

APPENDIX C
WATER ASSESSMENT AND WATER BODY REPORT

**KINGSTON SOLAR LP
SOL-LUCE KINGSTON
SOLAR PV ENERGY PROJECT**

**WATER ASSESSMENT AND
WATER BODY REPORT**

**Submitted to:
Kingston Solar LP
55 Standish Court, 9th Floor
Mississauga, ON
L5R 4B2**

**Submitted by:
AMEC Environment & Infrastructure,
a Division of AMEC Americas Limited
160 Traders Blvd., Suite 110
Mississauga, Ontario
L4Z 3K7**

**September 2012
TC111406
168335-0002-160-RPT-0016**



IMPORTANT NOTICE

This Document was prepared exclusively for Kingston Solar LP, by AMEC Americas Limited. The quality of information contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this document. This document is intended to be used by Kingston Solar LP only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance upon this document by any third party for any other purpose will be at that party's sole risk.

REV.	DATE	DETAILS OR PURPOSE OF REVISION	PREPARED	CHECKED	APPROVED
A	14/12/2011	Issued for client review			
B	30/04/2012	Issued for client review			
0	08/05/2012	Issued for use.			
1	14/09/2012	Issued for use.			

TABLE OF CONTENTS

	PAGE
1.0 INTRODUCTION.....	1
1.1 Project Overview	1
1.2 Report Requirements	5
2.0 METHODS	7
2.1 Definition of a Water Body	7
2.2 Records Review	7
2.3 Site Investigations	8
2.4 Qualifications.....	9
3.0 EXISTING CONDITIONS AND PREDICTED IMPACTS.....	11
3.1 Species at Risk	11
3.2 Water Bodies.....	11
3.2.1 Glenvale Creek	19
3.2.2 Millhaven Creek	26
3.2.3 Other Water Bodies and Drainage Features	28
3.3 Summary of Predicted Impacts to Fish Habitat and Approval Processes	29
3.3.1 Fisheries Habitat	47
3.3.2 Species at Risk	49
4.0 POTENTIAL IMPACTS OR EFFECTS.....	51
4.1 General Construction Related Impacts	51
4.2 Culverts and Access Roads.....	51
4.3 Overhead Collector Lines and Transmission Line	52
4.4 Underground Collector Lines	52
4.5 Solar Panel Placement and Maintenance.....	52
4.6 Collector Substation	53
4.7 Operations and Maintenance Building	53
4.8 Surface Run-off and Stormwater	53
4.9 Water Taking Activities	54
4.10 Discharge into the Environment.....	54
4.11 Accidental Spills and Contaminants.....	54
5.0 STANDARD MITIGATION MEASURES FOR WORKING AROUND FISH HABITAT	56
5.1 General Mitigation Measures	56
5.2 Mitigation Measures for New Culvert Crossings	57
5.3 Mitigation Measures for Overhead Collector Lines.....	58
5.4 Mitigation for Underground Collector Lines	58
6.0 MONITORING.....	61
6.1 Construction	61
6.2 Operation	61

7.0	CLOSURE.....	63
8.0	REFERENCES.....	64

LIST OF TABLES

Table 1-1: Water Assessment and Water Body Report Requirements under O.Reg. 359/09	6
Table 3-1: Summary of Water Bodies and Water Features within the 120 m Zone of Investigation.....	12
Table 3-2: Secondary Source Information - Fish Species List.....	19
Table 3-3: Site Investigation Fish Species List (October 2011).....	20
Table 3-4: Species-Specific Catch per Sample Location for Minnow Traps.....	21
Table 3-5: Species Specific Catch by Location by Backpack Electroshocking	21
Table 3-6: Species Specific Catch by Location by Dip Netting.....	21
Table 3-7: Potential Environmental Impacts and Mitigation for Water Bodies and Drainage Features within the 120 m Zone of Investigation	30

LIST OF FIGURES

Figure 1-1: Project Site Location.....	3
Figure 1-2: Project Boundary and Existing Watercourse / Water Body Information.....	4
Figure 2-1: Fish Sampling Locations Summary Map.....	10
Figure 3-1: Aquatic Features and Classifications Overview Map	15
Figure 3-1a: Aquatic Features and Classifications Summary Map A	16
Figure 3-1b: Aquatic Features and Classifications Summary Map B	17
Figure 3-2: Inaccessible Portion of GC Trib-2 within the 120 m Setback Investigation Area	18

LIST OF APPENDICES

Appendix A: Curricula Vitae
Appendix B: Correspondence
Appendix C: Photographic Record
Appendix D: Field Notes, Data Sheets and Supplemental Data Summaries
Appendix E: Department of Fisheries and Oceans Operational Statements for the Province of Ontario

1.0 INTRODUCTION

1.1 Project Overview

Kingston Solar LP (hereinafter referred to as “Proponent”) proposes to develop a solar facility with a maximum name plate capacity of approximately 100 MW AC (megawatts of alternating current) in Eastern Ontario located in the city of Kingston and Loyalist Township. If approved, this facility would use photovoltaic (PV) technology to convert solar energy into electricity. Power generated by the proposed facility would be fed into the provincial grid via a substation located adjacent to the Hydro One Networks Inc. (HONI) transmission line which crosses the study area. The output of the solar PV Project will be collected and connected to an electrical substation capable of transforming the power from distribution voltage to a transmission voltage of 230 kV.

The proposed facility is to be known as the “Sol-luce Kingston Solar PV Energy Project” (hereinafter referred to as “the Project”). The Project is designated as a Class 3 solar facility in accordance with the definition in Section 4 of O.Reg. 359/09. The development of the Project would help the Province of Ontario meet its goal of increasing the proportion of electricity generated from renewable energy sources.

The Project is proposed in the City of Kingston and Loyalist Township and is generally bounded by a northing of 4910430 (NAD 83 UTM), Highway 38 to the east, Millhaven Creek and Odessa Lake to the west and Highway 401 to the south (Figure 1-1 and 1-2).

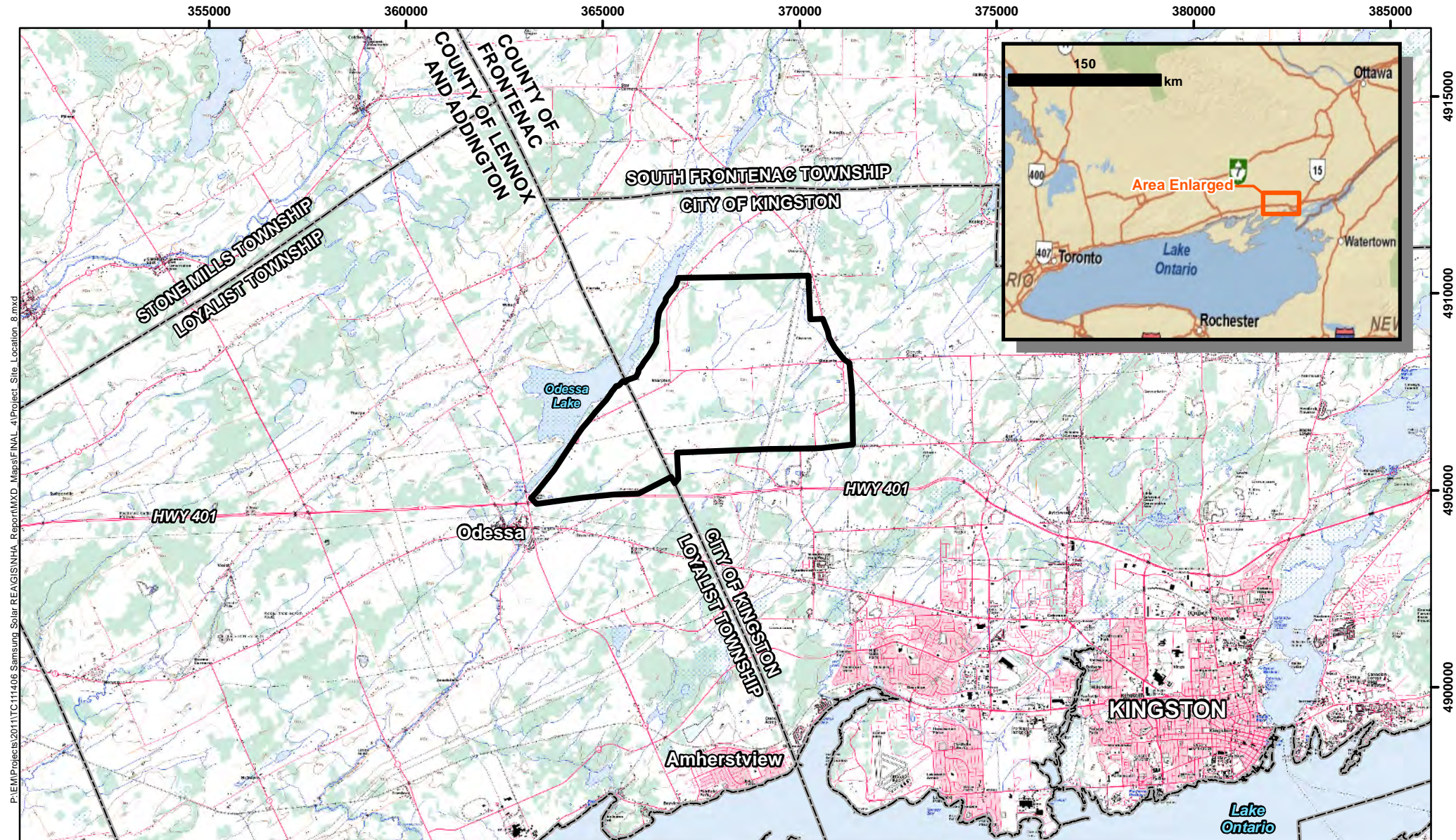
The basic components of the Project include fixed ground mounted photovoltaic panels (crystalline solar cells) located on sections of privately owned, leased lands within the Project Location, which covers an area of approximately 261 ha.

The Project Location includes all land and buildings/structures associated with the Project. This includes structures such as solar panels, access roads, and power distribution lines as well as any temporary construction zones surrounding access roads (constructible areas) which will be required during the construction of the Project. This also includes the corridors surrounding infrastructure such as access roads in which the final infrastructure may be located.

For the purposes of the identification of natural heritage features and the assessment of potential effects, a “Zone of Investigation” has been identified based on the requirements of Ontario Regulation 359/09 (O.Reg. 359/09), the Ministry of Natural Resources’ (MNR’s) *Approval and Permitting Requirements Document for Renewable Energy Projects* (APRD) (September 2009) and the Ministry of the Environment (MOE’s) *Technical Guide to Renewable Energy Approvals* (TGREA) (2011, 2012). The Zone of Investigation encompasses the Project Location and an additional 120 m surrounding the Project Location. This ensures that adverse environmental effects that may result from construction and operational activities have been assessed.





The Proponent has retained AMEC Environment & Infrastructure, a Division of AMEC Americas Limited (AMEC) to prepare a Renewable Energy Approval (REA) application, as required under O.Reg 359/09. This *Water Assessment and Water Body Report* is included as a component of the REA application, to meet the requirements of sections 29, 30, 31, 39, and 40 of O.Reg 359/09 and in accordance with the MNR's APRD and MOE's TGREA.



P:\EIP\Projects\2011\TC121406 Samsung Solar REAGIS\NHA_Report\MXD_Maps\FINAL_A\Project_Site_Location_8.mxd

LEGEND

 Project Area

 Municipal / County Boundary

NOTES:
 - Background topographic DRG map extracted from Geogratis.ca, 1:50k NTS

KINGSTON SOLAR LP



SOL-LUCE KINGSTON SOLAR PV ENERGY PROJECT

Regional Study Area

Datum: NAD83
 Projection: UTM Zone 18N



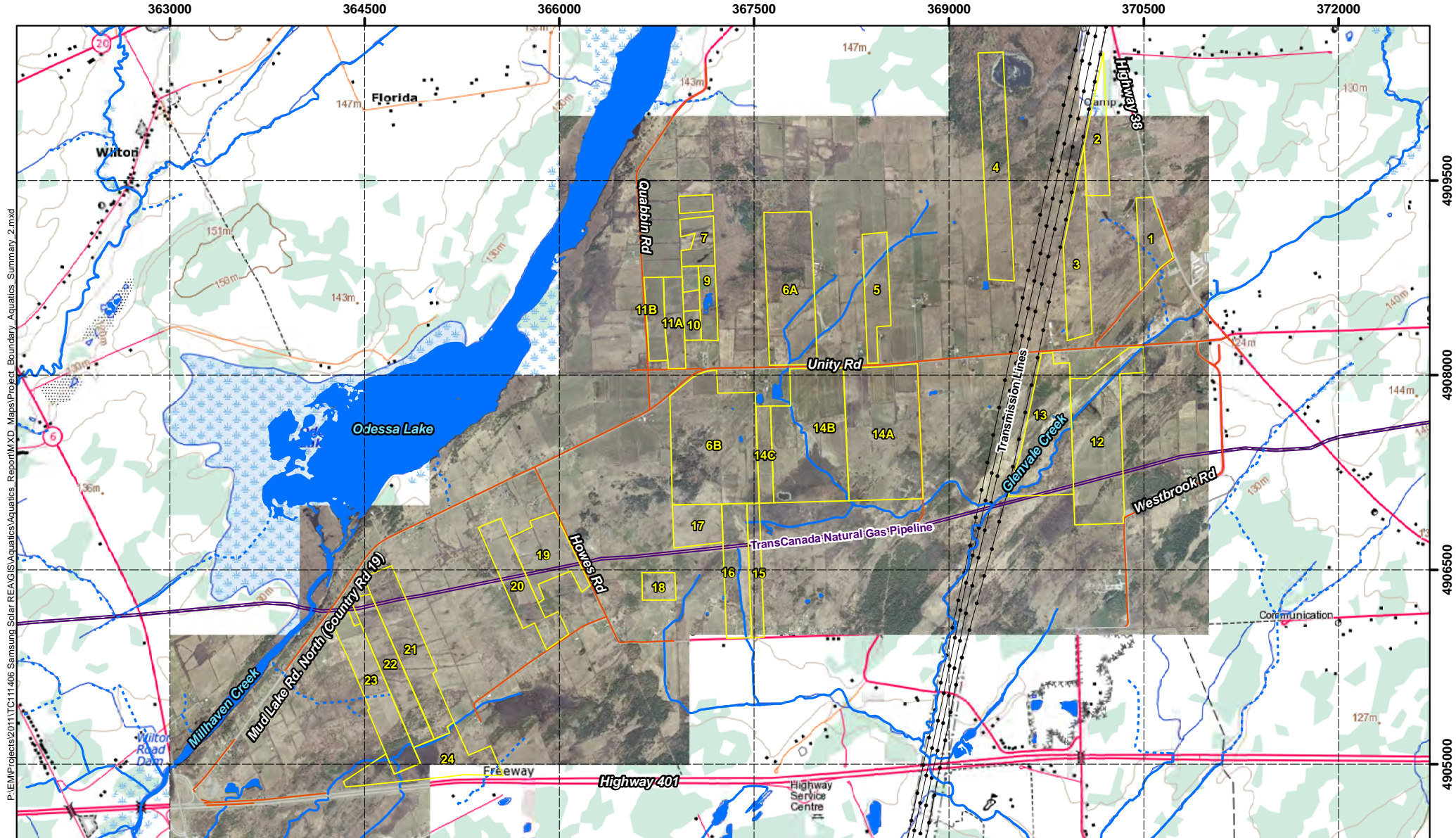
PROJECT N^o: TC121402

FIGURE: 1-1



SCALE: 1:135,000

DATE: June 2012



P:\E\MP\Projects\2011\TC111406 Samsung Solar RE\ANGS\Aquatics\Aquatics_Report\MXD_Maps\Project_Boundary_Aquatics_Summary_2.mxd

- LEGEND**
- 6B Property Area that is Potentially Eligible for Development
 - Roads
 - TransCanada Natural Gas Pipeline ROW (Approx.)
 - Transmission Lines

- Watercourse/Waterbody (LIO-MNR)
- Intermittent (CRCA-warm water stream)
- Permanent (CRCA-warm water stream)
- Waterbody (LIO-MNR)

NOTES:

- Background topographic DRG map extracted from Geogratis.ca, 1:50k NTS, Natural Resources Canada
- Watercourse and Waterbody data extracted from Land Information Ontario, Ministry of Natural Resources, 2011
- Watercourse classification provided by Cataraqui Region Conservation Authority (CRCA) watercourse data, 2011

KINGSTON SOLAR LP

SOL-LUCE KINGSTON SOLAR PV ENERGY PROJECT

Project Area and Existing Watercourse / Waterbody Information

Datum: NAD83
 Projection: UTM Zone 18N



PROJECT N^o: TC111406

FIGURE: 1-2



SCALE: 1:41,000

DATE: December 2011

1.2 Report Requirements

A Water Assessment is a required component of a REA application, and includes a records review and a site investigation to determine the presence and the boundaries of water bodies as defined by O.Reg. 359/09 and are 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). A Lake Trout lake at or above development capacity is defined to mean a lake that has been designated by the MNR for Lake Trout management (MOE 2011, 2012). If water bodies are identified within 120 m of the Project Location, a Water Body must be prepared. Revisions to the Renewable Energy Approval (REA) regulation (O.Reg. 359/09) and the Technical Guide for Renewable Energy Approvals (Technical Guide, 2012) are currently under review and this *Water Assessment and Water Body Report* has been prepared with consideration of the proposed regulations and revised Technical Guide.

The Project Location refers to any land, structure or air space in, on or over which part of a renewable energy project is proposed. This includes structures such as solar panels, access roads and power lines, as well as any temporary work areas (constructible areas) which are required to be utilized during the construction of the Project. Specifically, the Project Location includes the solar panels, substation, collector lines, transformers, access roads, and an operations and maintenance building within the Project Area.

This *Water Assessment and Water Body Report* is intended to satisfy the requirements outlined within sections 29, 30, 31, 39, and 40 of O.Reg 359/09 and in accordance with the MNR's APRD and MOE's TGREA. Table 1-1 summarizes the documentation requirements of the *Water Assessment and Water Body Report* as specified under O.Reg. 359/09.

Table 1-1: Water Assessment and Water Body Report Requirements under O.Reg. 359/09

Requirements (Water Assessment)	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.	X	3.1, 3.2, Table 3-2
2. A site investigation conducted in accordance with section 31, including:		
31(4)(1). A summary of any corrections to the report.	X	2.3
31(4)(2). Information relating to each water body.	X	3.2, 3.3
31(4)(3). A map showing boundaries, location/type and distances.	X	Figures 3-1, 3-1a, 3-1b, 3-1c
31(4)(4). A summary of methods used to make observations for the purposes of the site investigation.	X	2.3
31(4)(5). The name and qualifications of any person conducting the site investigation.	X	2.4
31(4)(6)(i). The dates and times of the beginning and completion of the site investigation.	X	2.3
If an investigation was conducted by visiting the site:		
31(4)(6)(ii). The duration of the site investigation.	X	2.3
31(4)(6)(iii). The weather conditions during the site investigation	X	2.3
31(4)(6)(iv). Field notes kept by the person conducting the site investigation.	X	Appendix D
If an alternative investigation of the site was conducted:		
31(4)(7)(i). The dates of the generation of the data used in the site investigation.		N/A
31(4)(7)(ii). 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.		3.2, Appendix B
Requirements (Water Body)		
4. Report identifies and assesses any negative environmental effects of the project on a water body and on land within 30 metres of the water body.	X	3.1, 3.2, 3.3, 4.0
5. Report identifies mitigation measures in respect of any negative environmental effects.	X	3.3, 5.0
6. Report describes how the environmental effects monitoring plan addresses any negative environmental effects.	X	6.0
7. Report describes how the construction plan report addresses any negative environmental effects.	X	5.0, 6.1

2.0 METHODS

2.1 Definition of a Water Body

The presence or absence of water bodies within the Project's 120 m Zone of Investigation was assessed using the following definition of a water body, provided under O.Reg 359/09:

"...a water body is defined to include a lake (including kettle lakes and Lake Trout lakes), a permanent stream, an intermittent stream and a seepage area but does not include:

- Grassed waterways;
- Temporary channels for surface drainage, such as furrows or shallow channels that can be tilled and driven through;
- Rock chutes and spillways;
- Roadside ditches that do not contain a permanent or intermittent stream;
- Temporary ponded areas that are normally farmed;
- Dugout ponds; and,
- 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."

This definition was applied throughout records review and site investigation stages of this study. Where applicable, information is presented pertaining to water conveyance or retention features (i.e., drainages, water courses, ponds or lakes that do not meet the definition of a water body under O.Reg. 359/09) for the purpose of completeness and to provide supporting information regarding construction design and possible future permitting requirements for the Project.

2.2 Records Review

A water records review was conducted according to Section 30(1) of O.Reg. 359/09. Water record mapping was reviewed from the following sources:

- Ministry of Natural Resources (MNR) Land Information Ontario mapping (LIO) (MNR 2009);
- Fisheries and Oceans Canada;
- Cataraqui Region Conservation Authority; and
- Natural Resources Canada.

Figures depicting the water bodies and water conveyance or retention features as identified by these mapping sources are provided in Figure 1-2 and Figure 2-1. Additional potential water bodies and water conveyance or retention features were identified using satellite imagery of the Zone of Investigation. Further information pertaining to these water bodies and features was obtained via site investigation.

Secondary source information pertaining to aquatic resources and specifically fish communities as well as aquatic species at risk in the Zone of Investigation was provided by:

- MNR Kingston Area Office; and,
- Cataraqui Region Conservation Authority (Beaubiah 2004).

Additional information regarding significant species occurrences and species at risk was obtained from Fisheries and Oceans Canada (DFO) (DFO, 2011), the Cataraqui Region Conservation Authority (CRCA), and from the MNR's Natural Heritage Information Centre (NHIC) (NHIC, 2011) online database.

2.3 Site Investigations

Following the records review, site investigations were undertaken within the 120 m Zone of Investigation from October 3 to 7 and October 25 and 26, 2011. Weather conditions ranged from partial cloud and sun to overcast with light precipitation. The average daily air temperature ranged from 8 to 17°C. Prior to investigations conducted on October 25 and 26 a relatively substantial amount of rainfall occurred in the Kingston region, providing more saturated conditions compared to the previous field visit to the Project Location. Site investigations consisted of confirming water body locations and morphology as per the records review as well as documenting any additional water bodies that might exist, outside those identified in the records review. Site reconnaissance was used to identify the boundaries of any water body located within the 120 m of the Project Location. When possible, water bodies were investigated along their length (e.g., streams, drainage features) or at multiple sample locations along the water body at reaches of habitat transition when site access was not feasible. Linear water bodies and ponds were investigated for the following habitat features:

- Floodprone, bankfull and wetted width and depth;
- Overall channel gradient;
- Morphological distribution (pools, flats and runs);
- Substrate composition;
- Cover composition, distribution and extent;
- Possible groundwater interface;
- Riparian and aquatic vegetation composition; and,
- Overall bank stability.

Fish community assessments were also conducted at applicable water bodies and water conveyance or retention features that were holding sufficient water for sampling purposes. Fish community sampling consisted of minnow trapping, dip netting and backpack electrofishing.

Minnow traps were set at sampling locations for short durations (<5 hours) or overnight (18 to 24 hours). Minnow traps were baited in all cases with dog kibble to maximize the capture of foraging species within a short duration.

Directed dip netting with small mesh (2 mm) dip nets was used as an active capture technique in linear flow and ponded habitats throughout the Project Location.

One-pass electroshocking was conducted with a Smith-Root model LR-24 electroshocker unit. Reaches were sampled moving upstream in a sweeping motion concentrating on equal effort in different habitats (bank, woody debris, large cobble/boulder, riffle complexes and pools). The electroshocker was set (frequency and voltage) to facilitate the capture of smaller bodied fish.

The gear specific effort was recorded for each sampling period as well as the species-specific catch. All captured fish were identified to species and enumerated. Sub-samples of individual fish were measured for length (fork and standard).

