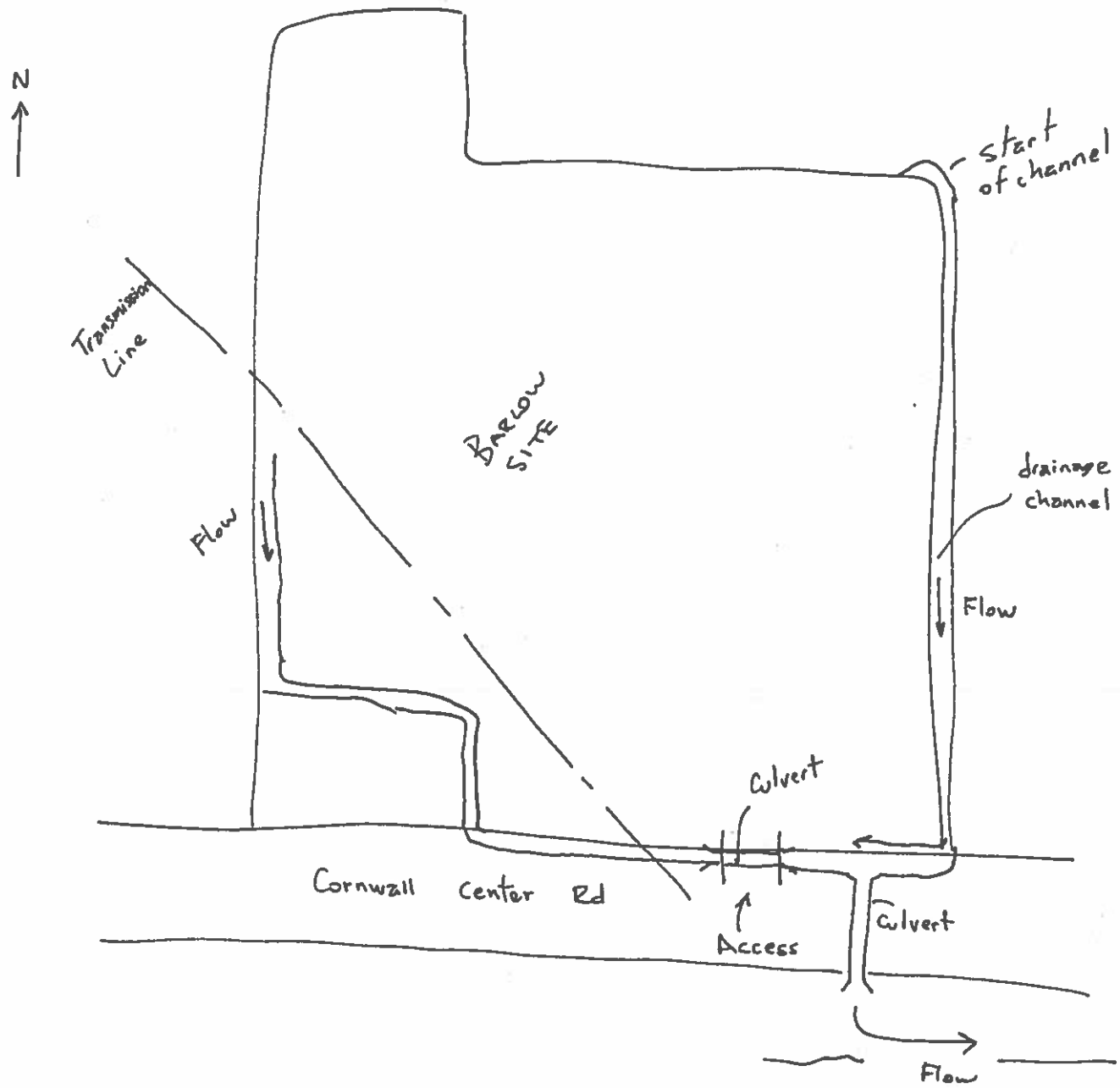
Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: None
(seasonal; permanent)
Fish Observed: Small bodied fish observed
(note any fish observations)

Characteristics

Natural Watercourse:
Trapezoidal Channel: ✓
Roadside Ditch:
Buried Tile:
Seep:
Temporary Channel: (e.g., furrows)
Dugout Pond:
Other (describe below):

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☑ check if notes continued on back of this form

Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial: Andres Rodriguez AR (field notes author)
Print Name & Initial: (field notes QA/QC personnel)



Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial: Andres Rodriguez AR (field notes author)

Print Name & Initial: _____ (field notes QA/QC personnel)

Stantec

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph ON N1G 4P5

Waterbody Rapid Assessment Form

Project Number:
Project Name: Barlow
Date: 06 / May / 2016
Field Personnel: J. Mansell A. Rodriguez
Weather Conditions: (current) 18 TEMP (°C) | 0 mm PRECIPITATION
Weather Conditions: (previous 24-hrs) 4 - 18 TEMP (°C) | 0 mm PRECIPITATION
Station No.: 02
Watercourse Name: Unnamed
UTM Coordinates: 18T (Zone) E 514259 (Easting) N 4988438 (Northing)
Datum: NAD 83
Start Time: 13:48
End Time: 14:00
Photos:
Descriptive Location: North boundary of property

Water Quality

Dissolved Oxygen: 8.36 mg/L
pH: 7.58
Conductivity: 398 µS/cm
Water Temperature: 19.02 °C
Air Temperature: 18 °C
Time in situ measurements taken: 13:55

Watercourse Dimensions & Morphology

Mean Wetted Width: 1.5 (m)
Maximum Pool Depth: 40 (cm)
Mean Bankfull Width: 2.0 (m)
Mean Water Depth: 30 (cm)
Riffle: 0 %
Pool: 100 %
Run: 0 %
Flat: 100 %
Evidence of Eroding Banks: No evidence
Comments on Bank Stability: Banks are formed by excavation, no signs of flow erosion or instability

Substrate (percent cover)

Bedrock: % Cobble: % Sand: % Silt: % Muck: %
Boulder: % Gravel: % Clay: 100 % Marl: % Detritus: %

In-water Cover (check cover types present)

☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☑ Aquatic Vegetation
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other:

Riparian Zone

Riparian Cover: 20% cover on north side by wooded area, 0% cover on south side
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: Wooded area to the north, agricultural to the south on property

Fish Habitat Potential

Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: None
(seasonal; permanent)
Fish Observed: Small bodied fish were observed
(note any fish observations)

Characteristics

Natural Watercourse: Trapezoidal Channel: Roadside Ditch: Buried Tile: Seep:
Temporary Channel: (e.g., furrows) Dugout Pond: Other (describe below): Semi-circular

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☐ check if notes continued on back of this form

Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial: Andres Rodriguez AR (field notes author)
Print Name & Initial: (field notes QA/QC personnel)

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial:_____ (field notes author)

Print Name & Initial:_____ (field notes QA/QC personnel)

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph ON N1G 4P5

Waterbody Rapid Assessment Form

Project Number:
Project Name: Barlow
Date: 06 / May / 2016
Field Personnel: J. Mansell A. Rodriguez
Weather Conditions: (current) TEMP (°C): 18 | PRECIPITATION: 0 mm
Weather Conditions: (previous 24-hrs) TEMP (°C): 4 – 18 | PRECIPITATION: 0 mm
Station No.: 03
Watercourse Name: Unnamed
UTM Coordinates: Zone 18 T Easting E 514428 Northing N 4987982
Datum: NAD 83
Start Time: 14 : 20
End Time: 14 : 35
Photos:
Descriptive Location: Western side of property running North - South

Water Quality

Dissolved Oxygen: 9.45 mg/L
pH: 7.89
Conductivity: 8470 µS/cm
Water Temperature: 19.15 °C
Air Temperature: 19 °C
Time in situ measurements taken: 14 : 29

Watercourse Dimensions & Morphology

Mean Wetted Width: 1 m (m)
Maximum Pool Depth: 40 (cm)
Mean Bankfull Width: 2.5 m (m)
Mean Water Depth: 30 (cm)
Riffle: 0 %
Pool: 100 %
Run: 0 %
Flat: 100 %
Evidence of Eroding Banks: No evidence
Comments on Bank Stability: Stable channel with vegetation developed on both sides

Substrate (percent cover)

Bedrock: % Cobble: % Sand: % Silt: % Muck: %
Boulder: % Gravel: % Clay: 100 % Marl: % Detritus: %

In-water Cover (check cover types present)

☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☑ Aquatic Vegetation
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other:

Riparian Zone

Riparian Cover: 20% cover on west bank by wooded area, 0% cover on east side
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: Wooded area to the east, agricultural to the west (site)

Fish Habitat Potential

Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: Not observed
(seasonal; permanent)
Fish Observed: Small bodied fish observed
(note any fish observations)

Characteristics

Natural Watercourse:
Trapezoidal Channel: ✓
Roadside Ditch:
Buried Tile:
Seep:
Temporary Channel: (e.g., furrows)
Dugout Pond:
Other (describe below):

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☐ check if notes continued on back of this form

Excavated channel running on western boundary of property

Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial: Andres Rodriguez AR (field notes author)
Print Name & Initial: (field notes QA/QC personnel)

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial:_____ (field notes author)

Print Name & Initial:_____ (field notes QA/QC personnel)

Stantec **Stantec Consulting Ltd.**
70 Southgate Drive, Suite 1, Guelph ON N1G 4P5

Waterbody Rapid Assessment Form

Project Number: _____ Project Name: Barlow
Date: 06 / May / 2016 Field Personnel: J. Mansell A. Rodriguez
Weather Conditions: (current) TEMP (°C): 19 | PRECIPITATION: 0 mm
Weather Conditions: (previous 24-hrs) TEMP (°C): 4-19 | PRECIPITATION: 0 mm

Station No.: 04b Watercourse Name: Unnamed
UTM Coordinates: Zone 18T Easting E 514629 Northing N 4987720 Datum: NAD 83
Start Time: 14:40 End Time: 14:55 Photos: _____
Descriptive Location: South boundary of property running east to west

Water Quality
Dissolved Oxygen: 10.59 mg/L pH: 8.29 Conductivity: 492 µS/cm
Water Temperature: 19.57 °C Air Temperature: 19 °C Time in situ measurements taken: 14:43

Watercourse Dimensions & Morphology
Mean Wetted Width: 1.5 (m) Maximum Pool Depth: 30 (cm)
Mean Bankfull Width: 3.0 (m) Mean Water Depth: 20 (cm)
Riffle: 0 % Pool: 100 % Run: 0 % Flat: 100 %
Evidence of Eroding Banks: No evidence
Comments on Bank Stability: Bank is stable with vegetation on both sides

Substrate (percent cover)
Bedrock: ___ % Cobble: ___ % Sand: ___ % Silt: ___ % Muck: ___ %
Boulder: ___ % Gravel: ___ % Clay: 100 % Marl: ___ % Detritus: ___ %

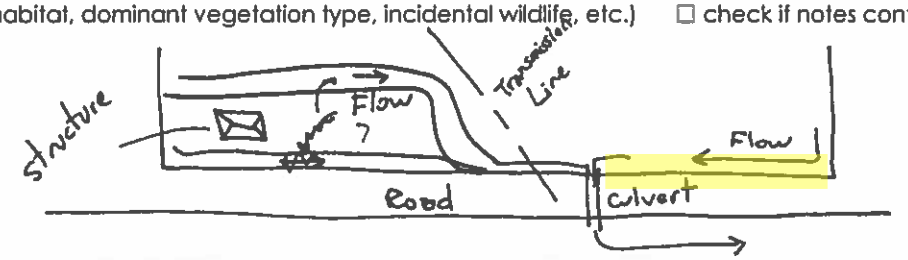
In-water Cover (check cover types present)
☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☑ Aquatic Vegetation
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other: _____

Riparian Zone
Riparian Cover: 25 % coverage on south bank by trees, no cover on north bank
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: South is transportation, north is agricultural

Fish Habitat Potential
Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: None
(seasonal; permanent)
Fish Observed: None
(note any fish observations)

Characteristics
Natural Watercourse: _____ Trapezoidal Channel: ✓ Roadside Ditch: _____ Buried Tile: _____ Seep: _____
Temporary Channel: _____ (e.g., furrows) Dugout Pond: _____ Other (describe below): _____

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☐ check if notes continued on back of this form



PAGE 1 OF 1 Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial: Andres Rodriguez AR (field notes author) Print Name & Initial: _____ (field notes QA/QC personnel)

Stantec **Stantec Consulting Ltd.**
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Waterbody Rapid Assessment Form

Project Number: _____ Project Name: Barlow
Date: 06 / May / 2016 Field Personnel: J. Mansell A. Rodriguez
Weather Conditions: (current) 20 (TEMP (°C)) | 0 mm (PRECIPITATION) Weather Conditions: (previous 24-hrs) 4 - 20 (TEMP (°C)) | 0 mm (PRECIPITATION)

Station No.: ~~05~~ 4a Watercourse Name: Unnamed
UTM Coordinates: 18T (Zone) E 514952 (Easting) N 4987844 (Northing) Datum: NAD 83
Start Time: 15:00 End Time: 15:20 Photos: _____
Descriptive Location: South boundary of property running west to east

Water Quality
Dissolved Oxygen: 15.90 mg/L pH: 8.09 Conductivity: 581 µS/cm
Water Temperature: 16.47 °C Air Temperature: 20 °C Time *in situ* measurements taken: 15:06

Watercourse Dimensions & Morphology
Mean Wetted Width: 1.5 (m) Maximum Pool Depth: 30 (cm)
Mean Bankfull Width: 3.5 (m) Mean Water Depth: 20 (cm)
Riffle: 0 % Pool: 100 % Run: 0 % Flat: 100 %
Evidence of Eroding Banks: No evidence
Comments on Bank Stability: Heavy vegetation on both banks

Substrate (percent cover)
Bedrock: % Cobble: % Sand: % Silt: % Muck: %
Boulder: % Gravel: % Clay: 100 % Marl: % Detritus: %

