



**NORTHLAND
POWER**

North Burgess Solar Project Water Body Site Investigation Report

November 11, 2011

Northland Power Inc.
on behalf of
Northland Power Solar
North Burgess L.P.
Toronto, Ontario

Water Body
Site Investigation Report

North Burgess Solar Project

H334844-0000-07-124-0113

Rev. 1

November 11, 2011

Disclaimer

This report has been prepared by or on behalf of Northland Power Inc. for submission to the Ontario Ministry of the Environment as part of the Renewable Energy Approval process. The content of this report is not intended for the use of, nor is it intended to be relied upon by, any other person. Neither Northland Power Inc. nor any of its directors, officers, employees, agents or consultants has any liability whatsoever for any loss, damage or injury suffered by any third party arising out of, or in connection with, their use of this report.

Project Report

November 11, 2011

**Northland Power Inc.
North Burgess Solar Project**

Water Body Site Investigation Report

Table of Contents

1. Introduction 3

 1.1 Project Description 3

 1.2 Legislative Requirements..... 3

2. Summary of Water Body Records Review Results 4

3. Site Investigation Methodology 5

 3.1 Date, Time, and Duration of Site Investigation 5

 3.2 Weather Conditions During Site Investigation 5

 3.3 Name and Qualifications of Person Conducting Site Investigation..... 5

 3.4 Survey Methods 6

4. Results of Site Investigation..... 6

 4.1 Permanent or Intermittent Streams..... 9

 4.1.1 Tributary A 9

 4.1.2 Tributary B 11

 4.1.3 Tributary C 12

 4.1.4 Tributary D..... 14

5. Conclusions 14

6. References..... 14

Appendix A Site Investigation Field Notes

List of Tables

Table 2.1 Summary of Water Body Records Review Determinations..... 5

List of Figures

Figure 4.1 Water Body and Project Boundaries 7
Figure 4.2 Photograph of On-line Pond on Tributary A on the Project Site 9
Figure 4.3 Photograph of Large Cattail Marsh on Tributary A on the Project Site –
View Toward Northwest..... 10
Figure 4.4 Photograph of On-line Open Water Marsh on Tributary B on the Project Site..... 12
Figure 4.5 Photograph of Shrub Thicket and Cattail Marsh Surrounding Tributary C
where it Flows onto the Project Site..... 13

1. Introduction

1.1 Project Description

Northland Power Solar North Burgess L.P. (hereinafter referred to as “Northland”) is proposing to develop a 10-megawatt (MW) solar photovoltaic project titled North Burgess Solar Project (hereinafter referred to as the “Project”). The Project site will be located on approximately 85 hectares (ha) of land, located in Tay Valley Township, within Lanark County.

1.2 Legislative Requirements

Ontario Regulation (O. Reg.) 359/09 – *Renewable Energy Approvals Under Part V.0.1 of the Act*, (herein referred to as the “REA Regulation”) made under the *Environmental Protection Act* identifies the Renewable Energy Approval (REA) requirements for renewable energy projects in Ontario. Per Section 4 of the REA Regulation, ground mounted solar facilities with a name plate capacity greater than 10 kilowatts (kW) are classified as Class 3 solar facilities and require a REA.

Section 31 of the REA Regulation requires proponents of Class 3 solar projects to undertake a water site investigation for the purpose of determining

- a) whether the results of the analysis summarized in the (Water Body Records Review) report prepared under Subsection 30(2) are correct or require correction, and identifying any required corrections
- b) whether any additional waterbodies exist, other than those that were identified in the (Water Body Records Review) report prepared under Subsection 30(2)
- c) the boundaries, located within 120 m of the Project location, of any water body that was identified in the records review or the site investigation
- d) the distance from the Project location to the boundaries determined under clause (c).

The REA Regulation has specific requirements if designated lake trout lakes are present within 300 m of the Project area. These requirements were not deemed applicable to the Project as no such lakes were found within 300 m of the Project site during the Water Body Records Review (Hatch Ltd., 2010a).

Waterbodies are defined in Section 1(1) of the REA Regulation to include a lake, a permanent stream, an intermittent stream or a seepage area, but does not include

- a) grassed waterways
- b) temporary channels for surface drainage, such as furrows, or shallow channels that can be tilled or driven through
- c) rock chutes and spillways
- d) roadside ditches that do not contain a permanent or intermittent stream
- e) temporarily ponded areas that are normally farmed
- f) dug-out ponds, or

- g) artificial bodies of water intended for the storage, treatment or recirculation of runoff from farm animal yards, manure storage facilities and sites and outdoor confinement areas.