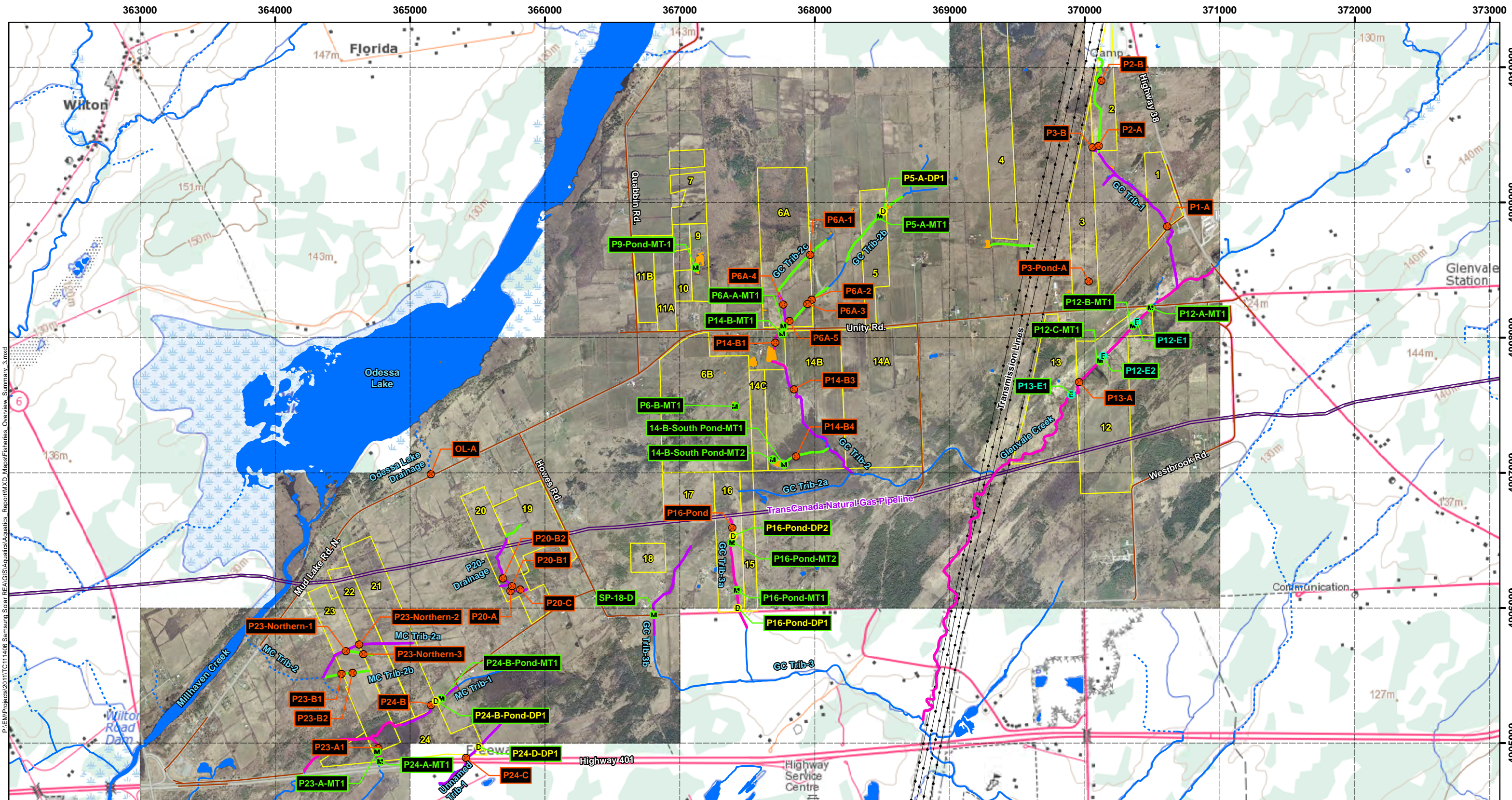
The locations of habitat assessments and fish community sampling is provided in Figure 2-1. Labelled locations indicate where fish collection efforts occurred or where full habitat assessments were completed. The reaches between these labelled points were typically walked and visually inspected for changes and for classification under O.Reg. 359/09.

2.4 Qualifications

Members of AMEC's Aquatic Resource Assessment Group were responsible for the identification of water bodies, water conveyance or retention features and for determining potential implications associated with Project development on the fish communities and fish habitat within the Project Location. These personnel included:

Jason P. Dietrich, M.Sc. – Aquatic Ecologist
Levi Snook, B.Sc. – Aquatic Specialist
Steve Agalotis – Aquatic Resources Technician

Curricula vitae for these individuals are provided in **Appendix A**.



LEGEND

Aquatic Habitat Assessment Station	Permanent Stream	Property Area that is Potentially Eligible for Development
Fish Sample Locations (by Gear Type)	Intermittent Stream	Roads
Dip Net	Grassed Waterway / Drainage Swale / Surface Drainage	TransCanada Natural Gas Pipeline ROW (Approx.)
Electrofisher	Dugout Pond / Standing Water	Transmission Lines
Minnow Trap	Watercourse/Waterbody (LIO-MNR)	
	Intermittent (CRCA-warm water stream)	
	Permanent (CRCA-warm water stream)	
	Waterbody (LIO-MNR)	

NOTES:

- Background topographic DRG map extracted from Geogratis.ca, 1:50k NT5, Natural Resources Canada
- Watercourse and Waterbody data extracted from Land Information Ontario, Ministry of Natural Resources, 2011
- Watercourse classification provided by Cataraqui Region Conservation Authority (CRCA) watercourse data, 2011

Datum: NAD83
Projection: UTM Zone 18N

KINGSTON SOLAR LP

SOL-LUCE KINGSTON SOLAR PV ENERGY PROJECT

Fish Sampling Locations Summary Map

PROJECT N ^o : TC111406	FIGURE: 2-1
SCALE: 1:27,000	DATE: December 2011

3.0 EXISTING CONDITIONS AND PREDICTED IMPACTS

3.1 Species at Risk

Review of available Species at Risk distribution mapping provided by DFO within the CRCA boundary showed no aquatic (fish or freshwater mussel) species at risk as protected by the federal *Species At Risk Act* (SARA) in the vicinity of the Project Location. Similarly, no species at risk as listed under the provincial *Endangered Species Act* (ESA) were indicated by the NHIC biodiversity explorer or through correspondence with the Kingston Area MNR for the area. Correspondence is provided in **Appendix B**.

3.2 Water Bodies

Water features are defined as a “water body” as per the definition of O.Reg. 359/09. This is done to provide a summary of water bodies within 120 m of the Zone of Investigation for the Project. Water features which do not meet the definition of a water body under O.Reg. 359/09 are identified (e.g., grassed waterway, drainage swale or human-made pond) and described in this section from the perspective of habitat as well as possible aquatic resources. Water features that are not water bodies are discussed as part of the water assessment portion of this report and included for future reference for construction and design purposes.

As a result of the records review the preliminary inventory of water bodies and water features as provided by provincial and federal agency map sources is shown in Figures 1-2. As a result of field investigations, water bodies and other water features within the 120 m of the Project Location were assessed and are summarized in Tables 3-1 and Figures 2-1, 3-1, 3-1a, 3-1b, and 3-2. Photographic representations of water bodies and water features are provided in **Appendix C**. Field notes, in-situ water quality measurements and supplemental habitat assessment summary data and fish capture tables are provided in **Appendix D**.

Table 3-1: Summary of Water Bodies and Water Features within the 120 m Zone of Investigation

Watershed	Subwatershed	Property ID	Reach ID / Pond ID Within Vicinity	Defined as Water Body (O.Reg. 359/09)	Description	Fish Habitat			Development Feature Type within 120 m of Water Body / Drainage Feature					Water Body Crossing (Access Road / Collector Line)	
						No	Direct	Indirect	Access Road	Overhead Collector Line	Underground Collector Line	Solar Panels	Substation / Building / Transformer		Component Within 30 m of Water Body
Glenvale Creek	Glenvale Creek	12	P12-A	X	Permanent Stream		X		X	X					X
		12	P12-B	X	Permanent Stream		X		X	X					
		12	P12-C	X	Permanent Stream		X								
		13	P13-A	X	Permanent Stream		X								
	Glenvale Creek Tributary 1	1	P1-A	X	Intermittent Stream			X	X	X	X	X			
		3	P3-B	X	Intermittent Stream			X	X		X	X			X
		2	P2-A		Grassed Waterway	X			X		X	X		X	
		2	P2-B		Grassed Waterway	X			X	X		X			
	Glenvale Creek Tributary 2	6A	P6A-A	X	Intermittent Stream			X	X	X		X			X
		14	P14-B1	X	Permanent Stream			X				X			
		14	P14-B2	X	Permanent Stream			X	X	X		X			
		14	P14-B3	X	Intermittent Stream			X	X	X		X			X
		14	P14-B4	X	Intermittent Stream			X							
		14B	14-B-South Pond		Human-made Pond	X							X		
	Glenvale Creek Tributary 2a	15	NA												
		14A	NR*		Permanent Stream		X		X		X	X			
	Glenvale Creek Tributary 2b	5	P5-A		Grassed Waterway & Human-made Pond	X									

Watershed	Subwatershed	Property ID	Reach ID / Pond ID Within Vicinity	Defined as Water Body (O.Reg. 359/09)	Description	Fish Habitat			Development Feature Type within 120 m of Water Body / Drainage Feature					Water Body Crossing (Access Road / Collector Line)		
						No	Direct	Indirect	Access Road	Overhead Collector Line	Underground Collector Line	Solar Panels	Substation / Building / Transformer		Component Within 30 m of Water Body	
Glenvale Creek		6A	P6A-2		Grassed Waterway	X			X		X	X				
		6A	P6A-3		Grassed Waterway	X			X		X	X				
		6A	P6A-5		Grassed Waterway	X			X	X	X	X				
	Glenvale Creek Tributary 2c	6A	P6A-1		Grassed Waterway	X			X		X	X				
		6A	P6A-4	X	Intermittent Stream			X	X		X	X		X	X	
	Glenvale Creek Tributary 3	NA	NR													
	Glenvale Creek Tributary 3a	16	P16-Pond	X	Pond		X									
		16	P16-A	X	Permanent Stream		X									
		16	P16-B	X	Permanent Stream		X									
		16	P16-C	X	Permanent Stream		X									
	Glenvale Creek Tributary 3b	18	SP-18-D	X	Intermittent Stream			X								
	Millhaven Creek	Millhaven Creek Tributary 1	24	P24-B	X	Intermittent Stream			X	X		X	X		X	X
			24	P24-B-Pond	X	Wetland Pond			X	X		X	X			
24			P24-A	X	Permanent Stream		X									
23			Upstream of P23-A1	X	Permanent Stream		X		X		X	X				
Millhaven Creek Tributary 2		NA	NA													
Millhaven Creek Tributary 2a		23	P23-Northern-1	X	Intermittent Stream			X	X		X	X			X	
		23	P23-Northern-2	X	Intermittent Stream			X	X		X	X				
		23	P23-Northern-3		Surface Drainage	X			X		X	X				
		22	P23-Northern-4	X	Intermittent Stream			X	X		X	X			X	
		21	P23-Northern-5	X	Intermittent			X	X		X	X			X	

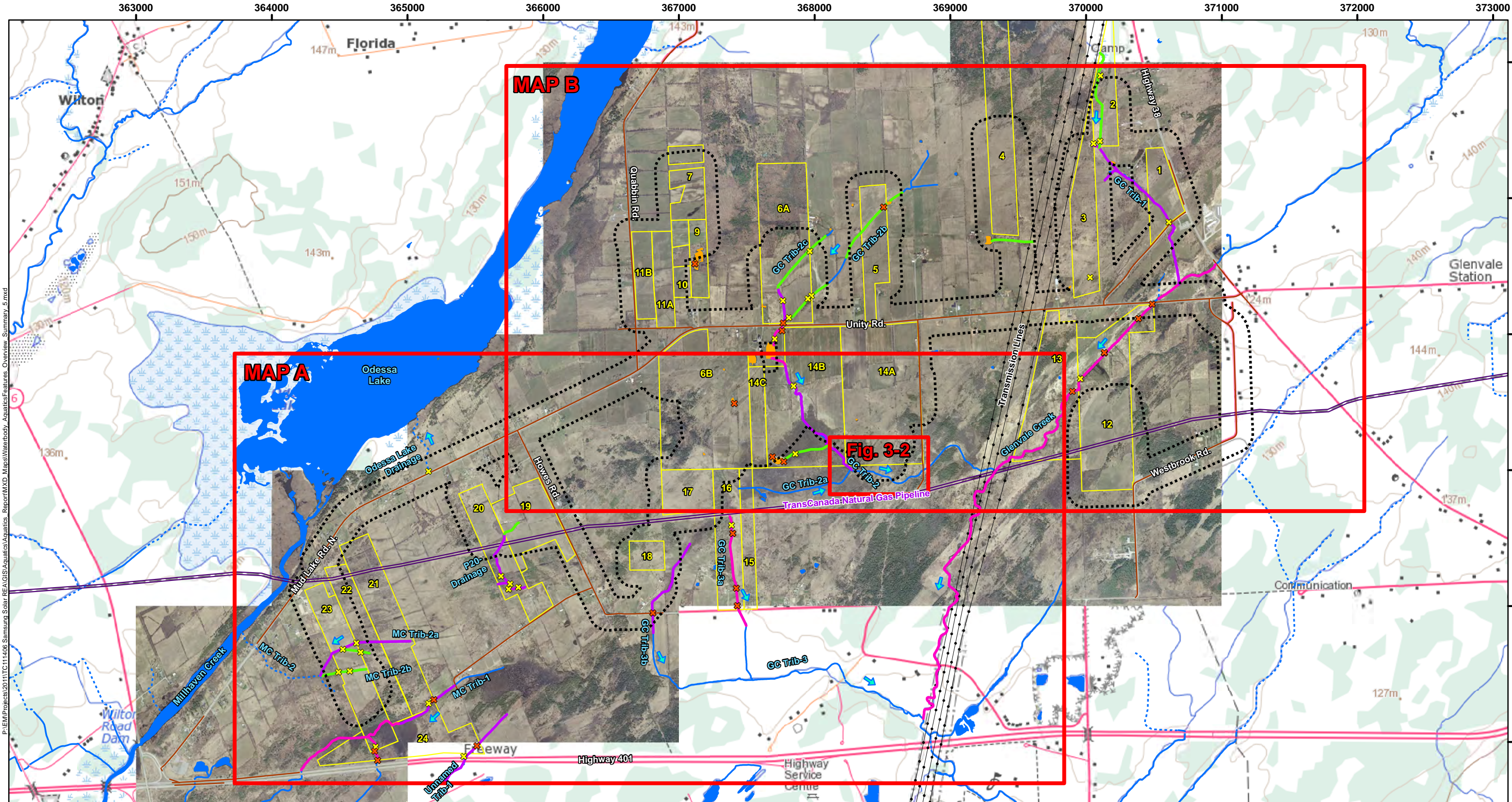
Watershed	Subwatershed	Property ID	Reach ID / Pond ID Within Vicinity	Defined as Water Body (O.Reg. 359/09)	Description	Fish Habitat			Development Feature Type within 120 m of Water Body / Drainage Feature					Water Body Crossing (Access Road / Collector Line)	
						No	Direct	Indirect	Access Road	Overhead Collector Line	Underground Collector Line	Solar Panels	Substation / Building / Transformer		Component Within 30 m of Water Body
					Stream										
	Millhaven Creek Tributary 2b	23	P23-B1		Drainage Swale	X			X		X	X			
		23	P23-B2		Drainage Swale	X			X		X	X			
Other features	Un-named Drainage 1	24	P24-C	X	Intermittent Stream			X	X		X	X			
		24	P24-D	X	Intermittent Stream			X	X		X	X			
	Property 20 Drainage	19	ASI		Drainage Swale	X			X		X	X			
		20	P20-A		Human-made Pond	X									
		20	P20-B1		Human-made Intermittent Stream*	X									
		20	P20-B2		Human-made Intermittent Stream*	X									
		20	P20-C		Human-made Pond	X									
	Property 14A Pond	14A	SA		Human-made Pond	X									
	Property 3 Pond	3	P3-Pond-A		Human-made Pond	X			X						
	Property 6B Pond	6B	P6B-Pond		Human-made Pond	X			X			X			
	South of Property 4 Drainage & Pond	4	NSA		Grassed Waterway & Human-made Pond	X			X	X	X	X	X		
	Property 9 Quarry Pond	9	P9-Quarry-Pond		Human-made Pond	X			X			X			
Odessa Lake Drainage	NA	OL-A		Grassed Waterway			X		X						

Notes:

NA - not applicable since not within 120 m of the Zone of Investigation

ASI – Alternative Site Investigation

* - channelization created by conveyance through piping of field run-off to forested area



LEGEND

AMEC Survey - Aquatic Feature Classifications

- Permanent Stream
- Intermittent Stream
- Grassed Waterway / Drainage Swale / Surface Drainage
- Dugout Pond / Standing Water

Watercourse/Waterbody (LIO-MNR)

- Intermittent (CRCA-warm water stream)
- Permanent (CRCA-warm water stream)
- Waterbody (LIO-MNR)

- Sample Location - Directed Habitat Assessment and Fish Surveys Conducted
- Sample Location - Targeted Fish Efforts were Conducted
- General Flow Direction

- 6B Property Area that is Potentially Eligible for Development
- 120 m Setback Investigation Area *
- Roads
- TransCanada Natural Gas Pipeline ROW (Approx.)
- Transmission Lines
- Large Scale Map Extent (Labelled with Map ID)

NOTES:

- Background topographic DRG map extracted from Geogratis.ca, 1:50k NTS, Natural Resources Canada
- Watercourse and Waterbody data extracted from Land Information Ontario, Ministry of Natural Resources, 2011
- Watercourse classification provided by Cataraqui Region Conservation Authority (CRA) watercourse data, 2011
- * Investigation area includes the 120m buffer from the proposed fence line for development sites, overhead and underground collector lines and access roads (Site Plan Nov. 30, 2011)

Datum: NAD83
Projection: UTM Zone 18N

KINGSTON SOLAR LP

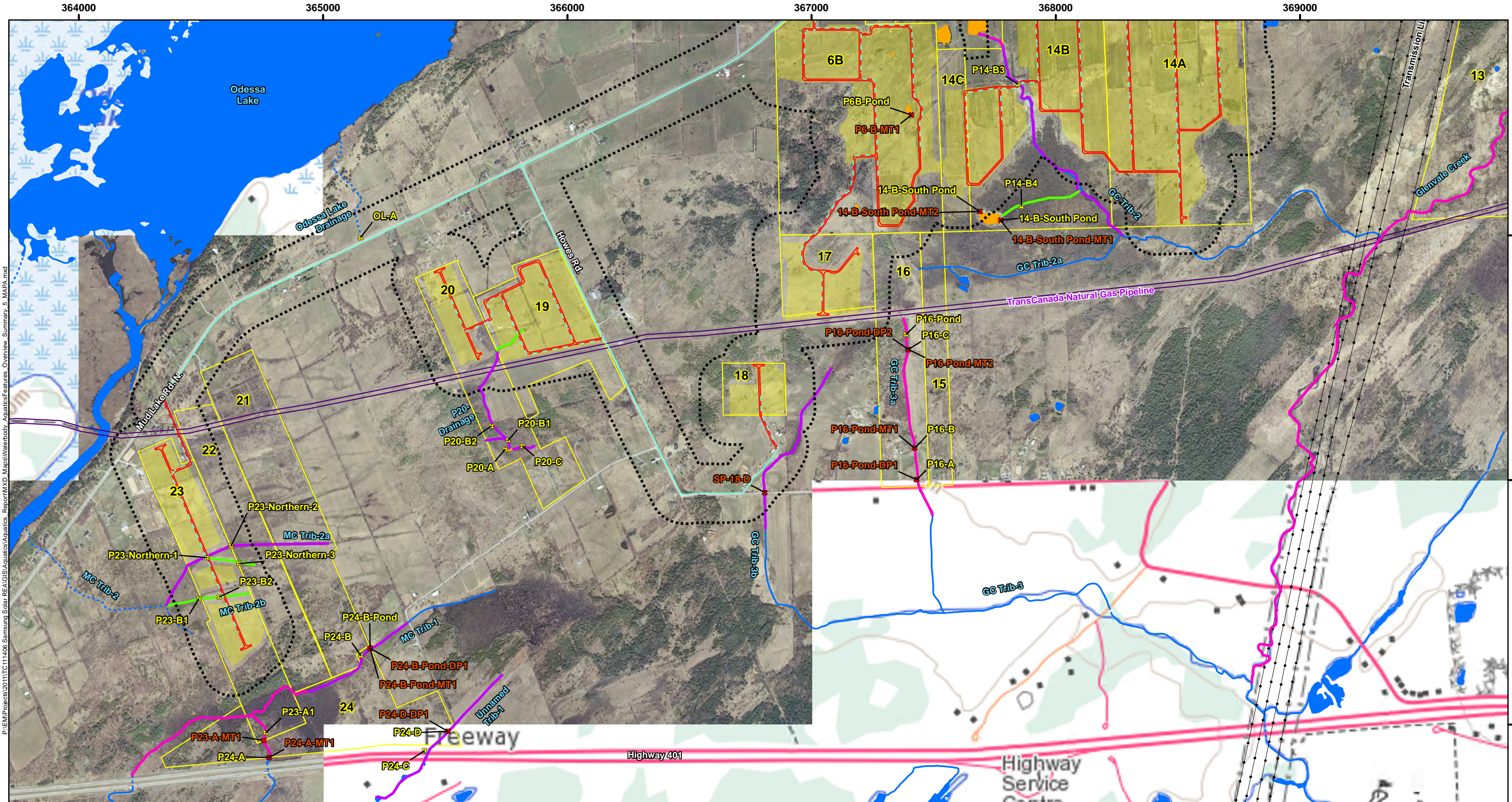
amec

SOL-LUCE KINGSTON SOLAR PV ENERGY PROJECT

Aquatic Features and Classifications Overview Map

PROJECT N^o: TC111406 **FIGURE: 3-1**

SCALE: 1:27,000 DATE: December 2011



LEGEND

AMEC Survey - Aquatic Feature Classifications

- Permanent Stream
- Intermittent Stream
- Grassed Waterway / Drainage Swale / Surface Drainage
- Dugout Pond / Standing Water
- Watercourse/Waterbody (LIO-MNR)
 - Intermittent (CRCA-warm water stream)
 - Permanent (CRCA-warm water stream)
 - Waterbody (LIO-MNR)

Proposed Development Features

- Collector Line (Overhead)
- Collector Line (Underground)
- Access Road
- Development Area (Solar Panels)

Other Features

- Sample Location - Directed Habitat Assessment and Fish Surveys Conducted (P24-A)
- Sample Location - Targeted Fish Efforts were Conducted (P24-A)
- General Flow Direction
- 120 m Setback Investigation Area *
- Property Area that is Potentially Eligible for Development (6B)
- TransCanada Natural Gas Pipeline ROW (Approx.)
- Transmission Lines

Scale: 0 to 4 Kilometres

NOTES:

- Background topographic DRG map extracted from Geogratis.ca, 1:50k NTS, Natural Resources Canada
- Watercourse and Waterbody data extracted from Land Information Ontario, Ministry of Natural Resources, 2011
- Watercourse classification provided by Cataraqui Region Conservation Authority (CRCA) watercourse data, 2011
- * Investigation area includes the 120m buffer from the proposed fence line for development sites, overhead and underground collector lines and access roads (Site Plan Nov. 30, 2011)

