

A small online pond is associated with the drain at this crossing location (Figure 2-2) which may provide some retention during higher surface flow periods. The pond had an approximate depth of 0.15 to 0.25 m with a maximum bankfull depth of 0.95 m. Lesser duckweed provided aquatic vegetative cover and riparian vegetation consisted of broad leaf cattail, black-girdled bulrush, willow and smartweed (*Polygonum* spp.).

The majority of the channel downstream of the crossing location is characterized by a bankfull width of 3.0 to 3.5 m with a bankfull depth of 1.05 to 1.12 m and floodprone width of approximately 9.0 m. The drain held water in ephemeral pools along this section with substrates of clay and detritus and vegetative litter. Riparian vegetation along this section consisted of soft-stem bulrush, Canada thistle, willow, common milkweed, goldenrod with pockets of European common reed.

Site reconnaissance of Government Drain #10 within the sections transecting the East Site indicated a permanent feature with intermittent / ephemeral reaches in drought conditions. Site reconnaissance confirmed the designation of Government Drain #10 as a Type C Drain under the DFO drain classification system. This section of the creek is likely to freeze to bottom in the winter therefore providing no overwintering habitat for fish. Project construction and operation will not affect fish or fish habitat following proper mitigation measures as described in Section 3.0.

Photos of the terrestrial ecosystem within the Project study area are provided in Appendix A (Photo Record) and field notes are provided in Appendix B.

2.4 Species at Risk

SAR are plant or animal species whose individuals or populations are considered Extirpated, Endangered, Threatened, or of Special Concern in Canada, as determined by the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the provincial Committee on the Status of Species at Risk in Ontario (COSSARO). SAR and any activities within their critical habitat are regulated by the federal *Species at Risk Act* (SARA) and the provincial ESA.

In Ontario, the federal SARA only applies on federal lands and defers the responsibility of regulating SAR on private lands to the ESA. If a species is listed under the ESA as an Extirpated, Endangered or Threatened, Section 9 of the Act prohibits killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling, leasing, trading or offering to buy, sell, lease or trade a member of the species. Some of these prohibitions also apply to body parts of a member of the species, and to things derived from a member of the species. Similarly, if a species is listed on the ESA as an Endangered or Threatened, Section 10 of the Act prohibits damaging or destroying the habitat of the species. This prohibition also applies to an Extirpated species if the species is prescribed by the regulations. The regulations may specifically prescribe an area as the habitat of a SAR, but if no habitat regulation is in force with respect to a species, "habitat" is defined to mean an area on which the species depends, directly or

indirectly, to carry on its life processes. Species listed as Special Concern are not afforded protection under Section 9 and 10 of the ESA.

To determine SAR potentially present in the Project study area, a review of the NHIC database and wildlife atlases (ABBO, AMO and OHSA) was conducted to establish a list of those SAR known to occur in the general vicinity of the Project study area. In addition, the MNR was contacted both by the Proponent in early August 2012 and later by AMEC on September 6 and 10, 2012 and the SCCA was contacted on September 5, 2012 to identify any further records not readily accessible through secondary source information searches. Based on consultation and the request for natural resource information, the MNR provided a response on September 21, 2012. In this correspondence (Appendix C), the MNR noted that four SAR are present in the local region of the project site, as follows:

“There is a known occurrence of Butler’s Gartersnake along Greenfield Road between the 2 (east and west) sites. The species is known to occur in the general area, therefore it has the potential to occur on the subject lands. Butler’s Gartersnake is an endangered species that receives both species and habitat protection under the ESA 2007.

Given the presence of PSW and ANSI in adjacent lands, there is also the potential for turtle SAR to be present, especially Blanding’s Turtle.

At least half of the property is within the top two abundance categories for Bobolink, which means that any suitable habitat present must be protected from damage or destruction. Bobolink is a threatened species with both species and habitat protection under the ESA 2007.

The area is within regulated habitat for Eastern Foxsnake (Carolinian population) and there are known occurrences in an adjacent properties, which means any suitable habitat present must be protected from damage and destruction. Eastern Foxsnake is an endangered species with both species and habitat protection under the ESA 2007.”

The records in MNR files are based on occurrences of these species within the greater area of the project site and reflect presence of the species in the general area. Accordingly, this occurrence information is intended to be applied as a guide only and does not necessarily confirm or refute the presence of a species at the study site.

Based on consultation and a review of secondary source information, a total of 16 SAR (plus 3 rare species) were identified as potentially occurring within the general vicinity of the Project study area, including eight bird species, three plant species, no mammal species, one amphibian species, six reptile species, and one fish species. Further screening of available habitat in the Project area relative to species-specific requirements was undertaken. A summary of SAR identified and the potential for occurrence within the Project footprint based on this screening is provided in Table 2-6.

Based on the habitat present in the Project site area, three SAR were identified as potentially occurring, including Butler's Gartersnake, Eastern Foxsnake and Blanding's Turtle. None of these SAR were incidentally observed during the site reconnaissance on September 10, 2012; however, species-specific surveys were not conducted during the site reconnaissance due to the seasonal constraints and sub-optimal survey windows. As such, the SAR assessment is based on an evaluation of habitat features within the Project study area and the potential for SAR occurrence relative to inferred habitat use and species-specific habitat criteria.

Butler's Gartersnake (Threatened) habitat is characteristically in open areas with dense grasses near ditches, tall grass prairie, cultural meadows, seasonally dry marshes, or other small bodies of water (COSEWIC, 2010). Butler's Gartersnake may be locally abundant in vacant lots in urban areas, and may occur within areas partially overgrown by shrubs and trees indicated tolerance to anthropogenic landscapes (COSEWIC 2010). The snake is often well concealed in dense grass cover with abundant dead vegetation, but may be found under rocks, boards, cardboard, and similar debris, and is often associated with old stone foundations, small mammal burrows, ant mounds and possibly crayfish burrows for hibernation (COSEWIC, 2010).

The Eastern Foxsnake (Endangered) mainly uses unforested areas, such as old fields, prairies, marshes and dune shoreline during the active season (COSEWIC, 2008). Hedgerows bordering farm fields and riparian zones along drainage canals are used regularly. In some areas of intensive farming, these linear habitat strips likely make up the bulk of habitat available to the Eastern Foxsnake (COSEWIC, 2008). Brush piles, table rocks, tree stumps, root systems of downed trees, driftwood, and combinations of these features may be used for basking or shelter. In winter, Eastern Foxsnakes have been found to hibernate in a variety of both natural and anthropogenic features, including limestone bedrock fissures, small mammal burrows, bases of utility poles, canals, wells, cisterns, and building foundations. Under Ontario Regulation 242/08, the MNR has developed habitat regulations outlining critical habitat protection for this species (MNR, 2012). Based on the habitat regulation, protected habitat features for this species may be present within the Project study area. As outlined in consultation with the MNR, the area "*is within regulated habitat for Eastern Foxsnake*".

The Blanding's Turtle (Threatened) survive in a variety of habitats, making it difficult to define critical habitat (COSEWIC, 2005). Blanding's Turtles are largely aquatic, inhabiting a variety of wetland habitats including lakes, permanent and temporary ponds, slow flowing brooks, creeks, marshes, river sloughs, marshy meadows, man-made channels, farm fields and coastal areas (COSEWIC, 2005). Generally, this species has been observed to prefer eutrophic wetlands that are characterized by shallow water with an organic substrate and high density of aquatic vegetation (COSEWIC, 2005). Blanding's Turtles can also spend significant portions of time in upland areas, consisting of mixed deciduous or coniferous forest, moving between wetlands (COSEWIC, 2005). This species has been observed to travel more than 2.5 km overland to nest, and can nest up to 410 m from the nearest water source (COSEWIC, 2005). Despite seasonal movements, this species displays strong site fidelity (COSEWIC, 2005).

2.4.1 Project Site Assessment - SAR

Relative to a review of vegetation typologies and land use in and adjacent to the Project site, and comparison of SAR habitat preferences, the potential for habitat features to support SAR was inferred. The majority of the east site is disturbed due to active agricultural land use (currently wheat). The annual/regular cultivation of the majority of the Project footprint site and associated complete disturbance of the landscape would not provide any sustained potential habitat for the noted species that occur in the region. Smaller remnant naturalized features remain on the site that have not been disturbed in the recent past. These features provide some potential habitat opportunities.

Drain #10 crosses the Project study area, passing through the disturbed agricultural lands. This feature provides run-off flow conveyance and does not appear to have been graded in the recent past under any drain maintenance program. The drain and the vegetated undisturbed banks represent a very narrow band of vegetation (~10 m wide). The drain is naturalized and, based on aerial photo interpretation, is contiguous with natural features bordering the site including the ANSI to the south, old field conditions to the south and north, and a rail spur area north of the Project study area (the rail spur also runs north/south immediately outside the west boundary of the site). Accordingly, the drain represents a potential corridor that is linked to a system of remnant corridors that contact some of the more significant remaining natural heritage features in the region. As such, there is a reasonable assumption that such continuity may promote the movement of certain SAR species along this drain (if maintained in a naturalized state). It should be noted that the corridor is fragmented by road crossings of the drain and the rail spur to the north and by Highway 40 to southeast which may represent some level of impediment to wildlife accessing the Project study area from the naturalized features farther afield. An existing farming road crosses Drain #10 at the proposed road crossing location. This crossing does not appear to represent an impediment to smaller wildlife being able to move along the drain corridor.



Table 2-6: Species at Risk (SAR) and Rare Species Identified as Potentially occurring within the Project Study Area

Species Name	Federal Species at Risk Ranking (SARA) ¹	Provincial Species at Risk Ranking (ESA) ²	S-Rank ³	Preferred Habitat	Potential Presence in Project Study Area
Blanding's Turtle, <i>Emydoidea blandingii</i>	Threatened, Schedule 1	Threatened	S3	Largely aquatic, inhabiting a variety of wetland habitats including lakes, permanent and temporary ponds, slow flowing brooks, creeks, marshes, river sloughs, marshy meadows, man-made channels, farm fields and coastal areas. Can spend significant portions of time in upland areas, consisting of mixed deciduous or coniferous forest, moving between wetlands.	Low – Suitable wetland habitat absent from the project site; potential for suitable seasonal corridor habitat associated with Drain #10, but no linkages to suitable habitats identified through aerial photo interpretation.
Butler's Gartersnake, <i>Thamnophis butleri</i>	Threatened, Schedule 1	Threatened	S2	Open habitats, such as prairies, dense grasslands (often near ditches), cultural meadows and old fields, where there are small marshes and seasonal wet areas. Often locally abundant in vacant lots in urban areas. Often associated with old stone foundations, small mammal burrows, old foundations, ant mounds and possibly crayfish burrows for hibernation.	Moderate – Open old field habitats present (1.2 ha), but mainly associated with Drain #10; large dense grasslands absent. Old homestead within close proximity to Drain #10 and within cultural meadow habitat.
Eastern Foxsnake (<i>Pantherophis gloydi</i> pop. 2)	Endangered, Schedule 1	Endangered	S2	Mainly uses unforested areas, such as old fields, prairies, marshes and dune shoreline during the active season. Hedgerows bordering farm fields and riparian zones along drainage canals commonly provide suitable habitat and serve as movement corridors between more contiguous habitat features. In some areas of intensive farming, these linear habitat strips provide remnant habitat features that maintain snake populations.	Moderate – Open old field habitats present, but limited based on habitat patch size. Suitable riparian zones along drainage canals present (Drain #10). Study area within regulated Eastern Foxsnake habitat.



Species Name	Federal Species at Risk Ranking (SARA) ¹	Provincial Species at Risk Ranking (ESA) ²	S-Rank ³	Preferred Habitat	Potential Presence in Project Study Area
Acadian Flycatcher, <i>Empidonax vireescens</i>	Endangered, Schedule 1	Endangered	S2S3B	Forest interior with large tracts of mature, shady, maple-beech forest.	None – No continuous forest with interior habitats present within or adjacent to the Project study area.
Barn Swallow, <i>Hirundo rustica</i>	No Status, No Schedule	Threatened	S4B	Often found feeding in a range of open habitats including fields, marshes, meadows, and ponds. They primarily use man-made structures such as building, bridges, and culverts for nesting.	None – No suitable nesting sites (box culverts, bridges) present with or adjacent to the Project study area.
Blue or Golden-winged Warbler, <i>Vermivora chrysoptera</i>	Threatened, Schedule 1	Special Concern	S4B	Areas of early successional vegetation, found primarily on field edges, hydro or utility right-of-ways, or recently logged areas.	None – No suitable nesting sites present within or adjacent to the Project study area.
Bobolink, <i>Dolichonyx oryzivorus</i>	No Status, No Schedule	Threatened	S4B	Large grasslands, hay fields, weedy meadows, and grassy areas (unmaintained)	None – Habitat dominated by goldenrods and asters. Grasslands habitats limited. Small size of Project study area prevents suitable nesting sites.
Cerulean Warbler, <i>Setophaga cerulean</i>	Special Concern, Schedule 1	Special Concern	S3B	Older, second-growth deciduous forests	None – No continuous forest with interior habitats present within or adjacent to the Project study area.
Common Snapping Turtle, <i>Chelydra serpentina</i>	Special Concern, Schedule 1	Special Concern	S3	Slow-moving water with a soft mud bottom and dense aquatic vegetation usually in ponds, sloughs, shallow bays or river edges and slow streams and wetlands.	None – No suitable habitat present such as ponds, sloughs or wetlands. Ditches unsuitable for hibernation.
Eastern Meadowlark, <i>Sayornis phoebe</i>	No Status, No Schedule	Threatened	S4B	Farm fields, grasslands, and wet fields. They nest on the ground and sing from exposed perches such as treetops, fence posts, and utility lines.	None – No suitable habitat large enough to support this species throughout cultural meadow habitat.



Species Name	Federal Species at Risk Ranking (SARA) ¹	Provincial Species at Risk Ranking (ESA) ²	S-Rank ³	Preferred Habitat	Potential Presence in Project Study Area
Eastern Spiny Softshell, <i>Apalone spinifera</i>	Threatened, Schedule 1	Threatened	S3	This is a highly aquatic species associated with lakes and large rivers. It rarely ventures far from the shoreline	None – No suitable habitat present within or adjacent to the Project study area.
Five-lined Skink, <i>Plestiodon fasciatus</i> pop. 1	Endangered, Schedule 1 (Carolinian Population)	Special Concern	S2	Rocky outcrops, dunes, fields, and deciduous forests. This species is generally associated with relatively open environments that provide a sufficient covering of debris for shelter.	None – No suitable habitat present within or adjacent to the Project study area.
Fowler's Toad, <i>Anaxyrus fowleri</i>	Endangered, Schedule 1	Endangered	S2	Sandy beaches along the north shore of Lake Erie.	None – This species is confined to sandy beaches along the north shore of Lake Erie. The last observed occurrence of this species in the vicinity of the Project area was in 1980.
Hairy Green Sedge, <i>Carex hirsutella</i>	None	None	S3	Dry, open woods and old fields.	None – Suitable habitat for this species is not found within the study area. There are only four (4) known occurrences of this species within the province. The last observed occurrence of this species in the vicinity of the Project area was in 1986.
Halberd-leaved Tearthumb, <i>Persicaria arifolia</i>	None	None	S3	Moist woods, swamps, and thickets.	None – Suitable habitat for this species is not found within the study area. The last observed occurrence of this species in the vicinity of the Project area was in 1985.



Species Name	Federal Species at Risk Ranking (SARA) ¹	Provincial Species at Risk Ranking (ESA) ²	S-Rank ³	Preferred Habitat	Potential Presence in Project Study Area
Palmate-leaved Violet, <i>Viola palmate</i>	None	None	S2S3	Upland woodlands, rocky open woodlands, wooded slopes, riverbanks and thinly wooded bluffs	None – Suitable habitat for this species is not found within the study area. The last observed occurrence of this species in the vicinity of the Project area was in 1986.
Prothonotary Warbler, <i>Protonotaria citrea</i>	Endangered, Schedule 1	Endangered	S1B	Dead trees of flooded woodlands or deciduous swamp forests.	None – No suitable habitat present within or adjacent to the Project study area.
Red-headed Woodpecker, <i>Melanerpes erythrocephalus</i>	Threatened, Schedule 1	Special Concern	S4B	Open woodland and woodland edges, especially in oak savannahs and riparian forests. These habitats contain a higher density of dead trees commonly used for nesting and perching.	None – No suitable habitat present within or adjacent to the Project study area.
Silver Chub, <i>Macrhybopsis storeriana</i>	Special Concern, Schedule 1	Special Concern	S2	In southern Ontario, the Silver Chub has been found in large lakes and connecting rivers, up to 20m in depth.	None – Suitable habitat for this species is not found within the study area. The NHIC record is inferred to be for a reported occurrence in the St. Clair River. The last observed occurrence of this species in the vicinity of the Project area was in 1921.