Further, intermittent streams are defined as “a natural or artificial channel, other than a dam, that carries water intermittently and does not have established vegetation within the bed of the channel, except vegetation dominated by plant communities that require or prefer the continuous presence of water or continuously saturated soils for their survival” (O. Reg. 359/09).

Seepage areas are defined as “a site of emergence of groundwater where the water table is present at the ground surface, including a spring” (O. Reg. 359/09).

Subsection 3 of Section 31 of the REA Regulation requires the proponent to prepare a report setting out the following:

1. A summary of any corrections to the (water body records review) report prepared under Subsection 30(2) and the determinations made as a result of conducting the site investigations under Subsection (1).
2. Information relating to each water body identified in the records review and in the site investigations, including the type of water body, plant and animal composition and the ecosystem of the land and water investigated.
3. A map showing
 - i. the boundaries mentioned in clause (1) (c)
 - ii. the location and type of each water body identified in relation to the Project location, and
 - iii. the distance mentioned in clause (1) (d).
4. The dates and times of the beginning and completion of the site investigation.
5. The duration of the site investigation.
6. The weather conditions during the site investigation.
7. A summary of methods used to make observations for the purposes of the site investigation.
8. The name and qualifications of any person conducting the site investigation.
9. Field notes kept by the person conducting the site investigation.

This Water Body Site Investigation Report has been prepared to meet these requirements.

2. Summary of Water Body Records Review Results

Table 2.1 summarizes the results of the Water Body Records Review (Hatch Ltd., 2010a).

Table 2.1 Summary of Water Body Records Review Determinations

Determination to be Made	Yes/No	Description
Is the Project in a water body?	No	The Project will not be situated in a water body.
Is the Project within 120 m of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity?	No	No lakes are present within 120 m of the Project site.
Is the Project within 300 m of the average annual high water mark of a lake trout lake that is at or above development capacity?	No	No lake trout lakes at or above development capacity are present within 300 m of the Project site.
Is the Project within 120 m of the average annual high water mark of a permanent or intermittent stream?	Yes	There are watercourses on and within 120 m of the Project site.
Is the Project within 120 m of a seepage area?	No	No seepage areas are present within the Project area.

Therefore, the Water Body Records Review (Hatch Ltd., 2010a) indicated that, depending on the layout of the proposed Project, some components could potentially be located within 120 m of the average annual high water mark of four permanent or intermittent watercourses.

3. Site Investigation Methodology

3.1 Date, Time, and Duration of Site Investigation

- Date: June 23, 2010
- Start Time: 0830
- Duration: 9 hours

3.2 Weather Conditions During Site Investigation

- Temperature: 22°C
- Beaufort Wind: 2
- Cloud Cover: 70 to 100%

3.3 Name and Qualifications of Person Conducting Site Investigation

The site investigation was completed by Martine Esraelian.

Martine Esraelian, B.Sc. is an Environmental Scientist specializing in species at risk and terrestrial ecosystems. She has a B.Sc. from Trent University where she specialized in Conservation Biology and Ecological Management and an Ecosystem Management Technician diploma from Sir Sandford Fleming College. During her time at Trent University, she completed a 1-yr internship with the Ministry of Natural Resources (MNR) which involved developing a genetic-based protocol for the extraction of DNA from unknown turtle eggshells to assist with species identification. The project

entailed extensive molecular genetics research and intensive lab work to develop a protocol able to supplement existing conservation management practices.

She offers expertise across the full breadth of the field from environmental assessments and technical analysis of environmental data to conservation management, corporate and government consulting, and community outreach. Martine has liaised with all levels of government, the community, and a portfolio of clients that includes consulting firms, planners, and high-profile developers. She has both technical and hands-on experience conducting site investigations (terrestrial and aquatic), evaluations of significance, environmental and agricultural impact studies, constraint analyses, water quality and soil assessments, species at risk, wildlife management and fisheries studies to meet regulatory requirements.