Datum: NAD83
Projection: UTM Zone 18N

KINGSTON SOLAR LP

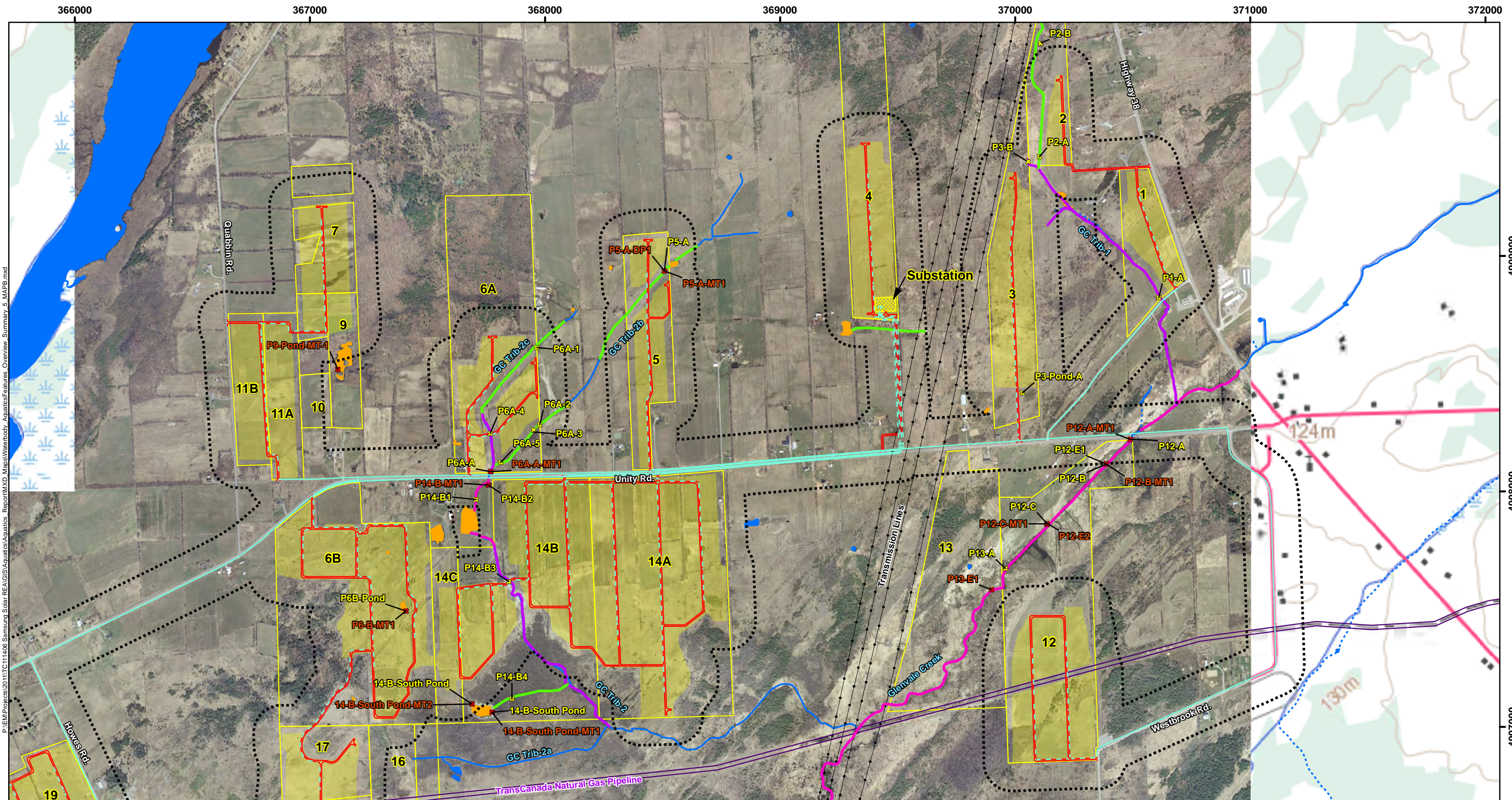
SOL-LUCE KINGSTON SOLAR PV ENERGY PROJECT

Aquatic Features and Classifications Summary Map A

PROJECT N°: TC111406 **FIGURE: 3-1a**

SCALE: 1:15,000 **DATE: December 2011**

P:\EM\Projects\2011\TC111406_Samsung Solar REA\GIS\Aquatics\Aquatics Report\MXD Maps\Waterbody_Aquatics\Features Overview_Summary_5_MAPA.mxd



LEGEND

AMEC Survey - Aquatic Feature Classifications

- Permanent Stream
- Intermittent Stream
- Grassed Waterway / Drainage Swale / Surface Drainage
- Dugout Pond / Standing Water

Watercourse/Waterbody (LIO-MNR)

- Intermittent (CRCA-warm water stream)
- Permanent (CRCA-warm water stream)
- Waterbody (LIO-MNR)

- P24-A (Yellow star) Sample Location - Directed Habitat Assessment and Fish Surveys Conducted
- P24-A (Red star) Sample Location - Targeted Fish Efforts were Conducted
- Blue arrow General Flow Direction

- 120 m Setback Investigation Area *
- 6B Property Area that is Potentially Eligible for Development
- TransCanada Natural Gas Pipeline ROW (Approx.)
- Transmission Lines

Proposed Development Features

- Collector Line (Overhead)
- Collector Line (Underground)
- Access Road
- Substation Location
- Development Area (Solar Panels)

NOTES:

- Background topographic DRG map extracted from Geogratis.ca, 1:50k NTS, Natural Resources Canada
- Watercourse and Waterbody data extracted from Land Information Ontario, Ministry of Natural Resources, 2011
- Watercourse classification provided by Cataraqui Region Conservation Authority (CRA) watercourse data, 2011
- * Investigation area includes the 120m buffer from the proposed fence line for development sites, overhead and underground collector lines and access roads (Site Plan Nov. 30, 2011)

Datum: NAD83
Projection: UTM Zone 18N

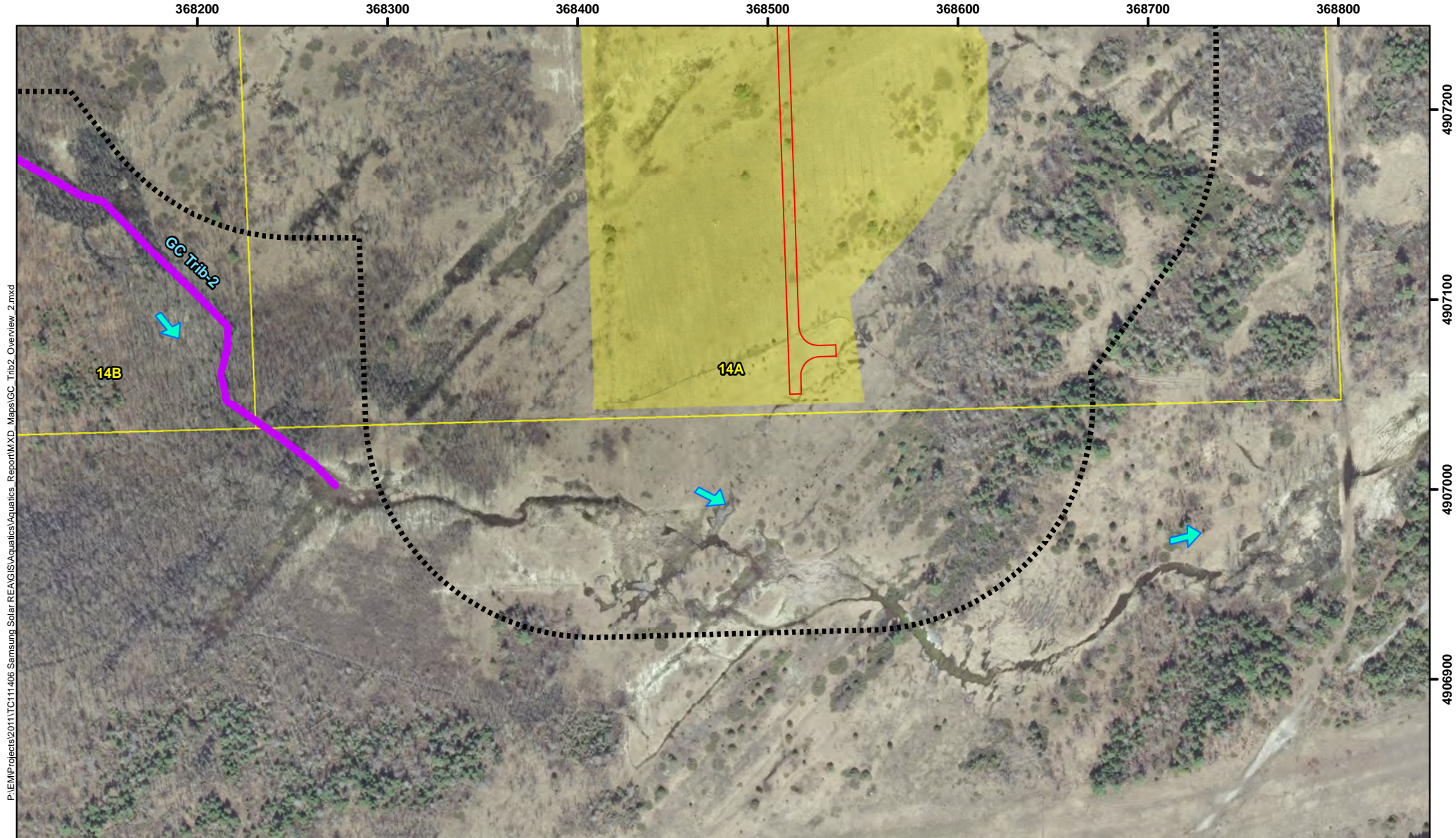
KINGSTON SOLAR LP

SOL-LUCE KINGSTON SOLAR PV ENERGY PROJECT

Aquatic Features and Classifications Summary Map B

PROJECT N^o: TC111406 **FIGURE: 3-1b**

SCALE: 1:15,500 DATE: December 2011



P:\EM\Projects\2011\TC11406 Samsung Solar REANGS\Aquatics\Aquatics_Report\MXD_Maps\GC_Trib2_Overview_2.mxd

LEGEND
AMEC Survey - Aquatic Feature Classifications

- Permanent Stream
- Intermittent Stream
- Grassed Waterway / Drainage Swale / Surface Drainage
- Dugout Pond / Standing Water
- General Flow Direction

Proposed Development Features

- Property Area that is Potentially Eligible for Development
- 120 m Setback Investigation Area *
- Access Road
- Development Area (Solar Panels)

NOTES:
 * Investigation area includes the 120m buffer from the proposed fence line for development sites, overhead and underground collector lines and access roads (Site Plan Nov. 30, 2011)

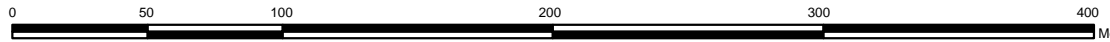
Datum: NAD83
 Projection: UTM Zone 18N

KINGSTON SOLAR LP

SOL-LUCE KINGSTON SOLAR PV ENERGY PROJECT

Inaccessible Portion of GC Trib-2 within the 120 m Setback Investigation Area

PROJECT N ^o : TC11406	FIGURE: 3-2
SCALE: 1:2,800	DATE: November 2011



3.2.1 Glenvale Creek

Glenvale Creek

The mainstem of Glenvale Creek which crosses Properties 12 and 13 is a permanent stream characterized by slow flows and a large floodprone area in the Project Location and meets the definition of a water body under O.Reg. 359/09. It is considered direct fish habitat (Table 3-1). Glenvale Creek is a tributary of Collins Creek which ultimately flows into Collins Bay of Lake Ontario. Previous information pertaining to this watershed was not available; however, information pertaining to Collins Creek is provided in Table 3-2. Field investigations conducted by AMEC in October 2011 indicated the presence of only warmwater species in the mainstem of Glenvale Creek. Species composition and catch by field investigations are provided in Tables 3-3 to 3-6. Northern Redbelly Dace (*Phoxinus eos*) were captured in the greatest abundance at these locations (P12A, P12B, P12C, P12-E1, P12-E2, and P13-E1). All species captured at these locations are considered tolerant of degraded habitat conditions.

Unity Road will be used as the main access to properties for this Project. An overhead collector line will also follow along Unity Road right of way (ROW). Therefore Glenvale Creek 120 m upstream and downstream of Unit Road is within the Zone of Investigation. Project Location components within Property 12 will not encroach on Glenvale Creek Habitat information for locations identified in Figure 3-1b is provided in Table 3-7 and with an assessment of potential impacts, mitigation measures and net effects.

Table 3-2: Secondary Source Information - Fish Species List

Common Name	Scientific Name	Water Body System Presence
Yellow Perch	<i>Perca flavescens</i>	Millhaven Creek, Odessa Lake
Rock Bass	<i>Ambloplites rupestris</i>	Millhaven Creek, Odessa Lake
Pumpkinseed	<i>Lepomis machrochirus</i>	Millhaven Creek, Collins Creek, Odessa Lake
Northern Pike	<i>Esox lucius</i>	Millhaven Creek, Collins Creek, Odessa Lake
Smallmouth Bass	<i>Micropterus dolomieu</i>	Millhaven Creek,
Largemouth Bass	<i>Micropterus salmoides</i>	Odessa Lake
Central Mudminnow	<i>Umbra limi</i>	Millhaven Creek, Collins Creek,
Banded Killifish	<i>Fundulus diaphanous</i>	Millhaven Creek, Collins Creek
Golden Shiner	<i>Notomigonus crysoleucas</i>	Collins Creek
Blacknose Shiner	<i>Notropis heterolepis</i>	Millhaven Creek
Bluntnose Minnow	<i>Pimephales notatus</i>	Millhaven Creek, Collins Creek
Common Carp	<i>Cyprinus carpio</i>	Collins Creek
Brown Bullhead	<i>Ameiurus nebulosus</i>	Collins Creek
Black Bullhead	<i>Ameiurus melas</i>	Odessa Lake
White Sucker	<i>Catostomus commersoni</i>	Odessa Lake
Muskellunge*	<i>Esox masquinongy</i>	Odessa Lake

Note:

Summarized from information provided by Kingston Area MNR and CRCA (1973 and 2003)

* Stocked in Odessa Lake from 1958 - 1961; unconfirmed if currently present

Table 3-3: Site Investigation Fish Species List (October 2011)

Common Name	Scientific Name	Water Body System Presence
Brook Stickleback	<i>Culaea inconstans</i>	Glenvale Creek
Northern Redbelly Dace	<i>Phoxinus eos</i>	Millhaven Creek, Glenvale Creek, Isolated human-made ponds
Finescale Dace	<i>Phoxinus neogaeus</i>	Glenvale Creek
Pearl Dace	<i>Margariscus margarita</i>	Glenvale Creek
Brassy Minnow	<i>Hybognathus hankinsoni</i>	Glenvale Creek, Isolated human-made ponds
Common Shiner	<i>Notropis cornutus</i>	Isolated human-made ponds
Golder Shiner	<i>Notemigonus crysoleucas</i>	Isolated human-made ponds
Fathead Minnow	<i>Pimephales promelas</i>	Glenvale Creek
Brown Bullhead	<i>Ameiurus nebulosus</i>	Isolated human-made ponds

Table 3-4: Species-Specific Catch per Sample Location for Minnow Traps

Watershed / Subwatershed	Sample Location ID	Date (dd/mm/yy)	Set Length (hrs)	Num. Traps Set	Trap Hours (hrs*Num. traps)	Species-Specific Catch									Total Fish Captured
						Brook Stickleback	Northern Redbelly Dace	Finescale Dace	Brassy Minnow	Common Shiner	Golden Shiner	Brown Bullhead	Pearl Dace	Fathead Minnow	
Glenvale Cr.	P12-A-MT1	03/10/11	2.5	2	5	1	0	0	0	0	0	0	0	0	1
Glenvale Cr.	P12-B-MT1	03/10/11	1.0	1	1	0	1	0	1	0	0	0	0	0	2
Glenvale Cr.	P12-C-MT1	04/10/11	4.0	2	8	1	174	1	5	0	0	0	1	0	182
Glenvale Cr. Trib.2	P6A-A-MT1	04/10/11	1.0	2	2	0	0	0	0	0	0	0	0	0	0
Glenvale Cr. Trib.2	P5-A-MT1	04/10/11	1.0	2	2	0	3	1	20	0	0	0	0	3	27
Glenvale Cr. Trib.3a	P16-Pond	05/10/11	1.5	1	1.5	0	0	0	0	0	0	0	0	0	0
Glenvale Cr. Trib.3a	P16-Pond-MT2	05/10/11	1.0	2	2	0	1	0	0	0	0	0	0	0	1
Millhaven Cr. Trib.1	P24-B-Pond-MT1	05/10/11	0.5	1	0.5	0	0	0	0	0	0	0	0	0	0
Millhaven Cr. Trib.1	P24-A-MT1	05/10/11	1.0	2	2	0	96	0	0	0	0	0	0	0	96
Millhaven Cr. Trib.1	P23-A-MT1	05/10/11	1.0	1	1	0	0	0	0	0	0	0	0	0	0
Glenvale Cr. Trib.2	14B-MT1	06/10/11	3.5	3	10.5	5	17	0	0	0	0	0	0	0	22
Glenvale Cr. Trib.2	14B-South Pond-MT1	06/10/11	1.0	2	2	4	27	1	0	0	0	0	0	0	32
Glenvale Cr. Trib.2	14B-South Pond-MT2	06/10/11	1.0	2	2	1	3	0	0	0	0	0	0	0	4
Glenvale Cr. Trib.2	P6-B-MT1	06/10/11	0.5	2	1	3	0	0	0	0	0	0	0	0	3
P9-Quarry-Pond	P9-Pond-MT-1	25/10/11	2.0	4	8	0	0	31	0	224	92	5	0	0	352
Glenvale Cr. Trib.3b	SP-18-D	25/10/11	16.0	2	32	0	0	0	0	0	0	0	0	0	0
Totals			38.5	27	81	15	322	34	26	224	92	5	1	3	722

Table 3-5: Species Specific Catch by Location by Backpack Electroshocking

Waterbody	Sample Location ID	Date (dd/mm/yy)	Effort (sec)	Species-Specific Catch										Total Fish Captured	
				Brook Stickleback	Northern Redbelly Dace	Finescale Dace	Brassy Minnow	White Sucker	Common Shiner	Golden Shiner	Brown Bullhead	Pearl Dace	Fathead Minnow		
Glenvale Cr.	P12-E1	03/10/11	550	2	2	3	0	0	0	0	0	0	0	0	7
Glenvale Cr.	P12-E2	04/10/11	762	1	0	0	0	0	0	0	0	0	0	0	1
Glenvale Cr.	P13-E1	04/10/11	1085	5	0	0	0	0	0	0	0	0	0	0	5
Total			2397	8	2	3	0	0	0	0	0	0	0	0	13

Table 3-6: Species Specific Catch by Location by Dip Netting

Waterbody	Sample Location ID	Date (dd/mm/yy)	Effort (Dips)	Catch Number By Species										Total Fish Captured	
				Brook Stickleback	Northern Redbelly Dace	Finescale Dace	Brassy Minnow	White Sucker	Common Shiner	Golden Shiner	Brown Bullhead	Pearl Dace	Fathead Minnow		
Glenvale Cr. Trib.2b	P5-A-DP1	04/10/11	40	0	0	0	0	0	0	0	0	0	0	0	0
Glenvale Cr. Trib.3a	P16-Pond-DP1	05/10/11	5	0	0	0	0	0	0	0	0	0	0	0	0
Glenvale Cr. Trib.3a	P16-Pond-DP2	05/10/11	15	12	38	0	0	0	0	0	0	0	0	0	50
Unnamed Trib 1	P24-A-DP1	05/10/11	6	0	0	0	0	0	0	0	0	0	0	0	0
Millhaven Cr. Trib.1	P24--B-Pond-DP1	05/10/11	10	0	0	0	0	0	0	0	0	0	0	0	0
Total			76	12	38	0	0	0	0	0	0	0	0	0	50

Glenvale Creek Tributary 1

Glenvale Creek Tributary 1 (GC Trib-1) (Figure 3-1b) collects drainage from the surface area of Property 2 and conveys it through a grassed waterway in a southerly direction where it becomes more channelized, indicating intermittent flow. This intermittent channel conveys water in a southeast direction where it flows, through Property 1, and under Rock Rd. through a CSP culvert southward until its confluence with the mainstem of Glenvale Creek. As such the reaches of this tributary south of Property 2 as represented by P1-A and P3-B with respect to habitat meet the definition of a water body. During the time of field investigation, this watercourse was dry or had small ephemeral section of standing water along its length. As such fish collections were not feasible, however, during periods of flow, this tributary would provide indirect fish habitat and contribute to baseflow of the Glenvale Creek system.

Proposed works located near GC Trib-1 defined as a water body include:

- Solar panels within 120 m of the lower reaches (P1-A to approximately 250 m upstream), and upper reaches (near P2-A and P3-B);
- Access roads in Properties 1, 2 and 3 within 120 m of the water body;
- Access road adjacent to intermittent stream and within 23 m of water body (35 m downstream of P3-B); and
- Underground collector lines within 120 m of the water body in Properties 1, 2 and 3.

Habitat information at locations identified in Figure 3-1b are provided in Table 3-7 with a more detailed assessment of potential impacts, mitigation measures and net effects for each location.

Glenvale Creek Tributary 2

Glenvale Creek Tributary 2 (GC-Trib- 2) (Figure 3-1b) collects surface water drainage from GC-Trib-2a, 2b and 2c and conveys it eastward to the mainstem of Glenvale Creek. GC-Trib-2 is a warmwater intermittent stream along most of its length from just south of a manmade pond near Property 14B (14-B-Cattle Pond) at P14-B3 until its confluence with the mainstem of Glenvale Creek southwest of Property 13 (Figure 3-1, 3-1b). As such this tributary meets the definition of a water body under O.Reg. 359/09. During the time of field investigation this watercourse was dry or having water depths of less than 10 cm between P14-B3 and its confluence with GC Trib-2a. As such fish collections were not feasible through this section. However, during periods of higher flow this tributary would provide indirect fish habitat and contribute to baseflow of the Glenvale Creek system.

The section of GC Trib-2 downstream of Property 14B and south of Property 14A was not visited as it was located within properties that were inaccessible at the time of site investigation (please refer to **Appendix B** for further detail regarding alternative site investigation). However, a desktop assessment of the water course based on secondary sources information and close-up satellite imagery of the reach of GC Trib-2 south of Property 14A was undertaken. In this section the watercourse is permanent along most of its length; however reaches of more diffuse flow are evident along with more pooled areas located to the south of Property 14A.

Reconnaissance by terrestrial biologists just north of this area within the property boundary of Property 14A on November 3, 2011 indicated dominance by cattails and other sedge species. It is expected that depths and widths in this section of the Glenvale Creek system would be less than those observed at the mainstem of the creek in Properties 12 and 13. As such it is expected that during dry years such as 2011 sections of the creek south of Property 14A would have wetted depths less than 0.5 m and in some cases would be dry (intermittent). It is expected that the fish community in this section of the Glenvale Creek system would be similar to the warmwater community that was observed in the mainstem portion of the system and consist mainly of cyprinid and stickleback species.

GC Trib-2 between P14-B2 and the associated human-made retention pond on Property 14B are permanent water features. The creek conveys water from GC Trib-2b and 2c in properties north of Unity Rd. through a CSP culvert under the road and into Property 14B. Through this section GC Trib-2 is a permanent water body and provided fish habitat even during the dry condition of October 2011. Fishing efforts in this section of GC Trib-2 and the retention pond yielded 36 fish in a short time span (2 hrs) with three minnow traps, the majority of these being Northern Redbelly Dace.

The small grassed waterway and associated human-made retention pond in the southern margin of Property 14B drains to the northeast into GC Trib-2. During the time of field investigation the linear grassed conveyance feature was dry. However, the large pond in the southwest corner of the property surrounded by low lying forest was retaining water. Piping previously used for distribution of this standing water into fields within Property 14B were observed and documented in the photo record (**Appendix C**). These did not meet the definition of water body as per O.Reg. 359/09.

Proposed works that may impact GC Trib-2 at reaches defined as a water body include:

- Solar panels within 120 m of the upper reaches of GC Trib-2 from P6A-A at Unity Rd. and approximately 250 m downstream of sample location P14-B3, on both sides of the creek;
- Access roads within 120 m of the upper reaches of GC Trib-2 from P6A-A at Unity Rd. and approximately 250 m downstream of sample location P14-B3, on both sides of the creek;
- Overhead collector line within 120 m of the upper reaches of GC Trib-2 in ROW of Unity Rd;
- Underground collector lines within 120 m of the upper reaches of GC Trib-2 from P6A-A at Unity Rd. and approximately 250 m downstream of sample location P14-B3, on both sides of the creek;
- Solar panels within 120 m of a lower reach (approx. 260 m in length) of GC Trib-2 south of Property 14A and approximately 1 km upstream this tributaries confluence with the mainstem of Glenvale Creek;

- Access Road within 120 m of a lower reach (approx. 160 m in length) of GC Trib-2 south of Property 14A and approximately 1 km upstream this tributaries confluence with the mainstem of Glenvale Creek;
- Underground collector lines within 120 m of the mid reach of GC-Trib-2 from P14-B3; and,
- Access Road / underground collector line crossing of GC-Trib-2 approximately 32 m south of P14-B3

Habitat information at locations identified in Figures 3-1b and Figure 3-2 are provided in Table 3-7.