¹ Species at Risk Act (EC, 2012)

² Species at Risk in Ontario (MNR, 2012)

³ Provincial Rank: S1 - Critically Imperilled; S2 - Imperilled; S3 - Vulnerable; S4 - Apparently Secure; S5 - Secure; SNA - Not Applicable, S#B – Breeding season status (MNR, 2012)

Endangered: A wildlife species that is facing imminent extirpation or extinction (MNR, 2012)

Threatened: A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction

Special concern: A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats

Note: These species ranges have been identified in the region by the MNR and may or may not exist within the immediate vicinity of the Project area. Shaded species are those with the potential to occur within the Project study area.

382750

383000

383250

383500

383750

Greenfield South - CPCN - 518

Milliken Drain

Second Line Drain

Oil Springs Line

Transmission Line ROW

CN Railway






Union Gas ROW

Government Drain #10






Clay Creek Woodland
Life Science ANSI BoundaryBickford Oak Woods
Wetland Complex (PSW) Outlines

Rankin Drain

LEGEND

-  Property Boundary
-  Proposed General Site Layout Features
-  Railway
-  Transmission Line
-  Watercourses / Drains

Vegetation Cover (By ELC Code)

-  OAGM
-  SWD3-3
-  Dugout Pond
-  FOD2-2
-  CUM1-1

NOTES:

- Background imagery was extracted from GE pro.
- Watercourse/drain information and existing infrastructure was extracted from Land Information Ontario, MNR
- Property Boundary and proposed general site layout was provided by Eastern Power

Datum: NAD83
Projection: UTM Zone 17N

**GREEN ELECTRON POWER PROJECT**

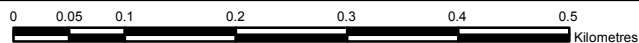
**East Site
Terrestrial Assessment
Summary Map**

PROJECT N^o: TC121601

FIGURE: 2-1

SCALE: 1:6,800

DATE: September 2012



382500 383000 383500 384000 384500

Greenfield South - CPCN - 520

4739000
4738500
4738000
4737500
4737000
4736500



LEGEND

Watercourse

- Permanent
- - - Intermittent

CA-DFO Drain Classification

- Type C - Warm Water with No Top Predators
- Type E - Warm Water, Top Predators Present, No Channelization within 10 Years
- Type F - Intermittent
- Natural Channel
- Unclassified

X GD-1 Watercourse Assessment Location

Proposed General Site Layout Features

- Railway
- Transmission Line
- - - Property Boundary

NOTES:

- Background imagery was extracted from GE pro.
- Watercourse/drain information and existing infrastructure was extracted from Land Information Ontario, MNR
- Property Boundary and proposed general site layout was provided by
- Permanency and DFO drain classification derived from MNR watercourse layer, constructed drain layer and St. Clair Region Conservation Authority Watershed Plan Report

Datum: NAD83
Projection: UTM Zone 17N



GREEN ELECTRON POWER PROJECT

East Site Aquatics Assessment Summary Map

PROJECT N^o: TC121601

FIGURE: 2-2

SCALE: 1:14,000

DATE: September 2012

3.0 ENVIRONMENTAL EFFECTS ANALYSIS AND MITIGATION MEASURES

3.1 Construction Phase

3.1.1 Surface Water and Aquatic Habitat, Fish

Predicted Effects

Activities related to the construction of access roads, Project infrastructure and power lines have the potential to lead to a temporary increase in surface water turbidity, with an increased risk of siltation in adjacent aquatic environments of Government Drain #10 due to runoff during construction activities, specifically at or near the on-site crossing. Furthermore, spills and leaks during construction could allow contaminated water to enter Government Drain #10. The potential for such effects is low if appropriate mitigation and environmental protection planning measures are applied consistent with Ontario Provincial Standards.

An existing farm access culvert crossing is present in the proposed location of the access facility road crossing of Government Drain #10. If this culvert requires upgrading to accommodate the development at the Site, the culvert must be sized according to hydrologic requirements of the drainage feature. Based on flow conditions observed during the Site reconnaissance, culvert upgrading, if required, could be completed in the dry, using appropriate mitigation measures. There is no plan for water taking, process water discharge, or site stormwater discharge relative to Government Ditch #10 in association with long-term operation of the facility. Accordingly, there are no related planned direct or indirect impacts to the drain or its surface waters during facility construction.

Any infrastructure components constructed adjacent to or crossing Government Drain #10 may have the potential to impact the aquatic environment of this water conveyance feature and may require further consultation with SRCA/DFO and MNR relative to possible upsets or incidents. Appropriate mitigation measures pertaining to these components and related to minimization of disturbance, prevention of siltation, and spill mitigation/management shall be provided as part of the environmental protection planning for the construction phase.

Power cables from the Project will be installed aboveground, as illustrated on Figure 2-2. These over-head interconnection lines will be constructed in a westward direction and greater than 100 m from Government Drain #10. However, for information the DFO Ontario Operational Statement Habitat Management Program: Overhead Line Construction is provided in Appendix D. This Operational Statement provides measures to protect fish and fish habitat when undertaking construction of this type. Although construction of overhead lines 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. The potential and significance of such effects is low if appropriate mitigation measures are applied. Collector lines for the proposed project will be constructed outside of the

riparian corridors of Government Drain #10 therefore providing no impact to water conveyance features.

Mitigation

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

- Any in-water work, for example widening of crossing, would be completed within MNR timing windows to protect local downstream fish populations during their spawning and egg incubation periods. The in-water timing window for construction provided by the MNR for Clay Creek is March 15 to June 30;
- 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.

General mitigation measures for potential culvert crossing work include:

- Construction 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.
- 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.
- 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.

Additional mitigation measures would be required in order to temporarily isolate the work area if work was completed at a time when water is present in the drain, as detailed below:

- Cofferdams (e.g., aqua-dams, sand bags, concrete blocks, steel or wood wall, clean riprap, sheet pile or other appropriate designs) can be used to separate the in-water work site from flowing water.
- If riprap 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.
 - 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.

Significance of Environmental Effects

If mitigation measures prescribed above are implemented, the potential for significant adverse effects to surface water from construction activities is low.

3.1.2 Plant Communities, General Wildlife, Habitat

Predicted Effects

Effects of the construction activities within the site on plant communities, general or common wildlife habitat and wildlife species will be generally limited due to the limited wildlife habitat over the entire property and the potential absence of significant wildlife species on-site.

The amount and type of habitat and/or land use affected within the proposed project site boundaries and within the facility footprint is provided below and shown in Figure 2-1.

Habitat Affected	Works and Activities	Area within Property Boundaries (ha)	Approximate Area Affected (ha)
Proposed Project Site			
Agricultural Land (OAGM)	Plant footprint	30.0	2.1
Woodland (FOD2-2 and SWD3-3)	Plant footprint	5.3	0
Herbaceous Area (buffer around drainage feature and area at north perimeter) (CUM1-1)	Plant footprint	1.2	<0.1
Man-made pond	Plant footprint	<0.1	0
Total Habitat (Agricultural, Woodland, Old Field, Pond)		36.5	2.1

The entire facility footprint will be situated on regularly disturbed and cultivated agricultural cropland which provides minimal to no wildlife habitat opportunities. The ANSI and PSW are located 500 m and 250 m from the closest project component, respectively and as such are not predicted to be affected by Project activities.

Specific impacts to wildlife and wildlife habitat include:

- Potential for contamination caused from construction equipment malfunction;
- Potential localized dust generation, soil erosion and sedimentation; and
- Potential sensory disturbance to wildlife due to noise from heavy machinery and construction activities occurring adjacent to the potential habitat areas.

Overall, effects on wildlife and wildlife habitat are considered to be low as the construction of the facility does not cause or introduce any new habitat fragmentation or barriers to wildlife migration.

Mitigation

Specific mitigation measures have been developed to minimize and/or avoid significant adverse environmental effects. Key mitigation measures include the following:

- Prior to construction the outer limits of the construction area will be staked and marked to ensure that contractors remain within the temporary construction areas.
- Construct silt fencing to keep wildlife out of Project footprint. Avoid use of silt fencing with nylon mesh netting reinforcing the regular, woven plastic strand material. Large-bodied snakes become entangled in this mesh and perish.
- The silt-fencing barriers will be regularly monitored and properly maintained during and following construction until soils in the construction area are re-stabilized with vegetation or the area has been returned to pre-disturbance conditions, after which they will be removed.
- Comply with the Migratory Bird Convention Act (MBCA) regulations and guidelines for vegetation clearing recommended by Environment Canada. In order to minimize the potential for incidental take of nesting migratory birds, vegetation clearing and any proposed work activities in migratory bird habitat will be undertaken outside of the active breeding season. Clearing is to be avoided from May 1 to August 1 for this project location. If clearing (or other work) in migratory bird habitat is required during the nesting season, a nest survey should be conducted by a qualified avian biologist immediately (i.e., within 2 days) prior to commencement of the works to identify and locate active nests of species covered by the MBCA. A mitigation plan (which may include establishing appropriate buffers around active nests) should then be developed to address any potential impacts on migratory birds or their active nests, and should be reviewed by Environment Canada prior to implementation.
- Minimize as much as possible any disturbance to existing vegetation.
- Ensure hazardous substances, if required, are stored, handled and applied in accordance with local regulations and in a manner which prevents release to the environment.
- Any hazardous substances stored within the laydown areas will be properly contained to prevent its release into the environment.
- Ensure a contingency plan is developed and implemented in the event of an accidental spill from construction vehicle, machinery or equipment.

- Limit the duration and timing of work activity as much as possible. Conduct construction activities during daylight hours to avoid potential effects of artificial night lighting and noise.

Significance of Environmental Effects

Due to the unspecialized nature of existing conditions at the proposed project site and avoidance of potential wildlife habitat, construction activities will have insignificant adverse effects on wildlife and wildlife habitat.

Summary of Effects, Mitigation Measures and Net Effects

The Project is committed to the implementation of all mitigation and impact management measures outlined in this report. A summary of these measures related to the construction phase of the Project is presented in Table 3-1.

3.1.3 Species at Risk

Based on the September 10, 2012 field investigation of the Project site conditions and existing environment, it has been determined that three SAR may potentially be present in the Project study area based on available habitat including Butler's Gartersnake, Eastern Foxsnake and Blanding's Turtle. The Butler's Gartersnake and Eastern Foxsnake were determined to have a moderate probability of occurrence based on the presence of habitat (Drain #10), whereas the Blanding's Turtle was determined to have a low probability of occurrence based on the absence of nearby suitable wetland habitat (only minor and seasonal potential along Drain #10). As such, precautions to protect individuals and their habitats should be considered in the project planning for the site and associated construction implementation. It is noted that the project development footprint is outside the area along this drainage ditch, with the exception of the facility access road crossing. The facility access road crossing has been located at an existing farm crossing to minimize disturbance to the drainage ditch.

Predicted Effects

Effects of the construction activities on SAR are expected to be minimal; however, the extent and use of potential SAR habitat is unknown and could not be determined at the time of this study. Potential impacts to SAR may include:

- Minor habitat loss or disruption due to construction activities; and
- Road mortality along the access road to the facility during construction and particularly at the Government Drain #10 crossing location.

Mitigation

Prior to construction, the MNR should be consulted again by the proponent for potential guidance and to determine the appropriate course of any action required relative to process requirements and any additional mitigation measures to those identified below that may be appropriate relative to the potential presence of SAR in the Project study area. On the basis of inferred habitat use and the assumption of potential SAR presence on site as noted previously, the following specific mitigation measures that may be considered for the minimization and/or avoidance of significant adverse environmental effects during construction include:

- During construction, construct silt fencing to keep wildlife out of Project footprint. Avoid use of silt fencing with nylon mesh netting reinforcing the regular, woven plastic strand material. Large-bodied snakes become entangled in this mesh and perish.
- Routine surveillance could be conducted to ensure that there is no SAR present at the work site. Identification material for potential SAR should be provided to construction contractors.
- Those working on the project shall alert the Project Manager if any SAR or those thought to be SAR are observed at the work site.
- Should a SAR be encountered at any time during the Project, work shall be stopped in the vicinity of the individual until the SAR can retreat to a safe distance or until measures can be implemented to avoid destruction, injury, or interference with the species, its residence and/or its habitat.
- Should any species designated as “Threatened” or “Endangered” be encountered during the progress of construction within the study area, MNR will be contacted immediately to determine any requirements pursuant to the ESA 2007.

It should be noted that the measures provided are based on general mitigation measures for SAR. Mitigation measures may be subject to change based on consultation with the MNR.

Significance of Environmental Effects

Overall, there is a low potential for residual effects if mitigation measures are applied. Continuing consultation with the MNR is required. Further species-specific considerations may be required, depending on the outcome of consultation with the MNR. Further information is provided in Section 4.0 (Follow-up and Monitoring).

Summary of Effects, Mitigation Measures and Net Effects

The Project is committed to the implementation of all mitigation and impact management measures outlined in this report. A summary of possible mitigation measures related to the construction phase of the Project is presented in Table 3-1.

3.2 Operation Phase

3.2.1 Surface Water and Aquatic Habitat, Fish

Predicted Effects

The overall approach to stormwater management is to allow undeveloped Project Site areas to drain naturally but to allow all stormwater from developed areas to be captured in catch basins and directed to the cooling tower where it will be consumed as process water, thereby displacing municipal water that would otherwise be needed to make up losses. As such, increased surface drainage due to increased impervious surfaces during operation is expected to be negligible.

The potential exists for leaks and spills of machinery lubricants and other products used on site for portable equipment/machinery during operation and maintenance. However, the risk of leaks and spills to the environment is expected to be low through the use of safe handling and reporting procedures. A protocol to minimize spills/leaks and their impact to the environment will be provided in the Emergency Response Plan. Routine inspection of Project construction sites and operations and maintenance infrastructure will be carried out to ensure continued use and function of best management practices, mitigation measures and spill control and prevention measures. Proper storage and management of materials and maintenance fluids can greatly reduce the potential for accidental spills and/or leaks. As such, spills and leaks would not be expected to enter Government Drain #10 and effects to surface water and aquatic habitat is not expected.

Culvert maintenance, including the removal of accumulated debris (logs, garbage, sediment, etc) may be required in order to maintain efficient passage of water and fish through the culvert structure. Culvert maintenance activities can affect fish and fish habitat by the removal of woody debris that provides cover for fish, by flooding and/or scouring due to removal of blockages too quickly, and by erosion and sedimentation caused by the use of construction equipment on watercourse banks. However, if culvert maintenance is carried out in accordance with DFO Operational Statement Culvert Maintenance, the potential for effects to surface water and aquatic habitat is low.