Martine has a wide range of field experience related to terrestrial and aquatic ecosystems and species at risk. She has conducted reptile and amphibian surveys, small-mammal trapping, benthic invertebrate monitoring and fisheries inventories (seine netting and electrofishing). She has conducted detailed natural areas inventories which involve species identification of flora and fauna, vegetation community mapping, identifying rare vegetation communities and significant wildlife habitats.

Martine has project management and fieldwork experience for a number of species at risk monitoring projects. Some of the species she has been involved with include: fowler's toad, massasauga rattlesnake, gray ratsnake, Jefferson salamander, northern dusky and mountain alleghany dusky salamander, blanding's turtle, map turtle, spotted turtle, snapping turtle, queen snake, milksnake, ribbonsnake, flowering dogwood, swamp rose mallow and spoon-leaved moss.

Martine is a certified Butternut Health Assessor (BHA) and also holds a certificate in the Ecological Land Classification (ELC) system.

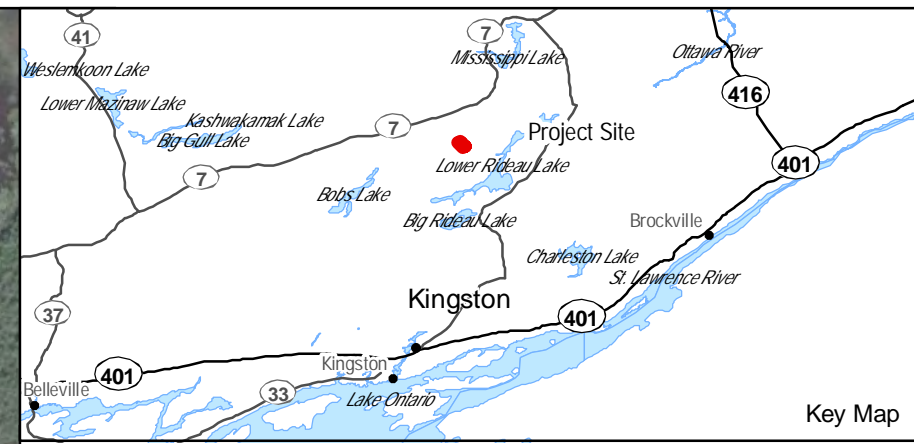
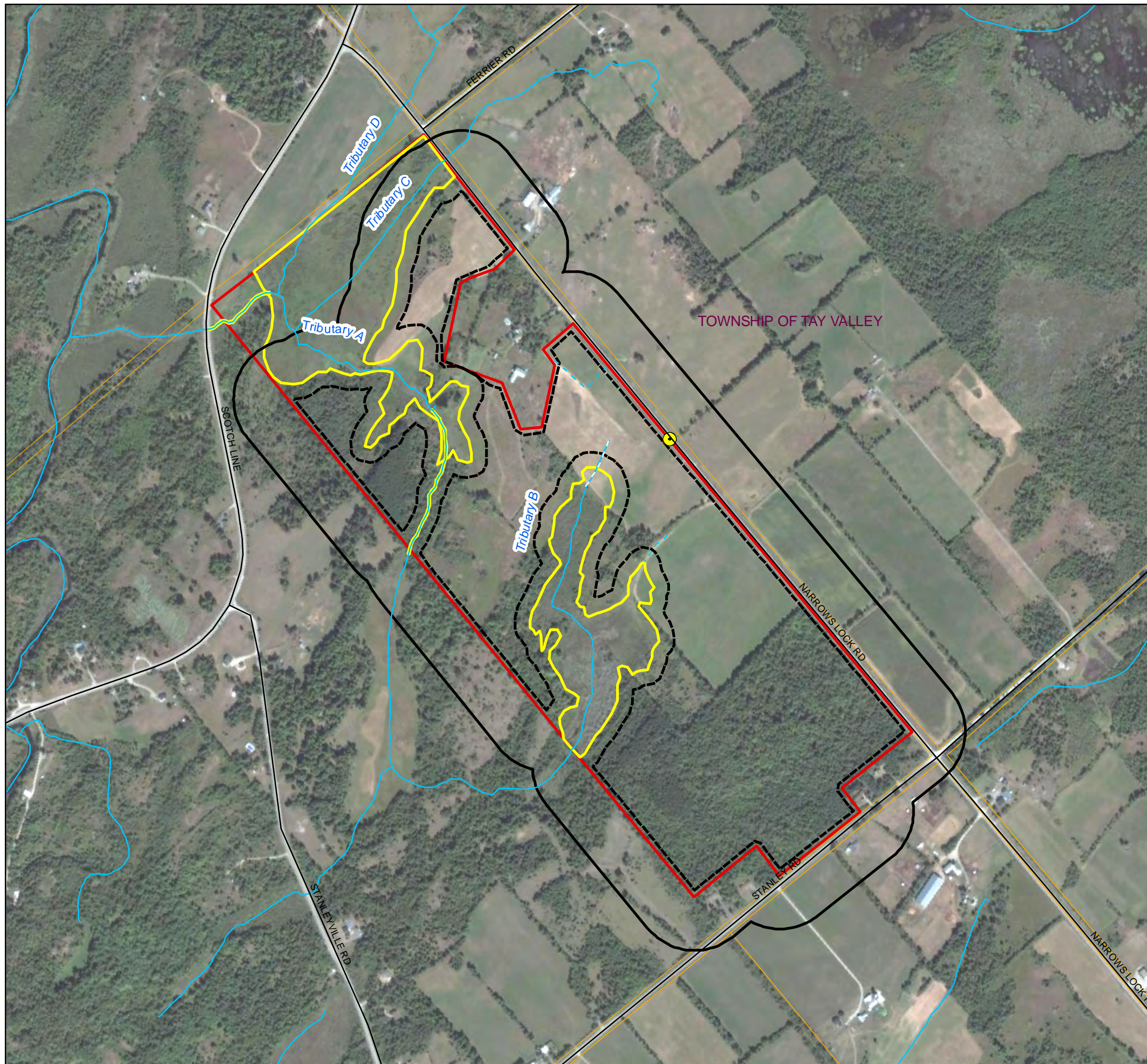
3.4 Survey Methods