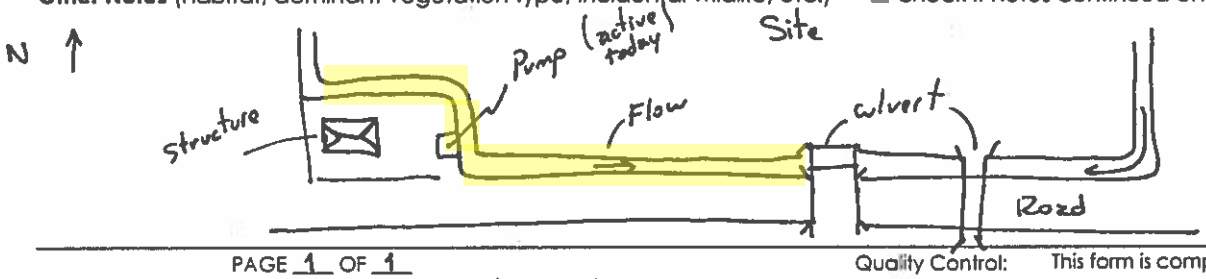
In-water Cover (check cover types present)
☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☑ Aquatic Vegetation
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other: _____

Riparian Zone
Riparian Cover: 0 % cover on both banks
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: Transportation on ~~not~~ south boundary and agricultural on north (site)

Fish Habitat Potential
Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: None
(seasonal; permanent)
Fish Observed: Small bodied fish observed
(note any fish observations)

Characteristics
Natural Watercourse: _____ Trapezoidal Channel: _____ Roadside Ditch: ✓ Buried Tile: _____ Seep: _____
Temporary Channel: _____ (e.g., furrows) Dugout Pond: _____ Other (describe below): _____

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☐ check if notes continued on back of this form



PAGE 1 OF 1 Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial: Andres Rodriguez AR (field notes author) Print Name & Initial: _____ (field notes QA/QC personnel)

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Waterbody Rapid Assessment Form

Project Number: 160950879
Project Name: Barlow Solar Energy
Date: 11/Aug/2016
Field Personnel: J. Mansell, A. Rodriguez

Weather Conditions (current): TEMP (°C) 35 | PRECIPITATION 0
Weather Conditions (previous 24-hrs): TEMP (°C) 36 | PRECIPITATION 0

Station No.: Station #1
Watercourse Name: Unnamed
UTM Coordinates: Zone 18T Easting E 514985 Northing N 4988179
Datum: NAD 83

Start Time: 1245
End Time:
Photos:
Descriptive Location: Drainage ditch along eastern boundary of property

Water Quality

Dissolved Oxygen: / mg/L
pH: /
Conductivity: / µS/cm
Water Temperature: / °C
Air Temperature: / °C
Time in situ measurements taken:

Watercourse Dimensions & Morphology

Mean Wetted Width: / (m)
Maximum Pool Depth: / (cm)
Mean Bankfull Width: 1.5 (m)
Mean Water Depth: / (cm)
Riffle: / %
Pool: / %
Run: / %
Flat: / %
Evidence of Eroding Banks: None
Comments on Bank Stability: /

Substrate (percent cover)

Bedrock: / %
Cobble: / %
Sand: / %
Silt: 20 %
Muck: / %
Boulder: / %
Gravel: / %
Clay: 80 %
Marl: / %
Detritus: / %

In-water Cover (check cover types present)

☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☐ Aquatic Vegetation
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other: n/a.

Riparian Zone

Riparian Cover: See previous notes from May 6/2016.
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: Woodland + agricultural field.

Fish Habitat Potential

Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: Seasonal - no water
(seasonal; permanent)
Fish Observed: None
(note any fish observations)

Characteristics

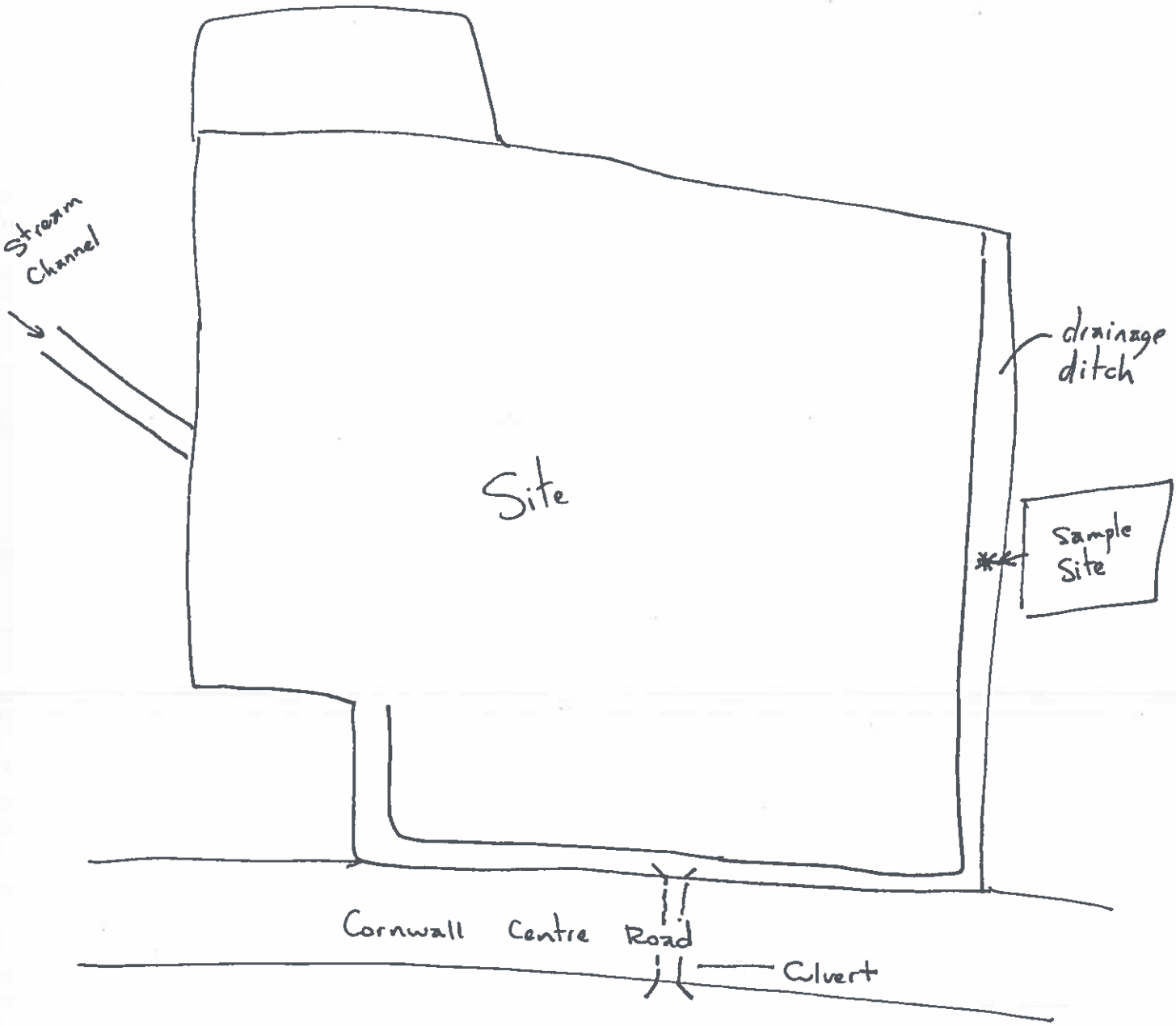
Natural Watercourse: ☐
Trapezoidal Channel: /
Roadside Ditch: ☐
Buried Tile: ☐
Seep: ☐
Temporary Channel: ☐ (e.g., furrows)
Dugout Pond: ☐
Other (describe below): Perimeter drainage swale

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☐ check if notes continued on back of this form

No water!!

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial: Jack Mansell (field notes author)
Print Name & Initial: (field notes QA/QC personnel)



Print Name & Initial: Jack Mansell (field notes author)

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial: (field notes QA/QC personnel)

Stantec **Stantec Consulting Ltd.**
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Waterbody Rapid Assessment Form

Project Number: 160950879
Date: 11 / Aug / 2016
Project Name: Barlow Solar Energy
Field Personnel: J. Mansell, A. Rodriguez

Weather Conditions (current): TEMP (°C): 35 | PRECIPITATION: 0
Weather Conditions (previous 24-hrs): TEMP (°C): 36 | PRECIPITATION: 0

Station No.: Station #2
Watercourse Name: Unnamed
UTM Coordinates: Zone 18T | Easting E 514270 | Northing N 4998447
Datum: NAD 83
Start Time: 1257
End Time:
Photos:
Descriptive Location: Drainage ditch along northern boundary of property

Water Quality

Dissolved Oxygen: / mg/L
pH: /
Conductivity: / µS/cm
Water Temperature: / °C
Air Temperature: / °C
Time in situ measurements taken: /

Watercourse Dimensions & Morphology

Mean Wetted Width: / (m)
Maximum Pool Depth: / (cm)
Mean Bankfull Width: 2.0 (m)
Mean Water Depth: / (cm)
Riffle: / %
Pool: / %
Run: / %
Flat: / %
Evidence of Eroding Banks: None
Comments on Bank Stability: /

Substrate (percent cover)

Bedrock: / %
Cobble: / %
Sand: / %
Silt: / %
Muck: / %
Boulder: / %
Gravel: / %
Clay: 100 %
Marl: / %
Detritus: / %

In-water Cover (check cover types present)

☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☐ Aquatic Vegetation n/a.
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other:

Riparian Zone

Riparian Cover: See previous notes from May 6/2016.
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: Forest + agricultural field.

Fish Habitat Potential

Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: Seasonal - no water
(seasonal; permanent)
Fish Observed: None
(note any fish observations)

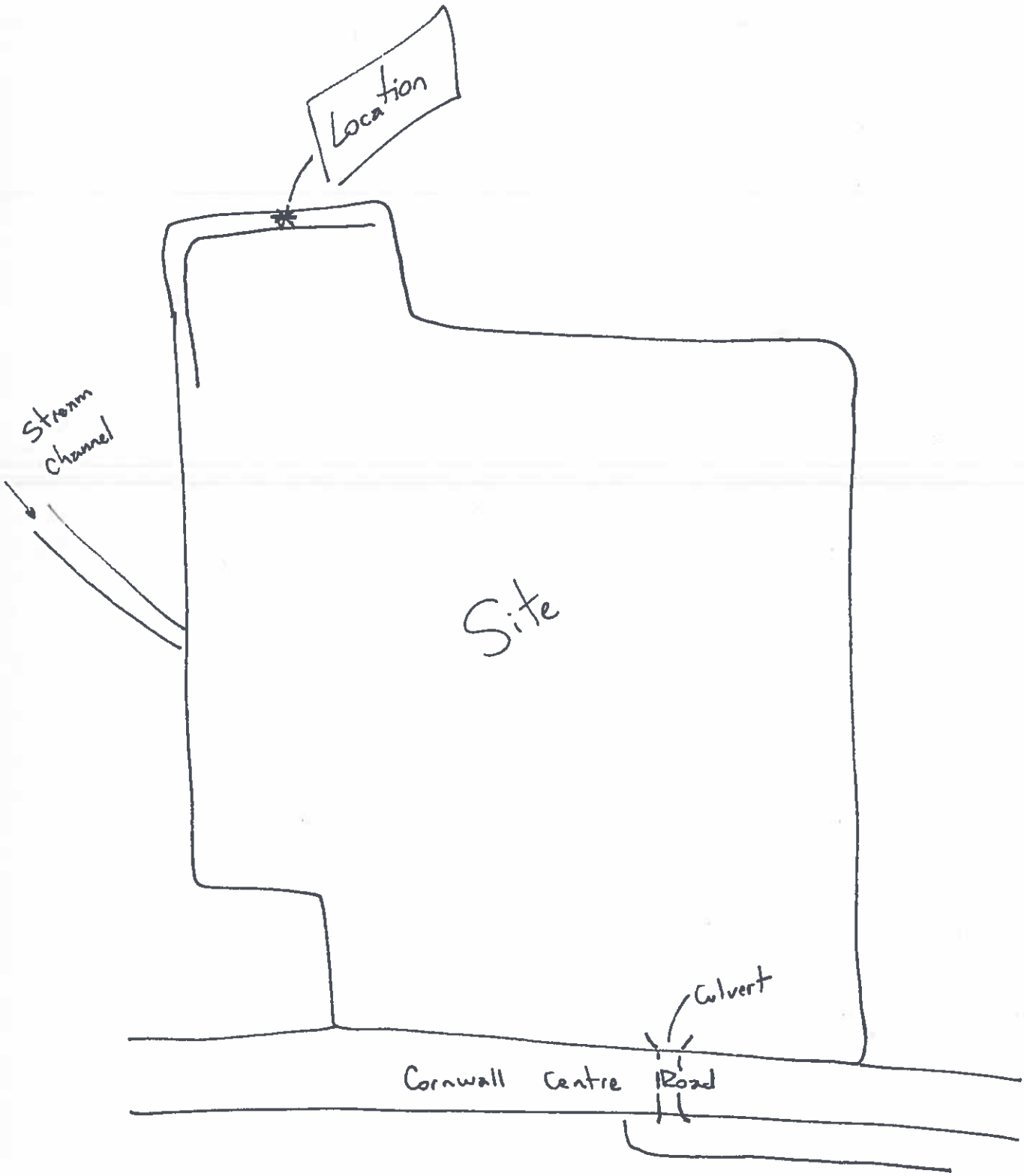
Characteristics

Natural Watercourse: ☐ Trapezoidal Channel: ✓ Roadside Ditch: ☐ Buried Tile: ☐ Seep: ☐
Temporary Channel: ☐ (e.g., furrows) Dugout Pond: ☐ Other (describe below): Drainage swale

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☐ check if notes continued on back of this form

No water!

Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial: Scott Mansell (field notes author)
Print Name & Initial: (field notes QA/QC personnel)



Print Name & Initial: Josh Marsell (field notes author)

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial: (field notes QA/QC personnel)

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Waterbody Rapid Assessment Form

Project Number: 160950879
Date: 11 / Aug / 2016
Project Name: Barlow Solar Energy
Field Personnel: J. Mansell, A. Rodriguez

Weather Conditions (current): TEMP (°C) 35 | PRECIPITATION 0
Weather Conditions (previous 24-hrs): TEMP (°C) 36 | PRECIPITATION 0

Station No.: Station #9
Watercourse Name: Unnamed
UTM Coordinates: Zone 18T Easting E 514346 Northing N 4988123
Datum: NAD 83

Start Time: 1259
End Time: –
Photos: –
Descriptive Location: Drainage ditch on western boundary of property

Water Quality

Dissolved Oxygen: / mg/L
pH: –
Conductivity: – µS/cm
Water Temperature: / °C
Air Temperature: / °C
Time *in situ* measurements taken: /

Watercourse Dimensions & Morphology

Mean Wetted Width: / (m)
Maximum Pool Depth: – (cm)
Mean Bankfull Width: 2.5 (m)
Mean Water Depth: / (cm)
Riffle: / %
Pool: / %
Run: – %
Flat: – %
Evidence of Eroding Banks: None
Comments on Bank Stability: /

Substrate (percent cover)

Bedrock: / %
Cobble: / %
Sand: / %
Silt: – %
Muck: – %
Boulder: / %
Gravel: / %
Clay: 100 %
Marl: – %
Detritus: – %

In-water Cover (check cover types present)

☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☐ Aquatic Vegetation
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other: n/a.

Riparian Zone

Riparian Cover: See notes from previous May 6/2016.
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: Forest + agricultural field.

Fish Habitat Potential

Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: Seasonal - no water.
(seasonal; permanent)
Fish Observed: None
(note any fish observations)

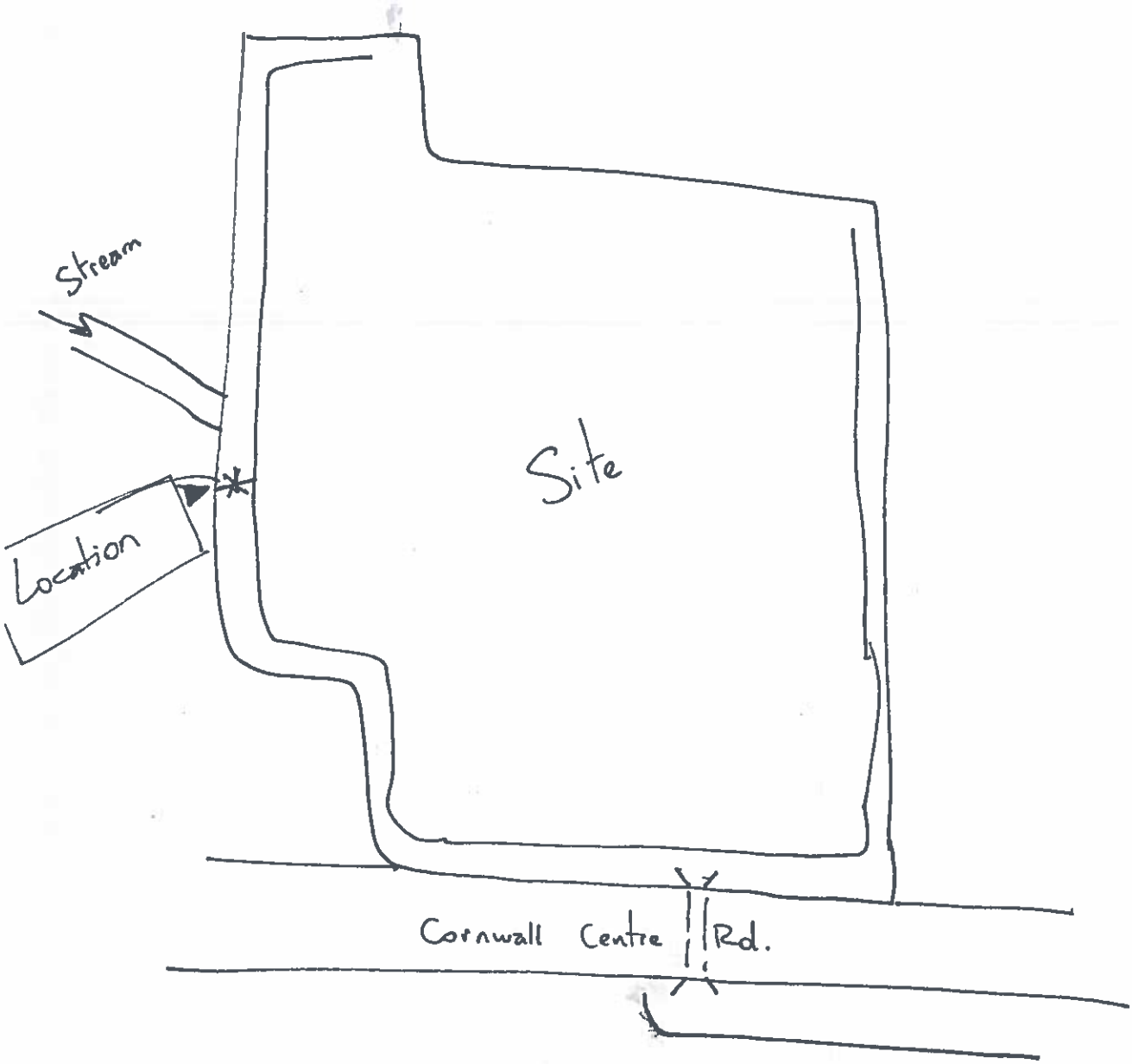
Characteristics

Natural Watercourse: ☐
Trapezoidal Channel: /
Roadside Ditch: ☐
Buried Tile: ☐
Seep: ☐
Temporary Channel: ☐ (e.g., furrows)
Dugout Pond: ☐
Other (describe below): Perimeter drainage swale

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☐ check if notes continued on back of this form

No water!!

Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial: Josh Mansell (field notes author)
Print Name & Initial: (field notes QA/QC personnel)



Print Name & Initial: Josh Mossell (field notes author)

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial: _____ (field notes QA/QC personnel)

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph ON N1G 4P5

Waterbody Rapid Assessment Form

Project Number: 160950879
Project Name: Barlow Solar Energy
Date: 11/Aug/2016
Field Personnel: J. Mansell, A. Rodriguez

Weather Conditions (current): TEMP (°C) 35 | PRECIPITATION 0
Weather Conditions (previous 24-hrs): TEMP (°C) 36 | PRECIPITATION 0

Station No.: Station #4
Watercourse Name: Unnamed
UTM Coordinates: Zone 18T | Easting E 514786 | Northing N 4987754
Datum: NAD 83

Start Time: 12:35
End Time: 12:40
Photos:
Descriptive Location: Drainage ditch along southern boundary of property

Water Quality

Dissolved Oxygen: – mg/L
pH: –
Conductivity: – µS/cm
Water Temperature: – °C
Air Temperature: – °C
Time in situ measurements taken: –

Watercourse Dimensions & Morphology

Mean Wetted Width: – (m)
Maximum Pool Depth: – (cm)
Mean Bankfull Width: 30 (m)
Mean Water Depth: – (cm)
Riffle: – %
Pool: – %
Run: – %
Flat: – %
Evidence of Eroding Banks: None
Comments on Bank Stability: –

Substrate (percent cover)

Bedrock: – %
Cobble: – %
Sand: – %
Silt: – %
Muck: – %
Boulder: – %
Gravel: – %
Clay: 100 %
Marl: – %
Detritus: – %

In-water Cover (check cover types present)

☐ Undercut Banks ☐ Deep Pool ☐ Watercress ☐ Aquatic Vegetation
☐ Overhanging Vegetation ☐ Woody Debris ☐ Boulder ☐ Other: n/a.

Riparian Zone

Riparian Cover: See previous notes from May 6/2016
(% of watercourse shaded; dominant vegetation; mature or early successional)
Adjacent Land Use: Roadside ditch + agricultural field

Fish Habitat Potential

Critical Habitat: None
(spawning or nursery areas; groundwater upwellings)
Migratory Obstructions: Seasonal - no water
(seasonal; permanent)
Fish Observed: None
(note any fish observations)

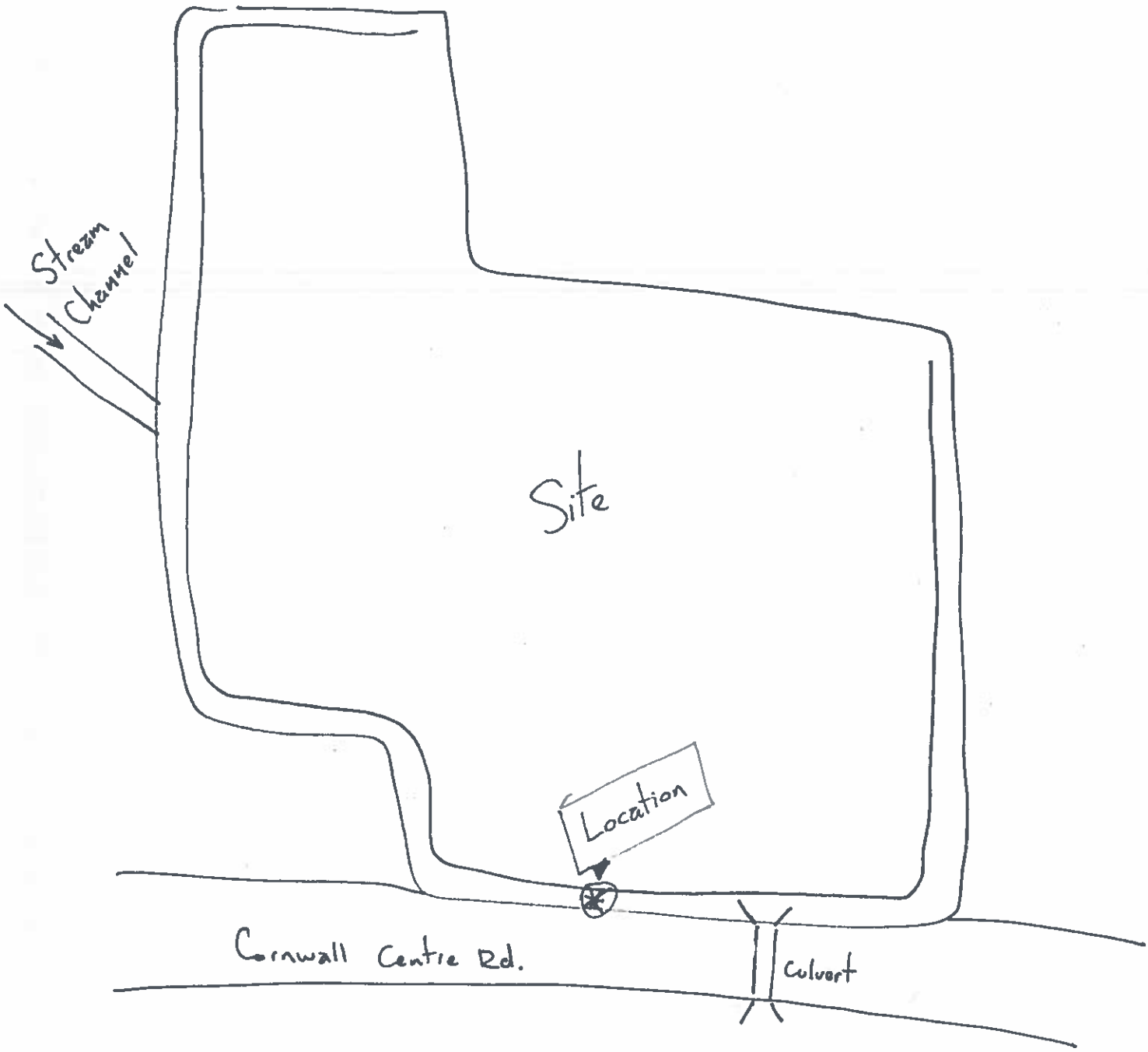
Characteristics

Natural Watercourse: ☐
Trapezoidal Channel: ✓
Roadside Ditch: ✓
Buried Tile: ☐
Seep: ☐
Temporary Channel: ☐ (e.g., furrows)
Dugout Pond: ☐
Other (describe below): ☐

Other Notes (habitat, dominant vegetation type, incidental wildlife, etc.) ☐ check if notes continued on back of this form

No water!!

Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial: Josh Mansell (field notes author)
Print Name & Initial: (field notes QA/QC personnel)



Print Name & Initial: Scott Marsell (field notes author)

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial: _____ (field notes QA/QC personnel)

APPENDIX D: CURRICULA VITAE

Stantec

Kathleen Todd M.Sc.

Senior Aquatic Ecologist

Kathleen has 18 years of environmental consulting experience, including 12 years at Stantec. She is a Discipline Leader for Environmental Services in Ontario, and a Regional Technical Leader for Freshwater Services in Central Canada. Kathleen's technical expertise is focused in aquatic ecology. She leads fisheries and aquatic habitat studies, benthic monitoring programs, and environmental impact assessments. Using ecosystem based approaches, Kathleen's typical multidisciplinary project involvement includes Class EAs and infrastructure siting/routing studies, evaluating alternative design concepts and developing mitigative solutions to minimize impacts to the natural environment.

Kathleen has acquired an understanding of federal and provincial legislation, policies and procedures for natural heritage features, particularly regarding working in and around fish habitat in Ontario. She is experienced in the *Fisheries Act* process, including evaluating the effects of development on aquatic habitat.

EDUCATION

M.Sc., Watershed Ecosystems, Trent University, Peterborough, Ontario, 2003

B.Sc.(Env.), Environmental Sciences, University of Guelph, Guelph, Ontario, 1997

CERTIFICATIONS & TRAINING

Ontario Freshwater Mussel Identification Workshop, Fisheries and Ocean Canada, Burlington, Ontario, 2008

Fisheries Protection Program Fisheries Act Training, Fisheries and Oceans Canada, Burlington, Ontario, 2015

Fisheries Specialist Awareness Workshop, MTO/DFO/OMNR Fisheries Protocol, Woodbridge, Ontario, 2013

Qualified Electrofishing Operator, Ontario Ministry of Natural Resources, Guelph, Ontario, 2010

Certified in the Ecological Land Classification (ELC), Ontario Ministry of Natural Resources, Turkey Point, Ontario, 2000

Qualified Southern and Northern Ontario Wetland Evaluator, Ontario Ministry of Natural Resources, North Bay, Ontario, 2000

Fisheries Assessment Specialist and Fisheries Contract Specialist Training, MTO/DFO/OMNR Fisheries Protocol, Downsview, Ontario, 2006

PROJECT EXPERIENCE

Power

Manitoba-Minnesota Transmission Project, Manitoba (Senior Aquatic Ecologist)

Advisor for the baseline reporting and environmental assessment of the fish and fish habitat component of a proposed large-scale transmission project; a high-voltage transmission line extending from Winnipeg to the US Border in southeastern Manitoba.