Table 3-1: Summary of Impacts, Mitigation and Net Effects – Construction

Potential Impacts	Mitigation/Impact Management	Net Effect
Surface Water and Aquatic Habitat, Fish		
<ul style="list-style-type: none"> Increased sediment loading to Government Drain #10 	<ul style="list-style-type: none"> Implementation of erosion and sediment control plan including dewatering plan Re-vegetation of disturbed surfaces immediately after completion of construction work 	Minor, very localized effect and temporary
<ul style="list-style-type: none"> Accidental spills of oil, fuel, and lubricants 	<ul style="list-style-type: none"> Fuels, oils, chemicals, and other hazardous substances to be provided with secondary containment Establish emergency clean-up protocols in the event of an accidental spill Ongoing environmental inspection during construction 	Minor, very localized effect and temporary
<ul style="list-style-type: none"> Impact to fish and fish habitat in Government Drain #10 due to replacement of culvert for access road 	<ul style="list-style-type: none"> Work to be completed in the dry Re-vegetation of disturbed surfaces immediately after completion of construction work 	Minor, very localized effect and temporary
<ul style="list-style-type: none"> Construction of overhead power lines 	<ul style="list-style-type: none"> Follow mitigation measures outlined in DFO Operational Statement Habitat Management Program: Overhead Line Construction (Appendix D) 	Minor, very localized effect expected to be outside of riparian corridors and temporary duration
Plant Communities, Wildlife and Wildlife Habitat		
<ul style="list-style-type: none"> Removal of 2.1 ha of agricultural land and <0.1 ha of cultural meadow as a result of the facility footprint 	<ul style="list-style-type: none"> Clear delineation of construction area Construction and regular monitoring of silt-fencing for a wildlife barrier 	Minor, very localized effect
<ul style="list-style-type: none"> Harm to wildlife within the Project footprint 	<ul style="list-style-type: none"> Minimize disturbance to existing vegetation and clearing of vegetation for access purposes 	Minor, very localized effect and temporary
<ul style="list-style-type: none"> Disruption of nesting birds 	<ul style="list-style-type: none"> Comply with the MBCA regulations. Conduct vegetation clearing outside the active breeding season (May 1 to August 1) 	Minor, very localized effect

Potential Impacts	Mitigation/Impact Management	Net Effect
<ul style="list-style-type: none"> Potential for contamination from use of construction equipment through accidental spills and/or leaks 	<ul style="list-style-type: none"> Ensure safe storage and handling of hazardous substances with a contingency plan available for implementation in case of accidental spill 	<p>Minor, very localized effect and temporary</p>
<ul style="list-style-type: none"> Localized dust generation, soil erosion and sedimentation 	<ul style="list-style-type: none"> Regularly monitor and maintained silt fencing 	<p>Minor, very localized effect and temporary</p>
Species at Risk		
<ul style="list-style-type: none"> Minor habitat loss, disruption and/or mortality due to construction activities 	<ul style="list-style-type: none"> During construction, construct silt fencing to keep wildlife out of Project footprint. Avoid use of silt fencing with nylon mesh netting reinforcing the regular, woven plastic strand material. Large-bodied snakes become entangled in this mesh and perish. Routine surveillance could be conducted to ensure that there is no SAR present at the work site. Identification material for potential SAR should be provided to construction contractors. Those working on the project shall alert the Project Manager if any SAR or those thought to be SAR are observed at the work site. Should a SAR be encountered at any time during the Project, work shall be stopped in the vicinity of the individual until the SAR can retreat to a safe distance or until measures can be implemented to avoid destruction, injury, or interference with the species, its residence and/or its habitat. Should any species designated as "Threatened" or "Endangered" be encountered during the progress of construction within the study area, MNR will be contacted immediately to determine any requirements pursuant to the ESA 2007. 	<p>Minor, very localized effect</p>

It is assumed that that sanitary sewage for the plant will be discharged to an approved sanitary septic field on site. It is assumed that location and design criteria of the septic field will meet provincial standards thereby negating an effect to localized groundwater and Government Drain #10.

Water for the purposes of plant processes as well as sanitary will be taken by the proponent under existing water taking permits from one of two sources:

- Municipal Water Supply (LAWSS supplies St. Clair Township); and
- CF-Terra Industries.

Assessment of these options is ongoing, however, after installation of infrastructure to deliver water from these sources to the site, potential effects due to water taking are expected to be negligible. Mitigation, best management practices and monitoring associated with water taking from these sources will be met under existing permits and future agreements.

The process wastewater from the site will be generated from Cooling Tower Blowdown (containing demineralizer treatment water effluent, heat exchanger cooling, condenser effluent, HRSG blowdown, CT evaporator cooler effluent), plant utility service water, minor flows from HRSG and CTG drains and the oil-water separator treating process areas and floor drains.

Quantity of effluent from the facility is estimated to be up to 1.23 m³ per minute at 30°C for a 5-cycle cooling tower operation and up to 0.53 m³ per minute at 30°C for an 11-cycle cooling tower operation. Water quality of the effluent has been provided by Eastern Power under separate cover and indicated a number of constituents (including temperature, phosphorus, cadmium, copper and zinc) that potentially will not meet Provincial Water Quality Objectives (PWQO).

It was noted that the process discharges will be from a facility that will be a “Peaking Plant” and thus not operate on a continuous 24-hour basis. The discharge to any receiver from the facility will not be continuous.

A provincial Environmental Compliance Approval (ECA) is required for any direct treated water discharge to the environment. The ECA would cover the effluents described above plus any stormwater pond discharge.

Three options for discharge to the environment are currently under consideration and discussion with the MOE. They include:

- Discharge to the St. Clair municipal sewage treatment system;
- Discharge to the CF-Terra Industries outlet channel; and
- Discharge to the St. Clair River.



Further assessment with regard to potential impacts and possible mitigation will be necessary as part of additional environmental impact studies once the preferred option is identified.

Mitigation

Standard mitigation with respect to reducing effect of spill and leaks include:

- 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.

Mitigation measures required for compliance with the DFO Operational Statement Culvert Maintenance include:

- Use of existing trails, road or cut lines to avoid disturbance to riparian vegetation;
- Removal of as little riparian vegetation as possible;
- Except for in emergency or total blockage conditions, complete culvert maintenance activities in appropriate timing windows in order to avoid disruption during sensitive fish life stages;
- Use of erosion and sediment control measures;
- Remove only accumulated materials necessary to that which is necessary to allow culvert function and fish passage and do so slowly;
- Operate machinery from land only;
- Stabilize waste materials removed from the site; and
- Re-vegetate disturbed areas.

Significance of the Effects

The effects of Project operation on fish and fish habitat are considered to be insignificant if all appropriate mitigation measures are applied.

3.2.2 Plant Communities, Wildlife, Habitat

Predicted Effects

During normal plant operation, minimal interactions are anticipated between the plant and the terrestrial habitats that could have an adverse effect. It is expected that on-site habitat values and plant and wildlife species diversity will remain unchanged over time. Relative to wildlife, potential effects of the Project during operation are predicted to be minimal. Potential effects include sensory disturbance to wildlife (birds, bats, amphibians) due to noise and light from plant operations.

Mitigation

No mitigative measures are required relative to terrestrial habitats, as the plant operation is not expected to have any adverse effects on these environment features. Mitigation measures to minimize potential impacts to wildlife include:

- Where appropriate, limit plant maintenance to daytime hours;
- Limiting facility lighting to only where it is required for safety and security reasons;
- Use “full cut-off” lighting to direct the light to where it is needed (minimizing sky glow);
- Use switches to limit duration where possible (exterior stairwells, stacks, and towers); and
- Where applicable, use high pressure sodium lighting in order to provide a less damaging spectra of light for wildlife.

To maximize potential beneficial effects, any on-site landscape features should be maintained in accordance with a site-specific landscape management plan. The plan will define:

- Mowing regimes;
- Management of woody vegetation;
- Management of invasive species;
- Desirable plant species lists; and
- Pest management practices.

The overall objective will be to limit intensive maintenance practices to any ornamental plantings and turf areas associated with the power plant’s site entrance, administration building, parking and amenity areas. All other landscape features should be permitted to develop into extensive near-natural vegetation communities and habitat structures. Maintenance intensity for the woodlots at the perimeter of the study area should be minimal allowing for natural succession towards and growth of the existing tree stands.



Significance of the Effects

Due to the unspecialized existing conditions at the proposed Project site, operation activities will have insignificant adverse effects on wildlife and wildlife habitat if mitigation measures are applied.

Summary of Effects, Mitigation Measures and Net Effects

The Project is committed to the implementation of all mitigation and impact management measures outlined in this report. A summary of these measures related to the operation phase of the Project is presented in Table 3-2.

3.2.3 Species at Risk

Based on the September 10, 2012 field investigation of the Project site conditions and existing environment, it has been determined that three SAR (Butler's Gartersnake, Eastern Foxsnake and Blanding's Turtle) have a moderate probability of occurrence in the Project study area. Special consideration and precautions to ensure the safety of these protected species (and any other SAR that may be found at the Project site) is required during operation.

Predicted Effects

Effects of the operation on SAR are expected to be minimal; however, the extent and use of potential SAR habitat is unknown and could not be determined at the time of this study. Potential impacts to SAR may include road mortality along the access road to the plant, particularly at the watercourse crossing.

Mitigation

Specific mitigation measures have been developed to minimize and/or avoid significant adverse environmental effects. Key mitigation measures during operation include the following:

- Provide culvert sizing and configuration at Government #10 Drain crossing by the access road that considers the maintenance of safe and unobstructed movement for Butler's Gartersnake, Eastern Foxsnake and Blanding's Turtle through this potential wildlife corridor;
- Consideration of a permanent snake fence along the access road at the Government#10 crossing location to maintain any snake movements in the drain channel and to avoid their access onto the travelled road surface (requires confirmation by MNR pending further discussions).



- Should any species designated as “Threatened” or “Endangered” be encountered during the progress of operation within the study area, MNR will be contacted immediately to determine any requirements pursuant to the ESA 2007.

Significance of Environmental Effects

Overall, there is a low potential for residual effect if mitigation measures are applied. Further consultation with MNR will provide guidance with respect to process and mitigation requirements relative to potential SAR within the Project study area. Further information is provided in Section 4.0 (Follow-up and Monitoring).

Summary of Effects, Mitigation Measures and Net Effects

The Project is committed to the implementation of all mitigation and impact management measures outlined in this report. A summary of these measures related to the operation phase of the Project is presented in Table 3-2.

Table 3-2 Summary of Impacts, Mitigation and Net Effects – Operation

Potential Impacts	Mitigation/Impact Management	Net Effect
Surface Water and Aquatic Habitat, Fish		
<ul style="list-style-type: none"> Surface water quality impairment 	<ul style="list-style-type: none"> Fuels, oils, chemicals, and other hazardous substances to be provided with secondary containment Establish emergency clean-up protocols in the event of an accidental spill Any spilled or leaked materials within developed area of the Project Site would enter catchbasins and be directed to the cooling tower to be used as process water, and therefore would not enter watercourses in the vicinity of the Project Site 	Minor, localized effect and temporary
<ul style="list-style-type: none"> Increase in stormwater run off volumes 	Stormwater from developed areas of site (impervious surfaces) will be captured in catch basins and directed to cooling tower where it will be consumed as process water. Increased surface drainage is not expected.	Minor, localized effect and temporary
<ul style="list-style-type: none"> Water quality impairments in receiving stormwater drains as a result of accidental spills of fuels, lubricants and other liquids 	<ul style="list-style-type: none"> Project to develop and implement Environmental Management Plan All sanitary waste water to be collected and directed for treatment to on-site treatment system Process waste water management system will have: <ul style="list-style-type: none"> Dechlorination system Oil/water separator Recycling of boiler blowdown and effluent from oil-water separator Temperature treatment in man-made Terra canal system Monitoring of effluent flow and quality Application of water treatment products that do not persist and do not bio-accumulate Stormwater discharge volumes within pre-development levels Secondary containment for hazardous materials storage Development and implementation of a spill response plan in the event of a spill 	Minor effect; concentrations are non-toxic to aquatic biota; there is no immediate discharge to significant fish habitat (Government Drain #10 is Type C Drain characterized as warmwater no sensitive species and therefore low risk)
<ul style="list-style-type: none"> Effluent discharge to aquatic environment, concentrations above 	<ul style="list-style-type: none"> Meet existing permit and best management practices for effluent discharge and assimilative capacities upon decision of preferred option for receiving water 	Further assessment necessary depending on preferred option selected



Potential Impacts	Mitigation/Impact Management	Net Effect
PWQO		
<ul style="list-style-type: none"> Disruption of aquatic habitat due to culvert maintenance activities 	Culvert maintenance to be carried out in accordance with DFO Operational Statement (Appendix D)	Minor, localized effect and temporary on a Type C Drain (low risk)
Plant Communities, Wildlife, Habitat		
<ul style="list-style-type: none"> Potential effects include sensory disturbance to wildlife (birds, bats, amphibians) due to noise and light from plant operations. 	<ul style="list-style-type: none"> Where appropriate, limit plant maintenance to daytime hours; Limiting facility lighting to only where it is required for safety and security reasons; Use “full cut-off” lighting to direct the light to where it is needed (minimizing sky glow); Use switches to limit duration where possible (exterior stairwells, stacks, and towers); and Where applicable, use high pressure sodium lighting in order to provide a less damaging spectra of light for wildlife. 	Minor, very localized effect and temporary
Species at Risk		
<ul style="list-style-type: none"> Road mortality along the access road to the plant, particularly at the watercourse crossing. 	<ul style="list-style-type: none"> Provide culvert sizing and configuration at Government #10 Drain crossing by the access road that considers the maintenance of safe and unobstructed movement for Butler’s Gartersnake, Eastern Foxsnake and Blanding’s Turtle through this potential wildlife corridor; Consideration of a permanent snake fence along the access road at the Government#10 crossing location to maintain any snake movements in the drain channel and to avoid their access onto the travelled road surface (requires confirmation by MNR pending further discussions). Should any species designated as “Threatened” or “Endangered” be encountered during the progress of operation within the study area, MNR will be contacted immediately to determine any requirements pursuant to the ESA 2007. 	Minor, very localized effect

4.0 FOLLOW-UP AND MONITORING PROGRAM

Construction monitoring may be required to determine the effectiveness of mitigation measures relative to erosion and sedimentation related effects on aquatic ecosystems. Such monitoring will be undertaken consistent with environmental management and protection planning procedures for the site.

Monitoring associated with site construction and operations will be consistent with any conditions of permits and approvals received during the project planning, detail design and construction phases.

Relative to the seasonal limitations represented by the timing of the field reconnaissance observations undertaken in support of this document, and with the potential presence of SAR therefore determined on the basis of MNR Regional records and inferred habitat use through the evaluation of site-specific habitat features within and adjacent to the project site, it is recognized that further consultation with the MNR will be required. Eastern Power will continue to consult with MNR to gain further direction relative to any technical and process requirements under ESA (2007), and to obtain guidance on any appropriate mitigation measures that may be required during construction and operation phases of the Project. Consultation should be consistent with the planning review process, as outlined in the MNR consultation (Appendix C). Any further SAR specific monitoring requirements will be determined through the consultation process.



5.0 AGENCY CONSULTATION

As part of the EIS preparation and to facilitate detailed design development, consultation with provincial and municipal agencies was undertaken in September 2012 to ascertain concerns or comments related the Project. Agencies consulted include the Ontario Ministry of Natural Resources (MNR – Aylmer District), and the St. Clair Region Conservation Authority (SCRCA). A response was received from the SCRCA and the MNR. Copies of all correspondence are included in Appendix C.

6.0 CONCLUSION

Based on field reconnaissance investigations conducted on September 10, 2012 and a review of available background information, the overall environmental effects of the Project with respect to the terrestrial and aquatic components are expected to be minimal with the proper implementation of proposed mitigation measures. The Project development has been designed in consideration of avoidance of natural heritage related features with disturbance occurring on actively cultivated agricultural crop lands. Minor disturbance in naturalized areas are related to access road development and transmission connections which can be accommodated with appropriate standard construction and operational mitigation measures.

Consultation will continue with MNR to gain further direction relative to any technical and process requirements under ESA (2007), and to obtain guidance on any appropriate SAR mitigation measures that may be required during construction and operation phases of the Project.

This report has been developed based on information gathered during site reconnaissance, as per the scope of work for the project, and based on the proposed Project footprint at the time of the report. Should changes to the Project footprint significantly alter potential impacts to the Project, revisions to this EIS may be required. Natural heritage based information made available through consultation with regulatory agencies and database searches are limited to the currency of the data.

AMEC Environment& Infrastructure, a division of AMEC Americas Limited

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APPENDIX A
PHOTO RECORD



Photo 1: Looking downstream (southeast) on Government Drain #10 at CN Rail ROW and confluence with Alton Drain (GD-1).



Photo 2: Looking upstream on Government Drain #10 at double CSP culverts conveying water through CN Rail ROW.



Photo 3: Looking downstream (southeast) at Government Drain #10 at existing agricultural crossing with CSP culvert.



Photo 4: Looking upstream on Government Drain #10 near GD-3 with dense channel vegetation.





Photo 5: Northward facing view of the Project study area



Photo 6: Southward facing view of the wheat field. The ANSI and PSW can be seen in the distance.



Photo 7: West facing view of small man-made pond.



Photo 8: South facing view of the old field cultural meadow.





APPENDIX B
FIELD RECORDS

13:00 pris of Hawkish Drain

looking West = 655
" East = 656

① 17T 380893
4738631

13:10 HD-3 @ property east
boundary.

17T 0380895
4738628

BFW = 102" FPW = 16ft
BFD = 29.5"
WW = 25"
WD = 1"
FPW = 8.5m

Berm to other ditch top
approx 15m.

- Substrate, WQ etc
Same as previous.
- in storm event

1406 Government Drain #10
(East site)

- where Alton Drain
+ Grov Drain #10
confluence (near train
tracks).

17T 0383098
4738458

(2) - Double CSP culverts - 3ft dia
conveying Grov #10 drainage
to South East.
- 1 smaller CSP input for
Alton - 1ft diam.

WW = 71" BFD = 35"
WD = 7" FPW = 13m
BFW = 155"

- substrate = clay, detritus,
leaf litter.

aquatic veg = Lemna (90% cover)
- bulrush.

terrestrial - willow

- thistle
- goldenrod.
- milkweed.