The entire site and adjacent lands were searched by the observer on foot in order to document waterbodies. Photographs of the site and water body features were taken. Any observations of waterbodies, including the type of water body, instream habitat types, surrounding riparian areas, average annual high water mark and wildlife use were noted. Geographic coordinates at representative areas of the average annual high water mark were recorded using a sub-meter accuracy GPS for mapping purposes.

A copy of the field notes kept by the observer is provided in Appendix A.

4. Results of Site Investigation

This section documents the results of the Site Investigation and discusses specific water features observed on and adjacent to the subject property. Features noted in the following sections, including the Project footprint boundary and the average annual high water mark and 30-m setback areas associated with watercourses are shown in Figure 4.1.



- Legend**
- Roads
 - - - - Grassed Waterways
 - Watercourse
 - Average Annual High Water Mark
 - Study Area
 - Project Site
 - Parcels
- Project Components**
- Connection Point With Existing Distribution Line
 - Solar Panel Footprint Boundary

0 75 150 300 Meters
1:8,000

▲ NORTH

Notes:
 1. OBM and NRVIS data downloaded from LIO, with permission.
 2. Spatial referencing UTM NAD 83, August 2010.
 3. Satellite imagery from Google Earth Pro.

Figure 4.1
 Northland Power Inc.
North Burgess Solar Project
Water Body and Project Boundaries

Blank back

4.1 Permanent or Intermittent Streams

The Water Body Records Review (Hatch Ltd., 2010a) noted the presence of four unnamed watercourses on the Project site (labelled as Tributaries A to D in Figure 4.1), all of which form part of the drainage of Grant's Creek, which is located approximately 350 m west of the Project site. The site investigation confirmed the presence of these watercourses. No other permanent or intermittent streams were observed during the site investigation.

4.1.1 Tributary A

Tributary A is the main watercourse on the Project site, with Tributaries B, C and D all draining into it. From its origin approximately 1.1 km west of the Project site, it flows in a north easterly direction through the northwest corner of the Project site, before draining into Grant's Creek approximately 350 m downstream from the Project site boundary.

Before flowing onto the Project site, Tributary A runs through several wooded areas and a large open wetland immediately adjacent to the western Project boundary. It enters a wooded area on the Project site and flows for approximately 300 m before emerging into an open wetland with a large on-line pond, created by a beaver dam across the tributary. The pond is approximately 20 m wide by 60 m long. It is surrounded by a hummocky meadow marsh comprised of a variety of grasses [e.g., Canada blue-joint (*Calamagrostis canadensis*)], sedges and forbs. There is dense submergent and floating leaved vegetation throughout much of the open water area. A photograph of the pond and surrounding wetland vegetation is provided in Figure 4.2.