Glenvale Creek Tributary 2a

Glenvale Creek Tributary 2a (GC Trib-2a) (Figure 3-1) is a permanent warmwater fish community watercourse as identified by secondary source information. However, in keeping with observations of the AMEC 2011 field investigation, it is likely that this section of the Glenvale Creek System is also intermittent. This creek was outside the Zone of Investigation for the purposes of this study. However, this tributary provides indirect fish habitat and contributes flow during higher flow periods to the lower sections of the Glenvale Creek system.

Glenvale Creek Tributary 2b

Glenvale Creek Tributary 2b (GC Trib-2b) (Figure 3-1b) collects drainage from properties northeast of Unity Rd. and for reference in this study provides a conveyance function for Properties 5 and 6A as well as those lands between these properties.

GC Trib-2b was characterized as a grassed water way and/or drainage swale along its length until its confluence with GC Trib-2c and 2b near Unity Rd. In its upper reach two human-made ponds are situated. One of which slightly to the east of Property 5 exhibited signs of previous concrete structures, possibly indicating past use of this area as a well or ground water source. Little to no flow was observed exiting this pond or the small ephemeral pool just downstream of this in Property 5 (**Appendix C**). The conveyance feature travels in a south-western direction traversing Properties 5 and into 6A where small sections of standing water were found with terrestrial vegetation. As it traverses 6A the water feature is bordered by large deciduous trees and evidence of past standing water in the hummocks between tree roots was observed.

Fish were captured in the small pond at the northeast margin of Property 5 by minnow trap with the majority being Brassy Minnows (*Hybognathus hankinsoni*) (Table 3-4).

GC Trib-2b is not a water body under O.Reg. 359/09; however, it is a water conveyance feature situated in lower lying land areas which will continue to collect surface drainage without changes to surface grading. As such this feature should be maintained as it provides water input to downstream sections of the Glenvale Creek System. Proposed works in this Property will not impact a permanent or intermittent water body and therefore would be mitigated following

standard mitigation measures for reducing sedimentation in surface flows. Habitat information at locations identified in Figures 3-1b is provided in Table 3-7.

Glenvale Creek Tributary 2c

Glenvale Creek Tributary 2c (GC Trib-2c) (Figure 3-1b) traverses Property 6A in a south-westerly direction in parallel with GC Trib-2b. This tributary then flows in a southerly direction through a concrete box culvert, under Unity Rd. and into property adjacent to Property 14B near P14-B2. The lower section of this waterway had some sections of flowing water while others had only a wet substrate which was exposed. As such, GC Trib-2c was classified as an intermittent stream from P6A-A to just north of P6A-4, and met the definition of a water body, with more upstream sections becoming less channelized and taking on the characteristics of a vegetated swale. Proposed works in the grassed waterway portion of this tributary will not impact a permanent or intermittent water body and therefore would be mitigated following standard mitigation measures for reducing sedimentation in surface flows.

Proposed works that may impact the intermittent portion of GC Tributary 2c are:

- Solar panels within 120 m of the intermittent stream section in Property 6A from 100 m upstream of P6A-4 down to Unity Rd.;
- Access road within 120 m of the intermittent stream section in Property 6A;
- Access road adjacent to water body and within 22 m of the intermittent stream section in Property 6A, directly upstream of P6A-4;
- Underground collector line within 120 m of the intermittent stream section in Property 6A; and,
- Crossing of intermittent water body at P6A-4 by access road and underground collector line.

Habitat information at locations identified in Figures 3-1b is provided in Table 3-7.

Glenvale Creek Tributary 3

Glenvale Creek Tributary 3 (GC Trib-3) (Figure 3-1) is a permanent stream that receives drainage from the north via GC Tribs 3 and 3b. It then flows in an easterly direction before changing course in a south-easterly direction before flowing into the mainstem of Glenvale Creek approximately 160 m north of Highway 401 and adjacent to the transmission line ROW. There are no proposed works within 120 m of this portion of the stream.

Glenvale Creek Tributary 3a

Glenvale Creek Tributary 3a (GC Trib-3) (Figure 3-1a) flows from north to south through Property 16. It is a permanent stream which was accessed at numerous locations characterized by fluvial and pond habitats within this property. There are no proposed works within 120 m of this portion of the stream and therefore is outside the 120 m Zone of Investigation for this

Project. However, site specific photographs and habitat information is provided in **Appendices C** and **D** respectively, for future reference for this area.

Glenvale Creek Tributary 3b

Glenvale Creek Tributary 3b (GC Trib-3b) (Figure 3-1a) is an intermittent stream that meets the definition of a water body at SP-18-D where access was available during the AMEC 2011 field investigation. This tributary flows south into GC Trib-3. At the Howes Rd. crossing, water pooling occurs at both the upstream and downstream end of the CSP culvert. Fishing effort yielded no fish in this section. There are no proposed works within 120 m of this portion of the stream and therefore is outside the 120 m Zone of Investigation for this Project. However, site specific photographs and habitat information is provided in **Appendices C** and **D** respectively, for future reference for this area.

Detailed habitat information at locations identified in Figures 3-1a is provided in Table 3-7.

3.2.2 Millhaven Creek

Millhaven Creek Tributary 1

Millhaven Creek Tributary 1 (Figure 3-1a) is located in the western portion of the proposed Project Location. It flows in a west to south-westerly direction and traverses Properties 21, 22, 23 and 24. It flows through wetland areas including cattail marsh and deciduous swamp before splitting into two permanent channels which flow separately southward toward Highway 401. It is an intermittent to permanent stream which was accessed at numerous locations characterized by fluvial, pond and wetland habitats within Properties 21 and 24.

Fish collection efforts were successful in confirming this tributary as warmwater fish habitat dominated by Northern Redbelly Dace with respect to abundance (Table 3-4).

Proposed works that may impact the intermittent portion of MC Trib-1 are:

- Solar panels within 120 m of the intermittent stream section in Properties 21, 22 and 24;
- Access road within 120 m of the intermittent stream section in Properties 21, 22 and 24;
- Access road adjacent to water body and within 24 m of the intermittent stream section in southern extremity of Property 21;
- Underground collector line within 120 m of the intermittent stream section in Properties 21, 22 and 24; and,
- Crossing of intermittent water body approximately 65 m downstream of P24-B by an access road and underground collector line.

Proposed works that may impact the permanent portion of MC Trib-1 are:

- Solar panels within 120 m of the permanent stream section south of Properties 21 and 22;

- Access road within 120 m of the permanent stream section south of Properties 21 and 22; and,
- Underground collector line within 120 m of the permanent stream section south of Properties 21 and 22.

Millhaven Creek Tributary 2

Millhaven Creek Tributary 2 (Figure 3-1a) is located in the western portion of the proposed Project Location. It was previously characterized as an intermittent stream by the CRCA which receives drainage from Properties 21, 22 and 23 and then flows northwest through a culvert at Mud Lake Road. (County Rd. 19) into Millhaven Creek, downstream of Odessa Lake. The main portion of this tributary is not within the 120 m Zone of Investigation. However, an intermittent tributary and grassed waterway (MC Trib-2a and MC Trib-2b, respectively) are within the Zone of Investigation and are described in greater detail below.

Millhaven Creek Tributary 2a

Millhaven Creek Tributary 2a (Figure 3-1a) is an intermittent stream with a distinct channel at certain reaches that is bordered by a hedgerow of old growth deciduous trees and collects water from south and north lying agricultural fields and conveys it in a west to southwest direction toward MC Trib-2. The intermittent stream meets the definition of a water body for reaches that traverse Property 23 and extend 120 m further upstream and downstream. Flow is conducted under farm laneways (which run parallel with property lines for Properties 22 and 23) by small diameter CSP culverts. This indicates the expected need for continued storm water management and maintenance of access to these areas. A secondary seasonal conveyance feature was located just south of MC Trib-2a which did not meet the definition of a water body under O.Reg. 359/09. This drainage feature provided some movement of water from P23-Northern-3 to P23-Northern-1 where it entered MC Trib-2a at a depression made by farm machinery access to the more southerly portions of these fields. At the time of investigation this drainage feature was only evident after a larger precipitation event and was characterized by standing or slow moving water which had pooled in a field depression between the laneway and the hedgerow containing MC Trib-2a.

Fish habitat was generally not available in these sections and therefore fish collections were not undertaken. Proposed works located near MC Trib-2a (defined as a water body) include:

- Solar panels within 120 m of the stream in Properties 21, 22 and 23;
- Access road and underground collector line crossing at P23-Northern-1;
- Access road and underground collector line crossing at P22-1; and,
- Access road and underground collector line crossing at P21-1.

Detailed habitat information at locations identified in Figures 3-1a is provided in Table 3-7. Reference habitat information for the drainage feature south of MC Trib-2a is provided in Table 3-7 for use in future design considerations.

Millhaven Creek Tributary 2b

Despite this feature (Figure 3-1a) being classified as an intermittent stream during records review, it was identified as a remnant grassed waterway which showed no signs of standing water or flow for at least a year. Terrestrial vegetation was consistent with field re-growth and only sparse representation of single bulrush plants indicated past inundation of lower lying areas of this field. As such this was not classified as a water body for the purposes of this report. Habitat information for this drainage feature is provided in Table 3-7 for use in future design considerations.

3.2.3 Other Water Bodies and Drainage Features

Property 20 Drainage

The Property 20 drainage feature was not previously described by sources contacted through the records review. However, site investigation of this property indicated a drainage system that conveyed water from the northern part of Properties 19 and 20 southward into two human-made ponds (**Appendix C**). The channel that was evident through forested sections of this system was incised and indicated relatively high flow rates compared to other drainage features in the area. The channels however did not show signs of aquatic life and were not characterized by typical riparian vegetation. The channel flowed into a human-made pond area approximately 18 m wide by 50 m in length. This dry area showed signs of ephemeral pools and moss at the interfaces of exposed limestone indicated the possible influence of groundwater. This pond is drained by another short channel through a wooded area into a smaller pond which was dry at the time of investigation. Based on the channel morphology this water feature was classified as an intermittent stream.

Proposed works located near the intermittent stream portion of Property 20 drainage include:

- Solar panels within 120 m of the intermittent stream from P20-B1 and upstream to the property line of Property 20 and Property 19;
- Access road and associate turnaround areas within 120 m of the intermittent stream from P20-B2 and upstream to the property line of Properties 19 and 20;
- Underground collector line within 120 m of the intermittent stream within Property 19; and,
- Access road within 120 m of the intermittent stream within Property 19 (at the property line of Properties 19 and 20).

Detailed habitat information at locations identified in Figure 3-1a are provided in Table 3-7 with a more detailed assessment of potential impacts, mitigation measures and net effects for each location.

Odessa Lake Drainage

The Odessa Lake Drainage feature is located in the northwest corner of the Project Location. It conveys surface water from the roadside ditches of Mud Lake Road North / Unity Road northward toward Odessa Lake. Some water is conveyed under the road during wet periods by CSP. At the time of field investigation this grassed waterway was not holding water. The vegetation was dominated by field species and no significant signs or recent wetting were observed and wetland sedge or grass species were not present. Therefore this drainage feature did not meet the definition of a water body, and since dry was not sampled for fish. However, a proposed overhead collector line would follow the ROW of Unity Road and habitat information for this drainage feature is provided in Table 3-7 for use in future design considerations.

Other Non Water Bodies

A number of human-made retention ponds not previously described were indicated by records review as well as through site investigations (Figures 3-1, 3-1a, 3-1b, and 3-2). Of these a number were within the 120 m Zone of Investigation yet did not meet the definition of a water body under O.Reg. 359/09. These include:

- Property 14A Pond;
- 14B-South Pond;
- Property 3 Pond;
- Property 6B Pond;
- South of Property 4 Drainage and Pond;
- Property 9 Quarry Pond; and,
- Property 16 Pond.

Of these; 14B-South Pond, Property 9 Quarry Pond and Property 6B Pond were proven to have warmwater fish species inhabiting them (Table 3-4 to 3-6). It is likely due to the lack of connectivity of these water features to any of the creek systems in the area that fish were introduced there by avian introduction. It is unknown if these water features provide adequate habitat for overwintering of these fish as they are typically shallow and characterized by bedrock substrates. Further information pertaining to these features is provided in Table 3-7.

3.3 Summary of Predicted Impacts to Fish Habitat and Approval Processes

Predicted impacts to water bodies as described in Section 3.2 are summarized in Table 3-7 with an assessment of proposed works net effects. Possible impacts to fish habitat are listed as well as possible requirements of provincial and federal approval processes.

Table 3-7: Potential Environmental Impacts and Mitigation for Water Bodies and Drainage Features within the 120 m Zone of Investigation

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
Glenvale Creek	Glenvale Creek	12	P12-A	Permanent stream, Bankfull Width = 10.2 m Bankfull Depth = 2.0 Substrate = 80% Silt/Muck/10% Detritus/10% Cobble, Fished Oct 2011 Fish Habitat	Access road Overhead Collector Line	With the exception of potential construction activities overhead collector lines should not impact fish or fish habitat (see Sections 4.1 and 4.3) Existing access on Unity Rd. will be used and will not impact fish or fish habitat (see Section 4.1)	See sections: 5.1, 5.3 and refer to DFO Operational Statement (OS) for Overhead Line Construction (Appendix E)	None expected
		12	P12-B	Permanent stream, Braided and diffuse section Bankfull Width = 2.5 m Bankfull Depth = 0.8 m Substrate = 90% Silt & Muck / 10% Detritus / 10% Cobble, Fished Oct 2011 Fish Habitat	Access road Overhead Collector Line	With the exception of potential construction activities overhead collector lines should not impact fish or fish habitat (see Sections 4.1 and 4.3) Existing access on Unity Rd. will be used and will not impact fish or fish habitat (see Section 4.1)	See sections: 5.1, 5.3 and refer to DFO Operational Statement (OS) for Overhead Line Construction (Appendix E)	None expected
		12	P12-C	Permanent stream, Channelized Bankfull Width = 8.0 m Bankfull Width = 1.06 m Substrate = 80% Silt & Muck / 10% Clay / 10% Detritus Fished Oct 2011 Fish Habitat	None proposed	None	NA	None
		13	P13-A	Permanent stream, Channelized Bankfull Width = 3.0 Bankfull Depth = 0.65 Substrate = 80% Silt & Muck / 10% Clay / 10% Detritus Fished Oct 2011 Fish Habitat	None proposed	None	NA	None

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
Glenvale Creek Tributary 1		1	P1-A and upstream approximately 250 m	Intermittent stream CSP culvert at Unity Rd. crossing Bankfull Width = 3.0 m Bankfull Depth = 0.7 m\ Cobble/Gravel/Sand/ Terrestrial leaf litter/Boulders upstream Dry as of Oct 2011 Indirect Fish Habitat	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) With the exception of potential construction activities overhead collector lines should not impact fish or fish habitat (see Sections 4.1 and 4.3) Crossing – Warmwater fish community/habitat; HADD not expected: LOA from CRCA	See Sections 5.1, 5.3 and 5.4 as well as DFO OS for Overhead and Underground Collector Line Construction (Appendix E)	None expected
		2	P2-A	Grassed Waterway Sedge and Graminoid vegetation Bankfull Width = 1.0 m Bankfull Depth = 0.45 Not fish habitat	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5)	See Sections 5.1 and 5.4	None
		2	P2-B	Grassed Waterway Sedge and Graminoid vegetation Bankfull Width = 1.0 m Bankfull Depth = 0.45 Not fish habitat	Solar panels Access road	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, and placement of panels (see Section 4.1, 4.2, and 4.5)	See Sections 5.1 and 5.4	None
		3	P3-B	Intermittent stream Limestone bedrock Substrate = Silt & Muck, Leaf Litter, exposed limestone bedrock channel in some reaches Bankfull Width = 2.5 m Bankfull Depth = 0.65 m Dry as of Oct 2011 Indirect Fish Habitat	Solar panels Access road Access road adjacent to intermittent stream and within 23 m of water body (35 m downstream of P3-B)	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, and placement of panels (see Section 4.1, 4.2, and 4.5)	See Sections 5.1 and 5.4	None expected

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
	Glenvale Creek Tributary 2	6A	P6A-A	Intermittent stream At box culvert at Unity Rd. crossing of creek Substrate = Silt & Muck / Cobble / Detritus / Leaf litter Bankfull Width = 2.6 m Bankfull Depth = 0.75 m Wetted Depth only 0.18 m as of Oct 2011 – not fished Indirect Fish Habitat	Solar panels Access road Overhead collector line Underground collector line Crossing – Overhead collector line in ROW of Unity Rd.	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) With the exception of potential construction activities overhead collector lines should not impact fish or fish habitat (see Sections 4.1 and 4.3) Crossing – Warmwater fish community/habitat; HADD not expected: LOA from CRCA	See Sections 5.1, 5.3 and 5.4 as well as DFO OS for Overhead and Underground Collector Line Construction (Appendix E)	None expected
		14B	P14-B1	Permanent stream flowing into cattle pond on Taylor Property Inflow to pond Substrate = limestone bedrock, Silt & Muck, Clay, Detritus Bankfull Width = 10.0 m Bankfull Depth = 1.0 m Fished Oct 2011 Fish Habitat Similar Habitat from here to 120 m downstream of the cattle pond.	Solar panels Access road Overhead collector line Underground collector line Crossing – Overhead collector line; ROW of Unity Rd.(same as above) Note – Cattle pond is outside 120 m zone of investigation	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) With the exception of potential construction activities overhead collector lines should not impact fish or fish habitat (see Sections 4.1 and 4.3) Crossing – Warmwater fish community/habitat; HADD not expected: LOA from CRCA	See Sections 5.1, 5.3 and 5.4 as well as DFO OS for Overhead and Underground Collector Line Construction (Appendix E)	None expected

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		14B	P14-B2	Permanent stream flowing into cattle pond on Taylor Property Other side of box culvert at Unity Rd. Substrate = limestone bedrock, Silt & Muck, Detritus Bankfull Width = 3.0 m Bankfull Depth = 0.5 m Fished Oct 2011 Fish Habitat	Solar panels Access road Overhead collector line Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) No expected changes to creek crossing of Unity Rd. (Box Culvert) With the exception of potential construction activities overhead collector lines should not impact fish or fish habitat (see Sections 4.1 and 4.3)	See Sections 5.1, 5.3 and 5.4 as well as DFO OS for Overhead and Underground Collector Line Construction (Appendix E)	None expected
		14B	P14-B3	Intermittent stream < 0.1 m wetted depth in Oct 2011 Bankfull Width = 1.0 m Bankfull Depth = 0.4 m Not fished Indirect fish habitat	Solar panels Access road Underground collector line Access Road and Underground collector line crossing at P14-B3	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Crossing - Direct impact on watercourse due to culvert and underground collector line crossing at sample location P13-B3 (see Sections 4.1, 4.2, and 4.4). Crossing – HADD not expected; LOA from CRCA	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, and DFO OS for Culvert Maintenance (Appendix E)	None expected

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		14B	P14-B4	Grassed waterway	None proposed	None	NA	None
		14A	GC Trib-2 South of Property 14A	Intermittent / Permanent Stream Alternative assessment (See Section 3.2 and Figure 3-2) Expected Warmwater Fish Habitat	Solar panels Access road	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Sections 4.1, 4.2, 4.4 and 4.5)	See Section 5.1	None expected
		14B	14-B-Cattle Pond	Human-made feature Part of permanent waterway	None proposed	None	NA	None
		14B	14-B-South Pond	Human-made retention feature Fish bearing Closed system fish habitat	Access road Solar panels	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads and placement of panels (see Sections 4.1, 4.2, and 4.5)	See Section 5.1	None
	Glendale Creek Tributary 2a	15	NA	NR	None proposed	None	NA	None
		14A	NA	NR	None proposed	None	NA	None
	Glendale Creek Tributary 2b	5	P5-A	Grassed waterway / Drainage swale Dry in Oct 2011 Bankfull Width = < 1.0 m Bankfull Depth = < 0.25 m Field species vegetation in "channel" Not fished Not Fish Habitat	None	NA	NA	None
		5	P5-Ponds	Two ponds at margin of P5 Smaller pond is ephemeral with limestone bottom Larger pond is off of leased lands and is permanent, human-made feature Concrete structure may indicate previous use as a well.	None	NA	None	None

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		6A	P6A-2	Grassed drainage swale Dry in Oct 2011 accept at CSP culvert conveying water between Property 6A and Property immediately to the east (< 0.20 m deep at culvert) Bankfull Width = 0.75 m Bankfull Depth = 0.25 m Not Fish Habitat	Solar panels Access roads	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads and placement of panels (see Sections 4.1, 4.2, 4.4 and 4.5)	See Section 5.1	None
		6A	P6A-3	Grassed drainage swale Dry in Oct 2011 Bankfull Width = 0.8 m Bankfull Depth = 0.3 m Not Fish Habitat	Solar panels	None	NA	None
		6A	P6A-5	Grassed waterway / Drainage swale Grasses and Sedge left in this depression through cutting practices Bankfull Width = 0.75 m Bankfull Depth = 0.25 m	Solar panels Overhead collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during placement of panels and overhead collector line (see Section 4.1)	See Sections 5.1 and 5.3	None
	Glenvale Creek Tributary 2c	6A	P6A-1	Grassed drainage swale Dry in Oct 2011 Bankfull Width = 0.8 m Bankfull Depth = 0.3 m Not Fish Habitat	Solar panels Access roads Underground Collector Lines	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Sections 4.1, 4.2, 4.4 and 4.5)	See Sections 5.1 and 5.4	None

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		6A	P6A-4	Intermittent stream Wet as of Oct 2011 Substrate = Exposed limestone in sections, Silt & Muck, Detritus Bankfull Width = 0.85 m Bankfull Depth = 0.6 m Insufficient water for fishing effort Indirect Fish Habitat	Solar panels Access road Underground collector line Access road adjacent to water body and within 22 m of the intermittent stream section in Property 6A, directly upstream of P6A-4. Crossing - Access Road and Underground collector line crossing at P6A-4	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Sections 4.1, 4.2, 4.4 and 4.5) Crossing - Direct impact on watercourse due to culvert and underground collector line crossing at sample location P6A-4 (see Section 4.1, 4.2, and 4.4). HADD not expected: LOA from CRCA	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected
	Glenvale Creek Tributary 3	NA	NR	NR	None proposed	None	NA	None
	Glenvale Creek Tributary 3a	16	P16-Pond	Permanent stream Pond feature Woody structure and organic debris Substrate = 40% Clay / 30% Silt & Muck / 30% Detritus. Wetland species riparian vegetation Aquatic vegetation Fished Oct 2011 Fish Habitat	None proposed	None	NA	None
16		P16-A	Permanent stream CSP Culvert at Howes Rd. Crossing Bankfull Width = 2.8 m Bankfull Depth = 0.4 m Substrate = Silt & Muck, Detritus, Leaf Litter Less than 0.15 m of water, not fished	None proposed	None	NA	None	
16		P16-B	Permanent stream Bankfull Width = 3.45 m Bankfull Depth = 0.69 m Substrate = Silt & Muck, Detritus, Leaf Litter Less than 0.15 m of water, not fished	None proposed	None	NA	None	