WQ = 636 μ S

318 ppm

7.73 pH

17.1 $^{\circ}$ C

- permanent - receives
drainage from corn field
(west) hayfield (east) + road &
train track ROW.

pics = 657 - 660

14:30

GD-2

Greenfield South - CPCN - 555

- @ proposed
road crossing
location.

17T0383226

4738211

- existing culvert, poor
conveyance of water to
the South east side of
culvert

- large phragmites stand
on ~~down~~ SE side

- NW side shows CPP
inputs from farmer fields
(hay).

BFW = 171"

BFD = 39"

WW = 98"

WD = 11"

FPW = 8.5 m

culvert - single - 1/4 ft CSP

WQ = same.

- clay, silt, sand (fine) in detritus
80% 5% 25%
"Rotten the Rain"

- emergents = bulrush

aquatics - decaying bladder
leaf pondweed

- no Lemna here
- same as other site

- phragmites dominate
one side

pics NW - ~~US 662~~ DS 663
SE - ~~US~~ DS 664 665
Bank RB - 661

14:57 GD-3 @ location near
where layout may
encroach within
80 m of drain

17T 0383334 4738020

- wetted with some flow
- channel choked w
graminoids + phragmites

WW = 13"
WD = 7"
BFW = 127"
BFD = 44"
FPW = 9 m

WQ = 732 μ S 17.0°C
351 ppm 7.96 pH

Sed = clay / silt / 8% 20% detritus
+ grass
litter.

- no fish habitat
observed @ time of
visit, possible capped
habitat @ culverts
where standing water
creates greater depths.
- flow may provide
some oxygenation

pics US - 666
DS 667

15:12

Small ponded area
online to drain @
higher water.

- depth approx 5-10'
- cattail.
- bulrush?
- smartweed.
- lemna dominates surface.
- willow all along. LB.
- all clay/silt

- WWD = 9.5 m. ~~Width~~

WD = 0.30 m

BFD = 16 m. width

BFW = 16 m width

BFLen = 38 m. length

- possible use as retention pond, yet w/in regulated area.

EAST SITE → MON - OPG

- OLD WHEAT / STRAW FIELD
(MOTHAY)

- OLD FOUNDATION + WEEDY AREA

UPSIDE ON MAP

- BURDOCK (O)

- BULL THISTLE (O)

- S.W. CLOVER

- C. WICK (O)

- RAGWEED (O)

- WILD CARROT

- DANDELION

- ELYMREP

- CANOLA

H.G. BEARD

SYMPNOU

SOLICAN

ENTHGRA

C. MULKWEED

- POND UPSIDE
ON MAP

- DUCKWEED
TYPHAT

SALIX SP

- MAN-MADE

HOLA (*60)

- FLOCK OF

MOSQUITOES (*30)

HOSP (*25)

- AMGO (*10)

KILL
RWBL

SUMPER

PHRAGMITES

SMARTWEED (CH)

JUNC EFF (CH)

B.F. TREFOLD

R. CLOVER

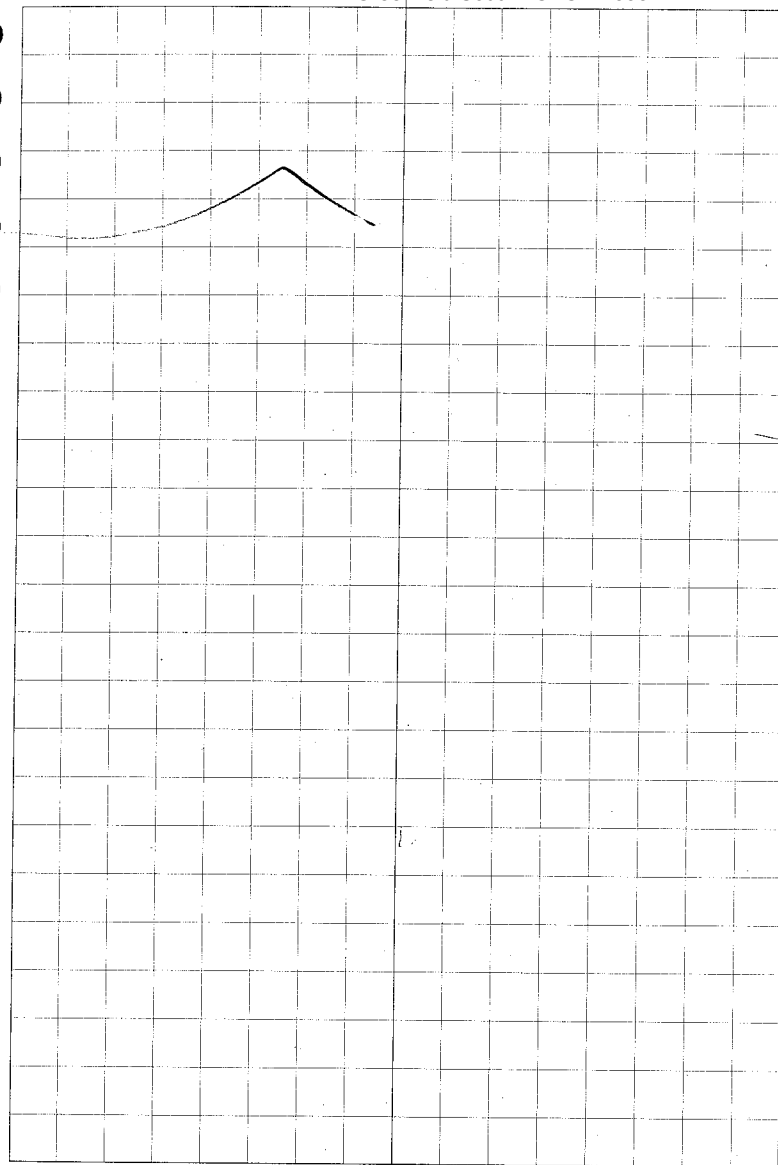
JUNC ?

(TERMINAL)

PIGWEEED

ALFALFA

NO SAR HABITAT





APPENDIX C
CORRESPONDENCE



September 5, 2012

St. Clair Region Conservation Authority
205 Mill Pond Cres.
Strathroy, Ontario
N7G 3P9

Attention: Ms. Michelle Fletcher

**Re: Environmental Impact Study
Eastern Power Limited - New Natural Gas-fired Combined Cycle Electricity
Generating Facility
Oil Springs Line, St. Clair Township**

AMEC Environment & Infrastructure (AMEC) has been retained to undertake work on behalf of Eastern Power Limited on the above-noted Project to address both terrestrial and aquatic natural science issues. The Project involves the construction and operation of a new, clean, natural gas fuelled electricity generating plant which will facilitate the replacement of coal-fired power generation in Ontario.

There are two potential locations under review for this Project (see attached project location plan):

East Site: on the south side of Oil Springs Line, approximately 0.6 km west of highway #40 and 0.9 km east of Greenfield Road (see Fig. 2.1 - Site Map). This site is on vacant industrially zoned land, in an overall area that is designated for heavy industrial uses. The site has been used for agricultural purposes for many years and is presently under cultivation.

West Site: on the north side of Oil Springs Line, approximately 1.3 km west of Highway 40 (see attached plan).

Based on a review of the SCRCA's St. Clair River Tributaries Watershed Plan, Government Drain #10 flows through the East Site and drains to Clay Creek; and Bowens Creek and Hawkins Drain flow along the west and south sides of the West Site, respectively. It is further understood that Government Drain #10 is classified as a Type C drain (warm water, no top predators), that Bowens Creek is a natural watercourse, and that Hawkins Drain has not been classified.

Request

AMEC would like to take this opportunity to inquire if you hold any additional information on these locations, such as:

- new or updated aquatic fish habitat mapping or classifications,
- new or updated fish community data,
- SAR location information; and
- terrestrial ELC (preference for shapefile access).

AMEC Environment & Infrastructure
a division of AMEC Americas Limited
160 Traders Blvd. East, Suite 110
Mississauga, Ontario
CANADA L4Z 3K7
Tel +1 (905) 568-2929
Fax +1 (905) 568-1686
www.amec.com



We are planning field reconnaissance for the week of September 10th to confirm existing data and to collect additional detailed information. We are requesting a response as early as possible to aid in identifying any gaps in existing documentation in order to augment our scheduled field investigations. Equally, we would be pleased to know if you have any issues relating to the proposed development of this site that you would like to draw to our attention.

If you have any questions, please contact the undersigned. Thank you for your assistance in this matter.

Kind Regards,

A handwritten signature in blue ink, appearing to read "Tracy Wolowidnek".

Tracy Wolowidnek, B.Sc.
Environmental Scientist

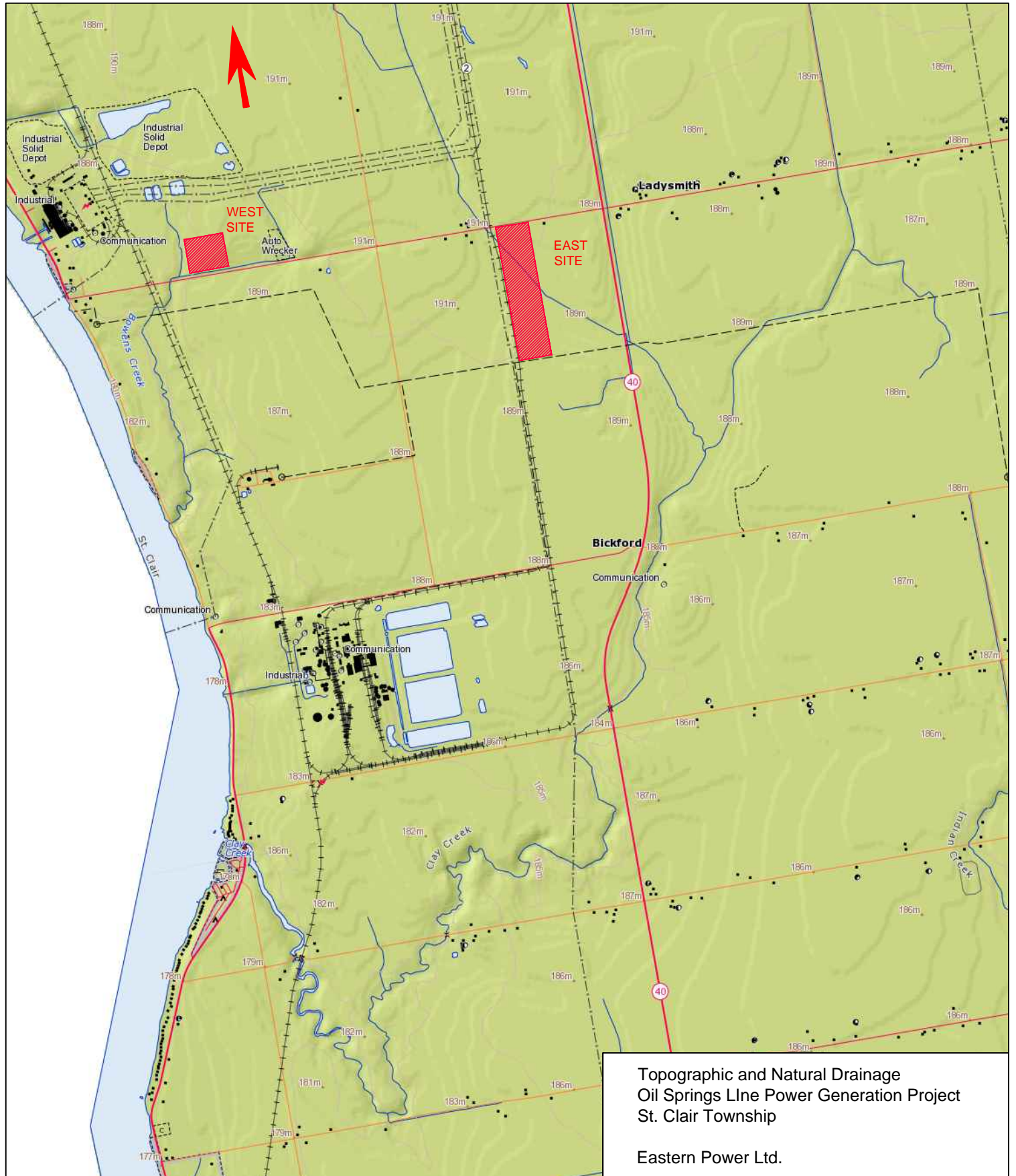
**AMEC Earth and Environmental,
A division of AMEC Americas Limited**

Tel: (905) 687-6616

Fax: (905) 687-6620

Email: tracy.wolowidnek@amec.com

Attachment: Figure: Project Location Plan





September 6, 2012

Ministry of Natural Resources
615 John Street North
Aylmer, ON
N5H 2S8

To whom it may concern,

**Re: Environmental Impact Study
Eastern Power Limited - New Natural Gas-fired Combined Cycle Electricity
Generating Facility
Oil Springs Line, St. Clair Township**

AMEC Environment & Infrastructure (AMEC) has been retained to undertake work on behalf of Eastern Power Limited on the above-noted Project to address both terrestrial and aquatic natural science issues. The Project involves the construction and operation of a new, clean, natural gas fuelled electricity generating plant which will facilitate the replacement of coal-fired power generation in Ontario.

There are two potential locations under review for this Project (see attached project location plan):

East Site: on the south side of Oil Springs Line, approximately 0.6 km west of highway #40 and 0.9 km east of Greenfield Road (see attached plan). This site is on vacant industrially zoned land, in an overall area that is designated for heavy industrial uses. The site has been used for agricultural purposes for many years and is presently under cultivation.

West Site: on the north side of Oil Springs Line, approximately 1.3 km west of Highway 40 (see attached plan).

AMEC has conducted a review of the Natural Heritage Information Centre and the St. Clair Region Conservation Authority has been contacted regarding SAR in the vicinity of the proposed project sites.

AMEC would like to take this opportunity to inquire if you hold any additional information on these locations, such as:

- natural heritage features;
- wildlife and plant federal species at risk (SARA and COSEWIC);
- provincial species at risk (SARO); and
- any species with a provincial rank of S1-S3



We are planning field reconnaissance for the week of September 10, 2012 to confirm existing data and to collect additional detailed information. We are requesting a response as early as possible to aid in identifying any gaps in existing documentation in order to augment our scheduled field investigations. Equally, we would be pleased to know if you have any issues relating to the proposed development of this site that you would like to draw to our attention.

If you have any questions, please contact the undersigned. Thank you for your assistance in this matter.

Kind Regards,

A handwritten signature in black ink, reading "Erin Hellinga".