Figure 4.2 Photograph of On-line Pond on Tributary A on the Project Site

After flowing out of the pond, Tributary A flows into an expansive marsh, dominated primarily by cattails (*Typha sp.*) in the area surrounding the tributary channel. A photograph of the cattail marsh on Tributary A in the northwest corner of the Project site is provided in Figure 4.3.



Figure 4.3 Photograph of Large Cattail Marsh on Tributary A on the Project Site – View Toward Northwest

The outflow from the cattail marsh is located at the northwestern corner of the Project site. From this outflow, Tributary A flows for approximately 150 m, crossing Scotch Line and discharging into the low-lying wetland areas around its mouth on Grant's Creek.

The reach of Tributary A flowing through the Project site appears to provide a number of ecological functions including provision of habitat for aquatic and wetland wildlife, including species of birds, mammals, reptiles and amphibians, as well as fish and benthic invertebrates. Additional discussion on wildlife habitat is provided in the Natural Heritage Site Investigations Report (Hatch Ltd., 2010b). The tributary and associated wetlands would also serve to regulate hydrology in the downstream watercourses, both through storm flow attenuation due to the storage in the wetlands, and provision of baseflow during lower flow periods due to slow release from the wetlands. The wetlands and surrounding riparian areas would also protect surface water quality in downstream reaches by buffering surface water runoff from adjacent areas.

The site investigation has confirmed that Tributary A is a permanent stream, comprised predominantly of wetlands on the Project site. To establish the average annual high water mark (as per the REA requirement), (i) riparian vegetation was assessed to establish the boundary of vegetation species tolerant of annual flooding and (ii) valley and topographic features such as the top of bank were observed. Based on these observations made during the site investigation, the high water mark along Tributary A was primarily assessed as the edge of the wetland vegetation adjacent to the main channel of tributary A. The average annual high water mark, associated 30-m setback (as required by the REA Regulation) and proposed development footprint boundary are shown in Figure 4.1.

The proposed Project will be constructed between 30 and 120 m from the average annual high water mark of Tributary A. Therefore, an Environmental Impact Study (EIS) will be required to assess the potential for adverse effects and mitigation measures required to prevent/minimize these adverse effects.

4.1.2 Tributary B

Tributary B originates in the mid-portion of the Project site and flows in a southerly direction for approximately 500 m before flowing off the Project site. From the Project boundary, it turns west and flows through a wooded area before draining into Tributary A, approximately 360 m west of the Project boundary.

Mapping obtained from Land Information Ontario as part of the Water Body Records Review (Hatch Ltd., 2010a) indicates that Tributary B originates the open fields on the Project site. The site investigation confirmed that the tributary is formed from surface drainage during precipitation events collecting in a low point in the fields, which directs drainage toward and adjacent wetland. As shown in Figure 4.1, the upstream-most approximately 100 m of the tributary are identified as a grassed waterway, since there is no defined channel and vegetation is dominated by meadow species that do not require or prefer submergence or continuously saturated soil conditions. Therefore, no setback is required around this section of the tributary, although the surface drainage that occurs in the area will require consideration during Project planning to ensure existing drainage patterns are maintained and erosion is prevented.

The grassed waterway discharges to a relatively open wetland, consisting of a series of open water ponds, joined by short reaches through wet meadow and shrub thicket wetlands. A large area of open water, bordered by wet meadow, shrub thicket and swamp forest communities is present in the last several hundred meters before the tributary flows off the Project site. A photograph of this wetland area is provided in Figure 4.4.



Figure 4.4 Photograph of On-line Open Water Marsh on Tributary B on the Project Site

The reach of Tributary B flowing through the Project site appears to provide a number of ecological functions including provision of habitat for aquatic and wetland wildlife, including species of birds, mammals, reptiles and amphibians, as well as fish and benthic invertebrates. Additional discussion on wildlife habitat is provided in the Natural Heritage Site Investigations Report (Hatch Ltd., 2010b). The tributary and associated wetlands would also serve to regulate hydrology in the downstream watercourses (including Tributary A and Grant's Creek), both through storm flow attenuation due to the storage in the wetlands, and provision of baseflow during lower flow periods due to slow release from the wetlands. The wetlands and surrounding riparian areas would also protect surface water quality in downstream reaches by buffering surface water runoff from adjacent areas.