Springwood Wind Project, Belwood, Ontario (Senior Aquatic Ecologist)

Provided senior review for the Water Assessment and Water Body Report, as mandated under O. Reg. 359/09, describing existing conditions and potential impacts resulting from a proposed wind project (9.2 MW).

Whittington Wind Project, Dufferin County, Ontario (Senior Aquatic Ecologist)

Provided senior review for the Water Assessment and Water Body Report, as mandated under O. Reg. 359/09, describing existing conditions and potential impacts resulting from a proposed wind project consisting of 3 turbines (6.9 MW).

Fairview Wind Project, Stayner, Ontario (Senior Aquatic Ecologist)

Provided senior review for the Water Assessment and Water body Report, as mandated under O. Reg. 359/09, describing existing conditions and potential impacts resulting from a proposed wind project consisting of 8 turbines (18.4 MW).

Kathleen Todd M.Sc.

Senior Aquatic Ecologist

Grand Renewable Energy Park, Haldimand County, Ontario (Senior Aquatic Ecologist)

Provided senior review for the Water Assessment and Water Body Report, as mandated under O. Reg. 359/09, describing existing conditions and potential impacts resulting from a proposed wind project consisting of 67 turbines and solar project consisting of 425,000 solar panels (250 MW).

Plateau Wind Project, Grey County, Ontario (Senior Aquatic Ecologist)

Provided senior review for relevant sections of the Environmental Screening Report, as mandated under O. Reg. 116/01, describing existing aquatic conditions and potential aquatic impacts resulting from a proposed wind project consisting of 18 turbines (30 MW).

Shekak River Post Impoundment Environmental Monitoring for the Shekak-Nagagami Hydroelectric Development, Hearst, Ontario (Aquatic Ecologist)

Addressed agency concerns regarding environmental monitoring in the headpond area of a river impoundment. Evaluated shoreline erosion and the viability of fish habitat compensation measures, including a walleye spawning shoal and aquatic invertebrate enhancement works.

Oil & Gas

Energy East Pipeline Project, Baseline and Effects Assessment, Canada (Senior Aquatic Ecologist)

Fisheries and aquatic habitat Discipline Lead for the Ontario component of a proposed 4,500 km pipeline system carrying oil from Alberta to refineries and export terminals in Quebec and New Brunswick. In Ontario, the project involves converting approximately 1,925 km of existing natural gas pipeline to oil and creating approximately 105 km of new pipeline.

Ecological Risk Assessment of Residual Heavy Oil in a Wetland*, Southwestern Ontario, Ontario (Natural Scientist)

Analyzed stream and wetland data to determine potential aquatic food chain impacts of a historical heavy oil release. Analyzed invertebrate community structure and identified exposure pathways and community end-points. Considered site remediation options on the basis of these data.

Mining

Environmental Effects Monitoring Programs for Mining Sector Clients, Various Sites, Canada (Benthic Ecologist)

Contributed the benthic ecology chapter to numerous EEM reports for Canadian metal mines. Statistically analyzed and reported on invertebrate data to determine whether the respective mine effluent was responsible for an aquatic community level effect. EEM experience includes:

- Hudson Bay Mining & Smelting Co. Ltd., Chisel North Mine, Snow Lake, Manitoba
- Hudson Bay Mining & Smelting Co. Ltd., Snow Lake Mill / Anderson Tailings, Snow Lake, Manitoba
- Hudson Bay Mining & Smelting Co. Ltd., Flin Flon Tailings Impoundment System and Trout Lake Mine, Flin Flon, Manitoba
- Hudson Bay Mining & Smelting Co. Ltd., Ruttan Mine, Leaf Rapids, Manitoba
- Hudson Bay Mining & Smelting Co. Ltd., Konuto Lake Mine, Denare Beach, Saskatchewan
- SMC (Canada) Ltd., McAlpine Mill, Cobalt, Ontario

Environmental Effects Monitoring Program for the Antamina Mine & Port Facility, Peru (Benthic Ecologist)

Analyzed biological (metal concentrations in fish and shellfish tissues, fish health, benthic invertebrate community structure) and physical (water and sediment chemistry) data collected in the vicinity of both an inland mine (freshwater environment) and a coastal mining port facility (marine environment) to determine if the local ecosystems were being adversely affected by mining/shipping operations.

Benthic Invertebrate Monitoring Program*, Caledonia, Ontario (Benthic Ecologist)

Assessed the Fox Creek invertebrate community to determine if the stream habitat was being adversely affected by adjacent mining effluent discharge.

Environmental Baseline and Feasibility Study for a Decommissioned Gold Mine*, Northern Ontario (Natural Scientist)

Conducted aquatic and terrestrial ecosystem inventories to determine the environmental feasibility of re-opening a gold mine. Assessed streams, wetlands and woodlots. Conducted invertebrate and fish collections, avifauna and wildlife surveys, and vegetation community inventories.

** denotes projects completed with other firms*

Kathleen Todd M.Sc.

Senior Aquatic Ecologist

Cement / Aggregates

Proposed Acton Quarry Extension, Acton, Ontario (Aquatic Ecologist / Project Manager)

The extension of the existing Acton Quarry is proposed to meet the need for additional close-to-market aggregate resources of high quality Amabel Dolostone. The area of focus encompasses approximately 615 ha, across two Conservation Authority watersheds within the Regional Municipality of Halton Hills. Kathleen participated in extensive ecological field work, including aquatic species surveys and habitat assessments, inventories for potential Species at Risk habitat, and aquatic rehabilitation planning. She co-authored technical reports produced in accordance with the Provincial Policy Statement and Aggregate Resources Act application requirements, as well as participated in interdisciplinary consultation with agencies and agency-appointed committees.

Municipal

Benthic Monitoring Program in Support of the Expansion of the Komoka Wastewater Treatment Facility, London, Ontario (Senior Aquatic Ecologist)

Documented baseline benthic community conditions in the Thames River prior to facility upgrades, and compared with post-expansion conditions over a multi-year monitoring program.

Municipal Road Improvement Projects, Various Sites, Ontario (Natural Scientist)

Collected aquatic and terrestrial ecosystem field data, conducted environmental impact assessments, and obtained required agency approvals related to municipal transportation projects, including:
*- City of Hamilton, Bridge & Culvert Master Plan**
*- City of London, Airport Road Widening**
- City of London, Bradley Avenue Extension
- City of London, Western Road Widening
*- Town of Markham, Woodbine Avenue By-Pass**
*- Township of Wilmot, Haysville Bridge Replacement**

Fort Creek Restoration*, Sault Ste. Marie, Ontario (Aquatic Ecologist)

In consultation with DFO, completed a restoration plan for an urban creek that outlets to Lake Huron and provides salmon spawning habitat. Habitat enhancement involved the removal of in-stream debris, channel stabilization, riparian plantings, substrate enhancement, and creation of refuge areas. Fisheries Act Authorization was obtained, and environmental monitoring during construction was conducted.

Medway Sanitary Trunk Sewer Extension, London, Ontario (Aquatic Ecologist)

Conducted aquatic habitat assessment and relocation of freshwater mussels, including species at risk mussels, for three proposed pipeline crossings of Medway Creek.

Professional and Consultant Services Roster (C12-06-10), Hamilton, Ontario (Project Manager)

Under the terms of a 2-year Roster Agreement (2011-2012), four individual assignments were completed, including:
- Garner/Rymal Road and Garth Street Environmental Assessment
- Eastern Flowering Dogwood (Cornus florida) Survey for a Species at Risk
- Scube Central, Scube East Parcel 'A', and Scube East Parcel 'B' Breeding Bird Surveys for Species at Risk
- Fruitland-Winona Secondary Plan Area Breeding Bird Survey for Species at Risk

Minnow Lake Restoration Program*, Sudbury, Ontario (Aquatic Ecologist)

Coordinated a lake-wide monitoring program to evaluate the degree of water pollution resulting from stormwater discharge to an urban lake. Participated in frequent public consultation to liaise with residents of the Minnow Lake Restoration Group.

Municipal Water and Wastewater EAs, Various Sites, Ontario* (Aquatic Ecologist)

Evaluated natural heritage features in terms of ecological sensitivity and watermain and/or trunk sewer construction feasibility options (tunnel vs. open cut). Aquatic habitat was assessed at all potential watercourse crossings and recommendations were provided regarding Fisheries Act requirements, construction mitigation measures and timing restrictions on in-water works. Also responsible for siting a chlorine booster station, surface water treatment plants and pumping stations, and mitigating impacts from emergency overflow of chlorinated water into adjacent watercourses. Water and wastewater experience includes:
- City of Barrie, Surface Water Treatment Plant Class EA & Impact Assessment, Barrie
- Region of Niagara, Water Supply Class EA, Port Abino
- Region of Peel, West Brampton Reservoir, Pumping Station & Watermain Class EA, Brampton
- Region of York, Steeles Avenue West Forcemain Class EA, Etobicoke
- Region of York, Southeast Collector Trunk Sewer Class EA, Markham

** denotes projects completed with other firms*

Nancy A. Harttrup B.Sc.

Fisheries Biologist / Project Manager

Nancy is a Fisheries Biologist and Project Manager with extensive experience collecting and analyzing data related to aquatic systems. Project experience includes aquatic impact assessments related to urban development, highway and pipeline construction, and aggregate extraction. Nancy has also managed environmental effects monitoring (EEM) programs for the mining and pulp and paper industries and has been involved in watershed studies, literature searches and biomonitoring programs that include the design of field studies and the analysis of benthic invertebrate and water quality data.

EDUCATION

B.Sc. (Honours), Co-op Biology, University of Waterloo, Waterloo, Ontario, 1986

CERTIFICATIONS & TRAINING

Fisheries Assessment Specialist (MTO RAQ's) and MTO/DRO/OMNR Fisheries Protocol Training, MTO, Ontario, 2013

Fisheries Protection Program Fisheries Act Training, Fisheries and Oceans Canada, Burlington, Ontario, 2015

PROJECT EXPERIENCE

Power

Springwood Wind Project & Port Dover and Nanticoke Wind Project, Ontario (Fisheries Biologist)

Prepared the Water Assessment Report and Water Body Report for the Springwood Wind Project as per Ontario Reg. 359/09. The reports include information regarding the characteristics and locations of water bodies in the Zone of Investigation, potential aquatic impacts resulting from the project, recommended mitigation measures, and an assessment of overall effects on water bodies in the Zone of Investigation.

Amherst Island Wind Farm, Amherst Island, Ontario (Fisheries Biologist)

Prepared the Water Assessment Report and Water Body Report for the Amherst Island Wind Farm as per Ontario Reg. 359/09. The reports include information regarding the characteristics and locations of water bodies in the Zone of Investigation, potential aquatic impacts resulting from the project, recommended mitigation measures, and an assessment of overall effects on water bodies in the Zone of Investigation. The project includes a submarine cable crossing of Lake Ontario. The project includes DFO consultation (ongoing) to determine whether or not Fisheries Act authorization will be required for the cable landing areas.

Proposed Hydro Development at Locks 24 and 25 on the Trent-Severn Waterway, Ontario (Fisheries Biologist / Task Manager)

A work plan was developed and implemented for Walleye and Bass spawning and habitat surveys in support of an Environmental Assessment (EA) for the installation of Very Low Head (VLH) turbines at Dams 24 and 25 on the Otonabee River. The data collected will be used to assess impacts to fish habitat. The impact assessment will become part of the EA and will be used to work through Fisheries and Oceans Canada (DFO) Risk Management Framework to determine whether or not Fisheries Act Authorization is required for the project.

Water Assessment and Water Body Reports in Support of Various Renewable Energy (Wind) Projects, Ontario (Aquatic Biologist / Senior Reviewer)

Provided Senior Review of the Water Assessment and Water Body reports for the following renewable energy projects:
- Cedar Point Wind Farm
- Adelaide Wind Farm
- Niagara Region Wind Project
- St. Columban Wind Project
- Bow Lake Wind Project
- David Brown Solar Project

K2 Wind Power Project – Aquatic Habitat Assessment of Curran Drain (Senior Aquatic Biologist)

Designed and implemented a study to characterize the thermal regime and sensitivity of aquatic habitat in the Curran Drain. The survey was required due to proposed discharge from a stormwater management pond. The survey consisted of the collection of benthic invertebrates, fish, continuous temperature data (loggers) and the confirmation of flow regime. The results of the survey were incorporated into the Long-Term Stormwater Management Plan for the K2 Wind Power Project.

** denotes projects completed with other firms*

Nancy A. Harttrup B.Sc.

Fisheries Biologist / Project Manager

DFO Request for Review Submissions in Support of Various Renewable Energy Projects (Wind) (Senior Aquatic Biologist)

Prepared or reviewed Request for Review forms and submission packages for the permitting phase of the following renewable energy projects:

- *Amherst Island Wind Project*
- *Niagara Region Wind Project*
- *K2 Wind Power Project*
- *Grey Highlands Clean Energy Wind Project*
- *St. Columban Wind Project*
- *Snowy Ridge ZEP Wind Project*

Environmental Impact Assessments

Galt Country Club Letter of Intent for DFO Authorization, Cambridge, Ontario (Biologist / Task Manager)

The redesign of a golf course fairway at the Galt Country Club resulted in changes to fish habitat in a golf course pond located in the floodplain and connected to the Grand River. Information regarding available data on fish species in the Grand River and detailed plans regarding changes to the pond were prepared as a Letter of Intent (LOI) and submitted to DFO for authorization of the project. The LOI included details of the existing and proposed pond areas and depths, illustrating that the new pond would provide and increase in available habitat. Habitat enhancements were added to the plan to provide structure cover.