Erin Hellinga, B.Sc.
Environmental Technician

**AMEC Environment & Infrastructure,
A division of AMEC Americas Limited**

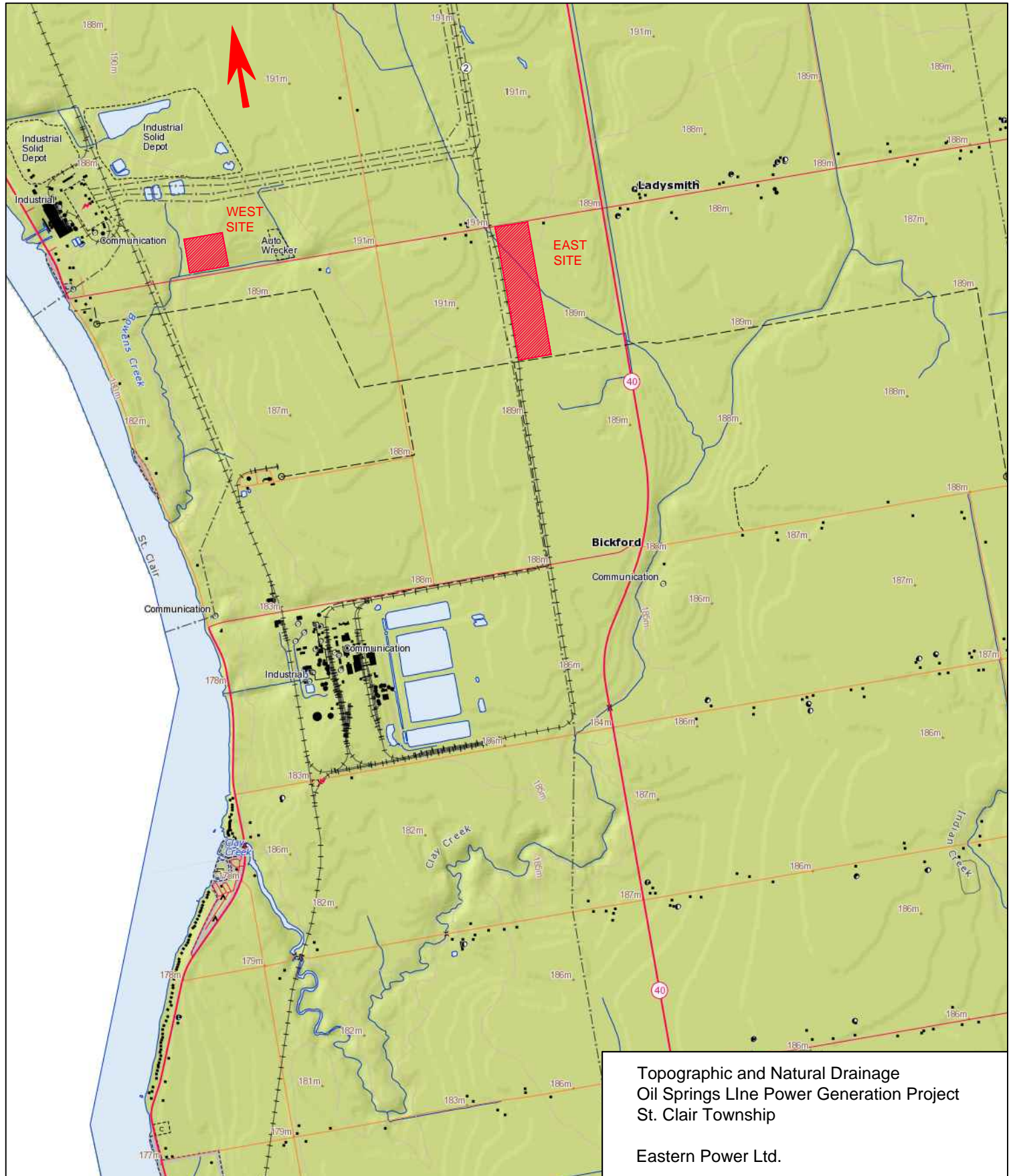
Tel: (905) 568-2929

Fax: (905) 568-1686

Email: erin.hellinga@amec.com

Attachment: Figure: Project Location Plan

c.c.: Jeff Balsdon, AMEC





September 10, 2012

Ministry of Natural Resources
615 John Street North
Aylmer, ON
N5H 2S8

Attention: Mr Ben Hindmarsh
Senior Fish & Wildlife Technical Specialist

**Re: Environmental Impact Study
Eastern Power Limited - New Natural Gas-fired Combined Cycle Electricity
Generating Facility
Oil Springs Line, St. Clair Township**

Dear Mr. Hindmarsh:

AMEC Environment & Infrastructure (AMEC) has been retained to undertake work on behalf of Eastern Power Limited on the above-noted Project to address both terrestrial and aquatic natural science issues. The Project involves the construction and operation of a new, clean, natural gas fuelled electricity generating plant which will facilitate the replacement of coal-fired power generation in Ontario.

There are two potential locations under review for this Project. Both of these potential Project Sites are on vacant industrial-zoned land, in an overall area that is designated for heavy industrial uses. Both sites have been used for agricultural purposes for many years. The Site locations and associated water features are as follows (see attached project location plan):

East Site: on the south side of Oil Springs Line, approximately 0.6 km west of Highway 40 and 0.9 km east of Greenfield Road. Government Drain No 10 bisects this Site, and drains to Clay Creek, which drains to St. Clair River.

West Site: on the north side of Oil Springs Line, approximately 1.3 km west of Highway 40. Bowens Creek runs just outside the west boundary of this Site, and Hawkins Drain flows between the Site and Oil Springs Line and drains to Bowens Creek near the southwest corner of the Site. Bowens Creek drains directly to St. Clair River.

AMEC has conducted a review of the Natural Heritage Information Centre and the St. Clair Region Conservation Authority has been contacted regarding natural heritage information available for the vicinity of the proposed Project Sites.

AMEC would like to take this opportunity to inquire if you hold any additional information specific to fish and fish habitat in these watersheds, such as:

- Waterbody type – thermal regime (e.g. cold water, warm water);
- Habitat information/locations;
- Fish species present (including species at risk information);

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Fax +1 (905) 568-1686
www.amec.com



- OMNR fisheries management objectives;
- OMNR interpretation of fish and fish habitat and sensitivity within the general area of the project Sites (high, moderate, low); and
- In water timing windows.

We are planning field reconnaissance for the week of September 10, 2012 to confirm existing data and to collect additional information. We are requesting a response as early as possible to aid in identifying any gaps in existing documentation in order to augment our scheduled field investigations. Equally, we would be pleased to know if you have any issues relating to the proposed development of this site that you would like to draw to our attention.

If you have any questions, please contact the undersigned. Thank you for your assistance in this matter.

Kind Regards,

A handwritten signature in blue ink, appearing to read "Tracy Wolowidnek", written over a light blue grid background.

Tracy Wolowidnek, B.Sc.
Environmental Scientist

**AMEC Earth and Environmental,
A division of AMEC Americas Limited**

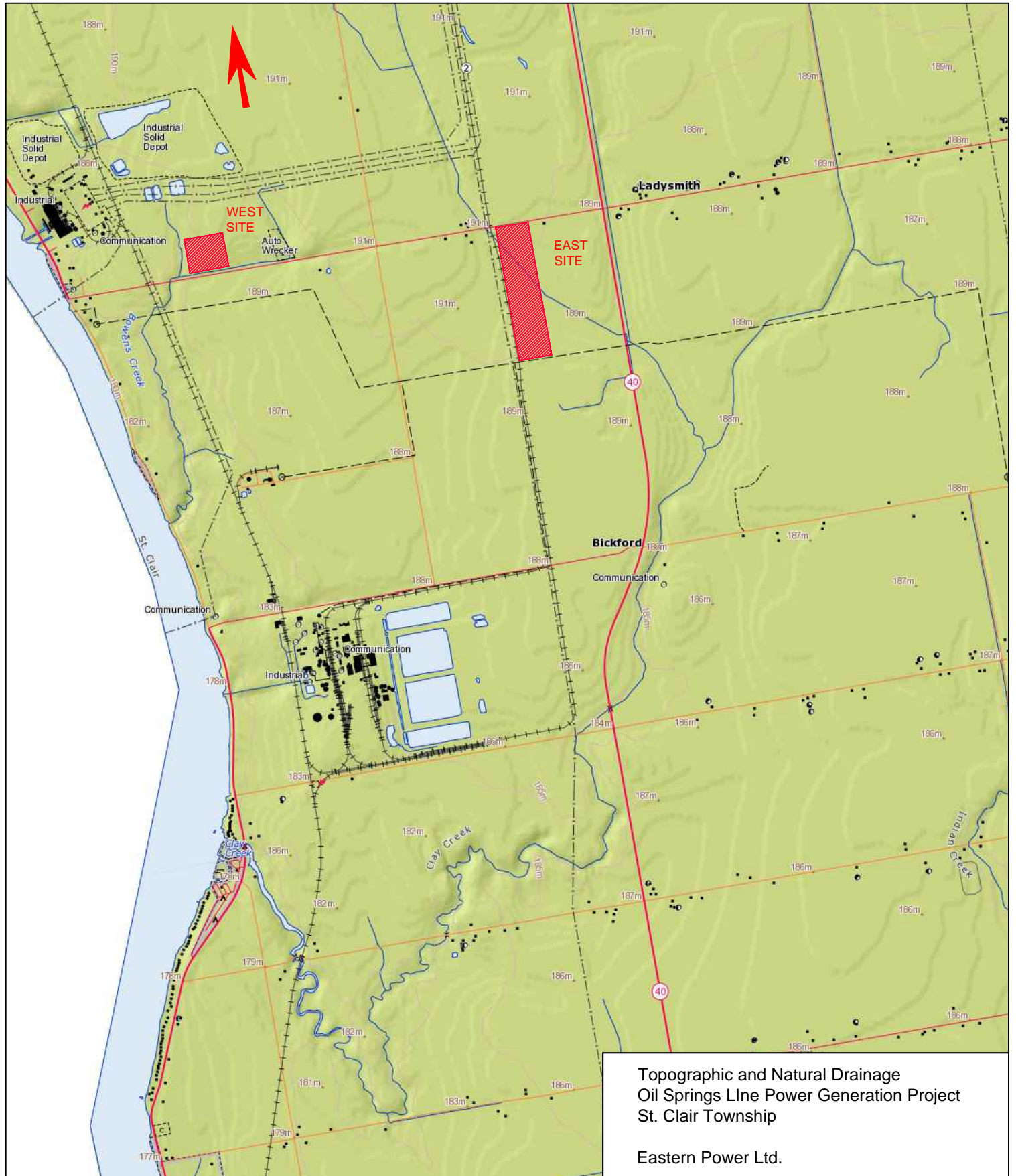
Tel: (905) 687-6616

Fax: (905) 687-6620

Email: tracy.wolowidnek@amec.com

Attachment: Figure: Project Location Plan

c.c.: Jason Dietrich, AMEC





September 6, 2012

Tanya Taylor
NHIC Information Analyst
300 Water Street, 2nd Floor, North Tower
P.O. Box 7000
Peterborough, ON K9J 8M5

Attention: Ms. Tanya Taylor

**Re: Environmental Impact Study
Eastern Power Limited - New Natural Gas-fired Combined Cycle Electricity
Generating Facility
Oil Springs Line, St. Clair Township**

AMEC Environment & Infrastructure (AMEC) has been retained to undertake work on behalf of Eastern Power Limited on the above-noted Project to address both terrestrial and aquatic natural science issues. The Project involves the construction and operation of a new, clean, natural gas fuelled electricity generating plant which will facilitate the replacement of coal-fired power generation in Ontario.

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West Site: on the north side of Oil Springs Line, approximately 1.3 km west of Highway 40 (see attached plan).

AMEC has conducted a review of the Natural Heritage Information Centre and the St. Clair Region Conservation Authority has been contacted regarding SAR in the vicinity of the proposed project sites.

AMEC would like to take this opportunity to inquire if you hold any additional information on these locations, such as:

- natural heritage features;
- wildlife and plant federal species at risk (SARA and COSEWIC);
- provincial species at risk (SARO); and
- any species with a provincial rank of S1-S3



We are planning field reconnaissance for the week of September 10, 2012 to confirm existing data and to collect additional detailed information. We are requesting a response as early as possible to aid in identifying any gaps in existing documentation in order to augment our scheduled field investigations. Equally, we would be pleased to know if you have any issues relating to the proposed development of this site that you would like to draw to our attention.

If you have any questions, please contact the undersigned. Thank you for your assistance in this matter.

Kind Regards,

A handwritten signature in black ink, reading "Erin Hellinga".

Erin Hellinga, B.Sc.
Environmental Technician

**AMEC Environment & Infrastructure,
A division of AMEC Americas Limited**

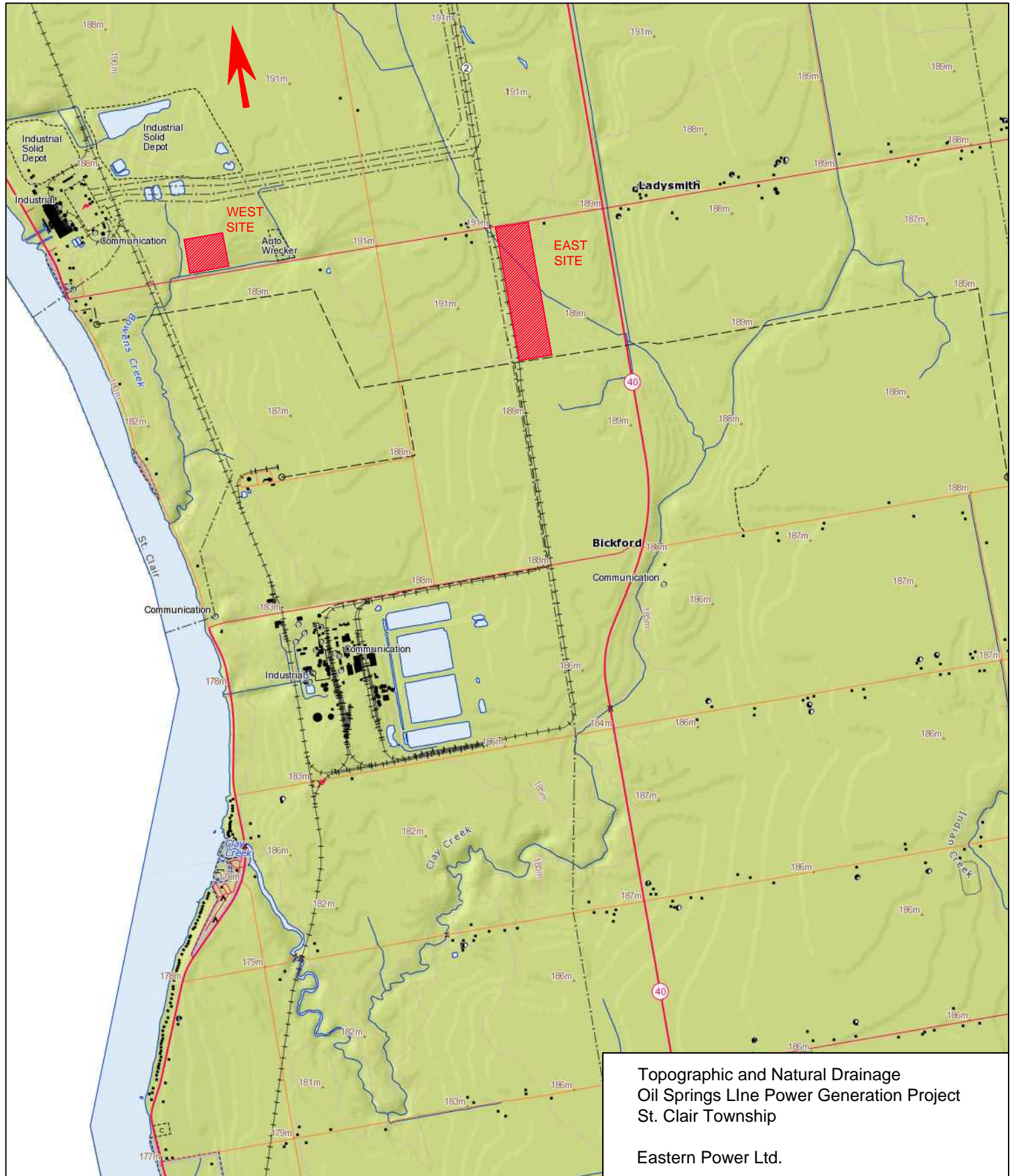
Tel: (905) 568-2929

Fax: (905) 568-1686

Email: erin.hellinga@amec.com

Attachment: Figure: Project Location Plan

c.c.: Jeff Balsdon, AMEC



Hellinga, Erin

From: Chris Durand [cdurand@scrca.on.ca]
Sent: Thursday, September 06, 2012 9:55 AM
To: Wolowidnek, Tracy
Cc: Michelle Fletcher
Subject: FW: Information Request

Hi Tracy, I was forwarded your request from Michelle Fletcher...

The SCRCA acknowledges your request for information for the Eastern Power project but unfortunately, much of what you are requesting is either not in our possession or simply does not exist. Please see below my comments on the data you are looking for.

- new or updated aquatic fish habitat mapping or classifications, - **DFO Drain classification map**
- new or updated fish community data, - fish community data... **we have 1 e-fish site on Clay Creek**
- SAR location information; and – **please refer to the MNR/NHIC**
- terrestrial ELC (preference for shapefile access). – **no ELC mapping exists for this study area**

As with all requests for background information for EA's, if you wish the SCRCA to undertake a search and retrieval of all datasets (ie. regulated areas, natural heritage features, sampling locations (fish, benthic, water quality)) that may be available for your study area, our fee for service as approved by our Board of Directors is listed below:

Technical Report Review and/or Background Data Collection (*plus applicable taxes)		
Report Review and Background Data Collection		
Minor (scoped, small area, potential low impact)		
a)	Provision of Background Information	\$300.00
b)	Report Review – detailed review and provision of comments for Final Reports ie. scoped EIS, geotech, coastal	\$300.00
Major (large study area, potential high impact) **		
a)	Provision of Background Information	\$500.00-\$1000.00
b)	Report Review – detailed review and provision of comments for Final Reports ie. Comprehensive EIS, floodline, coastal fully developed dynamic beach)	\$500.00-\$1000.00
**Authority staff reserve the right to charge technical report review fees over the above noted fees for complex projects or reports covering one or more issues. Costs will be related to multiple technical report reviews, multiple meetings, etc Director and GM to approve fee.		

If you wish the SCRCA to proceed in retrieval and provision of this information, please forward the fee with your request. Please allow up to 2 weeks for a response.

If you have any questions, please do not hesitate to contact me.