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		16	P16-C	Permanent stream Bankfull Width = 1.80 m Bankfull Depth = 0.35 m Substrate = Silt & Muck, Detritus, Leaf Litter Less than 0.15 m of water, not fished Possible fish habitat as extension of fish bearing pond	None proposed	None	NA	None
	Glenvale Creek Tributary 3b	18	SP-18-D and upstream approx. 250 m	Intermittent Stream CSP culvert at Howes Rd. crossing Wet in Oct 2011 Bankfull Width = 1.25 m Bankfull Depth = 0.65 Substrate = Silt with exposed bedrock limestone Fished Oct 2011 Not fish habit	None proposed	NA	NA	None
Millhaven Creek	Millhaven Creek Tributary 1	24	P24-A	Permanent stream / Cattail Marsh Channelized as well as diffused flow through cattails Box culvert at 401 crossing Bankfull Width (of channelized section) = 8.5 m Bankfull Depth (of channelized section) = 1.6 Substrate = Silt & Muck, Clay, Organics and Detritus Fished Oct 2011 Warmwater Fish Habitat	None proposed	None	NA	None
		24	P24-B-Pond	Intermittent Stream / Ephemeral Pond Conveyance from fields east of Properties 21 and 24 Substrate = Silt & Muck, Detritus, Exposed bedrock (limestone) Fished Oct 2011 Not Fish Habitat	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Sections 4.1, 4.2, 4.4 and 4.5)	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		24	P24-B	Intermittent stream Dry in Oct 2011 CSP culvert in wood cradle bridge at laneway Not fished Not Fish Habitat	Solar panels Access road Underground collector line Crossing - Access Road and Underground collector line crossing at P24-B	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Crossing - Direct impact on watercourse due to culvert and underground collector line crossing at sample location P24-B (see Section 4.1, 4.2, and 4.4). HADD not expected: LOA from CRCA	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected
		22	Approx. 115 m reach of intermittent portion of MC-Trib-1; south of Property 22	Intermittent stream Dry in Oct 2011 CSP culvert in wood cradle bridge at laneway Not fished Not Fish Habitat	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5)	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected
		21	From P24-B to 160 m downstream, south of Property 21	Intermittent stream Dry in Oct 2011 CSP culvert in wood cradle bridge at laneway Not fished Not Fish Habitat	Solar panels Access road Underground collector line Access road adjacent to water body and within 24 m of the intermittent stream section in southern extremity of Property 21	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5)	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		23	P23-A1	Permanent stream / Cattail Marsh Channelized as well as diffused flow through cattails Box culvert at 401 crossing Bankfull Width = Not applicable as no distinct channel – low lying inundated area (wetland) Max Depth = 0.8 Substrate = Silt & Muck, and Detritus Fished Oct 2011 Warmwater Fish Habitat	None proposed	None	NA	None
		22	Permanent section of MC-Trib-1 from P23-A1 upstream to properties 22 and 23 property line	Permanent stream / Cattail Marsh Channelized as well as diffused flow through cattails Box culvert at 401 crossing Bankfull Width = Not applicable as no distinct channel – low lying inundated area (wetland) Max Depth = 0.8 Substrate = Silt & Muck, and Detritus Fished Oct 2011 Warmwater Fish Habitat	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads and placement of panels (see Sections 4.1 and 4.2)	See Sections 5.1	None expected
		23	Permanent section of MC-Trib-1 from properties 22 and 23 property line to change in Water Body to intermittent stream	Permanent stream / Cattail Marsh Channelized as well as diffused flow through cattails Box culvert at 401 crossing Bankfull Width = Not applicable as no distinct channel – low lying inundated area (wetland) Max Depth = 0.8 Substrate = Silt & Muck, and Detritus Fished Oct 2011 Warmwater Fish Habitat	Solar panels Access road	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads and placement of panels (see Sections 4.1 and 4.2)	See Sections 5.1	None expected
	Millhaven Creek Tributary 2	NA	NA	NR	None proposed	None	NA	None

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
	Millhaven Creek Tributary 2a	21	P21-1	Intermittent Stream Wetted in Oct 2011 Bankfull Width = 1.15 m Bankfull Depth = 0.08 m Substrate = Silt & Muck, Field Soils, Detritus, Leaf Litter Not Fish Habitat	Solar panels Access road Underground collector line Crossing - Access Road and Underground collector line crossing at P23-Northern-1	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Crossing - Direct impact on watercourse due to culvert and underground collector line crossing at sample location P21-1 (see Section 4.1, 4.2, and 4.4). HADD not expected: LOA from CRCA	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected
		22	P22-1	Intermittent Stream Wetted in Oct 2011 Bankfull Width = 1.15 m Bankfull Depth = 0.08 m Substrate = Silt & Muck, Field Soils, Detritus, Leaf Litter Not Fish Habitat	Solar panels Access road Underground collector line Crossing - Access Road and Underground collector line crossing at P23-Northern-1	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Crossing - Direct impact on watercourse due to culvert and underground collector line crossing at sample location P22-1 (see Section 4.1, 4.2, and 4.4). HADD not expected: LOA from CRCA	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		23	P23-Northern-1	Intermittent Stream Wetted in Oct 2011 Bankfull Width = 1.15 m Bankfull Depth = 0.08 m Substrate = Silt & Muck, Field Soils, Detritus, Leaf Litter Not Fish Habitat	Solar panels Access road Underground collector line Crossing - Access Road and Underground collector line crossing at P23-Northern-1	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Crossing - Direct impact on watercourse due to culvert and underground collector line crossing at sample location P23-Northern-1 (see Section 4.1, 4.2, and 4.4). HADD not expected: LOA from CRCA	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected
		23	P23-Northern-2 and 120 m to the east into Property 22	Intermittent Stream CSP culvert conveys water between Properties 22 and 23 Wetted in Oct 2011 Bankfull Width = 2.12 m Bankfull Depth = 0.04 m Substrate = Silt & Muck, Field Soils, Detritus, Leaf Litter Not Fish Habitat	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Expected need for continued conveyance of water in east to west direction across Properties 21, 22 and 23 to MC Trib-2	See Sections 5.1 and 5.4 as well as DFO OS for Underground Collector Line Construction (Appendix E)	None expected

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
	Millhaven Creek Tributary 2b	23	P23-Northern-3	Grassed waterway / standing water depression in field Not Fish Habitat	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Expected need for continued conveyance of water in east to west direction across Properties 21, 22 and 23 to MC Trib-2	See Sections 5.1 and 5.4	None expected
		23	P23-B1	Grassed waterway / drainage swale Dry in Oct 2011 Bulrush sparse representation only indication of past wet conditions Small CSP culvert at west fence line of P23 indicates past conveyance toward MC Trib-2 No Fish Habitat	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5)	See Sections 5.1 and 5.4	None expected
		23	P23-B2	Grassed waterway / drainage swale Dry in Oct 2011 Bulrush sparse representation only indication of past wet conditions No Fish Habitat	Solar panels Access road Underground collector line Access Road and Underground collector line crossing at P23-Northern-1	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Expected need for continued conveyance of water in east to west direction across Properties 21, 22 and 23 to MC Trib-2 Crossing – Non-REA water body and not fish habitat; No HADD; LOA not expected.	See Sections 5.1, 5.2 and 5.4, DFO OS for Underground Collector Line Construction, DFO OS for Culvert Maintenance (Appendix E)	None expected

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
Other features	Un-named Tributary 1	24	P24-C	Intermittent drainage Small box culvert at 401 crossing Bankfull Width = 0.95 m Bankfull Depth = 0.3 m Dry in Oct 2011 Fished in Oct 2011 – No fish captured	Access road / Turnaround area Solar panels	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads and placement of panels (see Sections 4.1 and 4.2)	See Sections 5.1	None expected
		24	P24-D	Intermittent drainage / Ephemeral Pool and Small Wetland feature CSP culvert at crossing of Hegadorn Rd. Bankfull Width (ponded area) = 1.5 m Bankfull Depth (ponded area) = 0.4 m Cattail and Sedge Fished in Oct 2011 – no fish captured	Solar panels	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads and placement of panels (see Sections 4.1 and 4.2)	See Sections 5.1	None expected
	Property 20 Drainage	19	P19 (From Property 20/19 property line east approx. 115 m	Grassed waterway / Drainage swale Dry in Oct 2011 Not Fish Habitat	Solar panels Access road Underground collector line Crossing – Access road and underground Collector Line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5) Expected need for continued conveyance of water in east to southwest direction across Properties 19 to Property 20 Drainage system Non-REA drainage crossing; no HADD.	See Sections 5.1, 5.2 and 5.4	None

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
		20	P20-A	Man—made retention pond Ephemeral Dry in Oct 2011 Exposed Limestone, slightly wetted with mosses and sedge indicate possible groundwater near surface Bankfull Length = 50 m Bankfull Width = 18 m Bankfull Depth = 1.2 m	None proposed	None	NA	None
		20	P20-B1	Intermittent stream Dry in Oct 2011 Channelized and incised Substrate = Silt / Clay / Detritus / Leaf Litter / Moss Bankfull Width = 1.37 m Bankfull Depth = 0.57 m	Solar panels	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads and placement of panels (see Sections 4.1 and 4.2)	See Sections 5.1	None expected
		20	P20-B2 and upstream approx. 322 m to Property 20/19 property line	Intermittent stream Dry in Oct 2011 Channelized and incised Substrate = Silt / Clay / Detritus / Leaf Litter / Moss Bankfull Width = 0.95 m Bankfull Depth = 0.45 m	Solar panels and Access road within 120 m at upper section of intermittent stream of this drainage	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, and placement of panels (see Section 4.1 and 4.2)	See Sections 5.1	None expected
		20	P20-C	Human-made Pond Dry in Oct 2011 at most downstream section of Property 20 Drainage	None proposed	None	NA	None
	Property 14A Pond	14A	East of 14A	Human-made pond Ephemeral	Solar Panels within 120 m (only on west fringe of water feature)	Temporary increase in surface water turbidity and risk of siltation due to placement of panels (see Section 4.5)	See Section 5.1	None expected
	Property 3 Pond	3	P3-Pond-A	Human-made dug out pond Dry in Oct 2011 Cattail and sedge Moss and some wetting of vegetation may indicate some groundwater impact Bedrock (limestone) bottom	Solar panels Access road Underground collector line Overhead collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, collector lines and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5)	See Sections 5.1, 5.3 and 5.4	None

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
	Property 6B Pond	6B	P6B-Pond	Human-made pond Wet in Oct 2011 Cattail and sedge Substrate = bedrock, Silt & Muck, Detritus Fished Oct 2011 Fish bearing	None	NA	NA	None
	South of Property 4 Leased Area Drainage & Pond	4	South of Property 4	Human-made pond Approx. 2 ha, L-shaped To drainage swale below the Property Dry in Oct 2011 Not fished in 2011 as no site access	Solar panels Access road Underground collector line Overhead collector line Substation Operations and Maintenance Building Access road and overhead collector line crossing of drainage swale south of P4	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector lines, overhead collector lines, placement of panels and construction of the substation along with appurtenances from the substation to the existing transmission lines located east of P4 (see Section 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6) Expected need for continued conveyance of water in east to west direction south of P4. Therefore placement of culvert at access road crossing Crossing – Non-REA drainage; No HADD	See Sections 5.1, 5.2, 5.3 and 5.4 as well as DFO OS for Underground and Overhead Collector Line Construction (Appendix E)	None expected
	Property 9 Quarry Pond	9	P9-Quarry-Pond	Human-made Water filled former Quarry Wet in Oct 2011 Substrate = Bedrock / Boulder / Cobble / Gravel / Sand / Silt & Muck Fished Oct 2011 Fish bearing	Solar panels Access road Underground collector line	Temporary increase in surface water turbidity and risk of siltation due to runoff during construction of access roads, underground collector line and placement of panels (see Section 4.1, 4.2, 4.4 and 4.5)	See Sections 5.1, 5.3 and 5.4 as well as DFO OS for Overhead Collector Line Construction (Appendix E)	None expected
	Quarry Pond North of 14 C	14C	North of 14C	No Access, visual inspection Oct 2011 Possibly stocked with salmonids Shear/steep bedrock shoreline	None	NA	NA	None

Watershed	Subwatershed	Property ID	Reach ID / Pond ID in Proximity to Project Structure	Site Description	Proposed Work within 120 m of Water Body or Drainage Feature	Potential Impact	Mitigation	Net Effects
	Odessa Lake Drainage	NA	OL-A	Grassed waterway / Drainage swale / Roadside drainage	Within 120 m of the Mud Lake Rd. / Unity Rd. ROW overhead collector line	With the exception of potential construction activities overhead collector lines should not impact water quality (see Sections 4.1 and 4.3)	See Sections 5.1	Non expected

Notes:

ROW – Right of Way

DFO OS – Department of Fisheries and Oceans Ontario Operational Statement

HADD – Harmful Alteration, Disruption or Destruction of Fish Habitat under Section 35 of the *Fisheries Act*

LOA – Letter of Advice as issued by the CRCA / DFO that confirms the works will not result in a HADD

Authorization – *Fisheries Act* Subsection 35(2) Authorization of HADD of fish habitat

CRCA – Cataraqui Region Conservation Authority which holds a Level II Agreement with DFO (See Section 3.3.1 and 3.3.1.1)

NA – Not applicable as water features does not meet the criteria of a water body under O.Reg. 359/09

3.3.1 Fisheries Habitat

The federal *Fisheries Act* governs the protection of fish and aquatic habitat, including the harmful alteration, disruption or destruction (HADD) of fish habitat (Section 35), and the deposition of deleterious substances into fish bearing waters (Section 36). Fisheries and Oceans Canada has signed agreements with 35 of the 36 Conservation Authorities in Ontario, to review proposed projects under Section 35 of the *Fisheries Act*. CRCA holds a Level II agreement with DFO. Therefore, the CRCA may conduct initial review of the Project to identify any impacts to fish and fish habitat. Furthermore the CRCA may determine appropriate mitigation to any potential impacts to fish and fish habitat. If mitigation is possible the CRCA/DFO can issue a Letter of Advice (LOA) that confirms the works will not result in a HADD. However, in the event that impacts to fish and fish habitat cannot be mitigated the Project will be forwarded to the local DFO office (Prescott, Ontario) for further review.

The DFO's Risk Management Framework (RMF) is a process through which the risk of a project and associated works to fish habitat can be assessed. Project risk is based on the sensitivity of fish habitat and the nature of the work being proposed. By providing information in a format that follows the RMF, all the necessary information will be available for efficient review and decision making.

Based on the current Project layout and proposed environmental mitigation measures, in-water work would potentially impact fish or fish habitat, or areas that contain fish habitat or contribute indirectly to fish habitat, at eight (8) crossing locations and three (3) encroachments of less than 30 m to an adjacent water body (as summarized in Table 3-7) which include:

Crossings:

- Overhead collector line crossing at P12-A;
- Overhead collector line crossing at P6A-A;
- Access road and underground collector line crossing of intermittent water body approximately 65 m downstream of P24-B;
- Access road and underground collector line crossing at P23-Northern-1;
- Access road and underground collector line crossing at P22-1;
- Access road and underground collector line crossing at P21-1;
- Access Road and underground collector line crossing of GC-Trib-2 approximately 32 m south of P14-B3; and,
- Access road and underground collector line crossing of intermittent water body at P6A-4.

Access road and collector line crossings at the locations listed above pose a low risk of long-term impact to the associated water bodies. Overhead line crossings are proposed at locations where existing road crossings (Unity Road.) exist. Standard mitigation measures for overhead collector line construction as provided in Section 5.0 and **Appendix E** will ensure no impact to the low-risk warmwater fish communities and habitats associated with these crossings. Access road and underground collector line crossings are proposed at the remainder of these

crossings. In all cases these crossings would be at intermittent water bodies which were dry during site investigations in 2011 or support warmwater fish communities. Therefore, a low risk of impact is expected if standard mitigation measures for collector line and general construction (as discussed in Section 5.0 and **Appendix E**) are followed.

Encroachment within 30 m of a Water Body:

- Access road and collector line adjacent to intermittent stream and within 23 m of water body (35 m downstream of P3-B);
- Access road and underground collector line adjacent to water body and within 22 m of the intermittent stream section in Property 6A, directly upstream of P6A-4; and,
- Access road and collector line adjacent to water body and within 24 m of the intermittent stream section in southern extremity of Property 21 (P21-1).

Access roads and collector lines currently proposed to encroach within 30 m of an intermittent tributary as listed above will not constitute an impact to the permanent creek as detailed in Table 3-7, provided mitigation measures as described in Section 5.0 are used. These encroachments are on intermittent water bodies which contain indirect warmwater fish habitat or communities which would be considered low risk to Project related impacts.

All solar panels within the proposed Project layout are setback 30 m from the average annual high water mark of defined water bodies as required by Subsection 40(1) of O. Reg. 359/09 for a Class 3 solar facility.

All other encroachments of proposed Project layout on water bodies that are within the 120 m Zone of Investigation are greater than 30 m in distance. These encroachments are on water bodies which contain warmwater fish habitat or communities which would be considered low risk to Project related impacts following standard mitigation measures as provided in Table 3-7 and Section 5.0.

3.3.1.1 Cataraqui Region Conservation Authority

If impacts to fish and fish habitat can be fully mitigated, a LOA will be issued by the CRCA indicating that the proposed activities will not likely cause a HADD if the proposed set of mitigation measures is followed. If the CRCA determines that impacts cannot be fully mitigated, the project is forwarded to the local DFO office for further review. If the DFO determines that HADD of fish habitat will occur, the Proponent needs to submit a Letter of Intent (LIO) to Compensate for Fish Habitat Loss (outlining the details of the proposed work and required mitigation measures, and the resulting net impact to fish habitat). The LIO should include a Fish Habitat Compensation Plan that identifies the proposed habitat enhancement works to compensate for the predicted impacts to fish habitat. DFO approval under the *Fisheries Act* allows the HADD to occur following the conditions of the Authorization.

3.3.2 Species at Risk

Records review and site investigation of the water bodies and water features within the Project Zone of Investigation did not indicate the presence of any federally or provincially listed aquatic species at risk or species of special concern (*Species at Risk Act* (SARA)(2003) and *Endangered Species Act* (ESA)(2007), respectively). Therefore it is assumed that there will be no effect to aquatic species at risk habitat located within the area.

3.3.2.1 Species at Risk Act

Under Section 32(1)(i) of SARA, it is prohibited to:

- “Kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species”.

Additionally, Section 58(1) of SARA prohibits the destruction of:

- “Any part of the critical habitat of any listed endangered species or of any listed threatened species”.

Section 73 of SARA provides for a permitting mechanism, whereby Sections 32 and 58 may be legally contravened provided that the following conditions are met:

- All reasonable alternatives to the activity that would reduce the impact on the species have been considered and the best solution has been adopted;
- All feasible measures will be taken to minimize the impact of the activity on the species or its critical habitat or the residences of its individuals; and
- The activity will not jeopardize the survival or recovery of the species.

At this time it is not anticipated that the Project will result in net effects to federally protected species at risk.

3.3.2.2 Endangered Species Act

Under Section 9(1)(a) of the Endangered Species Act (ESA, 2007) it is prohibited to:

- kill, harm, harass, capture or take a living member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species;
- Additionally, under Section 10(1) of the ESA, it is prohibited to “destroy the habitat of”:
 - A species that is listed on the Species at Risk in Ontario List as an endangered or threatened species; or

Section 17(1) of the ESA states:

- The Minister may issue a permit to a person that, with respect to a species specified in the permit that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species, authorizes the person to engage in an activity specified in the permit that would otherwise be prohibited by section 9 or 10, 2007, c. 6, s. 17 (1).

At this time it is not anticipated that the Project will result in net effects to provincially protected aquatic species at risk.

4.0 POTENTIAL IMPACTS OR EFFECTS

The potential for effects on watercourses exists from soil erosion resulting from the removal of vegetative cover during construction activities. Erosion may result in sediment transport, short-term increase in surface water turbidity, and potential impacts to fish and fish habitat. Due to the Project Location's agricultural land use, the watercourses are not highly sensitive to temporary disturbances. However, the magnitude and duration of potential effects to watercourses depend on the specific characteristics of each watercourse (e.g., flow regime, water velocity, bed substrates, bank conditions, local soils and the extent and duration of exposure).

The solar panels are mounted above the ground therefore infiltration, filtration through vegetation, and other natural hydrologic process will be similar to existing conditions. Generally, drainage will be directed to existing receiving systems (drainage paths, roadside ditches, etc.) as under current conditions.

All Project sites will be surrounded by security fencing which will be erected around the site perimeter prior to start-up. This would consist of 1.8 m high chain link fencing. The security fencing is estimated to be approximately 32 km in length. Manual lockable gates will be supplied at all entrance locations. Detail project design may also include consideration of landscaping such as berms or vegetation screens where practical and effective to mitigate potential visual effects.

4.1 General Construction Related Impacts

The potential impacts of the Project on water features located within 120 m of the Project Location could include:

- Soil erosion and movement during construction;
- Short-term increase in turbidity from runoff; and,
- Water quality and habitat effects.

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 watercourse;
- Loss of bed material within the length of the culvert; and,
- Changes to riparian vegetation within road allowance.

Culverts must be designed and installed such that there is no:

- Restriction of flows through the culvert resulting in upstream pooling;

- Erosion at the culvert inlets and outlets;
- Overall change to the hydrology and delivery of water to larger watercourses; and,
- Barrier to fish passage to upstream environments.

The current movement of water within the Project Location is delineated by grassed drainages and seasonal drainage swales as dictated by low lying area between agricultural fields. Similar management of water around the Project Location will allow for the continued flow and input of water to permanent and intermittent water bodies which provide direct and indirect warm water fish habitat.

4.3 Overhead Collector Lines and Transmission Line

Short-term impacts on watercourses may include localized loss of riparian vegetation which reduces the functionality of buffer areas in decreasing turbidity during construction. Loss of riparian habitat may 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 collector lines outside of these localized areas.

4.4 Underground Collector Lines

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

- Erosion and sedimentation from site disturbance and dewatering;
- Collapse of the punch or bore hold under the stream;
- Disturbance of riparian vegetation can reduce cover, shade and thermal regimes and food production areas; and,
- 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).

4.5 Solar Panel Placement and Maintenance

Soil erosion as a result of vegetation removal is expected during solar panel placement and during maintenance activities. This removal of vegetation will also reduce the attenuation and filtration properties of field areas therefore increasing the flow of surface water to low lying areas and conveyance features within Project Location. Together these changes may increase the downstream transport of sediment, increasing the potential for seasonal turbidity, thereby impacting fish and fish habitat. Due to the historic land use associated with the Project Location being that of agriculture, the watercourses were likely influenced by this similar change in vegetative cover seasonally and as such not highly sensitive to temporary disturbances. Reestablishment of ground cover in the Project Location under above ground solar panels will facilitate a similar surface water response to that which is currently occurs.

However, the magnitude and duration of potential effects to watercourses and their associated intermittent drainage features are based on seasonal precipitation and infiltration rates. Materials such as fuel and lubricants used during Project maintenance have the potential for release to the environment if improperly managed. Further information regarding best management practices and mitigation during construction and operation with regard to spills/leaks is provided in Sections 5.1 and 6.2.

4.6 Collector Substation

Surface run-off from the impervious structure of the Collector Substation will be conducted through the grassed waterway and ponded drainage feature located approximately 50 m south of Property 4. Drainage will continue in an easterly direction through grassed waterway which will ultimately drain toward the Glenvale Creek system. This will ensure conveyance of runoff as well as water quality control, and will meet the MOE *SWM Planning and Design Guidelines Manual* (2003). Due to the historic land use associated with the Project Location being that of agriculture, the watercourses were likely influenced by this similar change in vegetative cover seasonally and as such not highly sensitive to temporary disturbances. Further description related to this and general Project Location storm water management is provided in the *Design and Operations Report* (AMEC, 2012).

4.7 Operations and Maintenance Building

The operations and maintenance building would be the operational hub of the Project and will be located adjacent to the Collector Substation. Surface run-off from the impervious structure of the operations and maintenance building will be conducted and managed in the same fashion as described in Section 4.6 for the Collector Substation. Due to the historic land use associated with the Project Location being that of agriculture, the watercourses were likely influenced by this similar change in vegetative cover seasonally and as such not highly sensitive to temporary disturbances

The operations and maintenance building would include a septic tank for holding sanitary wastes from the washrooms and kitchen in the operations and maintenance building. The tank would have a level monitoring system and include a high level alarm. A contract would be arranged with a licensed septic hauler for emptying the tank. The sewage system would be designed and permitted in accordance with provincial codes and building standards. Flows would be less than 1,500 L/day. No significant negative effects on groundwater or surface water are expected.