Municipal

Assessment of Impacts of Seepage from Caledon Landfill on Fisheries of the Credit River, Region of Peel (Aquatic Biologist)

Benthic invertebrates were collected from a perched fen downgradient of the Caledon Landfill site. The qualitative survey collected organisms to determine species presence/absence in the fen. The survey included the collection of water samples for chemical analysis and toxicity testing. Nancy was involved in earlier project work for the Caledon Landfill, collecting benthic invertebrates from the Credit River adjacent to the landfill site.

Assessment of Wetland Pond Health and Downstream Water Quality at Chinguacousy Landfill (Aquatic Biologist)

Benthic invertebrates were collected from a wetland pond at the Chinguacousy Landfill site to determine if the pond life was affected by landfill leachate. The survey included the collection of water chemistry data from the pond, the outflow stream, and nearby reference locations. Baseline data collection for the project included toxicity testing to determine if the site runoff was toxic to aquatic organisms.

Assessment of the Benthic Invertebrate Community in the Saugeen River and Floodplain ponds Adjacent to the Hanover Landfill Site, Town of Hanover (Aquatic Biologist)

A biological monitoring program was developed to compare benthic invertebrate community health in the Saugeen River upstream and downstream of the Hanover Landfill. The ongoing program requires the collection of benthic invertebrate samples from the river using artificial substrates. Results are used as an indicator of water quality adjacent to the landfill. A second component of the program compares emergent insects collected from floodplain ponds located between the landfill site and the Saugeen River.

Oxbow Lake Investigation at the New Hamburg Wastewater Treatment Plant, New Hamburg, Ontario (Aquatic Biologist)

Background fisheries data were collected and reviewed for a tributary of the Nith River originating in an abandoned oxbow of the Nith River. Bi-weekly collection of surface water samples were collected along the oxbow feature to determine if the existing oxbow provides additional treatment or can be modified to augment treatment.

Wilmot Centre Trout Spawning Surveys, Waterloo (Wilmot Centre), Ontario (Project Manager)

Annual Brook Trout spawning surveys have been completed in a small coldwater creek in Wilmot Centre in the vicinity of groundwater wells that provide drinking water to the supply Regional Municipality of Waterloo. The program is part of the Wilmot Centre monitoring program and looks at annual Brook Trout spawning activity in the creek as an indicator of the quantity and quality of suitable habitat. Brook Trout depend on areas of groundwater upwelling for spawning purposes therefore the health of the fishery is related to groundwater levels in the area.

** denotes projects completed with other firms*

Nancy A. Harttrup B.Sc.

Fisheries Biologist / Project Manager

Brant Mill Pond Fisheries Impact Assessment, Brant County, Ontario (Biologist / Task Manager)
A bridge replacement was required on a road crossing the outlet of Brand Mill Pond. The mill pond dam was structurally tied to the bridge, therefore a method was needed to reduce water pressure on the dam prior to bridge removal and replacement. Various construction scenarios were considered, including draining or partially draining the mill pond. A bathymetric survey of a mill pond was conducted to provide an indicator of available fish habitat in the pond (by depth) and the predominant substrate types. A document summarizing fish habitat conditions in the pond and possible impacts to fish habitat based on the selected construction method was submitted to GRCA for review.

Mining
Metal Mining Environmental Effects Monitoring, Initial Monitoring Program - Hudson Bay Mining & Smelting Co., Ltd., Flin Flon, Manitoba (Aquatic Biologist)

Metal Mining Environmental Effects Monitoring, Study Design and Initial Monitoring - SMC (Canada) Ltd., McAlpine Mill Site, Cobalt, Ontario (Project Manager)

Aquatic Impact Assessments of Kidd Creek and the Porcupine River near Timmins, Ontario, Falconbridge Ltd. (Project Manager)

Baseline Water Quality, Benthos and Fisheries Environmental Impact Assessments in Night Hawk Lake; Impact Assessment and Fisheries Compensation for a Proposed Gold Mine Expansion in Three Nations Lake, Timmins, Ontario, Royal Oak Mines Inc. (Project Manager)

Benthic Invertebrate Survey of Pothole Lakes Near Sudbury; Aquatic Inventory of West Morgan Lake near Sudbury, Falconbridge Ltd. (Project Manager)

Aquatic Impact Assessment at Detour Lake Gold Mine (1995, 1998); EDTA Baseline Study (2002); Predictive Impact Assessment of Pit De-Watering on Receiving Waters, Placer Dome North America (Project Manager)

Wastewater
Wastewater Treatment Plant Biomonitoring, Woodstock, Ontario (Senior Biologist / Project Manager)
A Benthic macro-invertebrate sampling program and a multi week in-situ water quality monitoring program were designed and completed. The program was designed to identify the potential impacts of the municipal wastewater treatment plant discharge on the biota and water quality of the Thames River.

Middle-Grand River Assimilative Capacity Assessment, Kitchener, Ontario (Aquatic Biologist)
Collection, review and summary of background data with respect to downstream users; assessment of effluent and outflow structure changes to aquatic habitat. Peer review of Grand River Surface Water Quality Monitoring Report.

Cycle 1 Environmental Effects Monitoring: project management, field studies and data analysis, Domtar Packaging, Norampac Inc., Red Rock, Ontario (Aquatic Biologist / Project Manager)

Cycle 1 Environmental Effects Monitoring: Project Management, Field Studies and Data Analysis, Domtar Packaging, Trenton, Ontario (Aquatic Biologist)

Cycle 1, 2 and 3 Environmental Effects Monitoring: Project Management, Field Studies and Data Analysis, Domtar Fine Papers, Cornwall, Ontario (Aquatic Biologist)

Cycle 2 and 3 Environmental Effects Monitoring: Project Management and Data Analysis, Provincial Papers Inc., Cascades Fine Papers Group, Thunder Bay, Ontario (Project Manager)

** denotes projects completed with other firms*

Nancy A. Harttrup B.Sc.

Fisheries Biologist / Project Manager

Cement / Aggregates

Mill Creek Surface Water Monitoring Program, Guelph, Ontario (Project Manager, Fisheries Biologist)

To assess potential impacts on Mill Creek (a tributary to the Grand River), a long-term Surface Water Monitoring Program (SWMP) was initiated to monitor water quality, Brown Trout (Salmo trutta) populations, water levels and stream temperatures over time. During her 10-years involvement with the project, Nancy's duties included project management, the coordination of annual spawning surveys, population surveys and water quality sampling. Annual reports included the compilation of annual fisheries data and the integration of fisheries data with groundwater and surface water data into a comprehensive monitoring report.

Industrial

Receiver Biomonitoring in Canagagigue Creek, Elmira, Ontario (Project Manager)

Nancy was the Project Manager for a long-term Biomonitoring Program in Canagagigue Creek in Elmira, ON. The monitoring is now a biannual program that sees the collection of benthic invertebrate, sediment and fish community data in the creek. The program is a condition of the C of A for discharge of treated groundwater to the creek. Nancy was responsible for Project Management of the survey, the coordination of data collection, data analysis and reporting.

Benthic Invertebrate Community Survey in the Maitland River at Wingham, Wingham, Ontario (Project Manager)

Nancy was the Project Manager for an ongoing benthic invertebrate survey in the Maitland River in Wingham, Ontario. The monitoring was an annual program that involved the collection of benthic invertebrate samples from the river as an indicator of the quality of aquatic habitat in the river adjacent to a closed landfill site. Nancy was responsible for Project Management of the survey, the coordination of data collection, data analysis and reporting.

Oil & Gas

Brantford to Kirkwall Natural Gas Pipeline (Senior Aquatic Biologist)

Provided quality review for the aquatic habitat component of environmental reports and prepared the Request for Review submission package for DFO review. DFO review was required for the infilling of three pond areas adjacent to the gas pipeline. The infilling proceeded without the need for a Fisheries Act authorization.

Transportation

Letter of Intent for DFO Authorization, Strasburg Creek at Strasburg Road Extension, Kitchener, Ontario (Biologist / Task Manager)

The extension of Strasburg Road in the City of Kitchener required a new crossing of Strasburg Creek, which provides coldwater fish habitat. Data collection consisted of a habitat inventory, fish community survey, summer water temperatures (hourly data by instream loggers) and a fall spawning survey. All fisheries and fish habitat data were summarized and used in the Letter of Intent (LOI) submitted to DFO for authorization of the project. The LOI included mitigation and compensation measures for the loss of fish habitat that resulted from the installation of the 40m long culvert.

Fish Community Assessment and Habitat Inventory of Strasburg Creek near Doon Village Road, Kitchener, Ontario (Project Manager)

An aquatic habitat survey was conducted in Strasburg Creek, mapping physical features such as substrates, stream morphology, and instream and riparian cover. The data were required as part of the natural environment inventory for the future alignment of Doon Mills Road. Subsequent to the initial survey, fish community data were also collected in the area. During the construction phase, Nancy participated in the transfer of fish from the creek to the temporary diversion channel, prior to creek realignment for the new bridge.

** denotes projects completed with other firms*

Nancy A. Harttrup B.Sc.

Fisheries Biologist / Project Manager

Fish and Fish Habitat Surveys, Highway 40 Near Chatham, Ontario (Fisheries Assessment Specialist / Task Manager)

As a part of a Detail Design study for rehabilitation of Highway 40 south of Chatham, Nancy conducted field surveys and prepared an Impact Assessment Report for watercourses that cross Highway 40 between Highway 401 and the Thames River. The study involved the collection of background data, detailed habitat mapping and the collection of fish community data. Reporting included an assessment of aquatic habitat impacts, and mitigation measures to protect fish habitat in the watercourses during construction.

Fish and Fish Habitat Surveys, Rehabilitation of Highways 66 and 624, Larder Lake, Ontario (Fisheries Assessment Specialist / Task Manager)

As a part of a Detail Design study for the Rehabilitation of Highways 66 and 624 (District of Timiskaming) Nancy managed the field surveys and reporting for this project. Limited background data were available for the study area. Field data collection and reporting followed the 2006 MTO/DFO/OMNR Protocol and reporting included impact assessments for the numerous watercourses in the study area. Impact assessments were based the proposed work required at each culvert (e.g. rehabilitation, replacement) which subsequently lead to the completion of appropriate forms and submissions to DFO.

Highway 7 and Highway 35 Structural Culvert Replacement/Rehabilitation at Various Locations, and Trent Canal Bridge Rehabilitation (Detail Design); MTO Eastern Region, Ontario (Fisheries Assessment Specialist)

Comprehensive Fisheries Assessments were conducted at five culvert locations in Eastern Ontario on Highway 7 and Highway 35 (Mariposa Creek, Mariposa Brook, Corben Creek, Martin Creek and South McLaren Creek). Existing Conditions and Impact Assessment Reports were prepared. 'No HADD' forms were submitted and approved sites. Bridge rehabilitation work at the Trent River on will follow DFO's Operational Statement for Bridge Maintenance.

Highways 3, 6, and 24 Rehabilitation (Detail Design); MTO West Region, Ontario (Fisheries Assessment Specialist)

Comprehensive Fisheries Assessments were conducted at all culvert sites providing fish habitat and Existing Conditions and Impact Assessment Reports were prepared. 'No HADD' forms were submitted to DFO and approved for all sites. The project included additional correspondence with DFO and the MNR regarding the potential presence of an aquatic species at risk in one watercourse.

Highway 24 Rehabilitation (Detail Design); MTO West Region, Cambridge, Ontario (Fisheries Assessment Specialist)

Fish habitat and fish community assessments were completed at watercourse crossings along Highway 24 south of Cambridge. Fish habitat was present at one coldwater stream, where a Comprehensive Fisheries Assessments was conducted. Input was provided to the culvert design, which required additional considerations due to existing culvert conditions and the presence of a recreational trail parallel to the highway. An Existing Conditions and Impact Assessment Report was prepared and a 'No HADD' form was submitted and approved by DFO.

Rehabilitation of Highway 6/10 from Chatsworth to Owen Sound (Detail Design); MTO West Region, Ontario (Fisheries Assessment Specialist)

Comprehensive Fisheries Assessments were completed at watercourse crossings potentially affected by the rehabilitation of Highway 6/10. Correspondence with the MNR confirmed habitat sensitivities and thermal regimes, based on results of the field program. The highway rehabilitation did not require work within 30 m of any of the identified watercourses, therefore submissions to DFO were not required.

** denotes projects completed with other firms*

Nancy A. Harttrup B.Sc.

Fisheries Biologist / Project Manager

Highway 9 Holland Drainage Canal Bridge Replacement; MTO Central Region, Ontario (Fisheries Assessment Specialist)

A Comprehensive Fisheries Assessment was completed at the Holland Drainage Canal in the vicinity of the Highway 9 bridge. An Information Gathering Form was submitted to the MNR due to the possible presence of American Eel in the Holland Drainage Canal. The MNR determined that the proposed bridge would not adversely affect American Eel. Due to the bridge location, the project required coordination among two MNR districts. The project included an impact assessment the proposed new bridge and the assessment of activities required to re-enforce the bridge abutments and mid-water piers on a short-term basis prior to future bridge replacement.

Rehabilitation and Replacement of Four Structures on Highway 11 and Highway 17B near North Bay; MTO Northeastern Region, Ontario (Fisheries Assessment Specialist)

Fish community and fish habitat information was collected at three watercourse locations where structure replacement or rehabilitation was proposed. The assessment and reporting of fish and fish habitat at the sites followed the 2013 MTO/DFO/OMNR Fisheries Protocol. Reports included mitigation measures (design and construction) to protect fish habitat and an impact assessment of the proposed rehabilitation/replacement measures.