The site investigation has confirmed that Tributary B is likely a permanent watercourse. The average annual high water mark, based on the extent of wetland vegetation surrounding the tributary is shown in Figure 4.1. The Project footprint boundary will be located between 30 and 120 m from a portion of the tributary. Therefore, an EIS will be required to assess the potential for adverse effects and mitigation measures required to prevent/minimize these adverse effects.

4.1.3 *Tributary C*

Tributary C originates approximately 450 m east of the northern portion of the Project site. It flows through the adjacent agricultural fields and narrow wooded corridors, beneath Narrows Lock Road

and onto the northeastern corner of the Project site, where it enters the shrub thicket and cattail marsh wetland adjacent to Tributary A (Figure 4.1). Although no defined channel is present through the cattail portion of the marsh, Tributary B flows for approximately 500 m across the Project site before draining into Tributary A.

A photograph of the shrub thicket where Tributary C enters the Project site is provided in Figure 4.5.



Figure 4.5 Photograph of Shrub Thicket and Cattail Marsh Surrounding Tributary C where it Flows onto the Project Site

Tributary C appears to be an intermittent watercourse, but it likely provides a number of ecological functions including provision of wildlife habitat and regulation of hydrology and surface water quality in downstream reaches.

The average annual high water mark was determined during the site investigation to be the limit of wetland vegetation adjacent to the tributary. This high water mark, associated 30-m setback and the proposed development footprint are shown in Figure 4.1. The proposed Project will be constructed between 30 and 120 m from Tributary C, so the EIS must assess potential adverse effects and mitigation measures required to protect the ecological functions provided by the tributary.

4.1.4 Tributary D

Tributary D originates in a series of wetlands > 2 km west of the Project site and flows in a general westerly direction before entering the northern-most portion of the Project site to drain into the cattail marsh surrounding Tributary A. Given the setbacks around Tributaries A and C (as discussed previously), no development will occur within 120 m of Tributary D (see Figure 4.1). Therefore, the EIS is not specifically required to assess potential effects on Tributary D, due to the distance from the Project boundary. However, the mitigation specified in the EIS to protect Tributaries A and C will also protect Tributary D.

5. Conclusions

Based on the results of the site investigation discussed above, there are no corrections to the results of the Water Body Records Review (Hatch Ltd., 2010a). However, the Project Footprint and study area have been refined in this report compared to that shown in the Records Review, which only depicted the leased portion of the property.

Based on the results of the site investigation and the proposed Project footprint shown in Figure 4.1, some components of the facility will be located between 30 and 120 m of Tributaries A, B and C. Therefore, an EIS will be required.

6. References

Hatch Ltd. 2010a. North Burgess Solar Project – Water Body Records Review Report. Prepared for Northland Power Inc.

Hatch Ltd. 2010b. North Burgess Solar Project – Natural Heritage Site Investigation Report. Prepared for Northland Power Inc.

Appendix A
Site Investigations
Field Notes

Project: North Burgess

SW Field

Date: June 23, 2010
 Time: 0830 - 1730 (9.0 hrs)
 % C.C.: 100% overcast ^{morning} / 70% sunny

Bar. Bar. Wind State: 2
 Temp: 22°C
 Observer: Martin Esnelian
 Caleb Campbell

Severe's Redstart ♀	porcupine
red-winged blackbird	chipmunk
common grackle	american toad
northern flicker	rose breasted grosbeak
common crow	eastern phoebe
tree swallow	
Savannah sparrow	
northern harrier	
great-crested flycatcher	
Mallard	
great-blue heron	

Low-lying poor drainage
 sedges
 small-fruited bulrush
 wild sunflower
 fall buttercup
 wild cucumber
 cow vetch
 Common milkweed
 Field horsetail
 Sp. knotweed
 horsetail
 grasses
 wild rice
 red-top
 white clover
 noddy
 sensitive fern
 fern
 yellow
 orange hawkweed
 Fox sedge
 bob's edge
 hog clover
 rough-fruited cinquefoil

curly dock
 wild basil
 poison ivy

Hedge row / Scrub / small wooded area (SW)
 at property, east of large wetland
 box elder
 Bur oak
 common
 buckthorn (A)
 weibank grape (A)
 green ash (D) tree
 bitter-sweet nightshade
 pinky ash (D)
 black-eyed susan (A)
 goldenrod sp. (E)
 American Blin (A)
 Virginia creeper