Regards,

Chris Durand, IT / GIS Specialist

St. Clair Region Conservation Authority
 205 Mill Pond Cres., Strathroy, ON N7G 3P9
 Tel.: 519-245-3710 Fax.: 519-245-3348

Attention:

Privileged/Confidential Information may be contained in this message. Disclosure to any person other than the named recipient is unauthorized. If you are not the intended recipient, please delete all copies of this information and kindly notify the sender by reply email. Opinions, conclusions and other information in this message that do not relate to the official business of the SCRCa shall be understood as neither given nor endorsed by it. The SCRCa reserves the right to monitor all e-mail communications through its networks. Thank you.

From: Wolowidnek, Tracy [<mailto:tracy.shute@amec.com>]
Sent: September-05-12 4:41 PM
To: mfletcher@scrc.ca
Subject: Information Request

Hi Michelle:

Please find attached an information request for an Environmental Impact Study AMEC is preparing for a new natural gas-fired combined cycle electricity generating facility, proposed for one of two sites on Oil Springs Line, in St. Clair Township.

AMEC is completing the natural heritage component of the EA for this project on behalf of Eastern Power. We have been given very short deadlines for this project, and anticipate a field visit early next week followed by completion of a draft report (Eastern Power) late next week. As such we would greatly appreciate your earliest response to this request. I have already obtained a copy of the St. Clair River Tributaries Watershed Plan from your website, and am just looking for any additional/updated information that may be available.

Please let me know if you have any questions or require any further information on this project.

Thank you,

Tracy Wolowidnek, B.Sc.
Environmental Scientist
AMEC

Environment & Infrastructure
3300 Merrittville Hwy, Unit 5, Thorold, Ontario L2V 4Y6 Canada
Tel (905) 687-6616, fax (905) 687-6620
Mobile/cell (905) 380-3699
tracy.wolowidnek@amec.com
amec.com

Business sustainability starts here... AMEC is committed to reducing its carbon footprint.

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.

Wolowidnek, Tracy

From: Nelson, Michael (MNR) [Michael.Nelson@ontario.ca]
Sent: Thursday, September 13, 2012 2:24 PM
To: Wolowidnek, Tracy
Cc: McCloskey, Amanda (MNR); Dietrich, Jason P; Walker, Korey (MNR)
Subject: RE: Information Request
Attachments: 2012-09-12 Fisheries Background Request.doc

Hello Tracy,

Please find attached the fisheries background request. Please note that Amanda McCloskey, Aylmer District Planner, should be used as a point person for contacting the District with any planning related matters.

Michael Nelson
Ministry of Natural Resources
Tel: 519-354-8210

From: Wolowidnek, Tracy [<mailto:tracy.shute@amec.com>]
Sent: Wednesday, September 12, 2012 2:13 PM
To: Nelson, Michael (MNR)
Cc: Hindmarsh, Ben (MNR); Dietrich, Jason P
Subject: RE: Information Request

Hello Mike;

Just to follow-up on the voicemail I left you a few minutes ago, we would really appreciate any information you could provide us for the proposed project sites detailed in the attached information request. We apologize for asking for this with such short notice; we would really like to have as much background information as possible in order to complete our report. If you require any further information, please let me know.

I can be reached by cell phone at 905-380-3699 or by email.

Thanks in advance,

Tracy Wolowidnek, B.Sc.
Environmental Scientist
AMEC
Environment & Infrastructure
3300 Merrittville Hwy, Unit 5, Thorold, Ontario L2V 4Y6 Canada
Tel (905) 687-6616, fax (905) 687-6620
Mobile/cell (905) 380-3699
tracy.wolowidnek@amec.com
amec.com

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From: Hindmarsh, Ben (MNR) [<mailto:Ben.Hindmarsh@ontario.ca>]
Sent: Monday, September 10, 2012 8:13 AM
To: Wolowidnek, Tracy; Nelson, Michael (MNR)
Subject: FW: Information Request

Hello Tracy,

Lambton County is handled by our Chatham area office. By copy, I'll ask Mike Nelson to respond.

Thanks,
Ben Hindmarsh

Ben Hindmarsh
Sr. Fish and Wildlife Technical Specialist
Ministry of Natural Resources
615 John St. N.

From: Wolowidnek, Tracy [<mailto:tracy.shute@amec.com>]
Sent: September 9, 2012 9:51 AM
To: Hindmarsh, Ben (MNR)
Cc: Dietrich, Jason P
Subject: Information Request

Hello Ben;

Please find attached a fish and fish habitat information request for an Environmental Impact Study AMEC is preparing for a new natural gas-fired combined cycle electricity generating facility, proposed for one of two sites on Oil Springs Line, in St. Clair Township.

AMEC is completing the natural heritage component of the EA for this project on behalf of Eastern Power. We have been given very short deadlines for this project, and anticipate a field visit early during the week of September 10th followed by completion of a draft report (Eastern Power) later in the week. As such we would greatly appreciate your earliest response to this request. I will follow up with you by phone early in the week to discuss this request.

Please let me know if you have any questions or require any further information on this project.

Thank you,

Tracy Wolowidnek, B.Sc.
Environmental Scientist
AMEC

Environment & Infrastructure
3300 Merrittville Hwy, Unit 5, Thorold, Ontario L2V 4Y6 Canada
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If you receive this e-mail in error, please notify the sender by reply e-mail and delete and destroy the message.

Project Title
Environmental Impact Study
Eastern Power Limited - New Natural Gas-fired Combined Cycle Electricity
Generating Facility
Oil Springs Line, St. Clair Township

MNR Reviewer: Michael Nelson, Chatham Area Office

Date Review Completed: September 12, 2012

Waterbody Name and location (GPS coordinates & Google Earth map)	Watercourse classification (i.e. warmwater, coldwater)	Habitat information/ locations (fish passage barriers, known spawning habitats etc.)	Historical data on fish species present, including whether the subject waterbody(s) at the Highway 401/40 Interchange are considered to support any vulnerable, threatened or endangered aquatic species	MNR fisheries management objectives, if applicable	MNR interpretation of fish and fish habitat sensitivity (scale of high, moderate, low or unknown as per DFO's Risk Management Framework)	In-water timing windows for construction
Clay Creek	Warmwater	None known	brown bullhead, white sucker, common carp, green sunfish, bluegill, common shiner, spottail shiner, tadpole madtom, fathead minnow, black crappie, central mudminnow, pumpkinseed, freshwater drum.		Low	March 15 to June 30
Bowen's Creek	Warmwater	None known	rock bass, mottled sculpin, pumpkinseed, bluegill, smallmouth bass, white perch, emerald shiner, spottail shiner, spotfin shiner, rainbow smelt, yellow perch, fathead minnow, creek chub, brook silverside.		Low	March 15 to June 30

Hellinga, Erin

From: McCloskey, Amanda (MNR) [Amanda.McCloskey@ontario.ca]
Sent: Friday, September 21, 2012 1:14 PM
To: hvogt@easternpower.on.ca; Hellinga, Erin; Wolowidnek, Tracy
Cc: Walker, Korey (MNR); Nelson, Michael (MNR); Jong, Catherine (MNR); McCloskey, Amanda (MNR); Emery, Mark (MNR)
Subject: Notice of Commencement of Environmental Screening and Review and Information Request
Attachments: MNR Alymer information request.pdf; FW: Information Request; 2012-09-12 Fisheries Background Request.doc

Hi Erin, Tracy and Monika,

Thank you for your Notice of Commencement of Environmental Screening and Environmental Review and requests for information for a proposed natural gas fuelled electricity generating facility in St. Clair Township. The MNR understand that this project is subject to the Ontario Ministry of Environment's environmental assessment requirements for electricity projects. We also understand that there are two potential locations under review for this Project.

- East Site: on the south side of Oil Springs Line, approximately 0.6 km west of Highway 40 and 0.9 km east of Greenfield Road. Government Drain No 10 bisects this Site, and drains to Clay Creek, which drains to St. Clair River.
- West Site: on the north side of Oil Springs Line, approximately 1.3 km west of Highway 40. Bowens Creek runs just outside the west boundary of this Site, and Hawkins Drain flows between the Site and Oil Springs Line and drains to Bowens Creek near the southwest corner of the Site. Bowens Creek drains directly to St. Clair River.

The MNR has reviewed both sites and would like to provide the following information.

Species at Risk

The Species at Risk in Ontario (SARO) List is Ontario Regulation 230/08 issued under the *Endangered Species Act, 2007*. The *Endangered Species Act, 2007* (ESA) came into force on June 30, 2008 and provides both individual protection (section 9) and habitat protection (section 10) to species listed as endangered or threatened on the SARO List. The current SARO List, issued under the ESA 2007, can be found on e-laws (<http://www.e-laws.gov.on.ca/navigation?file=home&lang=en>). If an activity or project will result in adverse effects to species and/or habitat protected under the ESA, an authorization under the ESA would be required to avoid contravening the act. Please note that authorizations are not guaranteed and that the review timelines for Authorization Request Packages can be several months. Site-specific investigation within and adjacent to the study area may find additional species and/or habitat location on or adjacent to the site.

An initial ESA Screening has been completed and there are several known occurrences of Species at Risk in area.

General (both sites):

- There is a known occurrence of Butler's Gartersnake along Greenfield Road between the 2 sites. The species is known to occur in the general area, therefore it has the potential to occur on the subject lands. Butler's Gartersnake is an endangered species that receives both species and habitat protection under the ESA 2007.

- Given the presence of PSW and ANSI in adjacent lands, there is also the potential for turtle SAR to be present, especially Blanding's Turtle.

West Site

- At least half of the property is within the top two abundance categories for Bobolink, which means that any suitable habitat present must be protected from damage or destruction. Bobolink is a threatened species with both species and habitat protection under the ESA 2007.
- There are known occurrences of Barn Swallow within 1 km of the property, which is a threatened species that receives both species and habitat protection.

East Site

- At least half of the property is within the top two abundance categories for Bobolink, which means that any suitable habitat present must be protected from damage or destruction. Bobolink is a threatened species with both species and habitat protection under the ESA 2007.
- The area is within regulated habitat for Eastern Foxsnake (Carolinian population) and there are known occurrences in an adjacent properties, which means any suitable habitat present must be protected from damage and destruction. Eastern Foxsnake is an endangered species with both species and habitat protection under the ESA 2007.

It should be noted that this is an initial project screening for SAR and the absence of an element occurrence does not indicate the absence of species. The province has not been surveyed comprehensively for the presence or absence of SAR, and MNR data relies on observers to report sightings of SAR. Consequently, the presence of element occurrences is useful to flag the presence of SAR within the project location and surrounding area, but is not an appropriate tool to determine whether a species or habitat is present at the local (property-scale) level.

It is important to note that changes may occur in both species and habitat protection which could affect whether proposed projects may have adverse effects of SAR. The ESA applies to species listed on the SARO List (www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/246809.html). The Committee on the Status of Species in Ontario (COSSARO) meets regularly to evaluate species for listing and / or re-evaluate species already listed. As a result, species designations may change, which could in turn change the level of protection they receive under the ESA. Also, habitat protection provisions for a species may change (i.e. if a species-specific habitat regulation comes into effect). The regulation would prescribe the area as the habitat of the species.

Provincially Significant Wetlands

The Bickford Oak Woods Provincially Significant Wetland Complex could be on the subject lands or within the adjacent lands of the East Site however it is hard to tell based on the scale of the mapping provided. Please let me know if you would like a copy of the Bickford Oak Woods, wetland evaluation file.

Significant wildlife habitat

Significant wildlife habitat may be present on the subject lands. Please consult the *Significant Wildlife Habitat Technical Guide*, (OMNR, 2000). Significant wildlife habitat is identified by planning authorities using the criteria and processes recommend in the Significant Wildlife Habitat Technical Guide (OMNR, 2000). Link to

the guide: http://www.mnr.gov.on.ca/en/Business/FW/Publication/MNR_E001285P.html The Natural Heritage Reference Manual (please see below) also provides guidance in section 9.0.

ANSI

The Clay Creek Woodland Regionally Significant Area of Natural and Scientific Interest is either on the subject lands or within the adjacent lands to the East Site, based on the scale of the mapping provided it is difficult to determine.

Fisheries

Please find attached the fisheries background request.

Petroleum Well

Please note that our records show a number of known petroleum wells in the area. It appears as though there is an abandoned (plugged) well on or adjacent to the East Site. Additional well information may be obtained from the Ontario Oil, Gas and Salt Resources Library website www.ogsrlibrary.com. It is recommended that the definitions and terminology guides on the website be referenced in order to understand the petroleum well data and any implications it may have with respect to development on the site. Building structures directly on top of abandoned (plugged) wells is not recommended as they may still pose potential hazards.

The proponent should be advised that MNR can not guarantee the accuracy of the data in these records as some of the information is historical and may be inaccurate or incomplete. Also, please note that the wells retrieved in this search reflect only known wells. Other wells may exist in the project area for which we do not have a record.

Please Note for future requests:

We ask that proponents/ consultants visit the Natural Heritage Information Centre (NHIC) Biodiversity Explorer and Land Information Ontario to gather natural heritage information on the site of interest prior to submitting a request an information through MNR. In future submissions to the district, please provide with the results of your search efforts/ the information obtained from NHIC and LIO, as well as, information on the following, a description of the location of the proposed project (including a map), a description of the project and what it entails, expected timelines associated with the project and identify what planning process you are in. We will review the information provided and MNR will provide any additional information we may have at the district.

Natural Heritage Information Centre (NHIC) compiles, maintains and distributes information on species at risk, natural species, plant communities and spaces of conservation concern in Ontario. This information is stored in a spatial database used for tracking this information and can be located:

<http://nhic.mnr.gov.on.ca/nhic.cfm> This is a web-based GIS map function, that you can use to zoom in on the subject lands and download recorded information. NHIC is not complete, as data always exists outside of databases, but it gives an idea of where to start.

Land Information Ontario (LIO) manages geographic information for use in maps and Geographic Information Systems (GIS). LIO has a web-accessible data warehouse that contains more than 250 different layers of geographic data. The data ranges from the location of underground wells to satellite imagery. LIO can be reached at (705) 755-1878. You can also access the general user version online at:

<http://www.mnr.gov.on.ca/en/Business/LIO/index.html>

Also in the future if you are requesting general natural heritage information or specific SAR information but the project is related to a planning file please send the information request directly to me. If the request is SAR specific and not tied to a planning file please use the ESAScreeningRequest.AylmerDistrict@ontario.ca.

If you have any questions regarding the information provided above please let me know.

Thanks,

Amanda McCloskey
District Planner



APPENDIX D

DFO OPERATIONAL STATEMENTS

TIMING WINDOWS

Fisheries and Oceans Canada
Ontario Operational Statement

Version 1.0

ONTARIO IN-WATER CONSTRUCTION TIMING WINDOW GUIDELINES FOR THE PROTECTION OF FISH AND FISH HABITAT

Restricted activity timing windows are just one of many measures used to protect fish and fish habitat when carrying out a work or undertaking in or around water. Be sure to follow all of the measures outlined in the Operational Statements to avoid negative impacts to fish habitat.

Restricted activity timing windows are applied to protect fish from impacts of works or undertakings in and around water during spawning migrations and other critical life history stages. In Ontario, the Ministry of Natural Resources (MNR) has the responsibility for setting timing window guidelines. These guidelines are determined on a case by case basis according to the species of fish in the water body, whether those fish spawn in the spring or fall, and whether the water body is located in the Northwest, Northeast or Southern Region of Ontario.

The timing windows in Table 1 identify periods when **no** in-water work is allowed, except with permission (see measure #5) and the implementation of protective measures.

Note that the restricted activity timing windows below only apply to projects completed using an Operational Statement.

Timing windows identified on Conservation Authority permits, MNR work permits or DFO *Fisheries Act* authorizations may differ and take precedence.

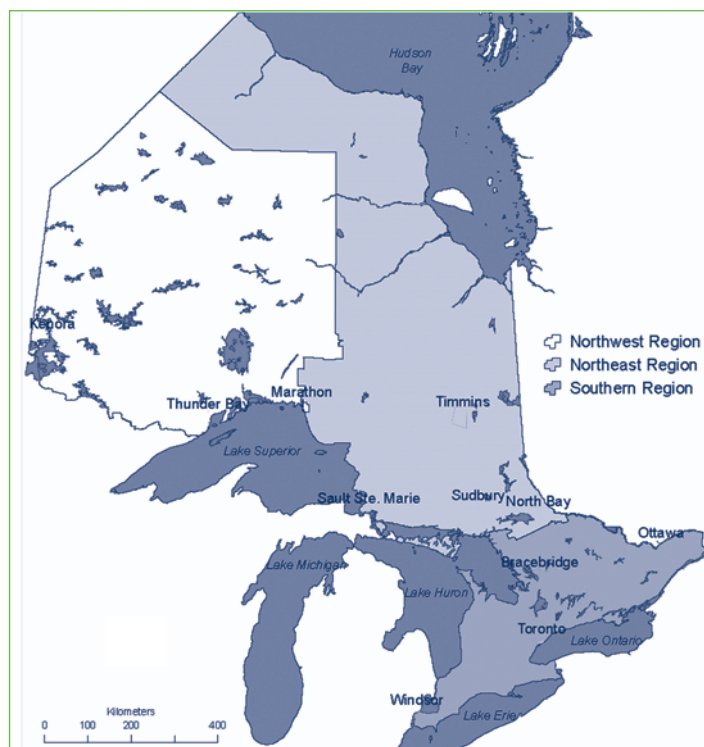


Figure 1:
Ontario's Northwest, Northeast and Southern Region boundaries for determining application of restricted activity timing windows.