4.8 Surface Run-off and Stormwater

Surface run-off associated with the Project is expected to be similar to that currently experienced within the Project Location as a result of annual precipitation patterns, topography, conveyance features and current land use practices. Project components are not expected to create impervious structures to precipitation infiltration in the long-term, accept for the Collector Substation (see Section 4.6). Marginal increases in surface water run-off and associated

siltation and increased nutrient loading are potential effects of construction. Due to the historic land use associated with the Project Location being that of agriculture, the watercourses were likely influenced by similar changes in vegetative cover seasonally and as such not highly sensitive to temporary disturbances. Mitigation measures and best management practices to ensure adequate surface run-off and stormwater management include:

- Maintain and provide vegetative buffers following prescribed setback requirements for ancillary equipment and solar panels to control erosion, sedimentation and nutrient inputs;
- Minimize the widths of rights-of-ways;
- Install adequate culverts and gravel base to maintain flow of surface water and shallow groundwater through existing and engineered conveyance systems;
- Minimize the area of paved surfaces; design roads without curbs, gutters and sidewalks to promote infiltration;
- Maintain streams (permanent and intermittent) and timing and quality of flows; and,
- Reseed and establish vegetation as soon as possible following disturbance.

This will help to ensure conveyance of runoff as well as water quality control will meet the MOE *SWM Planning and Design Guidelines Manual* (2003). Further description related to the general Project Location storm water management plan is provided in the *Design and Operations Report*(AMEC 2012).

4.9 Water Taking Activities

Taking of surface waters for power production or operations from water bodies within the Project Location is not expected. Water supply for amenities associated with the operation and maintenance building will come from a municipal supply and arrive at the Project Location via truck. On-site water storage will be in an above ground water tank installed within the building. Bottled water would be provided for drinking purposes. Further detail concerning operation and maintenance water supply is provided in the *Design and Operations*.

4.10 Discharge into the Environment

It is not expected that power production or operations for the Project will have any associated discharge into the environment. Construction related dewatering, if required will be of short duration and at a rate of less than 50,000 L/day as discussed in the *Construction Plan Report*.

4.11 Accidental Spills and Contaminants

A protocol to minimize spills/leaks and their impact to the environment will be provided in the Emergency Response Plan.

A proposed transformer containment pit system to prevent accidental spills of oil from leaving the site or contaminating is described in the *Design and Operations Report*. A general outline of this system is provided below:

- A “double containment system” will be implemented for transformers at the substation. In addition to the “first stage” of containment, namely the transformer enclosures (conservator, tank, etc.), a “second stage” of containment will be in the form of a transformer containment pit system;
- The containment pit around the transformer will be sized to hold a volume of water in the amount of the transformer oil held in the unit plus fire suppression water plus stormwater runoff; and,
- Drainage from the transformer pit would be removed by either manually or automatically operating a sump pump to discharge the liquid. In either case, an oil/grease sensor would be mounted on the pump to detect any oil/grease in the liquid. If oil/grease is detected, the liquid would be removed from site via a licensed waste hauler and the source of the leakage would be identified. If no oil/grease is detected in the liquid, discharge would be via the stormwater collection system.

Routine inspection of Project construction sites, equipment, and operations and maintenance infrastructure to ensure continued use and function of best management practices, mitigation measures and spill control and prevention measures. The Operations and Maintenance building would include secure areas for hazardous materials and lubricant storage. Proper storage of materials and maintenance fluids at off-site storage containers can greatly reduce the potential for accidental spills and/or leaks. Further information regarding best management practices and mitigation during construction and operation with regard to spills/leaks is provided in Sections 5.1 and 6.2.

5.0 STANDARD MITIGATION MEASURES FOR WORKING AROUND FISH HABITAT

Standard mitigation measures for works conducted in and around water are provided below. Specific details regarding mitigation measures that may need to be implemented for this Project on a localized scale will be determined through consultation with the City of Kingston, Loyalist Township, the CRCA, MNR and DFO. The extent of mitigation will be dependent on the Project details such as preliminary designs, technical requirements, construction methods and schedule.

5.1 General Mitigation Measures

There are many mitigation measures to protect fish and fish habitat from potential effects during the construction phase of a project. General mitigation measures for construction activities near a watercourse in the Zone of Investigation include:

- All in-water work would be completed within MNR timing windows to protect local fish populations during their spawning and egg incubation periods. A typical construction timing window for warmwater streams in the MNR's Kingston District is July 1 to March 15; however, the DFO timing window for this region for spring spawning fish as inhabit the watercourses in the Project Location is July 15 to March 15 as it applies to projects completed using DFO Operational Statements;
- All materials and equipment used for the purpose of site preparation and Project construction will be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering the water:
 - Any stockpiled materials will be stored and stabilized away from the water;
 - Refuelling and maintenance of construction equipment will occur a minimum of 100 m from a water body;
 - As appropriate, spills will be reported to the MOE Spills Action Centre;
 - Any part of equipment entering the water would be free of fluid leaks and externally cleaned/degreased to prevent any deleterious substance from entering the water; and,
 - Only clean material, free of fine particulate matter would be placed in the water.
- Sediment and erosion control measures would be implemented prior to construction and maintained during the construction phase to prevent entry of sediment into the water:
 - Silt fencing and/or barriers would be used along all construction areas adjacent to natural areas;
 - No equipment would be permitted to enter any natural areas beyond the silt fencing during construction;
 - All sediment and erosion control measures would 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 would be sufficiently distant from watercourses to preclude sediment inputs due to erosion of stored soil materials;
 - If the sediment and erosion control measures are not functioning properly, no further work would occur until the sediment and/or erosion problem is addressed;

- All disturbed areas of the construction site would be stabilized immediately and re-vegetated as soon as conditions allow; and,
- Sediment and erosion control measures would be left in place until all areas of the construction site have been stabilized.

5.2 Mitigation Measures for New Culvert Crossings

Culverts will be required at watercourse crossings at access roads and for conveyance at specific locations within the Project Location for storm water management. Culverts must be sized according to hydrologic requirements of the watercourse or conveyance feature which will be determined during the detailed design and permit application stage. It is possible that other technical requirements may influence culvert size and materials.

Where fish habitat is present, culverts must be installed such that fish passage is maintained. Where a watercourse provides indirect habitat, the culvert must continue to convey flow to downstream areas.

An Environmental Monitor (or designate) would be on-site during construction of watercourse crossings to ensure compliance with specifications and site plans. In particular, the Construction Contractor would ensure that pre-construction preparation is completed prior to commencement of in-stream work and that bank, bed, and floodplain conditions are restored to pre-construction conditions following completion of any construction activities.

Specific methods for culvert installation will be dependent on culvert type, size and construction season. If a temporary access road is required, the DFO Operational Statement for Temporary Stream Crossings can be used (**Appendix E**), provided the specific conditions can be met. This Operational Statement includes details for mitigation measures.

Under flowing water conditions, water must be pumped around the work area in order to install a culvert. The following steps outline how a site can be isolated for culvert construction:

Temporary Isolation

- Cofferdams (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 separate the in-water work site from flowing water;
- If rip rap or sand bags are used, clean, washed material would be used to build the berm. The berm face would consist of clean, washed granular material that is adequately sized (i.e., moderate sized rip rap and not sand or gravel) to hold the berm in place during construction. Material to build the berms would not be taken from below the high water mark;
- Cofferdams would be designed to accommodate any expected high flows of the watercourse during the construction period;
- Before starting construction, fish would be salvaged from behind the coffer dam and returned to an area immediately upstream of the isolated area. Salvage operations must

consist of techniques that successfully target the species and size classes of fish that inhabit the watercourse reach;

- Accumulated sediment would be removed (ensuring that the original bed of the watercourse is not excavated) from behind the coffer dam before its removal;
- The original channel bottom gradient and substrate would be restored after coffer dam removal;
- Water from dewatered areas would be treated or diverted into a vegetated area or settling basin to remove suspended solids and prevent sediment and other deleterious substances from entering the watercourse;
- Cofferdams would 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 would 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 would be sized to accommodate any expected high flows of the watercourse during the construction period. Back-up pumps would be kept on site in case of pump failure;
- The pump would be discharged to a grassed area to allow water to re-enter the watercourse only after it has been filtered through vegetation to prevent silt deposition. If no suitable areas exist, a filter bag would be placed on the outlet to filter the water prior to re-entry into the watercourse;
- Work would not be completed during flood stage flows or during times when heavy precipitation is occurring or is expected; and,
- The work must be carried out in such a way as to prevent sediment or debris from entering natural watercourses as outlined in a Sediment Control Plan.

5.3 Mitigation Measures for Overhead Collector Lines

The DFO Ontario Operational Statement Habitat Management Program: Overhead Line Construction is provided in **Appendix E**. This Operational Statement provides measures to protect fish and fish habitat when undertaking this construction of this type.

Although construction of overhead lines (as required) does not typically require any in-water works, riparian habitat is sensitive to disturbance from overhead line construction. Riparian vegetation occurs adjacent to watercourses and directly contributes to fish habitat by providing shade (thermal refuge), cover, and provides allochthonous habitat and food inputs.

5.4 Mitigation for Underground Collector Lines

Crossing techniques that may be employed for installation of a buried collector line include: 1) punch or bore, 2) high pressure directional drilling, 3) dry open-cut crossing and 4) isolated open-cut crossing, in order of preference by DFO for the protection of fish and fish habitat. DFO Operational Statements for each of these methods are included in **Appendix E**.

A summary of mitigation measures for Dry Open-Cut crossings and Isolated Open-Cut crossings is provided below:

Dry Open-Cut (Dry Watercourses)

- Crossings would be undertaken on days when precipitation is not expected;
- The tracked excavator would be working in the dry when excavating a trench;
- Topsoil stockpiles would be reasonably distant from watercourses to preclude sediment inputs due to erosion of stored soil materials;
- Water crossings would be backfilled with substrate material that is consistent with the existing substrate size and texture and would remain in/under the crossing;
- The water crossing bed and bank areas would be rehabilitated to pre-excavation condition; and,
- Materials such as sand bags, straw bales, geotextile filters, and/or pumps would 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)

Mitigation measures to employ for a low flow watercourse include:

- Where an open cut crossing is not possible, in-stream work would 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;
- To the extent practicable, crossings would take place on days when precipitation is not expected;
- To the extent practicable, crossings would take place on days when precipitation is not expected;
- Existing stream flows shall be maintained downstream of the de-watered work area without interruption, during all stages of the work;
- Fish, if present, shall be removed from the work area prior to de-watering and released alive immediately upstream;
- Flow dissipaters and/or filter bags, or equivalent, would be placed at water discharge points to prevent erosion and sediment release;
- Sediment laden dewatering discharge can be pumped to a temporary settling basin well away from the watercourse and allowed to settle and/or filter through the riparian vegetation before re-entering the watercourse downstream of the construction area;
- As conditions warrant the work area would be stabilized against the impacts of high flow events at the end of each workday;
- Work in the channel and floodplain will be suspended and the work area stabilized when there is a high probability of a convective rainfall event and during warm winter periods when there is a high likelihood of significant snowmelt runoff;
- Silt or debris that has accumulated around the temporary cofferdams would be removed prior to their withdrawal; and,

- If greater than 50,000 L/day is to be taken from the dewatering area, a Permit to Take Water may be required. However, this is not anticipated to be necessary.

6.0 MONITORING

6.1 Construction

Methodologies/Sampling Protocols (as per the *Construction Plan Report*)

As appropriate and as per the Sol-luce Kingston Solar PV Energy Project *Construction Plan Report* an Environmental Monitor would be on-site during the construction and installation of Project components that may potentially affect aquatic resources and habitats. This will help to ensure compliance with design specifications, permits and approvals. The Construction Contractor will ensure that pre-construction preparation is completed prior to commencement of in-stream works (if required). Where applicable, the Construction Contractor would ensure that the detailed pre-construction profiles of slopes, banks, and beds are determined. This would be done prior to installation of access roads, crane paths and collector lines. The Environmental Monitor would help to ensure construction is conducted to minimize effects to the aquatic environment for example, by monitoring weather forecasts prior to the installation of access roads, crane paths and power lines near aquatic habitats in efforts to minimize the potential for siltation.

Performance Objectives/Additional Actions

When applicable and in consultation with the Sol-luce Kingston Solar PV Energy Project *Construction Plan Report*, the Environmental Monitor would help to ensure that the morphology of banks, beds, and floodplains are restored to pre-construction conditions following completion of the construction activities.

Environmental monitoring following the spring freshet and run-off the year following construction completion (first year of operations) would be conducted so as to review the effectiveness of the design form and function, channel stability, the re-vegetation plan (if applicable) and maintenance of surface drainage (e.g., culvert functionality). In the event that adverse effects are noted, appropriate remedial measures would be completed as necessary (i.e., site rehabilitation and re-vegetation) and additional follow-up monitoring conducted as appropriate, under the direction of an environmental advisor.

Additionally, compensation strategies and/or permits from DFO and/or the CRCA will include conditions of approval including construction and post-construction monitoring. All strategies and permits must be obtained prior to construction commencement. Appropriate steps to meet the conditions must be implemented as per the schedule detailed in approved strategies and permits.

6.2 Operation

Environmental inspection and monitoring is discussed for aquatic habitat and surface water in the *Construction Plan Report*. The Environmental Effects Monitoring Plan for the Project is provided in Section 5 of the *Design and Operations Report*. Operation activities that have the

potential to affect aquatic resources and their habitat include accidental spills and/or leaks. Proper storage of materials and maintenance fluids at off-site storage containers can greatly reduce the potential for accidental spills and/or leaks.

In the event of a spill or leak, appropriate remedial measures must be completed and additional follow-up monitoring conducted as appropriate and as discussed with the MOE (Spills Action Centre) as well as the CRCA and the MNR. The level of monitoring and reporting is typically based on the severity of the spill/leak and must be discussed with the MOE.

Monitoring requirements as conditions of *Fisheries Act* approvals will be stated in DFO Authorizations and/or CRCA Letters of Advice. Monitoring typically includes photographic records during construction and for two years following completion of construction to ensure form and function of design, stability and successful re-vegetation. Information may be required in a final construction report after this period. If significant habitat enhancement or compensation measures are implemented, monitoring is likely to include a fish community and habitat assessment component.

7.0 CLOSURE

AMEC has completed this *Water Assessment and Water Body Report* for the exclusive use of Kingston Solar LP for specific application to the Sol-luce Kingston Solar PV Energy Project. This document was prepared in accordance with the Ministry of the Environment (MOE's) *Technical Guide to Renewable Energy Approvals* (2011, 2012).

Sincerely,

**AMEC Environment & Infrastructure,
a Division of AMEC Americas Limited**

A handwritten signature in black ink, appearing to read "J. P. Dietrich".

Jason P. Dietrich, M.Sc.
Aquatic Ecologist

A handwritten signature in black ink, appearing to read "Rob Young".

Rob Young, M.Sc., P.Geo.
Associate Environmental Scientist
Power Sector Co-Lead

8.0 REFERENCES

AMEC. 2012. Kingston Solar LP Sol-Luce Kingston Solar PV Energy Project, *Design and Operations Report*.

AMEC. 2012. Kingston Solar LP Sol-Luce Kingston Solar PV Energy Project, *Construction Plan Report*.

Beaubiah, T. 2004. Millhaven Fishes Report, Electrofishing Survey – October 2003, Summary and Discussion. January 10, 2004, Cataraqui Region Conservation Authority.

Conservation Ontario 2011 Aquatic Species at Risk. 2011. Conservation Ontario. <http://www.conservation-ontario.on.ca/projects/DFO.html>

Ontario Ministry of the Environment (MOE). 2003. SWM Planning and Design Guidelines Manual.

Natural Heritage Information Centre (NHIC) database. 2011. Ontario Ministry of Natural Resources, Peterborough, Ontario. <http://nhic.mnr.gov.on.ca/>

APPENDIX A
CURRICULA VITAE

Jason Dietrich, M.Sc.

Aquatic Ecologist

Professional summary

Mr Dietrich is an aquatic ecologist with over 13 years of experience in aquatic resources research, assessment and management based projects. His work has focussed on understanding environmental effects, predator / prey associations, population dynamics, invasive species, species at risk, reintroductions, migratory behaviour, ecosystem function and fisheries management in marine, lake and river environments. He has experience in conservation strategies, GIS, database creation/management, and biostatistical analysis. His previous employment includes the Ontario Ministry of Natural Resources and the Toronto and Region Conservation Authority. Mr. Dietrich has been actively involved in the organization, study design, data collection, biostatistical analysis, and interpretive reporting consistent with environmental inventories and assessments, Environmental Effect Monitoring (EEM), conservation strategies, management plans, and other natural resource related consulting services.

Education

M.Sc. Biology, University of New Brunswick, Fredericton, Dec 2001

B.Sc. Biology and Chemistry with Environmental Science Option, Wilfrid Laurier University, April 1998

Memberships/Affiliations

American Fisheries Society, Canadian Aquatic Resources Section of American Fisheries Society.
American Fisheries Society, Ontario Chapter

Languages

English

Employment history

Aquatic Ecologist, AMEC Environment & Infrastructure, Mississauga, Ontario, 2006-present

Fisheries Biologist, Toronto and Region Conservation Authority, Toronto, Ontario, 2006

Management Biologist, Ontario Ministry of Natural Resources, Glenora, Ontario, 2006

Assessment Biologist, Ontario Ministry of Natural Resources, Glenora, Ontario 2005-2006

Special Projects Biologist, Ontario Ministry of Natural Resources, Glenora, Ontario, 2003-2005

Research Biologist, Ontario Ministry of Natural Resources, Glenora, Ontario, 2002-2003

Aquatic Biologist, Ontario Ministry of Natural Resources, Thunder Bay, Ontario, 2001-2002

M.Sc. Graduate Student, University of New Brunswick, Fredericton, New Brunswick, 1998-2001

Research Assistant, University of Waterloo Biotelemetry Institute, Waterloo, Ontario, summer 1997.

Representative projects

Conservation Strategies, Planning and Management Plans

■ *Toronto Natural Heritage Study, City of Toronto*

Mr. Dietrich undertook a project with the City of Toronto to further develop their Natural Heritage Strategy. The intent of incorporating the natural heritage system into the city's Official Plan should ensure that the system components that contribute to the health of the city and its

inhabitants be protected and sustained in the long term. Project tasks included developing the natural heritage strategy framework and criteria, consulting with experts from academic, private and government institutions and conducting workshops.

■ *Centennial Park, City of Toronto*

Mr. Dietrich has undertaken a project to develop a management plan for Centennial Park, an urban park located in Toronto, Ontario. Project tasks include collection baseline ecological data and interpretation, restoration design and implementation as well as public and stakeholder meetings and workshops.

■ *Rouge Park, City of Toronto*

Mr. Dietrich has undertaken a project to develop an ecological framework and management plan in preparation for an increase to the park's area to include former agricultural lands. Project tasks include collection baseline ecological data and interpretation, restoration design and implementation as well as public and stakeholder meetings and workshops.

■ *Fisheries and Species at Risk Management Plans*

As an ecologist Mr. Dietrich has been involved in the preparation of Fisheries Management Plans and species-specific Species at Risk Management Plans for both the Ontario provincial government and federal government. These plans suggest best management practices, including mitigation strategies for the conservation and/or sustainability of a population.

Environmental Effects Monitoring

■ *Lake Utopia Paper*

Effluent Effect Monitoring. As an aquatic ecologist with AMEC E&E, Mr. Dietrich was the biostatistician for a fourth cycle Pulp and Paper Environmental Effects Monitoring Program. Responsibilities included multivariate statistical analysis of endpoint and indicator variables collected from the Letang Estuary, New Brunswick and providing report material for governing agencies.

■ *De Beers Canada Inc., Victor Project*

As an aquatic ecologist with AMEC E&E, Mr. Dietrich is involved in the evaluation of existing conditions and monitoring of aquatic resources as they relate to the effects of the development of the Victor diamond mine site near James Bay, Ontario. Responsibilities included study design, project management, field program lead, data collection, statistical analysis and reporting for multiple the Ministry of the Environment (MOE) Certificate of Approval (C of A) effects assessments.

■ *Northgate Minerals Corporation, Young-Davidson/Matachewan Gold Project*

As an aquatic ecologist with AMEC E&E, Mr. Dietrich is involved in monitoring of aquatic resources as they relate to the effects of the development of the Young-Davidson Project site near Matachewan, Ontario. Responsibilities included effects monitoring programs and associated data synthesis and reporting to satisfy MOE C of As.

■ *Xstrata Copper, Kidd Metallurgical Division, Three Nations Creek Remediation Action Plan*

As an aquatic ecologist with AMEC E&E, Mr. Dietrich is involved in an effects monitoring program statistical analysis and reporting pertaining to biotic indicators associated with the Three Nations Creek Remediation Action Plan.

- *Xstrata Copper, Kidd Metallurgical Division, Kidd Mine Project*
As an aquatic ecologist with AMEC E&E, Mr. Dietrich was the biostatistician for a second cycle Metal Mining Environmental Effects Monitoring Program. Responsibilities included statistical analysis of endpoint and indicator variables collected from Kidd Creek, Ontario and providing interpretation of results.
- *Timminco Metals, Timminco Ltd., Haley Mine Project*
As an aquatic ecologist with AMEC E&E, Mr. Dietrich was the biostatistician for a second cycle Metal Mining Environmental Effects Monitoring Program. Responsibilities included statistical analysis of endpoint and indicator variables collected from the Ottawa River, Ontario and providing interpretation of results.
- *FNX Mining Company Inc., Podolsky Mine Project*
As an aquatic ecologist with AMEC E&E, Mr. Dietrich was the biostatistician for a Receiving Water Aquatic Environmental Assessment. Responsibilities included statistical analysis of endpoint and indicator variables collected from North Norman Creek and Post Creek, Ontario and providing interpretation and reporting of results.
- *Alexander Centre Industries, Fisher Harbour Biological Study*
As an aquatic ecologist with AMEC E&E, Mr. Dietrich was the biostatistician for an aquatic effects assessment, as stipulated by MOE C of A, of a shipping harbour in Lake Huron. Responsibilities included statistical analysis of endpoint and indicator variables collected from Fisher Harbour, Ontario and providing interpretation of results through reporting.
- *First Nickel Inc., Lockerby Mine Project*
As an aquatic ecologist with AMEC E&E, Mr. Dietrich was the biostatistician for a second cycle Environmental Effects Monitoring Study under MMER. Responsibilities included statistical analysis of endpoint and indicator variables, interpretation and review of results and reports.
- *Apollo Gold Corporation, Black Fox Project*
As an aquatic ecologist with AMEC E&E, Mr. Dietrich prepared MMER technical documentation for EC and an MOE C of A required Study Design for a Receiving Waters Environmental Effects Assessment behalf of the client.
- *Inter-Recycling Systems Ltd., Blackwell Road Landfill, Sarnia*
As an aquatic ecologist Mr. Dietrich lead an annual biological monitoring program to assess biological health for landfill lagoons. Responsibilities included program planning, data interpretation and reporting.

Site Assessment

- *Sanchez Engineering Inc., Saugeen River Sediment Quantity and Quality*
As an aquatic ecologist Mr. Dietrich managed a project designed to collect sediment from the Saugeen River near Southampton, ON. Bathymetry and sediment grain size and chemical properties were analyzed to further provide direction in refitting Denny's Dam with an improved fish passage way, and options for terrestrial sediment disposal. Responsibilities included data interpretation as pertains to the Ontario Site Assessment Guidelines under Ontario Regulation 153/04.
- *Sanchez Engineering Inc., Fairy Lake Garden Pond Sediment Quantity and Quality*
As an aquatic ecologist Mr. Dietrich managed a project designed to collect sediment from an urban storm water feature which connects to the East Holland River in Newmarket, ON.

Bathymetry and sediment grain size and chemical properties were analyzed to further provide direction for options related to dredging and terrestrial sediment disposal. Responsibilities included data interpretation as pertains to the Ontario Site Assessment Guidelines under Ontario Regulation 153/04.

Fisheries and Aquatic Ecology

■ *De Beers Canada Inc., Victor Project*

As an aquatic ecologist with AMEC E&E, Mr. Dietrich is the Project Manager in charge of the assessment of aquatic resources associated with the water bodies in the vicinity of the Victor Project. Responsibilities include conceptualizing and delivering annual fisheries index programs, fish removal and fish tissue studies, and project management. Statistical analyses and reporting as well as client and government liaison, with respect to permitting, are also included as responsibilities.