Fish and Fish Habitat Surveys for MTO Detailed Design Projects, Ontario (Fisheries Assessment Specialist/Task Manager)

- Structure Rehabilitation/ Replacements on Highways 11, 17, and 61 – administered by West Region
- QEW and Highway 403 Structural Rehabilitation – Central Region
- Highways 3, 19 and 24 Rehabilitations – West Region
- Rehabilitation and Replacement of 142 Structural Culverts in Southwestern Ontario - West Region
- Highway 401 Reconstruction, Municipality of Chatham-Kent West Region
- Highway 17 and Highway 101 Rehabilitation – Northeast Region

As part of the Detail Design studies for the above projects, fish community and fish habitat information was collected at watercourses potentially affected by proposed construction. The assessment and reporting of fish and fish habitat followed the 2013 MTO/DFO/OMNR Fisheries Protocol, including agency correspondence for the collection of background data. Reports included mitigation measures (design and construction) to protect fish habitat and impact assessments of the proposed construction. Additional correspondence with DFO and the MNRF was required at locations where background data indicated the possible presence of aquatic species at risk. Where required, Low Risk Notification forms were completed and submitted to DFO.

Fish and Fish Habitat Surveys for MTO Preliminary Design Projects, Ontario (Fisheries Assessment Specialist/Task Manager)

- Highway 400/North Canal Overpass Structure Replacement Central Region
- Replacement of the Highway 11 Mattawishkwia River Bridge, Hearst
- Highway 11 Access Review South of Huntsville
- Highway 11 Access Review from Powassan to Callander
- Evaluation of Highway 11 Access and Interchange Improvements, near Allensville
- Highway 401 and Evaluation of Highways 401 and 8 Access and Interchange Improvements
- Highway 26 near Grey Road 40 (near Camperdown)

As a part of the Preliminary Design studies for the above projects, the projects required the collection of background data, detailed habitat mapping and the collection of fish community data as per the 2006 MTO/DFO/OMNR Fisheries Protocol for watercourses in each study area. Reporting requirements varied by project but typically included the preparation of an Existing Conditions Report and a Preliminary Impact Assessment Report. The Preliminary Impact Assessment Report included a summary of recommended mitigation measures and an assessment of impacts based on the Preferred Plan for the project.

Land Development

Letter of Intent for DFO, Ninth Line Tributary, Markham, Ontario

** denotes projects completed with other firms*

Nancy A. Harttrup B.Sc.

Fisheries Biologist / Project Manager

Letter of Intent for DFO Authorization, Tributary of Baden Creek, Baden, Ontario (Biologist / Task Manager)

A stormwater management pond outfall in a new subdivision in the town of Baden resulted in the loss of fish habitat in a small tributary of Baden Creek. Together with available background data on the main channel of Baden Creek, fish habitat data were summarized and used in the Letter of Intent (LOI) submitted to DFO for authorization of the project. The LOI included mitigation and compensation measures for the loss of fish habitat that resulted from the SWM outfall.

** denotes projects completed with other firms*

Nancy A. Harttrup B.Sc.

Fisheries Biologist / Project Manager

PUBLICATIONS

Wren, C.D., N.A. Harttrup, B. Michelutti and G. Hall. 1997. Ecosystem Recovery in the Onaping River, Sudbury, Ontario.. *Proceedings of the 24th Aquatic Toxicity Workshop. Niagara Falls.*, 1997.

Wren, C.D., N.A. Harttrup and S. Harris. 1995. Ecotoxicology of mercury and cadmium.. *Handbook of Metals Ecotoxicology, Lewis Pub. D.J. Hoffman (ed.) pp.392-423.*, 1995.

Mark C. Pomeroy B.Sc.

Fisheries Biologist / Project Manager

Mark has over 16 years of experience designing, coordinating, and implementing small and large scale aquatic habitat and impact assessments, encompassing several aquatic habitat types. Mark has also developed and implemented many monitoring, mitigation, compensation and inventory programs. Past employment with Fisheries and Oceans Canada (DFO), and two Conservation Authorities (Grand River and St. Clair Region) contributes to Mark's extensive working experience with regulatory and approvals processes related to the *Fisheries Act*, the *Conservation Authorities Act* and the *Drainage Act*. He has extensive experience involving permitting and issues resolution related to the federal *Species at Risk Act* and the provincial *Endangered Species Act*. He also has extensive experience with the renewable energy approvals (REA) process.

EDUCATION

Honours B.Sc. (Agriculture), University of Guelph / Natural Resources Management, Guelph, Ontario, 2000

Royal Ontario Museum / Freshwater Fish Identification Course, Toronto, Ontario, 2011

Class 1 Electrofishing Certificate / Ministry of Natural Resources, Peterborough, Ontario, 2015

Ontario Freshwater Mussel Identification Workshop / Fisheries and Oceans Canada - Canada Centre for Inland Waters, Burlington, Ontario, 2007

Fisheries Assessment Specialist and Fisheries Contracts Specialist, MTO/DFO/OMNR Fisheries Protocol Course, Downsview, Ontario, 2006

CERTIFICATIONS & TRAINING

Fisheries Protection Program Fisheries Act Training, Fisheries and Oceans Canada, Burlington, Ontario, 2015

REGISTRATIONS

Certified Inspector #CAN0262, Certified Professional in Erosion and Sediment Control, Inc.

PROJECT EXPERIENCE

Renewable Energy

Renewable Energy Approval (REA), Multiple Projects, Various Sites, Ontario (Fisheries Biologist)

Planned, coordinated, conducted or contributed to field investigations to assess potential aquatic impacts resulting from proposed wind project and solar projects. Authored or contributed to Water Assessment and Water Body Report in accordance with Ontario Reg. 359/09.

- *Strong Breeze Wind Project, Elgin County, Ontario; Client: Invenergy – 20 turbines*
- *Lake Simcoe Regional Airport Solar Project, Simcoe County; Client: Invenergy – undetermined number of solar panels*
- *Pendleton Solar Energy Centre, United Counties of Prescott and Russell, Ontario; Client: EDF – undetermined number of solar panels*
- *Barlow Solar Energy Centre, Township of South Stormont, Ontario; Client: EDF – undetermined number of solar panels*
- *St. Columban Wind Project, Huron County, Ontario; Client: Veresen –15 turbines*
- *Grand Renewable Energy Park, Haldimand County, Ontario; Client: Samsung Renewable Energy – 69 turbines, 425,000 solar panels*
- *Sydenham Wind Energy Centre, Lambton County, Ontario; Client: Mainstream Renewable Power – up to 37 turbines*
- *Springwood Wind Project, Belwood, Ontario; Client: wpd Canada – 4 turbines*
- *Whittington Wind Project, Dufferin County, Ontario; Client: wpd Canada – 3 turbines*
- *Fairview Wind Project, Stayner, Ontario; Client: wpd Canada – 8 turbines*
- *White Pines Wind Project, Prince Edward County, Ontario; Client: wpd Canada – 29 turbines*
- *Ostrander Wind Energy Park, Prince Edward County, Ontario; Client: Gilead Power – 9 turbines*
- *Wolfe Island Wind Project, Wolfe Island, Ontario; Client: Canadian Hydro Developers – 86 turbines*
- *Amherst Island Wind Project, Amherst Island, Ontario; Client: Algonquin Power – approx. 36 turbines*

Mark C. Pomeroy B.Sc.

Fisheries Biologist / Project Manager

• Cedar Point Wind Power Project, Lambton County, Ontario; Client: Suncor Energy – 46 turbines
• Adelaide Wind Power Project, Middlesex County, Ontario; Client: Suncor Energy – 18 turbines
• Napier Wind Project, Middlesex County, Ontario; Client: wpd Canada – 2 turbines
• Kingsbridge II Wind Project, Huron County, Ontario; Client: Capital Power - 69 turbines
• Gosfield Comber Wind Energy Project, Essex County, Ontario; Client: Brookfield Renewable Power - 149 turbines
• Melancthon Wind Plant, Phases I & II, Melancthon and Amaranth Townships, Ontario; Client: Canadian Hydro Developers - 177 turbines
• Port Dover and Nanticoke Wind Project. Norfolk and Haldimand Counties, Ontario; Client: Captial Power - 58 turbines
• Zephyr Farms Inc. Wind Power Project, Lambton County, Ontario; Client: Green Breeze Energy Inc. - 4 turbines
• Niagara Region Wind Farm, Haldimand County, Ontario; Client: Niagara Region Wind Corporation – 77 turbines

Renewable Energy, Wind

Goulais Wind Project, District of Algoma, Ontario (Fisheries Biologist)

Provided permitting and approvals advice regarding Fisheries Act considerations for a proposed eleven turbine renewable energy project.

Plateau Wind Project, Grey County, Ontario (Fisheries Biologist)

Planned, coordinated and conducted field investigations to update previous field work to assess potential aquatic impacts resulting from proposed wind project consisting of eighteen turbines. Drafted relevant sections of the Environmental Screening Report (ESR) as mandated under Ontario Reg. 116/01. Provided advice concerning provincial species at risk concerns.

K2 Wind Power Project, Huron County, Ontario (Fisheries Biologist)

Planned, coordinated and conducted field investigations to update previous field work to assess potential aquatic impacts resulting from proposed wind project consisting of 140 turbines. Drafted amendment to Water Assessment and Watery Body Report in accordance with O. Reg. 359/09. Provided advice concerning provincial species at risk concerns.

Ganaraska ZEP Wind Farm - ERT, Municipality of Clarington, Ontario (Biologist)

Provided expert testimony regarding potential impacts to water bodies (as defined by O.Reg. 359/09), at an Environmental Review Tribunal (ERT).

Environmental Assessments

Pier 22 Wharf Completion, Hamilton Port Authority, Hamilton, Ontario (Aquatic Biologist)

Coordinated and executed a fish community survey, underwater habitat assessment, and pond survey. Successfully developed and negotiated a Fisheries Compensation Plan with DFO for proposed works (i.e. a pond infilling) deemed by DFO to constitute harmful alteration, disruption or destruction of fish habitat. The plan included aquatic enhancement, mitigation measures and a post-construction monitoring program.

Locks 24 and 25 – VLH Turbine Installation, Canadian Projects Limited, Lakefield, Ontario (Aquatic Biologist)

Conducted aquatic assessments including walleye and bass spawning and habitat surveys in support of an Environmental Assessment (EA) for the installation of Very Low Head (VLH) turbines at Dams 24 and 25 on the Otonabee River. Aquatic assessments inform the analysis of impacts to walleye and bass spawning habitat and habitat use by small-bodied fish. The impact assessment will also be used during the assessment of the project using the Fisheries & Oceans Canada (DFO) Risk Management Framework.

Pier 27 Dockwall Construction and Dredging, Hamilton Port Authority, Hamilton, Ontario (Aquatic Biologist)

Coordinated and conducted aquatic assessments, including a fish community survey and underwater habitat assessment in Hamilton Harbour, in support of the installation of a new dockwall and dredging to accommodate shipping traffic. Coordinated with DFO regarding Fisheries Act approvals.

Pier 22 Infrastructure Development Environmental Assessment, Hamilton Port Authority, Hamilton, Ontario (Aquatic Biologist)

Coordinated and conducted aquatic assessments for an Environmental Assessment Screening under CEEA. Negotiated compensation measureswith DFO and drafted letter of intent in pursuit of Fisheries Act Authorization.

** denotes projects completed with other firms*

Mark C. Pomeroy B.Sc.

Fisheries Biologist / Project Manager

Bruce to Milton Transmission Line, Various, Ontario (Fisheries Biologist)
Planned, coordinated and assisted with execution of large-scale fisheries field program to assess potential impacts of proposed hydroelectric corridor reinforcement project and provided input to the provincial environmental assessment process as well as the Fisheries Act and Conservation Authorities Act permitting processes. Managed data entry, analysis and completed reporting of aquatic resources sections. Coordinated multi-disciplinary team and regulatory agencies for acquisition of appropriate permits and approvals.

Yellow Falls Hydroelectric Project, Smooth Rock Falls, Ontario (Aquatic Biologist)
Planned, coordinated and assisted with execution of fisheries field program to assess potential impacts of proposed hydroelectric dam project. Assisted with fish, benthos, habitat, water and sediment sampling. Authored significant portions of the technical appendix related to aquatic study results. Facilitated acquisition of permits and approvals under the Fisheries Act.

King Street and Fountain Street Improvements Class Environmental Assessment Study, Cambridge, Ontario (Fisheries Biologist)
Planned, coordinated and conducted field investigations to assess aquatic habitat at watercourse crossings within the project study area. Data collected during field investigations was used to assess potential impacts of preferred option. Drafted text for relevant sections of Class EA document.

Franklin Boulevard Widening Class Environmental Assessment Study, Cambridge, Ontario (Fisheries Biologist)
Planned, coordinated and conducted field investigations to assess aquatic habitat at watercourse crossings within the project study area. Data collected during field investigations was used to assess potential impacts of preferred option. Drafted text for relevant sections of Class EA document.

Highway 69 - Patrol Yards between Parry Sound and Sudbury, Ontario (Fisheries Biologist)
Planned, coordinated and conducted field investigations to assess aquatic habitat at watercourses within the project study area. Data collected during field investigations was used to assess potential impacts of proposed maintenance patrol yards located adjacent to Highway 69. Drafted text for inclusion in Fisheries and Aquatic Ecosystems Report. All work was conducted in accordance with the MTO/DFO/MNR Protocol (2006).

Environmental Impact Assessments

Georgia Pacific Thorold Cycle 4 EEM, Thorold, Ontario (Aquatic Ecologist)
Assisted in field sampling programs of fish, benthos, water and sediment for federally regulated pulp and paper environmental effects monitoring.

Spruce Falls Cycle 4 EEM, Kapuskasing, Ontario (Aquatic Ecologist)
Assisted in field sampling of fish, benthos, water and sediment for federally regulated pulp and paper environmental effects monitoring.

Smooth Rock Falls Cycle 4 EEM, Smooth Rock Falls, Ontario (Aquatic Ecologist)
Participated in field sampling program of fish, benthos, water and sediment for federally regulated pulp and paper environmental effects monitoring.

Highway 11 - High Falls Road Access Improvements Class Environmental Assessment, Bracebridge, Ontario (Fisheries Biologist)
Planned and conducted field investigations to assess aquatic habitat at watercourse crossings within the project study area. All work was conducted in accordance with the MTO/DFO/MNR Protocol (2006).

** denotes projects completed with other firms*

Mark C. Pomeroy B.Sc.