How To Determine Timing Windows

1. Determine the fish species living in the water body where you wish to do work. Consult your Ontario Ministry of Natural Resources, Conservation Authority, Parks Canada (if the project is located within an area under its jurisdiction, including the Trent-Severn Waterway and Rideau Canal), or Fisheries and Oceans Canada (DFO) office.
2. Determine if the water body is located in the Northwest, Northeast or Southern Region of Ontario according to Figure 1.
3. Use Table 1 to determine the in-water restricted activity timing windows according to the location of the waterbody and all of the species of fish found within that waterbody (spring or fall spawners).
4. For water bodies with more than one species, the most restrictive timing windows should be combined for all species present (e.g. for a water body with both walleye and bass in Southern Region, the combined timing window should be: Mar. 15 to July 15).
5. If the intended work cannot be conducted outside of the timing windows below, please contact your local Conservation Authority, DFO or Parks Canada office (if the project is located within an area under its jurisdiction), as appropriate, for other options.

Table 1:

Restricted Activity timing windows for the protection of spawning fish and developing eggs and fry. Dates represent the period of time when NO in-water work should occur. Regional boundaries are shown in Figure 1.

Spawning Period	Fish Species	Northwest Region	Northeast Region	Southern Region
Spring	Walleye Northern Pike Lake Sturgeon Muskellunge Large/Smallmouth Bass Rainbow Trout Other/Unknown Spring Spawning Species	Apr. 1 to June 20 Apr. 1 to June 15 May 1 to June 30 May 1 to July 15 May 15 to July 15 Apr. 1 to June 15 Apr. 1 to June 15	Apr. 1 to June 20 Apr. 1 to June 15 May 1 to July 15 May 15 to July 15 May 15 to July 15 Apr. 1 to June 15 Apr. 1 to June 15	Mar. 15 to May 31 Mar. 15 to May 31 May 1 to June 30 Mar. 15 to May 31 May 1 to July 15 Mar. 15 to June 15 Mar. 15 to July 15
Fall	Lake Trout Brook Trout Pacific Salmon Lake Whitefish Lake Herring Other/Unknown Fall Spawning Species	Sept. 1 to May 31 Sept. 1 to June 15 Sept. 1 to June 15 Sept. 15 to May 31 Oct. 1 to May 31 Sept. 1 to June 15	Sept. 1 to May 31 Sept. 1 to June 15 Sept. 1 to June 15 Sept. 15 to May 15 Oct. 1 to May 31 Sept. 1 to June 15	Oct. 1 to May 31 Oct. 1 to May 31 Sept. 15 to May 31 Oct. 15 to May 31 Oct. 15 to May 31 Oct. 1 to May 31

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http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_f.asp

DFO/2007-1329

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CULVERT MAINTENANCE

Fisheries and Oceans Canada Ontario Operational Statement

Version 3.0

Culvert maintenance is undertaken to extend the life of the structure and to ensure that it functions as designed, thus ensuring public safety and safe fish passage. Culvert maintenance includes the removal of accumulated debris (e.g., logs, boulders, garbage, ice build-up) that prevents the efficient passage of water and fish through the structure. Culvert maintenance may also include the reinforcement of eroding inlets and outlets, but does not include the replacement of damaged or destroyed bevel ends. Culverts requiring regular maintenance should be considered for future remediation via redesign or reinstallation.

Culvert maintenance activities can affect fish and fish habitat by the removal of woody debris that is important for cover and food production, by causing flooding and excessive stream scouring if blockages are removed too quickly, excessive erosion and sedimentation from the use of equipment along the stream bank, and disruption of critical fish life stages. Replacement of eroded rock armouring can alter flows and fish movement patterns if done excessively.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your culvert maintenance project without a DFO review when you meet the following conditions:

- the work does not include realigning the watercourse, installing a culvert liner or support struts, replacing damaged or destroyed bevels ends, or extending/replacing the existing culvert,
- explosives are not used to remove debris,
- the work does not include any dredging, infilling (e.g., filling scour pools) or excavation of the channel upstream or downstream of the culvert, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Maintaining Culverts* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO

office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*. For activities carried out under the *Crown Forest Sustainability Act*, the requirements of this Operational Statement are addressed through an existing agreement and the Ontario Ministry of Natural Resources is the first point of contact.

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (www.sararegistry.gc.ca). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Maintaining Culverts

1. Use existing trails, roads, or cut lines wherever possible to avoid disturbance to the riparian vegetation.
2. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be required. This removal should be kept to a minimum.
3. Unless accumulated material (i.e., branches, stumps, other woody materials, garbage, ice build-up, etc.) is preventing the passage of water and/or fish through the structure, time material and debris removal to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*). Any proposal to conduct such work under ice-covered conditions, with the exception of ice build-up removal, requires prior review by your Conservation Authority, DFO, or Parks Canada office, as appropriate.
4. Emergency debris removal using hand tools or machinery (e.g., backhoe) can be carried out at any time of year. Emergencies include situations where carrying out the project

immediately is in the interest of preventing damage to property or the environment, or is in the interest of public health or safety. Your local Conservation Authority, DFO, or Parks Canada office, as appropriate, is to be notified immediately. **You should follow all other measures to the greatest extent possible.**

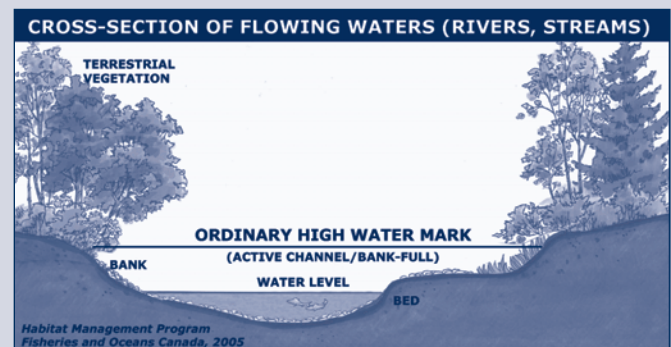
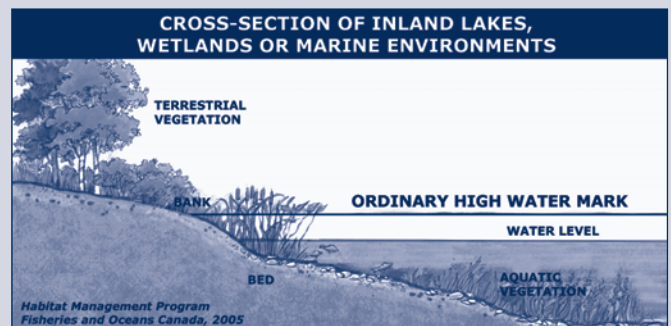
5. Install effective sediment and erosion control measures before starting work to prevent sediment from entering the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
6. Limit the removal of accumulated material (i.e., branches, stumps, other woody materials, garbage, etc.) to the area within the culvert, immediately upstream of the culvert and to that which is necessary to maintain culvert function and fish passage.
7. Remove accumulated material and debris slowly to allow clean water to pass, to prevent downstream flooding and reduce the amount of sediment-laden water going downstream. Gradual dewatering will also reduce the potential for stranding fish in upstream areas.
 - 7.1. A separate Operational Statement exists for the removal of beaver dams and associated debris and it applies to dams that are not directly connected or immediately adjacent to the culvert structure.
8. Operate machinery on land (from outside of the water) and in a manner that minimizes disturbance to the banks of the watercourse.
 - 8.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
 - 8.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
 - 8.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
 - 8.4. Restore banks to original condition if any disturbance occurs.
9. If replacement rock reinforcement/armouring is required to stabilize eroding inlets and outlets, the following measures should be incorporated:
 - 9.1. Place appropriately-sized, clean rocks into the eroding area.
 - 9.2. Do not obtain rocks from below the ordinary high water mark (see definition below) of any water body.
 - 9.3. Avoid the use of rock that is acid-generating. Also avoid the use of rock that fractures and breaks down quickly when exposed to the elements.
 - 9.4. Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment.
 - 9.5. Ensure rock does not interfere with fish passage or constrict the channel width.
 - 9.6. If any in-water work is involved, adhere to fisheries timing windows, as outlined in Measure 3 above.

10. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
11. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
 - 11.1. Maintain effective sediment and erosion control measures until re-vegetation of the disturbed areas is achieved.

Definition:

Ordinary high water mark – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the “active channel/bank-full level” which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO's *Fish Habitat and Determining the High Water Mark on Lakes*.



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OVERHEAD LINE CONSTRUCTION

Fisheries and Oceans Canada
Ontario Operational Statement

Version 3.0

Overhead lines are constructed for electrical or telecommunication transmission across many watercourses that range in size from small streams and ponds to large rivers, lakes and reservoirs. This Operational Statement applies to selective removal of vegetation along the right-of-way to provide for installation and safe operation of overhead lines, and passage of equipment and materials across the water body.

Although fish habitat occurs throughout a water system, it is the riparian habitat that is most sensitive to overhead line construction. Riparian vegetation occurs adjacent to the watercourse and directly contributes to fish habitat by providing shade, cover, and spawning and food production areas. It is important to design and build your overhead line project to meet your needs while also protecting riparian areas. Potential impacts to fish and fish habitat include excessive loss of riparian vegetation, erosion and sedimentation resulting from bank disturbance and loss of plant root systems, rutting and compaction of stream substrate at crossing sites, and disruption of sensitive fish life stages.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your overhead line project without a DFO review when you meet the following conditions:

- it does not require the construction or placement of any temporary or permanent structures (e.g. islands, poles, crib works, etc.) below the ordinary high water mark (HWM) (see definition below), and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Constructing Overhead Lines* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case,

you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (www.sararegistry.gc.ca). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Constructing Overhead Lines

1. Installing overhead lines under frozen conditions is preferable in all situations. On wet terrains (e.g., bogs), lines should be installed under frozen conditions, where possible, or using aerial methods (i.e., helicopter).
2. Design and construct approaches so that they are perpendicular to the watercourse wherever possible to minimize loss or disturbance to riparian vegetation.
3. Avoid building structures on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in erosion and scouring of the stream bed or overhead line structures.
 - 3.1. Wherever possible, locate all temporary or permanent structures, such as poles, sufficiently above the HWM to prevent erosion.
4. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to accommodate the overhead line. This removal

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

5. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing Operational Statement* is also available.

- 5.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
- 5.2. Grading of the stream banks for the approaches should not occur.
- 5.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
- 5.4. Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
- 5.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

6. Operate machinery on land and in a manner that minimizes disturbance to the banks of the watercourse.

- 6.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
- 6.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
- 6.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
- 6.4. Restore banks to original condition if any disturbance occurs.

7. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

- 7.1. Avoid work during wet, rainy conditions or use alternative techniques such as aerial methods (i.e., helicopter) to install overhead lines.

8. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.

9. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g.,

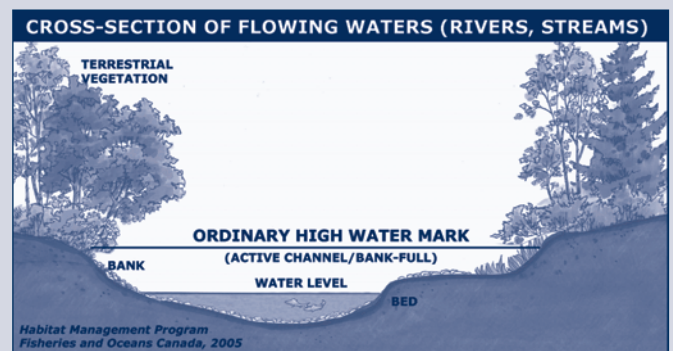
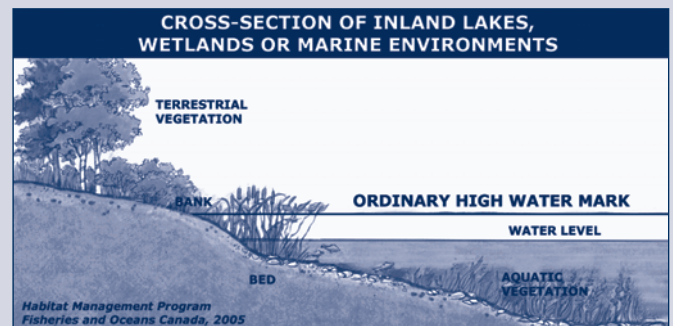
cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

- 9.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

Ordinary high water mark (HWM) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the “active channel/bank-full level” which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

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ISOLATED OR DRY OPEN-CUT STREAM CROSSINGS

Fisheries and Oceans Canada
Ontario Operational Statement

Version 1.0

For the purpose of this Operational Statement, the term “Isolated Crossing” means a temporary stream crossing technique that allows work (e.g., trenched pipeline or cable installation) to be carried out “in-the-dry” while diverting the natural flow around the site during construction. These types of open trenched crossings are isolated using flume or dam and pump techniques (see *Pipeline Associated Watercrossings*, 2005 at http://www.capp.ca/default.asp?V_DOC_ID=763&PubID=96717).

The term “Dry Open-cut Stream Crossing” means a temporary stream crossing work (e.g., trenched pipeline or cable installation) that is carried out during a period when the entire stream width is seasonally dry or is frozen to the bottom.

The risks to fish and fish habitat associated with isolated open cut stream crossings include the potential for direct damage to substrates, release of excessive sediments, loss of riparian habitat, stranding of fish in dewatered areas, impingement/entrapment of fish at pump intakes, and disruption of essential fish movement patterns. Similarly, dry open-cut stream crossings pose a risk to fish and fish habitat due to potential harmful alteration of substrates, loss of riparian habitat, and release of excessive sediment once stream flows resume.

The order of preference for carrying out a cable or pipeline stream crossing, in order to protect fish and fish habitat, is: a) punch or bore crossing (see *Punch & Bore Crossings* Operational Statement); b) high-pressure directional drill crossing (see *High-Pressure Directional Drilling* Operational Statement); c) dry open-cut crossing; and d) isolated open-cut crossing. This order must be balanced with practical considerations at the site.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your isolated or dry open-cut stream crossing project without a DFO review when you meet the following conditions:

- if working within the Thames River, Sydenham River, Ausable River, Grand River, or Maitland River, you have contacted your Conservation Authority or local DFO Office (see Ontario

DFO office list) to ensure that your project will not impact Schedule I mussel species at risk under the federal *Species at Risk Act* (SARA), before proceeding,

- for dry, open-cut crossings the watercourse is dry or frozen completely to the bottom at the site,
- for isolated crossings, the channel width of the watercourse at the crossing site is less than 5 meters from ordinary high water mark to ordinary high water mark (HWM) (see definition below),
- the isolated crossing does not involve the construction or use of an off-stream diversion channel, or the use of earthen dams,
- the isolated crossing ensures that all natural upstream flows are conveyed downstream during construction, with no change in quality or quantity,
- the site does not occur at a stream location involving known fish spawning habitat, particularly if it is dependent on groundwater upwelling,
- the use of explosives is not required to complete the crossing, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated or Dry Open-cut Stream Crossing* listed below.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial and federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with SARA (www.sararegistry.gc.ca). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending the Ontario Operational Statement notification form (www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/index_e.htm) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated or Dry Open-Cut Stream Crossing

1. Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.
2. Locate crossings at straight sections of the stream, perpendicular to the banks, whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in the erosion and scouring of the stream bed.
3. Complete the crossing in a manner that minimizes the duration of instream work.
4. Construction should be avoided during unusually wet, rainy or winter thaw conditions.
5. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the utility right-of-way.
6. Machinery fording a flowing watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and is to occur only if an existing crossing at another location is not available or practical to use. Operational Statements are also available for *Ice Bridges and Snow Fills*, *Clear-Span Bridges*, and *Temporary Stream Crossing*.
 - 6.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
 - 6.2. Grading of the stream banks for the approaches should not occur.
 - 6.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
 - 6.4. Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
 - 6.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.
7. Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.
 - 7.1. Protect entrances at machinery access points (e.g., using swamp mats) and establish single site entry and exit.
 - 7.2. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.