■ *Manitoba Science, Technology, Energy and Mines, Mine Site Rehabilitation Program*

As an aquatic ecologist with AMEC E&E, Mr. Dietrich is involved in the assessment of aquatic resources associated with the water bodies in the vicinity of the Central Manitoba Mine and Gunnar Tailings sites in south-central Manitoba. Responsibilities include conceptualizing and delivering baseline inventories for water quality, sediment, benthic invertebrates and fisheries.

■ *Toronto Waterfront Fish Community Assessment Summary*

As a biologist for the Toronto and Region Conservation Authority, Mr. Dietrich was responsible for the synthesis of a summary report detailing the long-term dynamics in the fish community of the Toronto waterfront as observed through electrofishing. This involved data analysis, report writing, and presentation to a multi-agency team (Remedial Action Plan Recovery Team).

■ *Lower Don River Fish Community Assessment Summary*

As a biologist for the Toronto and Region Conservation Authority, Mr. Dietrich was responsible for the synthesis of a summary report detailing the long-term dynamics in the fish community of the Lower Don River (Keating Channel) near the Toronto waterfront. This involved data analysis, report writing, for use in an Environmental Assessment Process.

■ *Toyota Motor Manufacturing Canada, Woodstock Plant*

As an aquatic ecologist with AMEC E&E, Mr. Dietrich liaised with client and provincial government agencies to provide services pursuant to permitting and licensing with respect to structural changes to drainage features including professional services in fish salvage.

■ *Native species restoration to Lake Ontario*

Mr. Dietrich represented the Ontario Ministry of Natural Resources as part of an international and multi-agency team exploring the feasibility and limitations of restoring a form of deepwater cisco to the waters of Lake Ontario with the purpose of restoring ecological function to the lake. Responsibilities included proposal preparation, budget, field logistics, and reporting to the Great Lakes Fisheries Commission. Furthermore, Mr. Dietrich served as a technical advisor to the multi-agency Lake Ontario Atlantic Salmon Recovery Team.

■ *Bay of Quinte / Oneida Lake Community Comparison*

As a biologist with the Ontario Ministry of Natural Resources, Mr. Dietrich worked with a team of researchers and managers populating a holistic mass balance models (ECOPATH) for the Bay of Quinte, Lake Ontario and Oneida Lake, NY. More specifically he estimated vital rates for fish species for use in the model and for comparative purposes.

- *Lake Ontario Lake Whitefish Test Netting Program*
As a biologist with the Ontario Ministry of Natural Resources, Lake Ontario Management Unit, Mr. Dietrich was in charge of an assessment program used to understand the efficacy of a prolonged lake whitefish fishery on Lake Ontario. This involved conceptualizing protocols, managing and analyzing data, and liaising with commercial fishermen and the Ontario Commercial Fisheries' Association (OCFA).
- *St. Lawrence River Community Index Netting*
As a biologist with the Ontario Ministry of Natural Resources, Lake Ontario Management Unit, Mr. Dietrich was lead biologist of an assessment program used to monitor the fish community in the St. Lawrence River. This involved conceptualizing protocols, managing and analyzing data, and annual reporting.
- *International Joint Commission Water Levels Study*
As a research biologist with the Ontario Ministry of Natural Resources Mr. Dietrich was part of a multi-discipline and multi-agency team investigating the impacts of water level regulation of the St. Lawrence / Lake Ontario waterway on the natural resources of the area. More specifically Mr. Dietrich studied the long-term (5 decades) dynamics in northern pike recruitment and its dependence on waterlevel and temperature in the Bay of Quinte and the Upper St. Lawrence River.
- *Invasive Species Research*
Mr. Dietrich has spearheaded a number of projects while with the Lake Ontario Management Unit of the Ministry of Natural resources designed at gaining an understanding of what predator species use the round goby (*Neogobius melanostomus*) as prey and how round goby remains can be identified after ingestion by predators in the Great Lakes.
- *Atlantic Salmon Ecology*
As a graduate student Mr. Dietrich investigated the life history of Atlantic salmon in a fiord lake in western Newfoundland. This research included or was affiliated with peer reviewed articles investigating the migration, production, growth, diet (stable isotopes), trophic structure and early life history of Atlantic salmon in this dynamic system.
- *Brook Trout Fragmentation Research*
As a biologist with the Ministry of Natural Resources, Northwest Science and Information, Mr. Dietrich researched the distribution and movement of brook trout in boreal streams near Thunder Bay and the fragmentation of sub-populations as a result of logging practices. Responsibilities included field crew leadership, technical expertise, data collection, management and analyses, and reporting.

Publications and presentations

"Drifters versus residents: assessing size and age differences in Atlantic salmon (*Salmo salar*) fry". Bujold, V., R.A. Cunjak, J.P. Dietrich, and D.A. Courtemanche. 2004. Canadian Journal of Fisheries and Aquatic Sciences 61: 273–282.

"American eel abundance indicators in Canada". Cairns, D.K., V. Tremblay, F. Caron, J.M. Casselman, G. Verreault, B.M. Jessop, Y. de Lafontaine, R.G. Bradford, R. Verdon, P. Dumont, Y. Mailhot, J. Zhu, A. Mathers, K. Oliveira, K. Benhalima, J.P. Dietrich, J.A. Hallett, and M. Lagacé. 2008. Canadian Data Report of Fisheries and Aquatic Sciences 1207.

- "The effects of long-term changes in climate and water level on recruitment and abundance of northern pike (*Esox lucius*) in Lake Ontario and the upper St. Lawrence River". Casselman, J.M., J.P. Dietrich, and K.A. Scott (In prep.).
- "Using stable isotope analysis with telemetry or mark-recapture data to identify fish movement and foraging". Cunjak, R.A., J.M. Roussel, M.A. Gray, J.P. Dietrich, K.R. Munkittrick, D. Cartwright, and T.D. Jardine. 2005. *Oecologia* 144: 636–646.
- "The behaviour, survival and production of Atlantic salmon (*Salmo salar* L.) smolts in the Western Brook system". M. Sc. Thesis, Dietrich, J.P. 2001. University of New Brunswick, Fredericton, NB.
- "The Impacts of Atlantic Salmon Stocking on Naturalized Rainbow Trout in Barnum House Creek, Lake Ontario". Dietrich, J.P., J.N. Bowlby and B.J. Morrison. 2008. Dietrich J.P. 2011. *Journal of Great Lakes Research* 34(3):495–505.
- "Estimates of Atlantic salmon smolt production in the Western Brook system, Newfoundland". Dietrich, J.P., Cunjak, R.A., Bujold V. and Mullins, C.C. 2004. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2556: vi +32p.
- "Evaluation of the impacts of Carlin Tags, Fin Clips and Panjet Tattoos on Juvenile Atlantic Salmon". Dietrich, J.P., and R.A. Cunjak. 2006. *North American Journal of Fisheries Management* 26:163–169.
- "Body and scale growth of wild Atlantic salmon smolts during seaward emigration". Dietrich, J.P. and R.A. Cunjak. 2007. *Environmental Biology of Fishes* 80(4): 495–501.
- "Methods for Estimating Ecopath Inputs for Fish Groups of the Upper Bay Of Quinte, Lake Ontario". Dietrich, J.P., J.A. Hoyle, J.M. Casselman, B.J. Morrison, and T.J. Stewart. 2006. In Koops *et al.* (eds). *ECOPATH w ECOSIM Oneida Lake and Bay Of Quinte Comparison*. *Canadian Technical Report of Fisheries and Aquatic Sciences* 0000.
- "Food partitioning among juvenile Atlantic cod and Greenland cod in a coastal marine habitat of Newfoundland". Dietrich, J.P., E. Kott, D. Cote and D. Scruton. (In prep.).
- "Alternative Ecological Pathways in the Eastern Lake Ontario Food Web — Round Goby in the Diet of Lake Trout". Dietrich, J. P., B.J. Morrison and J.A. Hoyle. 2006. *Journal of Great Lakes Research* 32(2): 395–400.
- "Allometric relationships between calcified structures and overall size of round goby (*Neogobius melanostomus*)". Dietrich, J.P., Taraborelli, A.C., Schaner, T. and B.J. Morrison. 2006. *North American Journal of Fisheries Management* 26:926–931.
- "The fish communities of the Toronto waterfront: summary and assessment, 1989 – 2005". Dietrich, J.P, Hennyey, A.M., Portiss, R., MacPherson, G., Montgomery, K. and Morrison, B.J. 2008. Toronto and Region Conservation. September 2008.
- "Identifying Potential Impediments to The Development Of A Restoration Stocking Program For Deepwater Ciscoes". Dietrich, J.P., Morrison, B.J., Ebener, M.P., Honeyfield, D.C., Noyes, A.C., Wright, G.M. and LaPan, S.R. 2006. Project Completion Report, Great Lakes Fishery Commission.
- "Resource use by salmonids in riverine, lacustrine and marine environments: Evidence from stable isotope analysis". Jardine, T.D., D.F. Cartwright, J.P. Dietrich and R.A. Cunjak. 2005. *Environmental Biology of Fishes* 73: 309–319.
- "The fish communities of the Toronto Waterfront: summary and assessment, 1989 – 2005". Dietrich, J.P. American Fisheries Society Annual Meeting, August 2008, Ottawa, ON.
- "The impact of Atlantic salmon stocking on naturalized rainbow trout in Barnum House Creek, Lake Ontario". Dietrich, J.P., J.N. Bowlby, B.J. Morrison and N.E. Jones. American Fisheries Society Annual Meeting, August 2008, Ottawa, ON.
- "A comparison of parametric versus non-parametric statistical techniques for estimating year-class strength in fisheries". Bowlby, J.N., J.P. Dietrich and B.J. Morrison. International Association for Great Lakes Research 47th Conference on Great Lakes Research, June 2004, Waterloo, ON.
- "Using stable isotope analysis and biotelemetry to study fish movement and foraging". Cunjak, R.A., J.M. Roussel, M.A. Gray, J.P. Dietrich, D.F. Cartwright, and T.D. Jardine. The 4th international

conference on application of stable isotope techniques to ecological studies. April 2004, Wellington, New Zealand.

“Drifters Versus Residents: Assessing Size and age Differences in Atlantic Salmon Fry”. Bujold, V.B., R.A. Cunjak, and J.P. Dietrich. American Fisheries Society Annual Meeting, August 2003, Quebec City, QC.

“The effects of long-term changes in climate and water level on recruitment and abundance of northern pike (*Esox lucius*) in Lake Ontario and the upper St. Lawrence River”. Casselman, J.M. and J.P. Dietrich. International Association for Great Lakes Research 46th Conference on Great Lakes Research, June 2003, Chicago, IL.

“Influence of a large fiord lake on the migration patterns of Atlantic salmon smolts”. Dietrich, J.P. and R.A. Cunjak. Canadian Conference for Fisheries Research (CCFFR), January 2001, Toronto, ON.

LEVI SNOOK, B.Sc.

Aquatic Specialist

Professional summary

Levi has been involved in the environmental consulting industry for two years, with experience conducting aquatic and terrestrial baseline studies on a number of proposed development sites across Ontario. While working for Amec, Levi has carried out fish and fish habitat investigations for the Ministry of Transportation, fish removal program for Xstrata Mining, and aquatic baseline data collection for Metalex Ventures.

Prior to his work with AMEC, Levi was involved in conducting aquatic investigation programs on proposed hydroelectric dam sites, including such work as lake sturgeon and walleye spawning studies, index netting programs, and detailed aquatic habitat mapping. He was also involved in carrying out terrestrial field investigations for proposed wind and solar power projects across Ontario, including winter bird studies, amphibian breeding surveys, bird and snake Species at Risk surveys, wetland delineations, and Ecological Land Classifications.

Levi has a strong background in aquatic and terrestrial biological identification and thorough knowledge of proper field data collection and reporting procedures.

Education

Honours B.Sc. in Environmental and Natural Resource Sciences, Trent University, Peterborough, Ontario, Canada, 2010.

Ecosystem Management Technology Diploma, Sir Sandford Fleming College. Lindsay, Ontario, Canada, 2008.

Ecosystem Management Technician Diploma, Sir Sandford Fleming College, Lindsay, Ontario, Canada, 2007.

Radio and Ultrasonic Telemetry: Fish, Wildlife, and Environmental Monitoring Certification, 2008.

Languages

English

Employment history

AMEC Environment & Infrastructure, Aquatic Specialist, Cambridge, Ontario, August 2011 to present.

Hatch Ltd, Environmental Scientist, Niagara Falls, Ontario, May 2010 to August 2011.

Representative projects

Aquatic Assessment Programs/ AMEC

- *Fish and Fish Habitat Studies, Ministry of Transportation, Greater Toronto Area, Ontario, Canada*
Levi carried out extensive fish habitat and fish community inventory investigations on watercourses crossing major highways throughout the Greater Toronto Area for the Ministry of Transportation. Such assessments involved fish collection using a backpack electrofisher, as well as detailed habitat mapping including identifying flow morphology, stream channel dimensions,

substrate compositions, aquatic and terrestrial vegetation, general water quality parameters, watercourse sensitivities, and overall availability of direct and indirect fish habitat.

■ *Fish Removal Program, Xstrata Copper Canada, Timmins, Ontario, Canada*

This program involved coordination with on-site construction crews in order to remove fish from in-water work areas prior to draining the area in preparation for the construction of grade control structures. The work involved the use of a back pack electrofisher to collect all fish located in areas that were proposed for construction. Fish were collected, identified to species, measured for length and weights, and released live into suitable habitat outside of construction areas. Levi was involved in coordinating with onsite construction managers and contractors to ensure the work was completed correctly and in proper sequence to ensure all fish were removed successfully prior to the creek being drained.

■ *Baseline Data Collection, Metalex Ventures, Attawapiskat River, Ontario, Canada*

Levi carried out the initial baseline data collection on the Attawapiskat River and associated tributaries at a proposed mine site for Metalex Ventures. The work involved the collection of water, sediment, and benthic macroinvertebrates samples from seven sites surrounding the proposed mine site. Sediment was collected using a petite ponar, and benthic macroinvertebrates sampled using a surber sampler from three replicate stations at each site. General conditions, water quality parameters, habitat descriptions, and photo logs were all recorded to ensure the detailed reporting of findings throughout the study area.

STEVE AGALLOTIS

FISHERIES TECHNICIAN

Professional summary

Mr. Agalotis is a graduate from Sir Sandford Fleming College where he earned his Fish & Wildlife Technician Diploma in 2007 and Environmental Technician Diploma in 2009. He is an avid outdoors enthusiast with plenty of fieldwork and laboratory experience to offer you. Currently he is pursuing a new career challenge which will allow him to release his potential in the environmental industry and utilize his extensive technician skills. He is self-motivated, enthusiastic and possesses a genuine desire to learn all aspects of his future profession. This can be noted by his previous student employment contract position as a Fisheries Habitat Technician where he further developed his investigation, stream discharge measurement, and species identification skills. In addition, he has completed Ontario Benthos Biomonitoring Network Certification and the Entry-Level Drinking Water Operators and Operator in Training Certification on his own initiative advancing his abilities to provide excellent industry related skills. He is detail oriented and have highly proficient computer, mathematical and interpersonal skills. It is with this direct work experience and solid academic foundation that makes him uniquely qualified to work in the Environmental/Fish and Wildlife industry.

Professional qualifications/registration(s)

Fish & Wildlife Technician Diploma, 2007

Environmental Technician Diploma, 2009

Education

Fish & Wildlife Technician Diploma, Sir Sandford Fleming College, 2007

Environmental Technician Diploma, Sir Sandford Fleming College, 2009

Languages

English (native)

Employment history

AMEC Earth & Environmental Inc., Mississauga, ON, Fisheries Technician, 2011 to present
Canada Post Corporation, Mississauga, ON, Postal Clerk/Letter Carrier, 1999 to present
Ontario Ministry of Natural Resources, Lindsay, ON, Fisheries Technician, summer 2009, 2008
Ontario Federation of Anglers and Hunters, Peterborough, ON, Fisheries Habitat Technician
Summer 2007

Representative projects

AMEC Environment & Infrastructure – Environmental Assessment

Victor Aquatic Biological Studies Data Entry, License Acquisition

Compiled raw data from fisheries investigations and organized it into a Fish Capture and Bio-sample Appendices Table for further reference, calculations, presentations and report writing
Assisted in writing the Request for Licence to Collect Fish for Scientific Purposes for the ongoing Fisheries Studies at the Detour Lake Project site

Rainy River Resources Aquatic Investigations Fieldwork, Data Entry

Assisted in collecting fisheries information to support provincial and federal scoping and permitting from the area surrounding the Rainy River Project, specifically in areas that may be associated with future mine development

Compiled raw data from fisheries investigations and organized it into a Fish Capture and Bio-sample Appendices Table for further reference, calculations, presentations and report writing.

Ministry of Transportation (MTO) Field Investigations Fieldwork, License Acquisition

Assisted in collecting fisheries information to support provincial scoping and permitting, specifically in areas that may be associated with future highway development

Prepared the Request for Licence to Collect Fish for Scientific Purposes for the Fisheries Studies at the associated future highway development site

Kingsbridge II Wind Farm REA Supporting Document

Compiled raw data from the MTO Site Investigations and assisted in creating the tables for the Wind Turbine and Site Descriptions Report

Xstrata Copper Canada Fish Removal Program

Assisted with coordinating the onsite construction managers and contractors to ensure the work was completed correctly and in proper sequence to be certain all fish were removed and relocated successfully prior to the creek being drained in preparation for the construction of grade control structures.

Samsung Solar Energy Natural Heritage Assessment Fieldwork, Data Entry

Assisted in collecting fisheries information to support provincial and federal scoping and permitting from the area surrounding the Samsung Solar Energy Project, specifically in areas that may be associated with future site development

Compiled raw data from fisheries investigations and organized it into a Fish Capture and Bio-sample Appendices Table for further reference, calculations, presentations and report writing

Ontario Ministry Natural Resources (OMNR)

Nearshore Community Index Netting Program (NSCIN)

End of Spring Trap Netting Program (ESTN)

Fall Walleye Index Netting Program (FWIN)

Gill Netting Surveys

Angler Creel Surveys

Sport Fish Contaminant Monitoring Program

Ontario Federation of Anglers and Hunters (OFAH)

Lake Ontario Atlantic Salmon Restoration Project

Certifications and training

Class G Ontario Drivers Licence

First Aid and Level C CPR Certificate, expiry 2014

OMNR WHIMIS Certificate

Industry Canada Radiotelephone Operator's Restricted Certificate (Aeronautical)

GPS and Wilderness Navigation Certificate (Canadian Ecology Centre National Standards), expiry 2012

Ontario Outdoors Card

Pleasure Craft Operator Card

STEVE AGALLOTIS, FISHERIES TECHNICIAN

Marine Emergency Duties (MED A3) Certificate
Firearms Licence (PAL) Non-restricted/Restricted, expiry 2015
Eaton Wilderness Survival Education Part One and Two Certificates
Ontario Hunter Education Safety Course
Burlington Rifle and Revolver Club Firearms Safety Course
Radio & Ultrasonic Telemetry for Fish & Wildlife Certificate
Entry-Level Drinking Water Operators Certificate (WCWC)
Wastewater Operator Licence, Operator-In-Training (MOE), expiry 2014
Class II Backpack Electrofishing Certificate, expiry 2013
Ontario Benthos Biomonitoring Network Certificate

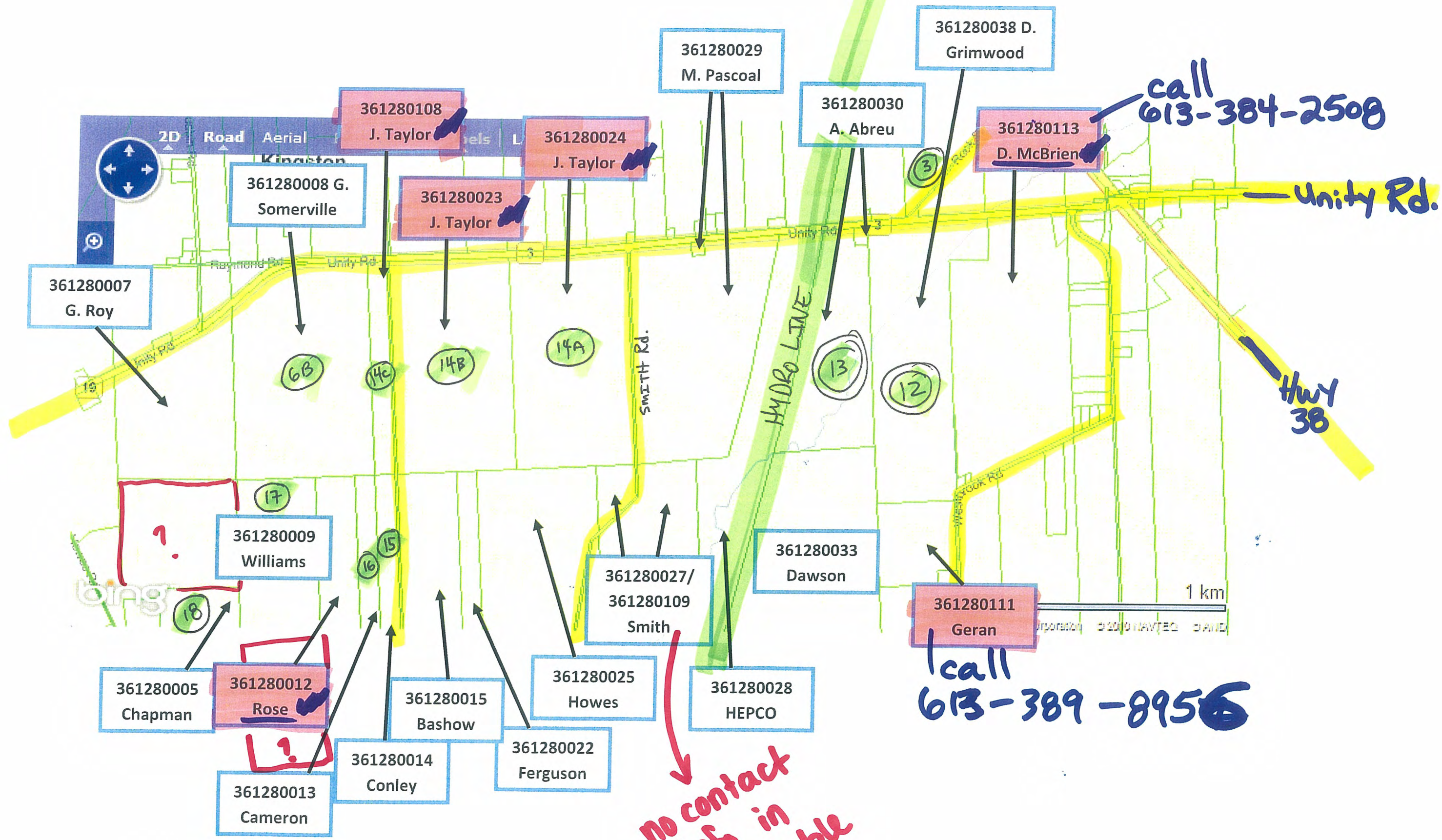
APPENDIX B
CORRESPONDENCE

B1: Water Assessment and Water Body Report Alternative Site Investigation Supporting Information

Investigation Details			Landowner Information				Access Granted (YES or NO)	Requests for Access, Correspondence and Responses
Study Type	Property ID	Rational for Alternative Investigation	First Name(s)	Last Name(s)	Telephone Number	Address		
Water Bodies and Water Assessment	14 A	Access not granted by non-participating landowner	Betty June	Howes	613-634-3954	3928 Howes Rd., Odessa, ON.	NO	Phone Call - Samsung

Notes:

Please see accompanying figure for indication of location of properties and associated land owners



no contact info in table

call 613-384-2508

call 613-389-8956

Unity Rd.

Hwy 38

Hydro Line

Smith Rd.

Westbrook Rd.

1 km

bing

2D Road Aerial

Kingston

Raymond Rd.

Unity Rd.

© 2010 NAVTEQ CANADA

From: Charette, Monique (MNR) [monique.charette@ontario.ca]
Sent: Friday, September 16, 2011 2:24 PM
To: Dietrich, Jason P
Subject: Samsung fish info

Millhaven Creek fish species:

- 1977 assessment: yellow perch, rock bass, pumpkinseed, northern pike and smallmouth bass
- There is an 8-10ft high waterfall a quarter of a mile upstream from the mouth that prevents migrating fish species from reaching the upper parts of Millhaven Creek. We do know that Rainbow Trout, Brown Trout, Lake Trout and Chinook Salmon go up to the first barrier (waterfall) in the fall. The project boundary is north of the waterfall so these migrating species are not found within the project area.