Fisheries Biologist / Project Manager

Highway 11 - Intersection Improvements, Powassan, Ontario (Fisheries Biologist)

Planned, coordinated and conducted field investigations to assess aquatic habitat at watercourse crossings within the project study area. Data collected during field investigations was used to assess potential impacts of preferred option, including potential impacts to Brook Trout. Drafted text for inclusion in Fisheries and Aquatic Ecosystems Report. All work was conducted in accordance with the MTO/DFO/MNR Protocol (2006).

Highway 3 - Rehabilitation between Jarvis and Renton, Ontario (Fisheries Biologist)

Planned, coordinated and conducted field investigations to assess aquatic habitat at watercourse crossings within the project study area. Data collected during field investigations was used to assess potential impacts of preferred option, including potential impacts to Brook Trout. Drafted Fisheries and Aquatic Ecosystems Report. All work was conducted in accordance with the MTO/DFO/MNR Protocol (2006), and included preparation and submission of "no HADD forms" to satisfy Fisheries Act requirements.

Highway 69 - Key River Bridge Replacement, Britt, Ontario (Fisheries Biologist)

Planned, coordinated and conducted field investigations to assess aquatic habitat in Key River at proposed location of bridge replacement. Data collected during field investigations was used to assess potential impacts of bridge replacement activities. Drafted Fisheries and Aquatic Ecosystems Report. All work was conducted in accordance with the MTO/DFO/MNR Protocol (2006), and included preparation and submission of "no HADD forms" to satisfy Fisheries Act requirements.

Replacement of Coutts Line Bridge over Baptiste Creek, Tilbury, Ontario (Fisheries Biologist)

Facilitated acquisition of provincial Endangered Species Act (ESA) approval (letter of advice) through provision of advice regarding construction techniques. Planned, coordinated and conducted field investigations to assess freshwater mussel community and habitat at bridge site.

Replacement of Dawn Mills Bridge over Sydenham River Creek, Dresden, Ontario (Fisheries Biologist)

Dawn Mills Bridge is located over a reach of the Sydenham River known to contain one of the largest number of taxa of federally regulated Species at Risk fish and mussels in Canada. Facilitated acquisition of federal approvals (Fisheries Act and Species at Risk Act, letter of advice) through provision of advice regarding construction techniques. Planned, coordinated and conducted field investigations to assess freshwater mussel habitat at bridge site.

Chinguacousy Road Widening, Brampton, Ontario (Fisheries Biologist)

Conducted fish community assessment to determine presence of Redside Dace (a provincially Endangered species). Drafted impact assessment reports and applications for Fisheries Act Authorization, Conservation Authorities Act approval, and Endangered Species Act approval. Provided input to engineering design for compensation measures related to Redside Dace habitat.

Detroit Windsor Truck Ferry Improvements (Design) (GWP 3071-06-00), Windsor, Ontario (Fisheries Biologist)

Provided aquatic community and habitat assessment services as well
as input regarding project design, construction staging and silt and sediment control planning. Acquired approvals under Fisheries Act and Conservation Authorities Act related to fish habitat. Negotiated compensation measures with Conservation Authority prior to project design change, resulting in no HADD.

Highway 24 - Intersection Improvements, Cambridge, Ontario (Fisheries Biologist)

Provided fish rescue services. Performed environmental inspection duties related to implementation of the Fisheries Act compensation plan and resolution of onsite issues related to construction.

** denotes projects completed with other firms*

Mark C. Pomeroy B.Sc.

Fisheries Biologist / Project Manager

Detroit Windsor Truck Ferry Improvements (Contract Administration) (WP 3071-06-00), Windsor, Ontario (Fisheries Biologist)

Construction monitoring services related to Fisheries Act implications (fish removals, species at risk identification training for contract staff , staging and implementation design review), provision of advice regarding alternative staging/construction operations to prevent impacts to aquatic habitat/organisms.

Fanshawe Park Road Widening, London, Ontario (Fisheries Biologist)

Facilitated acquisition of approvals from DFO for the realignment of Heard Drain/Snake creek during the expansion of Fanshawe Park Road. Performed construction inspection services, resolved onsite implementation issues related to the Fisheries Act.

Environmental Impact Assessments and Permitting

CN Milton Logistics Hub, Town of Milton, Ontario (Fisheries Biologist)

Planned and coordinated execution of large-scale fisheries field program to assess potential impacts of proposed construction and operation of a new logistics hub under the Canadian Environmental Assessment Act (CEAA) approval process. Primary author of Fish and Fish Habitat Technical Data Report (TDR) and Valued Component (VC) text to support CEAA approval application.

Energy East Pipeline Project, Various, Canada (Fisheries Biologist)

Participated in planning, coordinating and execution of Ontario portion of fisheries field program to assess potential impacts of proposed new pipeline and associated facilities in support of National Energy Board (NEB) approvals. Co-authored Ontario Fish and Fish Habitat Technical Data Report (TDR), as well as Fish and Fish Habitat Valued Component (VC) Biophysical Effects Assessment.

Dawn to Parkway Expansion - Hamilton to Milton Pipeline
(Fisheries Biologist)

Provided input to fisheries issues resolution and aquatic species at risk approvals process for a 20 km pipeline expansion involving the installation of a new 48 inch natural gas pipeline. Coordinated fish salvage operations for crossings along new pipeline.

Panhandle Reinforcement Project
(Fisheries Biologist)

Provided input to fisheries issues resolution and aquatic species at risk approvals process for the replacement of a 16 inch natural gas pipeline with a 36 inch diameter pipeline over 40 km.

Natural Resource Services

Municipal Drain Classification Program*, Various, Ontario (Drain Assessment Technician)

Planned and implemented large scale sampling protocol designed by DFO to assess the sensitivity of various municipal drains to disturbance. Sampling program encompassed all drains within the Grand River watershed and consisted of habitat, thermal and fish community characterization based on extensive field sampling. Analyzed substantial quantities of field data, summarized results and produced interim and final reports.

Fish Habitat Study*, Strathroy, Ontario (Biological Technician)

Planned and implemented field program to sample fish community in reservoirs managed by the St. Clair Region Conservation Authority. Responsible for writing final report concerning existing fish habitat status and providing recommendations based on field data. Participated in water quality and benthic community field sampling programs.

Various Environmental Assessments*, Sarnia, Ontario (Fish Habitat Biologist)

Assessed project proposals for impacts to fish habitat as defined in the Fisheries Act. Issued Letters of Advice and Authorization under the Fisheries Act. Carried out screening level environmental assessments of proposed projects under the Canadian Environmental Assessment Act. Participated in outreach programs and inter-agency work groups regarding Species at Risk recovery. Acquired familiarity with the Habitat Alteration Assessment Tool (HAAT).

** denotes projects completed with other firms*

Mark C. Pomeroy B.Sc.

Fisheries Biologist / Project Manager

Oil and Gas Midstream

Enbridge Integrity Dig Program, Various, Ontario (Conservation Authority Act Permitting Coordinator)

Coordinated preparation and submission of applications under Conservation Authorities Regulation for development, interference with wetlands and alterations to shorelines and watercourses for pipeline maintenance work in at several hundred sites across approximately 19 Conservation Authority jurisdictions.

Urban Land

Berczy Dam Removal, Markham, Ontario (Fisheries Biologist)

Provided fish rescue services, including resolution of issues related to Species at Risk.

Medway Sanitary Trunk Sewer Extension, London, Ontario (Fisheries Biologist)

Drafted Fisheries Act application and Endangered Species Act application for pipeline crossing of Medway Creek. Coordinated and completed aquatic habitat assessment and relocation of freshwater mussels. Negotiated compensation measures prior to project design change, resulting in no HADD.

Fox Hollow Subdivision, London, Ontario (Fisheries Biologist)

Facilitated acquisition of approvals from DFO for the realignment of the Heard Drain/Snake Creek and the installation of a stormwater management pond in relation to construction of the Fox Hollow Subdivision. Performed construction inspection services, resolved onsite implementation issues related to the Fisheries Act.

** denotes projects completed with other firms*

Andres Rodriguez M.Sc.E., P.Eng.

Water Resources Engineer

Mr. Rodriguez is a Water Resources Engineer with eleven years of experience specializing in the areas of surface hydrology and computational hydrodynamics with the Water group. His technical capabilities include computer modeling of hydrologic phenomena in urban and rural watersheds; extensive experience using hydrodynamic models in open channels and estuarine environments; and advanced knowledge of geographical information systems (GIS). Relevant projects include floodplain delineation studies, dam safety reviews and dam break assessments, water withdrawal assessments, hydraulic structure design, data management and statistical analysis, environmental studies, sediment erosion studies, sediment transport studies in freshwater and marine environments, fish passage assessments, bathymetric surveys, flow monitoring programs, characterization of water currents in streams and marine environments with Acoustic Doppler Current Profiler units, as well as advanced knowledge of discharge gauging techniques using a broad range of instruments.

Along with the above, Mr. Rodriguez is certified for electrofishing and has been responsible for all logistical and safety requirements during complex field trips to ensure that the scope of work is implemented safely, on time and on budget.

EDUCATION

B.Sc.Eng. (Civil Engineering), Universidad de Costa Rica, San Jose, Costa Rica, 2002

M.Sc.E. (Water Resources), University of New Brunswick, Fredericton, New Brunswick, 2005

REGISTRATIONS

Professional Engineer #M7058, Association of Professional Engineers and Geoscientists of New Brunswick

Professional Engineer #100223574, Professional Engineers Ontario

PROJECT EXPERIENCE

Gas & Liquid Pipelines

Emergency Action Plan, Enbridge, Montreal, Quebec

Two dimensional modeling on three rivers in Montreal as well as the Niagara River were conducted to determine the fate of contaminants during a hypothetic spill under different flow and wind scenarios. The results were used to develop an emergency action plan for the pipeline operator.

Saint John River Pipeline Crossing, Saint John, New Brunswick

Computer modeling was conducted on the Saint John River estuary to determine the feasibility of installing a natural gas pipeline on the river floor. A sediment transport analysis was also carried out using a two dimensional hydrodynamic model and GIS tools.

Hydrologic / Hydraulic Assessments

Caribou Mine Dam Break Assessment, Bathurst, New Brunswick

An open channel model of the tailings and receiving streams was developed to determine the hazard potential classification of four structures within the mine. The analysis included dam break scenarios for each individual structure as well as the effects of cascade failures. The resultant floodplains were mapped with GIS software.

Brant Mill Dam Break Assessment, County of Brant, Ontario

A dam break assessment was conducted to assess potential loss of life and loss of property. Flood maps for different scenarios were developed with HEC-RAS and HEC-GeoRAs. The resulting floodplains were mapped with GIS software.

** denotes projects completed with other firms*

Andres Rodriguez M.Sc.E., P.Eng.

Water Resources Engineer

Hazard Potential Classification, Ontario Graphite, Kearney, Ontario

A Hazard Potential Classification assessment which included a Dam Break Assessment was conducted to support the environmental permitting process of the Ontario Graphite Mine in Kearney, ON. The assessment included the development of a 1-D model to determine potential impacts of dam failures in the receiving environment.

Hydrotechnical Assessment, Corner Brook, Newfoundland

A hydrotechnical assessment at the proposed Water Treatment Plant for the city of Corner Brook was conducted to determine the potential effect of flood events on underground infrastructure, mainly water holding tanks. The project required 1-D modeling of the brook to determine maximum elevations and floodplain boundaries near the plant.

Canada Post Mail Processing Centre - Wall Stabilization Project, Saint John, New Brunswick

A one dimensional hydrodynamic model of a portion of Marsh Creek in east Saint John was developed to study the potential impacts of replacing a deteriorating timber wall along the bank with an armoured rip-rap wall to protect the site from erosion and flooding. The model was used to confirm maximum floodplain boundaries as well as rip-rap sizing.

Silver Falls Hyrdologic Assessment, Saint John, New Brunswick

A detailed hydrologic study of the watersheds upstream of the Silver Falls dam was developed and calibrated to determine the potential impacts of climate change on future water availability. The Silver Falls dam is used as the main water supply for a large industrial facility in east Saint John. The assessment included historical and modified weather patterns due to climate change.

Characterization of Currents, Yellowknife Bay, Northwest Territories

Data processing was conducted to create summaries of water current magnitudes and directions at Yellowknife Bay. The data was obtained during a field deployment using an Acoustic Doppler Current Profiler unit. The data was used to calibrate and validate a hydrodynamic model of the bay to support environmental work.

Hydrologic Assessments for Quarry Operations, Nova Scotia

Several hydrologic assessments for quarry operations in Nova Scotia were conducted to renew their permit to operate and/or expand the existing quarry footprint. The main objective was to quantify potential effects on the existing downstream streams and waterbodies due to a change in the runoff regime of each property. A secondary objective was to determine the size of the detention facilities to improve water quality prior to discharge, as required by the applicable guidelines and regulatory agencies.

Industrial

Hydrologic Study for the Containment of Stillwaters, Wing 5, Happy Valley Goose Bay, Newfoundland and Labrador

A flow monitoring program was conducted at five culvert crossings to provide baseline flow data to calibrate a hydrologic model of the site. The hydrologic model was used to determine potential changes to the hydrologic regime due to proposed containment measures, which may include infilling and/or capping large areas within the stillwaters.

Imperial Oil Refinery, Dartmouth, Nova Scotia

An assessment of the capacity of Morris Lake to sustain water withdrawals from the refinery was conducted to support the water withdrawal renewal application. The assessment included a field trip to install a flow monitoring station at the exit of Morris Lake as well as hydrologic modeling and GIS analyses.

Beaver Hills Aromatic Extraction Project, Edmonton, Alberta

Hydrologic modeling was used to calculate surface runoff in the area of a proposed Aromatics Extraction Plant. The results were used to size the drainage system to protect the project from flooding.

Proposed Eider Rock Refinery, Saint John, New Brunswick

Long term hydrologic modeling was carried out in several watersheds around the location of a proposed refinery site to identify the feasibility of a surface water supply source for the project during construction and operation. Additionally, hydrologic assessments were conducted to determine the potential impacts on the receiving environment due to a change in the land use of the property.