Wooded Area 90% C16
 Black Ash
 Large-leaved Asper
 / Bittersweet (A)
 Slm
 porcupine tongue - basswood area
 Black Cherry (A)
 White Ash
 dogwood
 Hawthorn
 Bittersweet (A)
 understory
 rock pile, exposed bedrock shallow
 pinky ash
 pinky sparschier
 ash sapling
 Virginia creeper
 buckthorn
 yellow sp.
 blue cohosh
 white ash (A)
 blue, yellow
 Ironwood
 bladder sedge
 green h sedge

pink
 poplar
 spm

Bitternut 40 1/2 ORN

Leopard Frog calling

Basswood, 32 + 47 (BH, 28) B.H., 28 1/2

Bitternut Hickory 29 1/2 ORN

Trembling Aspen - 48, 48 1/2

Black Cherry, 28 1/2, 33 1/2

Willow bush

ferns

fragrant bedstraw

spreading dogbane

Purple salix as road

Canada mayflower

Raspberry, sp.

connected to woodland

Scrub area north of small wooded area

scrubby ash (A) & grape

Hamamelis

dogwood

Trembling aspen

buckhorn (B)

Sugar maple (A)

Elm (D)

Ash, (A)

Bitternut hickory

Basswood

Black cherry

Willow sp.

red huckleberry

hickory species

Wetland extends onto field NE of Woodland

very poor drainage

- sedges, grasses, rushes (A)

- Willow sp.

- small patches of open water in bog

Field area near barn

- exposed bed coarse soil

butter & eggs / Toadflax

cow vetch

grass

chickweed sp

Common milkweed

Red Elm

Red Spruce

White Elm

bladder campion

shrub

virginiana grape

Common milkweed

black cherry

tall buckhorn

chipmunk

cond's ^{after pass} loose
"fill" piles of rocks within scrub
area / hedgehog + exposed bedrock
- prickly ash
yellow
wild carrot

Spice considering area near bank
red cedar (D)
red pine hedgehog
larch / spruce
spruce

prostratum small
mosses / lichen

NE Field Fence line

- spruce (D)
lime
As
low thorn
gray dogwood (A)
blackberry - board dogwood?
Black cherry

Thicket Swamp

gray dogwood
or narrow leaved madro wood
speckled alder
red pine
black madro wood
exposed bedrock
Burr oak

red blue
yellow

Sweet gum?

- blue flag (R)

Ash
 pucker ash
 Shrub sp
 Blue oak
 Sugar maple
 Buckthorn
 Rock elm
 Hawthorn
 Blackberry

Hedge row
 - American maple

wetland area
 yellow-throated warbler
 grackle
 white pine

western-most Field

Shrub sp
 - pucker ash
 Elm
 Sugar maple
 grey sycamore
 Black locust (TS)
 common juniper
 Ash
 white pine sapling
 narrow-leaved meadowweet

Shrub sp
 Elm
 Sugar maple
 grey sycamore
 Black locust (TS)
 common juniper
 Ash
 white pine sapling
 narrow-leaved meadowweet

white pine
 yellow
 willow
 red pine sapling
 Plantain
 Goldenrod

Wetland (adjacent to road)

Sugar maple (D)
 Red maple (D)
 Elm
 Sweet gum
 Black oak
 Black locust
 White pine (D)
 White Ash
 Buckthorn
 White birch (R)
 Large tooth Aspen - possible stick nest
 Basswood

adj. road on edge of field / woodland

South Woodlot

groundcover - sp. 112	CVR-30%
Trembling Aspen	wood ch. wh. sp.
Sugar maple	
Buckthorn	American trad.
Green dogwood	
Green ash	
Basswood	
Prickly-ash (A) understory	
nutleaf grape	
White pine	
Ironwood	
10-24 oak (A)	
510 (A)	
downed debris (A)	
leaf litter (A)	
Red oak	
American Beech	
Elm	
Large tooth Aspen	
will. grape	
fragrant bedstraw	
St. flower 2	
wild saucerpilla	

Sugar maple (A)
 Yellow Birch (A)
 American beech (A)
 White ash
 Green ash
 - ferns
 - sugar maple saplings