Glenvale Creek fish species:

- We have no file for this creek. However, it looks like Glenvale Creek flows into Collins Creek so the fish species may be the same as Collins Creek depending on where the barriers are in the creek. The salmon and rainbows do migrate up Collins Creek in the fall however barriers would prevent them from reaching Glenvale Creek.

Collins Creek fish species:

- Pumpkinseed, Northern Pike, Central Mudminnow, Banded Killifish, Golden Shiner, Rock Bass, Bluntnose Minnow, Yellow Perch, Carp and Brown Bullhead

Odessa Lake fish species:

- There is a lake survey form on file that lists the following fish species. Note: There is no date on this form and I suspect it was prepared in the 70's sometime.
- Muskellunge, northern pike, largemouth bass, yellow perch, black bullhead, pumpkinseed, rock bass and white sucker. This list is old and I haven't heard of this lake actually having musky. I think musky is listed because MNR stocked Odessa Lake with this species from 1958-1961.

Monique Charette
Area Biologist
Kingston Area Office
Kingston, ON
K7M 9B1
Telephone: 613-531-5715
Facsimile: 613-531-5735
Email: monique.charette@ontario.ca



Ontario

Ministry of Natural Resources

Ministère des Richesses naturelles

Licence to Collect Fish for Scientific Purposes

Permis pour faire la collecte de poissons à des fins scientifiques

Licence No. 1064889, Local Reference No., Issuer Account No. 6491089

This licence is issued under Part I of the Fish Licensing Regulation made under the Fish and Wildlife Conservation Act, 1997 to:

Ce permis est délivré en vertu de la Partie I du règlement sur la délivrance de permis de pêche formulé conformément à la Loi sur la protection du poisson et de la faune de 1997 à:

Name of Licencee: Mr. DIETRICH JASON P., Address: 900 MAPLE GROVE ROAD, UNIT 10, CAMBRIDGE, ON, N3H 4R7

to collect the species, size and quantities of fish from the waters as set out below.

Table with 6 columns: Species, Eggs, Juvenile, Adults, Numbers, Name of Waterbody. Row 1: ALL SPECIES, X, X, X, 1000, GLENVALE CR., TRIBUTARIES AND DRAINAGES OF ODESSA L., MILLHAVEN CR.

Additional species/Waterbody list attached / Liste d'espèces/d'étendue d'eau additionnelles ci-jointe

Purpose of collection: FISHERIES COMMUNITY INFORMATION FOR RENEWABLE ENERGY PROJECT.

Licence Dates: Effective Date 2011-09-19, Expiry Date 2011-12-31

Licence conditions: This licence is subject to the conditions contained in Schedule A if included.

Conditions du permis: Schedule A included. [X]

Issued by: PAUL KEHOE, AREA SUPERVISOR, Signature of Issuer: [Signature], Date of Issue: 2011-09-19

Signature of Licencee: [Signature], Date: 2011-09-19

Personal information contained on this form is collected under the authority of the Fish and Wildlife Conservation Act, 1997 and will be used for the purpose of licensing, identification, enforcement, resource management and customer service surveys.

Les renseignements personnels dans ce formulaire sont recueillis conformément à la Loi sur la protection du poisson et de la faune, 1997, et ils seront utilisés aux fins de délivrance de permis, d'identification, d'application des règlements, de gestion des ressources et de sondage sur les services à la clientèle.

Licence to Collect Fish for Scientific Purposes
Schedule A - Authorization Conditions

Authorization No. 1064889

This authorization is subject to the conditions listed below.

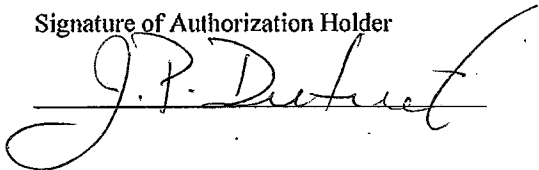
1. This Authorization is valid only for the persons, species, numbers, areas and calendar year indicated. A written report covering the operation of the preceding year must be submitted to the authorization issuer within 30 days of the termination date, but in no case later than January 31 next following the year of issue. The report shall contain a statement outlining the objectives of the operations, the methods used, the number and species of fish caught and their fate as well as a map indicating where the collections took place. An analysis is not required. The submission of a satisfactory report is a prerequisite to any subsequent renewals.
2. Before carrying out any operation under the authorization in any area the authorized person shall inform the Area Supervisor of his or her intentions at least a week before commencing work and include information as to the type of operation, location, duration, and the name or names of personnel involved.
3. A copy of the original authorization must be carried by the authorized person when working at the designated sites. An assistant of the authorized person who is carrying out activities under this authorization during the absence of the authorized person shall carry a copy of the authorization on his or her person.
4. All collection gear shall be clearly marked with the authorized person's and the organization's name.
5. This authorization is not valid in Provincial Parks, park reserves, or National Parks without the written permission from the authorized person in charge of the area concerned.
6. Capture gear shall be inspected regularly and live holding traps must be inspected at least once daily.
7. This authorization does not allow access to any property without permission of the landowner.
8. Gear permitted to collect the fish: **Backpack electroshocker, seine nets, fyke nets, minnow traps, dip nets, angling.**
9. Assistants: **Mark Ruthven, Matas Remeikis, James Patterson, Matthew Birarda, Levi Snook, Daryl Rideout, Steve Agallotis, Tracy Wolowidnek, Trevor Baetz.**

NEW CONDITIONS:

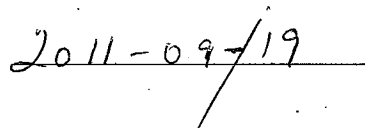
10 The Licensee, assistants and any personnel involved in the collection, handling, transportation and holding of fish must adhere to the Fisheries Section Technical bulletin-Best Management Practices-FS Bulletin 2008-01.

11. If a species at risk is incidentally caught, It must be immediately released at point of capture and in a manner that causes the least harm to the species. Please contact our office if you capture a species at risk to update our files.

Signature of Authorization Holder



Date



From: Prevost, Eric (MNR) [eric.prevost@ontario.ca]
Sent: Thursday, October 13, 2011 4:21 PM
To: Dietrich, Jason P
Subject: RE: Information Request for Property 9 - Samsung Sol-luce Kingston Solar Project

Hello Jason,

As a follow up to our telephone conversation this afternoon, I wanted to provide you with some information and direction in writing for your records.

At this time, MNR does not have any specific information related to the pond in questions and what natural features this pond may contribute to. Our recommendation would be to assess the physical composition and potential physical habitat components of this pond to determine if it may contribute to a wetland, or candidate wildlife habitat and whether further species specific surveys may be required. These additional assessment activities should also include considerations and appropriately scoped assessments for species at risk.

At this time, MNR does not have a specific role, nor are proponents required, to have MNR review or confirm the waterbodies reports identified in O.Reg. 359/09. Waterbodies reports are reviewed by the Ministry of the Environment and you should be contacting them directly with respect to this matter.

Should you have any questions or require further clarification, please feel free to contact me directly.

Best wishes,

Eric R. Prevost
Renewable Energy
Planning Ecologist
Ontario Ministry of Natural Resources
Peterborough District

(705) 755-3134

This communication is privileged and contains information intended only for the person(s) to whom it is addressed. Any unauthorized disclosure; copying, other distribution of this communication or taking any action on its contents is strictly prohibited. If you have received this message in error, please notify the sender immediately and delete this message without reading, copying or forwarding it to anyone. E-mail Messages and Attachments Are Not Official.

From: Dietrich, Jason P [<mailto:Jason.Dietrich@amec.com>]
Sent: October 13, 2011 3:14 PM
To: Prevost, Eric (MNR)
Cc: Balsdon, Jeff; Young, Rob; Raffael, Chris (ENE); Evans, Matt R
Subject: Information Request for Property 9 - Samsung Sol-luce Kingston Solar Project

Hello Eric,

We are trying to gain some further information on a waterbody on a particular property in Loyalist Township in the proposed project area of the Samsung Sol-luce Kingston Solar PV Energy Project.

The mapping attached shows a wetland or pond located in the middle of "property 9". It has been communicated that this waterbody is in fact a man-made quarry. Site reconnaissance continues at the project site, however, we would like to confirm the following if possible:

- 1) Is this waterbody / wetland features designated as an Ecologically Significant Area (ESA)
- 2) Has the waterbody / wetland been confirmed as habitat for any Species at Risk (and specifically Snapping Turtles)
- 3) If a man-made water body (i.e. quarry) is a water assessment needed under the for a REA? As per the guideline dugout ponds and artificial bodies of water do not meet the definition of a "waterbody" under O. Reg. 359/09.

Any information or direction you could provide for us would be greatly appreciated. Feel free to contact myself or Matt Evans for further detail.

Regards,

Jason Dietrich, M.Sc.
Aquatic Ecologist
AMEC
Environment & Infrastructure
900 Maple Grove Rd., Unit 10, Cambridge, ON N3H 4R7, Canada
Direct: 1-519-650-7133,
Main: 519-650-7100 xt. 7133
Fax: 1-519-653-6554
Cell: 1-519-616-0660
jason.dietrich@amec.com
amec.com

Be more sustainable - think before you print.

The information contained in this e-mail is intended only for the individual or entity to whom it is addressed.
Its contents (including any attachments) may contain confidential and/or privileged information.
If you are not an intended recipient you must not use, disclose, disseminate, copy or print its contents.
If you receive this e-mail in error, please notify the sender by reply e-mail and delete and destroy the message.

APPENDIX C
PHOTOGRAPHIC RECORD



Photo 1: Looking south towards Rock Rd. culvert on Glenvale Cr. Trib.1. Intermittent drainage is diffuse upstream to downstream culvert. **Site ID# P1-A**



Photo 2: Looking south towards Rock Rd. culvert on Glenvale Cr. Trib.1. **Site ID# P1-A**



Photo 3: Erosion upstream from Rock Rd. culvert. **Site ID# P1-A**



Photo 4: Upstream from Rock Rd. Channel is dry with lots in-grown terrestrial vegetation and leaf litter. **Site ID# P1-A**



Photo 5: 20-25 year old dug out pond, dry for some time. Historically was used as wading area for cattle. **Site ID# P3-Pond-A**



Photo 6: Looking west from pond where ground is elevated. **Site ID# P3-Pond-A**



Photo 7: Exposed limestone inside pond. Max depth is $\sim 0.20\text{m}$ when wet. **Site ID# P3-Pond-A**



Photo 8: Looking south towards Unity Rd. from southern edge of pond. **Site ID# P3-Pond-A**



Photo 9: Wet area of intermittent drainage thick with terrestrial vegetation. **Site ID# P3-B**



Photo 10: Looking West from lower lying area showing some die-off, woody trees and shrubs. **Site ID# P3-B**



Photo 11: Looking north from intermittently wetted low lying area, currently dry. **Site ID# P3-B**



Photo 12: Shallow drainage to neighboring property channel/pond. (Pond is man-made) Vegetation transitions to wetland species. **Site ID# P3-B**



Photo 13: Willow/dogwood/cattail marsh. Site ID# P2-B



Photo 14: Small intermittent and diffuse channels. Site ID# P2-B



Photo 15: Wetted channel choked with vegetation. Site ID# P2-B



Photo 16: Wetted "channel" along property line with graminoid and sedge vegetation. Site ID# P2-A



Photo 17: Narrow channel, looking south along property line towards Unity Rd. **Site ID# P2-A**



Photo 18: Narrow channel, looking north, <0.05 m wetted depth with a bankfull width of ~1m and a bankfull height of ~0.45m. **Site ID# P2-A**



Photo 19: North east end of property at Unity Rd. bridge looking south on Glenvale Cr. **Site ID# P12-A**



Photo 20: Looking north towards Unity Rd. bridge on Glenvale Cr. Large woody debris present. **Site ID# P12-A**



Photo 21: Looking west from Unity Rd. bridge at roadside ditch with heavy cattails. **Site ID# P12-A**



Photo 22: Channel going south-west from Unity Rd. **Site ID# P12-A**



Photo 23: Minnow trap set in channel south of Unity Rd. **Site ID# P12-B**



Photo 24: Looking west and downstream on Glenvale Cr. Riparian vegetation is dominated by sedge and grasses. **Site ID# P12-B**



Photo 25: Channelized section of Glenvale Cr. with in stream aquatic vegetation and riparian sedges and grasses. **Site ID# P12-B**



Photo 26: Looking downstream on Glenvale Cr. creek, location shown here is channelized but generally diffuse with connecting channels throughout large sedge and grass dominated riparian zone. **Site ID# P12-B**



Photo 27: Two minnow traps set at the cattle bridge on Glenvale Cr. View is looking north towards Unity Rd. **Site ID# P12-C-MT1**



Photo 28: Glenvale Cr. channel has little to no meander pattern through this reach and shows signs of riparian inundation at wetter periods **Site ID# P12-C**



Photo 29: Looking south-west on Glenvale Cr. in Property 12 riparian vegetation is more inundated. Site ID# P12-C



Photo 30: Looking south-west towards hydro line. Location is just west of fenced property boundary between P12 and P13. Site ID# P13-A



Photo 31: Higher mounds of vegetation in comparison the adjacent property. Channel morphology 100% flats. Site ID# P13-A



Photo 32: Suspected historic area of cattle crossing appears to be creating damming effect on creek. Site ID# P13-A



Photo 33: Looking north towards Unity Rd. on Glenvale Cr. Area of thick wetland vegetation. **Site ID# P13-A**



Photo 34: Glenvale Cr. Trib.2c, looking west from roadway. No water or distinct channel visible as suspected from mapping. Suspect to be a seasonal swale. **Site ID# P6A-1**



Photo 35: Glenvale Cr. Trib.2c culvert has pooled water present but no water upstream or downstream in suspected seasonal swale between fields. **Site ID# P6A-1**



Photo 36: Pool on the north side of Unity Rd. box culvert. **Site ID# P6A-A**





Photo 37: Looking east towards P5 from culvert with no signs of water conveyance, only terrestrial vegetation present. Suspect to be seasonal swale between fields. **Site ID# P6A-2**



Photo 38: Looking west from laneway at GC-Trib 2b seasonal swale. **Site ID# P6A-2**



Photo 39: Glenvale Cr. Trib.2c culvert has standing water in depression and is choked with vegetation. It's suspected to be an intermittent swale. **Site ID# P6A-2**



Photo 40: Pool from culvert on east side of roadway choked with vegetation. No channel or swale observed. **Site ID# P6A-2**





Photo 41: Glenvale Cr. Trib.2b looking west from culvert with no signs of water conveyance, only terrestrial vegetation present. Suspect to be seasonal swale along tree line. **Site ID# P6A-3**



Photo 42: Glenvale Cr. Trib.2b, west of laneway is completely dry appears to be a seasonal swale. **Site ID# P6A-3**



Photo 43: Seasonal swale looking west on property 6A. **Site ID# P6A-3**



Photo 44: Tree line looking west from drainage culvert. **Site ID# P6A-3**



Photo 45: Looking south at box culvert at Unity Rd. crossing. Flow is downstream into P14B pond. **Site ID# P6A-A**



Photo 46: Looking north just upstream from box culvert. Wetted depth is ~0.18m. **Site ID# P6A-A**



Photo 47: Looking west where swale branches into channel. Dry swale with no aquatic vegetation present is an intermittent drainage from upper fields' and drains into box culvert. **Site ID# P6A-A**



Photo 48: Looking north from fork where field water is conveyed over exposed limestone toward Unity Rd. **Site ID# P6A-A**





Photo 49: Looking west at small ephemeral pond on northern end of property boundary, ~7mx14m.
Site ID# P5-A



Photo 50: Looking south at pond where ground is low lying and limestone outcropping is observed.
Site ID# P5-A



Photo 51: Looking east at larger pond on adjacent property. Possible old well located here, likely ground water fed and drainage from the Glenvale Cr. Trib.2b. Site ID# P5-A



Photo 52: Looking east from large pond ground is low lying and is a grassed waterway with little defined depression with <0.05m of water.
Site ID# P5-A





Photo 53: Looking north from Howes Rd. CSP, looks to be typically wet and intermittent but currently dry. Site ID# P16-Pond



Photo 54: Looking north at standing water where leaf litter is choking flow in lower lying ground along tree line. ID# P16-Pond



Photo 55: Looking upstream where channel is more defined and has aquatic vegetation and leaf litter. Site ID# P16-Pond



Photo 56: Small pond at top of drainage holding water in low lying area, possibly area of water drainage from upper field. Site ID# P16-Pond



Photo 57: From the western bank looking north east across length of the pond. Currently dry and looks to have been for some time. **Site ID# P20-A**



Photo 58: Exposed limestone and terrestrial vegetation growing in basin. Damp soil and mosses may indicate some groundwater influence. **Site ID# P20-A**



Photo 59: Looking west along south bank of low pond basin, no drainage but possible ground water effect observed. **Site ID# P20-A**



Photo 60: Looking west along northern bank of low lying dry pond. **Site ID# P20-A**



Photo 61: Walking north from pond, relatively encised channel with noticeable gradient is found. Site ID# P20-B



Photo 62: Branching of encised channel. Channel with leaf litter, exposed roots, mosses. ID# P20-B



Photo 63: Upstream of P20-B2 a corrugated plastic pipe was found exposed in the channel. Channel leads to base of cleared field that likely drains to this feature. Site ID# P20-B2



Photo 64: Channel north of P20-pond with lots of organic debris. Area relatively forested. Site ID# P20-B2





Photo 65: Looking east into field from CSP at the end of Hegadorn Rd. laneway near the 401. (Unnamed Drainage) Area wetted but with little channelization. **Site ID# P24-D**



Photo 66: Looking west from Hegadorn Rd. laneway CSP with diffuse pooled pockets of water ~0.10m deep with no defined channel. **ID# P24-D**



Photo 67: Highway 401 box culvert crossing at ROW, 6mx8.5m pond. (Millhaven Cr. Trib.1) **Site ID# P24-A**



Photo 68: Looking north from highway 401, area is dominated by cattails. Nearby beaver activity observed. **Site ID# P24-A**



Photo 69: Looking north, CSP and cradle structure at the end of an access laneway near the Flying J billboard. **Site ID# P24-B**



Photo 70: Looking south from CSP, currently dry seasonal intermittent drainage with poorly defined channel. **ID# P24-B**



Photo 71: Looking south from crossing there is no defined channel or signs of aquatic vegetation. **Site ID# P24-B**



Photo 72: Looking north from crossing towards pond terrestrial vegetation is more dominant with lots of leaf litter. **Site ID# P24-B**





Photo 73: Looking north, pond is 6mx15m. Possible groundwater input to pond and drainage receiver from sod fields. **Site ID# P24-B-Pond**



Photo 74: Intermittent drainage upstream between two sod fields. **ID# P24-B-Pond**



Photo 75: Drainage swale to the north on restricted property. **Site ID# P24-B-Pond**



Photo 76: Looking south from north end of limestone pond. **Site ID# P24-B-Pond**



Photo 77: Looking south towards highway 401, area is a wetland complex with braids flowing at higher water levels. **Site ID# P23-A**



Photo 78: Surrounding vegetation is 100% cattails with high amounts of muck and detritus. **Site ID# P23-A**



Photo 79: Looking west the upstream bank has large limestone embankments with a mixed tree line. **Site ID# P23-A**



Photo 80: Looking north a beaver dam is observed on the left bank. **Site ID# P23-A**





Photo 81: Looking north towards Millhaven Cr / Odessa Lake. from CSP on Mud Lake Rd. area is 100% terrestrial. Swale is intermittent, currently dry. Site ID# OL-A



Photo 82: Roadside ditch on the north side of Mud Lake Rd. looking north, currently dry. Site ID# OL-A



Photo 83: Looking into dry CSP on south side of Mud Lake Rd. Scour at mouth indicates water conveyance with roadside ditch during wet periods. Site ID# OL-A



Photo 84: Looking south at opposite side of Mud Lake Rd. drain does not extend into farmer's field but is contained by roadside ditching. Site ID# OL-A



Photo 85: Looking east across field at intermittent drainage with no signs of wetting, possibly for multiple years. Site ID# P23-B2



Photo 86: Looking west at intermittent drainage swale/lane from west boundary of property. Site ID# P23-B1



Photo 87: Continuing to look west at drainage swale/lane where culvert has been placed to maintain lane crossing. Site ID# P23-Northern-1



Photo 88: Culvert crossing on second visit. Wet from rainfall and draining fields. Water is flowing from east to west. Site ID# P23-Northern-2





Photo 89: Intermittent drainage west boundary of property that was previously visited and was dry. Wet on second visit
Site ID# P23-Northern-1



Photo 90: Small culvert conveying field run-off under laneway with a large depression here from farming equipment collecting water.
Site ID# P23-Northern-1



Photo 91: Looking south at dug out permanent drainage feature from fields on north side (Property 6A) of Unity Rd. **Site ID# P14-B1**



Photo 92: Looking north at box culvert crossing at Unity Rd in cow pasture area upstream of man-made Property 14B Pond. **Site ID# P14-B2**





Photo 93: Looking south at small intermittent drainage swale ~0.3m wide and <0.1m deep when inundated. Location is just south of fence line for cattle. **Site ID# P14-B3**



Photo 94: Same drainage swale as previous photo looking south. **ID# P14-B3**



Photo 95: Large man-made pond situated in lower lying mixed forest at the south end of property 14B. **Site ID# P14-B-South-Pond**



Photo 96: Mixed forest at the base of large berm around the circumference of the pond. **Site ID# P14-B-South-Pond**





Photo 97: West side of pond looking north at tractor trail returning to farm from this location, water drawing in the past is evident.
Site ID# P14-B-South-Pond



Photo 98: Looking north from south end of standing water pond. East margin is dominated by cattails. No defined inflow or outflow to this man-made feature. **Site ID# P6-B**



Photo 99: North end of pond has large boulders with a clay and silt substrate. Also shown here is a line of dead trees on the eastern side of the pond extending to the south. **Site ID# P6-B**



Photo 100: Looking south from depression at the north end of the pond. **Site ID# P6-B**





Photo 101: Looking north from south end of pond (habitat type A). **Site ID# P9-Quarry-Pond**



Photo 102: Looking east (habitat type B) silt/muck, cobble, and bedrock substrate. Vegetation is dominated by graminoids with some mixed forest. **ID# P9-Quarry-Pond**



Photo 103: Looking east (habitat type C) substrate is cobble, silt/muck, and bedrock with the vegetation being dominated by graminoids and American elm. **Site ID# P9-Quarry-Pond**



Photo 104: Looking south (habitat type D) substrate consists of cobble, silt/muck, boulders, and bedrock. Vegetation is dominated by graminoids with some mixed forest. **ID# P9-Quarry-Pond**



SAMSUNG RENEWABLE ENERGY INC.

Client/Project **Samsung Renewable Energy Inc.** December 2011
Sol-Luce Kingston Solar PV Energy Project TC111406



Photo 105: Southerly view of cattail marsh situated north of Glenvale Creek Tributary 2 and south of property 14A. **Site ID# SP14-Cattail Marsh**



Photo 106: Looking south at intermittent drainage with water at roadside ditch. **Site ID# SP18-D**

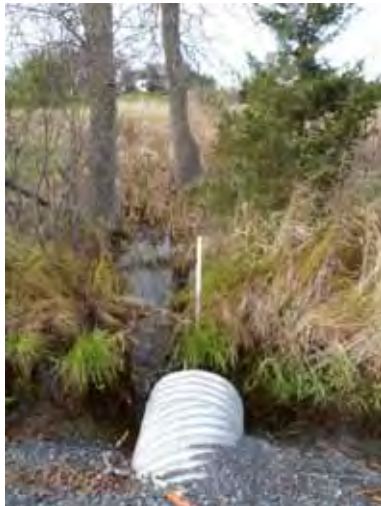


Photo 107: Looking north, at a defined channel present, dominated by cattails and sedges and between large ash trees. **Site ID# SP18-D**



Photo 108: Channel width wetted is 0.85m, with a substrate of silt and limestone. **Site ID# SP18-D**