** denotes projects completed with other firms*

Andres Rodriguez M.Sc.E., P.Eng.

Water Resources Engineer

Keltic Petrochemicals, Goldboro, Nova Scotia

This project required the development of a dam break assessment to satisfy the requirements of regulatory agencies in Nova Scotia. The project focused on potential flooding caused by a dam break during high flow conditions. HEC-RAS and HEC-GeoRAs were used with ArcView to model and map the resulting floodplain and identify potential risks to infrastructure downstream of the proposed dam.

Marine Environmental Studies
Proposed Bear Head LNG Terminal, Port Hawkesbury, Nova Scotia

Environmental work was conducted at a proposed pipeline crossing to support the environmental permitting task. The work included the characterization of marine currents using an Acoustic Doppler Current Profiler, collection of sediment and water samples and underwater video along the proposed pipeline crossing.

Characterization of Currents, Prince Rupert, British Columbia

Marine currents and directions over the water column were measured using an Acoustic Doppler Current Profiler unit in Prince Rupert. The data was processed and summarized to calibrate and validate a three-dimensional hydrodynamic model of the bay (done by a third party) to support environmental work.

Proposed Oil Export Terminal, Saint John, New Brunswick

Comprehensive baseline studies were conducted at potential oil export marine terminal sites in New Brunswick and Quebec. The study was part of the data acquisition program to support the environmental application for regulatory approval. The study included several field trips to collect current velocities, water and sediment samples as well as underwater video of the sediment substrate

Characterization of Marine Currents, Hopedale, Newfoundland

Marine currents were measured using an Acoustic Doppler Current Profiler unit (ADCP) at Hopedale Harbour, NL to support the development of a hydrodynamic computer model. The work included data acquisition and processing during full tidal cycles.

Canaport Marine Terminal, Saint John, New Brunswick

Current Measurements were conducted using an Acoustic Doppler Profiler unit (ADCP) near the proposed Canaport Marine Terminal to support the calibration and corroboration of a computer model of the area. The work was conducted during full tidal cycles. The acquired data was also processed and presented in a series of maps that were used for reporting purposes.

Mining & Minerals
Donkin Coal Mine, Xstrata Coal, Nova Scotia

A hydrologic assessment of the area of the proposed Donkin Coal Mine near Sydney, Nova Scotia was conducted to support environmental permitting. The assessment included the identification of areas of concern with respect to hydrologic regimes as well as changes in runoff patterns due to the construction of the mine waste piles.

Sisson Mine, Northcliff Resources, New Brunswick

A 1-D model of Napadogan Brook was developed to assess potential effects in the stream due to the construction of the mine including potential fish habitat alteration. The analysis included impacts due to flow and water temperature changes as a consequence of the proposed mine effluent discharge.

Decommissioned Mine Sites, Department of Natural Resources, Newfoundland

Hydrotechnical assessments were conducted to support dam safety reviews of three orphaned mines in central Newfoundland. The assessments included a field visit of each site followed by a desktop analysis focusing on the capacity of hydraulic structures within the tailings dam to convey large flood events. Hydrologic modeling was carried out for all sites.

Proposed Iron Ore Corp, Newfoundland

Field work was conducted at the proposed Kamistiatusset Mine near Wabush. The work included several field trips to install and maintain flow and water level stations within the mine property. The data was used to support further hydrologic work which was part of the mine's environmental permitting process.

** denotes projects completed with other firms*

Andres Rodriguez M.Sc.E., P.Eng.

Water Resources Engineer

Roads and Highways

Bridge and Culvert Replacements, Cape Breton, Nova Scotia

Hydraulic studies were carried out at three sites to support the design of a replacement structures on the Cabot Trail. The work included the determination of peak flow statistics and the development of open channel hydraulic models to ensure that the proposed structures provide adequate conveyance capacity while minimizing erosion and scour effects.

New Brunswick Southern Culvert Rehabilitation, St. John, New Brunswick

A culvert capacity assessment was conducted at a stream crossing for the New Brunswick Southern Railway. Flooding on a nearby housing development located upstream of the crossing was the trigger for the assessment. The hydrologic model HEC-HMS and the open channel hydraulics model HEC-RAS were utilized during the study.

Highway 1 Re-Alignment, Letang to Lepreau, New Brunswick

Flow monitoring stations were deployed in different streams at their intersection with the proposed highway re-alignment project. Flow data was obtained for baseline purposes as well as to identify potential environmental impacts to the streams from highway operations.

** denotes projects completed with other firms*

Andres Rodriguez M.Sc.E., P.Eng.

Water Resources Engineer

PUBLICATIONS

Erosional Properties of the Sediments in the Petitcodiac River Estuary at Moncton, New Brunswick. *Canadian Journal of Civil Engineering, Vol. 33, pp 1209-1216*, 2006.

Erosional Properties of the Sediments in the Petitcodiac River Estuary at Moncton, NB. *Master's Thesis, University of New Brunswick, Canada 141p*, 2005.

Erosional Properties of the Petitcodiac River Sediments. *Proceedings of the 2nd CSCE Speciality Conference on Coastal, Estuary and Offshore Engineering, Toronto, Ontario, OF-103-1*, 2005.

Modelacion Numerica de Transporte de Sedimentos. *Graduation Report, University of Costa Rica, San Jose, Costa Rica, 105p*, 2002.

Josh Mansell

Biologist

Josh Mansell is a Biologist in the Environmental Services Group for Stantec Consulting Ltd. His academic background encompasses many aspects of environmental sciences and natural resource management with a focus towards aquatic and terrestrial biology. Mr. Mansell is certified in Ontario's Southern Ontario Wetland Evaluation System and is experienced in its field and reporting applications. He also has field experience in avian and amphibian identification through sight and sound and their associated habitats, as well as conducting extensive terrestrial and aquatic flora identification. Josh's expertise encompasses a healthy knowledge of Ontario's freshwater fish species, familiarity with the Natural Heritage Information Centre, Natural Heritage Reference Manual, Significant Wildlife Habitat Technical Guide, the Species at Risk Act, Endangered Species Act, 2007 and Migratory Birds Convention Act, which aids in the analysis of natural heritage features to identify significance through Natural Heritage Assessments. Josh was the lead on a fisheries compensation project component that involved the design and creation of a coastal wetland along the St. Lawrence River for the purpose of creating and enhancing fisheries habitat where he was able to display his strong knowledge of the Fisheries Act and freshwater fisheries ecology. Also, he has experience in reporting findings for biological surveys, conducting the associated statistical analysis, preparing budgets and proposals.

EDUCATION

Fish and Wildlife Management Technologist, Sir Sandford Fleming College, Lindsay, Ontario, 2007

Ecosystems Management Technician, Sir Sandford Fleming College, Lindsay, Ontario, 2006

Fish and Wildlife Management Technician, Sir Sandford Fleming College, Lindsay, Ontario, 2005

CERTIFICATIONS & TRAINING

DFO Ontario Freshwater Mussel Identification Workshop, Finch, Ontario, 2010

AED and CPR (C) Certificate of Completion, Ottawa, Ontario, 2014

Ecological land Classification (ELC) Training Course Certificate of Completion, Kemptville, Ontario, 2014

ROM Species at Risk Fish Identification Certificate of Completion, Guelph, Ontario, 2013

Level II Certified, Ontario Freshwater Fish Identification Course, Kemptville, Ontario, 2011

ROM Fish Identification Certificate of Completion, Toronto, Ontario, 2010

MNR NHIC Training for SAR Management, Smiths Falls, Ontario, 2011

OSAP Training Course/Electrofishing Certificate (Class 2), Kemptville, Ontario, 2010

Fish Hatchery Operations Certificate, Lindsay, Ontario, 2007

Ontario Wetland Evaluation System Certificate (Southern Region), Lindsay, Ontario, 2007

PROJECT EXPERIENCE

Fisheries Management

Premier Gold Mines Ltd. - Hardrock Environmental Baseline Study, Geraldton, Ontario (Biologist)

Josh was appointed as a crew leader to conduct an intense fisheries field program to obtain baseline data to support an environmental assessment. Field activities included captaining a boat to set/fish experimental gill nets as prescribed by the MNRF, electrofishing watercourses, characterizing fisheries habitat with an emphasis on spawning and nursery habitats and obtaining water chemistry data. Bushcraft knowledge and orienteering were essential in completing this field program efficiently and safely due to the remoteness of the project area.

Josh Mansell

Biologist

National Research Council of Canada - Climatic Chamber Relocation, Ottawa, Ontario (Biologist)
A review of existing fisheries information, a fisheries habitat assessment and a fisheries community inventory was completed within the project area. The community inventory was completed with the use of minnow traps. An emphasis on the identification of federal species at risk as outlined in Species at Risk Act was required.

Fitztroy Harbour Community Centre - Slope Stabilization, Fitzroy Harbour, Ontario (Biologist)
Josh was retained by the City of Ottawa to conduct a complete fish rescue from the lower reaches of the Carp River in order to facilitate the relocation of the main channel of the Carp River. Josh coordinated with the contractor to discuss the best areas to erect barriers and conduct the fish rescue. All fish were identified, counted and relocated downstream.

Alderon Iron Ore Company - Fisheries Investigation, Sept-Iles, Quebec (Biologist)
Josh completed a fisheries investigation within freshwater watercourses on a proposed mine site to determine the extent of fish habitat as defined by DFO. Electrofishing and orienteering in remote locations were key components to the completion of his efforts.

CN Rail - Post-Construction Fisheries Monitoring, Brockville, Ontario (Biologist)
Post construction fisheries monitoring was completed on multiple watercourses from Brockville to Gananoque with an emphasis on SAR. Capture techniques and knowledge of aquatic SAR in the region was essential for the completion of this project. Safety training specific to CN Rail was completed in order to conduct field work.

Fleet Street Pump Station (FSPS) Fish Rescue, Ottawa, Ontario (Biologist)
Josh was retained by the City of Ottawa to construct and implement a strategy to complete a high profile fish rescue within the aqueducts and tailrace sections of the FSPS. American Eel were observed during dewatering efforts and Josh was responsible for coordinating with all the required agencies to address further efforts in order to not contravene the Endangered Species Act, 2007. He also assisted in the biological sampling and tagging procedures of the eel with the MNR. A thorough report was delivered to all proponents and agencies outlining all aspects of the fish rescues including recommendations as a fish rescue on this scale has not been completed before within the FSPS.

Ontario Graphite Ltd. - Fisheries Investigation, Kearney, Ontario (Terrestrial Biologist)
A simple fisheries investigation in remote locations was conducted to determine the current fisheries community within various waterbodies and watercourses in the study area. Orienteering and backpacking were large components of this project.

Slope Stabilization Project, Carp, Ontario (Terrestrial Biologist)
Josh provided a detailed description of the existing fisheries communities and habitat to the city for this project.

Windsor Park Village Environmental Inventory, Finch, Ontario (Terrestrial Biologist)
A simple fisheries investigation was conducted to determine the current fisheries community and habitat within the watercourse.

Liffey Creek, Arnprior, Ontario (Terrestrial Biologist)
Josh completed a fish rescue for the Township of Braeside-McNab in order for them to install a new culvert. Identification skills were a necessity because of identified SAR in the area.

Kemptville Commercial EIS, Kemptville, Ontario (Terrestrial Biologist)
Josh was involved with several fish and fish habitat components for this project. Identifying and describing the fisheries communities within several watercourses were a major component.

** denotes projects completed with other firms*

Josh Mansell

Biologist

MTO Highway 7 & 35, Lindsay, Ontario (Terrestrial Biologist)

A detailed fisheries community and habitat assessment was conducted along several watercourse crossings for this project using specific MTO guidelines.

City of Ottawa Campeau Drive, Kanata, Ontario (Terrestrial Biologist)

Josh was involved with several fish and fish habitat components for this project. Identifying and describing the fisheries communities within the Carp River were a major component.

Lake Ontario Atlantic Salmon Reintroduction Program* (Hatchery Technician)

Volunteered my services to the Lake Ontario Atlantic Salmon Reintroduction Program at Fleming College's Frost Campus fish hatchery. Enough hours were accumulated to obtain a Fish Hatchery Operations Certificate. Experience with Muskellunge at the hatchery was also obtained in previous years.

South Nation Conservation* (Fisheries Technician)

As a technician I had the responsibility of initiating, coordinating and implementing a stream fisheries monitoring project watershed wide. The Ontario Stream Assessment Protocol (OSAP) was conducted on various streams in outlined subwatersheds to obtain baseline data that is used to perform multiple restoration projects, fulfill data requests and update the municipal drain database. Morphological, chemistry and biological data was gathered during each sampling event. The Near Shore Community Index Netting (NSCIN) protocol was also conducted on the larger rivers of the watershed where important fisheries data was collected that was used to create a fisheries management plan for the watershed. Various other projects that were conducted involved species at risk management; including a rare turtle study, butternut and ginseng surveys and cutlip minnow sampling.

Aquatic Ecology

Stream Monitoring and Assessment Research Team Eastern Region (SMARTER)*

The purpose of the SMARTER group was to collaborate with Eastern Ontario stream researchers that talked about study designs, funding opportunities, evolving legislation and techniques. As a member of the Ontario Stream Assessment Protocol (OSAP) Steering Committee new information regarding the protocol was presented to the team biannually; who most of which implemented the protocol at their respective agencies.

Environmental Monitoring

Enbridge Pipelines Inc. - Integrity Digs, Multiple Sites, Ontario and Quebec (Biologist)

Josh was trained to conduct rigorous environmental monitoring at various Enbridge dig sites across Ontario and Quebec. Specific attention was paid to details that ensured Enbridge was in compliance with the regulatory agencies, such as the MOE, MNRF and conservation authorities, during their construction and remediation efforts. Aside from the duties outlined above Josh provided expertise to the construction management team and Enbridge Environment on both aquatic and terrestrial ecosystems in eastern Ontario and their potential constraints as they pertain to their integrity program.

Stream Rehabilitation

Catfish Creek Conservation Authority*, Aylmer, Ontario (Internship)

Involved with various stewardship projects in the watershed
Responsible for students of the Environmental Leadership Program
Aided with stream remediation projects to improve habitat

** denotes projects completed with other firms*