- 7.3. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent deleterious substances from entering the water.
- 7.4. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
8. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
9. Stabilize any waste materials removed from the work site, above the HWM, to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
10. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
 - 10.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated Crossing

Temporary isolation is used to allow work “in-the-dry” while maintaining the natural downstream flow by installing dams up and downstream of the site and conveying all of the natural upstream flow into a flume, or pumping it around the isolated area. In addition to measures 1 to 10, the following measures should be carried out when conducting an isolated stream crossing:

11. Time isolated crossings to protect sensitive fish life stages by adhering to fisheries timing windows (see Measure 6.4).
12. Use dams made of non-earthen material, such as water-inflated portable dams, pea gravel bags, concrete blocks, steel or wood wall, clean rock, sheet pile or other appropriate designs, to separate the dewatered work site from flowing water.
 - 12.1. If granular material is used to build dams, use clean or washed material that is adequately sized (i.e., moderately sized rock and not sand or gravel) to withstand anticipated flows during the construction. If necessary, line the outside face of dams with heavy poly-plastic to make them impermeable to water. Material to build these dams should not be taken from below the HWM of any water body.
 - 12.2. Design dams to accommodate any expected high flows of the watercourse during the construction period.

13. Before dewatering, rescue any fish from within the isolated area and return them safely immediately downstream of the worksite.

13.1. You will require a permit from DFO to relocate any aquatic species that are listed as either endangered or threatened under SARA. Please contact your Conservation Authority or the DFO office in your area to determine if an aquatic species at risk is in the vicinity of your project and, if appropriate, use the DFO website at www.dfo-mpo.gc.ca/species-especies/permits/sarapermits_e.asp to apply for a permit.

14. Pump sediment laden dewatering discharge into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering any water body.
15. Remove accumulated sediment and excess spoil from the isolated area before removing dams.
16. Stabilize the **streambed** and restore the original channel shape, bottom gradient and substrate to pre-construction condition before removing dams.
17. Ensure **banks** are stabilized, restored to original shape, adequately protected from erosion and re-vegetated, preferably with native species.
18. If rock is used to stabilize banks, it should be clean, free of fine materials, and of sufficient size to resist displacement during peak flood events. The rock should be placed at the original stream bank grade to ensure there is no infilling or narrowing of the watercourse.
19. Gradually remove the downstream dam first, to equalize water levels inside and outside of the isolated area and to allow suspended sediments to settle.
20. During the final removal of dams, restore the original channel shape, bottom gradient and substrate at these locations.
21. **Pumped Diversion**
Pumped diversions are used to divert water around the isolated area to maintain natural downstream flows and prevent upstream ponding.

- 21.1. Ensure intakes are operated in a manner that prevents streambed disturbance and fish mortality. Guidelines to determine the appropriate mesh size for intake screens may be obtained from DFO (e.g., *Freshwater Intake End-of-Pipe Fish Screen Guideline* (1995), available at www.dfo-mpo.gc.ca/Library/223669.pdf).
- 21.2. Ensure the pumping system is sized to accommodate any expected high flows of the watercourse during the construction period. Pumps should be monitored at all times, and back-up pumps should be readily available on-site in case of pump failure.
- 21.3. Protect pump discharge area(s) to prevent erosion and the release of suspended sediments downstream, and remove this material when the works have been completed.

Measures to Protect Fish and Fish Habitat when Carrying Out a Dry Open-Cut Stream Crossing

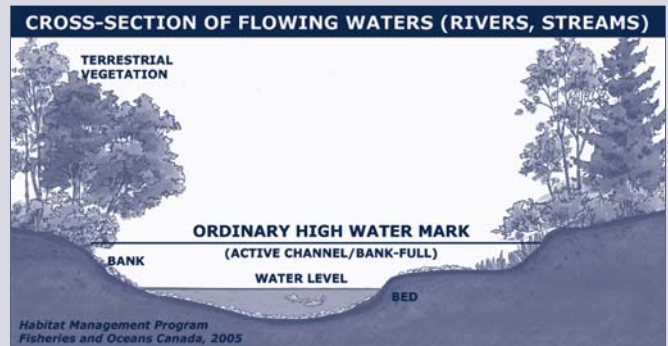
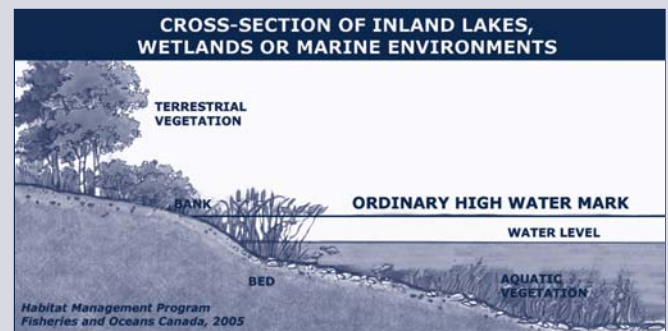
In addition to measures 1 to 10, the following measures should be carried out when conducting a dry open-cut stream crossing:

22. Stabilize the **streambed** and restore the original channel shape, bottom gradient and substrate to pre-construction condition.
23. Ensure **banks** are stabilized, restored to original shape, adequately protected from erosion and re-vegetated, preferably with native species.

Definition:

Ordinary high water mark (HWM) - The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO's Fish Habitat and Determining the High Water Mark on Lakes.



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Green Electron Project ESRR

17.5 APPENDIX 17.5 - Conceptual Stormwater Management Plan East Site

**CONCEPTUAL STORMWATER MANAGEMENT PLAN
GREEN ELECTRON POWER PROJECT
TOWNSHIP OF ST. CLAIR, LAMBTON COUNTY, ONTARIO**

DRAFT

Report No.: TC121601-001

Submitted to:

**Greenfield South Power Corporation
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Prepared by:

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September 2012
TC121601



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AMEC Environment & Infrastructure
 Stormwater Management Plan for the
 Green Electron Power Project

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AMEC Environment & Infrastructure
Stormwater Management Plan for the
Green Electron Power Project

Record of Approval

APPROVALS

DRAFT	September 19, 2012
Prepared by: Mark Sullivan, P.Eng., MBA	Date
DRAFT	September 19, 2012
Reviewed by: Peter Nimmrichter, M.Eng., P.Eng.	Date
DRAFT	September 19, 2012
Approved by: Rob Young, P.Geo., MCIP, RPP	Date

Rev.	Description	Prepared By	Checked	Approved	Date
001	Draft	MS	PN	RY	September 2012



1 INTRODUCTION

AMEC Environment & Infrastructure, a Division of AMEC Americas Limited (AMEC) has been retained by Greenfield South Power Corporation to develop a concept level stormwater management plan (SWM Plan) for the proposed Project site for the Green Electron Power Project (the Project). This report summarizes the development of the SWM Plan for this proposed development.

The Green Electron Power Project includes East and West Sites, which are both located in Courtright, Ontario, St. Clair Township. The project will ultimately be developed on either the East or West Site, depending on the relative ease of development associated with each site. The East Site is located on the south side of Oil Springs Line approximately 0.6 km west of Highway #40 and 0.9 km east of Greenfield Road (Figure 1-1). The West Site is located on the north side of Oil Springs Line approximately 0.9 km east of St. Clair Parkway (Highway 33) and 1.3 km west of Greenfield Road (Figure 1-1). Both East and West Sites are located on vacant industrially zoned land, as zoned appropriately for the Project's needs and in an overall area that is designated for heavy industrial uses. Both sites are located in the vicinity of Hydro One's 230 kV transmission corridor for circuit L28C. All of the plant's electrical output is to be delivered to the existing transmission circuit L28C.

The Project involves the construction and operation of a new, clean, natural gas fuelled, electricity generating plant which will facilitate the replacement of coal-fired power generation in Ontario. Under the contract with the Ontario Power Authority, the operating pattern of the power plant will likely be primarily during "shoulder" and "peak" electricity demand periods. The peak and shoulder demand periods occur typically between morning and evening on summer and winter business days. Current projections therefore indicate that the plant will likely run about 25% of the available hours in a given year. The plant will be able to start-up within 3 hours of request and advance from no-load to full-load status within 20 minutes.

The Project will have a generation capacity of approximately 300 MW and will comprise a gas turbo-generator set (approximately 200 MW) and a steam turbo-generator set (approximately 100 MW) configured as a combined cycle power plant to be fuelled entirely with natural gas. Final configuration and/or sizing of key plant equipment may require adjustment during the engineering and procurement phases of the Project. However, the completed plant will meet all of the performance obligations to the Ontario Power Authority. Any such engineering optimizations would be expected to not materially affect the scope or the conclusions of this SWM Plan. It should be noted that a detailed Stormwater Management Plan for the proposed project was previously completed by Greenfield South Power Corporation in 2007. Under the previous design, the site was to be located in Mississauga, however construction of the Mississauga facility was not completed. The proposed site plan/layout for the current development on the East and West Sites is proposed to be identical to the facility proposed for the Mississauga location.



This SWM Plan will update the previous Stormwater Management Plan (Greenfield, 2007) with updated rainfall information and other site specific information. The objective of this report is to determine if the previous SWM plan, and associated stormwater infrastructure, will be adequate to service the site in the new location.

The SWM plan for the Mississauga location involved the collection of stormwater in a series of catch basins which were ultimately directed to the cooling tower basin where stormwater was consumed as part of the plant process. Any stormwater delivered to the cooling tower basin was to displace municipal water which would otherwise be needed to make up the water losses from the cooling tower process. There was a sluice gate in a manhole downstream of the cooling tower basin which will normally be closed but would be opened when needed to discharge flows directly to the natural drainage course. The previous design also captured runoff from external lands which was to be directed to the cooling tower basin in an attempt to minimize the amount of municipal water needed.

The report is prepared with the condition that the design will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practice. Further, the recommendations and opinions in this report are applicable only to the proposed project as described above. Once the details of the works are finalized, on-going liaison with AMEC E&I is recommended during both the design and construction phases of the project to ensure that the recommendations in this report are applicable and/or correctly interpreted and implemented.

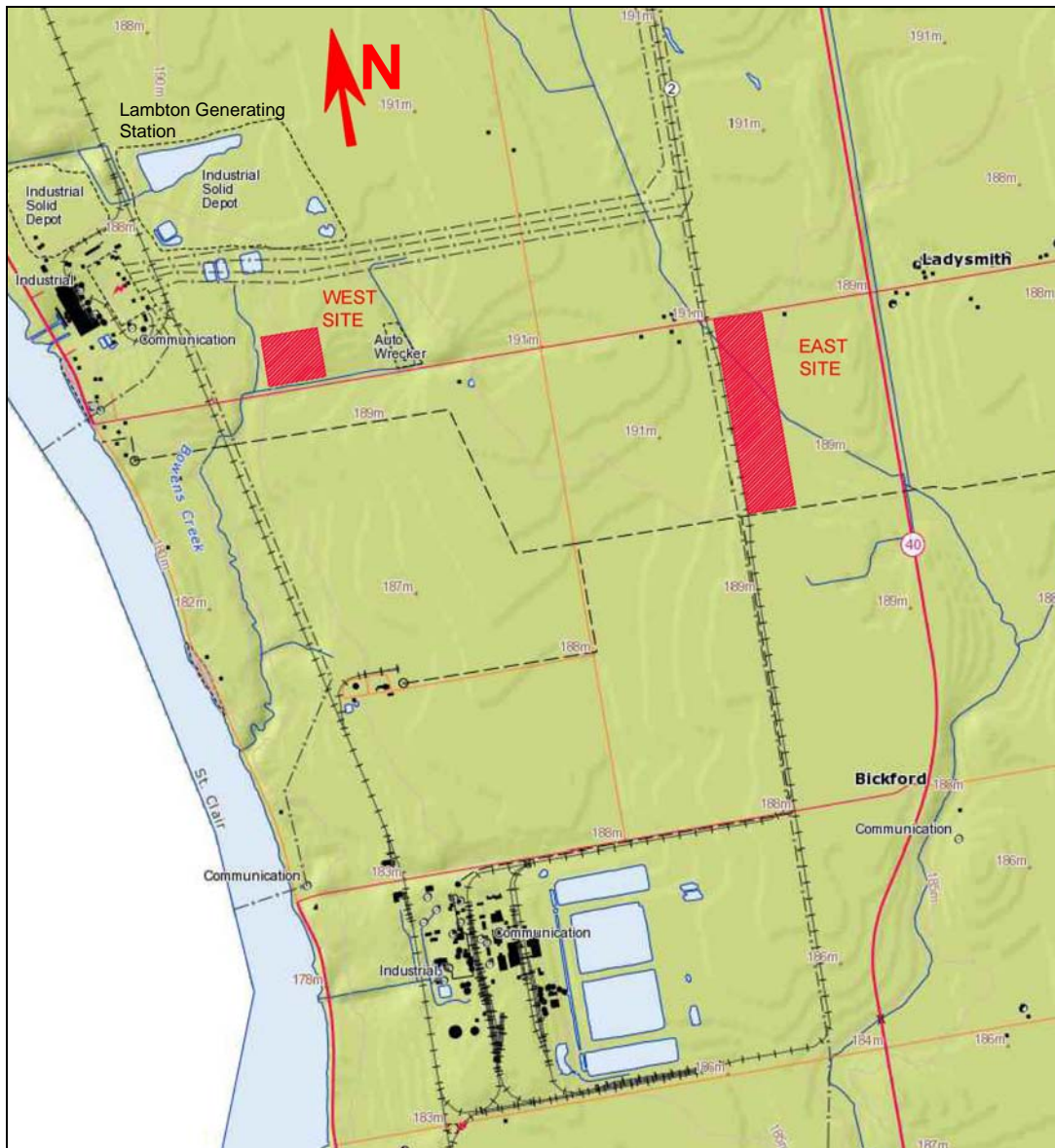


Figure 1-1: Site Location



2 EXISTING CONDITIONS

Existing topographic information for the East Site was taken from a topographical plan prepared by Monteith and Sutherland Ltd., Ontario Land Surveyors dated August 17, 2012. No topographic information has been provided by the proponent for the West Site. Both project sites are located east of the St. Clair River. Both project sites are situated in the St. Clair River watershed and fall under the jurisdiction of the St. Clair Region Conservation Authority (SCRCA).

The East Site has been used for agricultural purposes for many years and is presently under cultivation. The southern portion of the East Site contains some forested lands. The East Site is bounded by Oil Springs Line to the north and a railroad track to the east. Surrounding land uses are also primarily agricultural with a forested area located south of the East Site. Clay Creek enters the East Site in the north-west corner and exists in the central portion of the eastern property boundary. Clay Creek is a tributary to the St. Clair River which is located approximately 3 km west of the East Site. Stormwater drainage from the Site generally sheet flows directly to Clay Creek. Maximum fall across the site is approximately 1.5 m. General Site elevations are in the range of 186.1m to 187.5m.

The West Site is currently a pasture and also contains some forested area. The West Site is bounded by Oil Springs Line to the south, an active sludge dewatering area to the west, an ash disposal area to the north-east and a woodlot to the east. A section of Bowen's Creek is located just west of the property and drains south. Bowen's Creek is a tributary of the St. Clair River which is located approximately 1 km west of the West Site. Bowens Creek is a natural watercourse, originating approximately 500 m north of the proposed Project Site, and draining to St. Clair River approximately 2 km downstream of the proposed Project Site. The main channel of Bowens Creek is 3.4 km, with 8.3 km of total length including tributaries and the subwatershed is 6.61 km² in area (SCRCA, 2009). Hawkins Drain is located along the southern boundary of the West Site and flows west. Hawkins Drain, which drains to Bowens Creek near the southwest corner of the proposed Project site, has not been classified.

Available information¹ indicates that the proposed West Site does not lie within a known SCRCA regulated area, however, the East Site is located within a SCRCA regulated area (see Figure 2-1). No Regulatory Flood Plain Maps are available for the proposed development Sites.

Additional drains in the area of the proposed Project site include Milliken Drain, which drains to Hawkins Drain upstream of the proposed Project Site, and McIntosh Drain, which drains to Bowens Creek downstream of the proposed Project Site.

¹ As available from the Lambton GIS website at <http://www.lambtongis.ca/applications.htm> and using the Economic Site Selector application.



The surficial geology in the area of the proposed Project site is Rannoch Till (silt to clayey silt matrix, highly calcareous, clast poor) from the Pleistocene age (MNDM, 1991). Bedrock geology in the area of the proposed Project Site is classified as shale of the Port Lambton Group and/or Kettle Pont Formation, from the Paleozoic era (OGS, 1991).

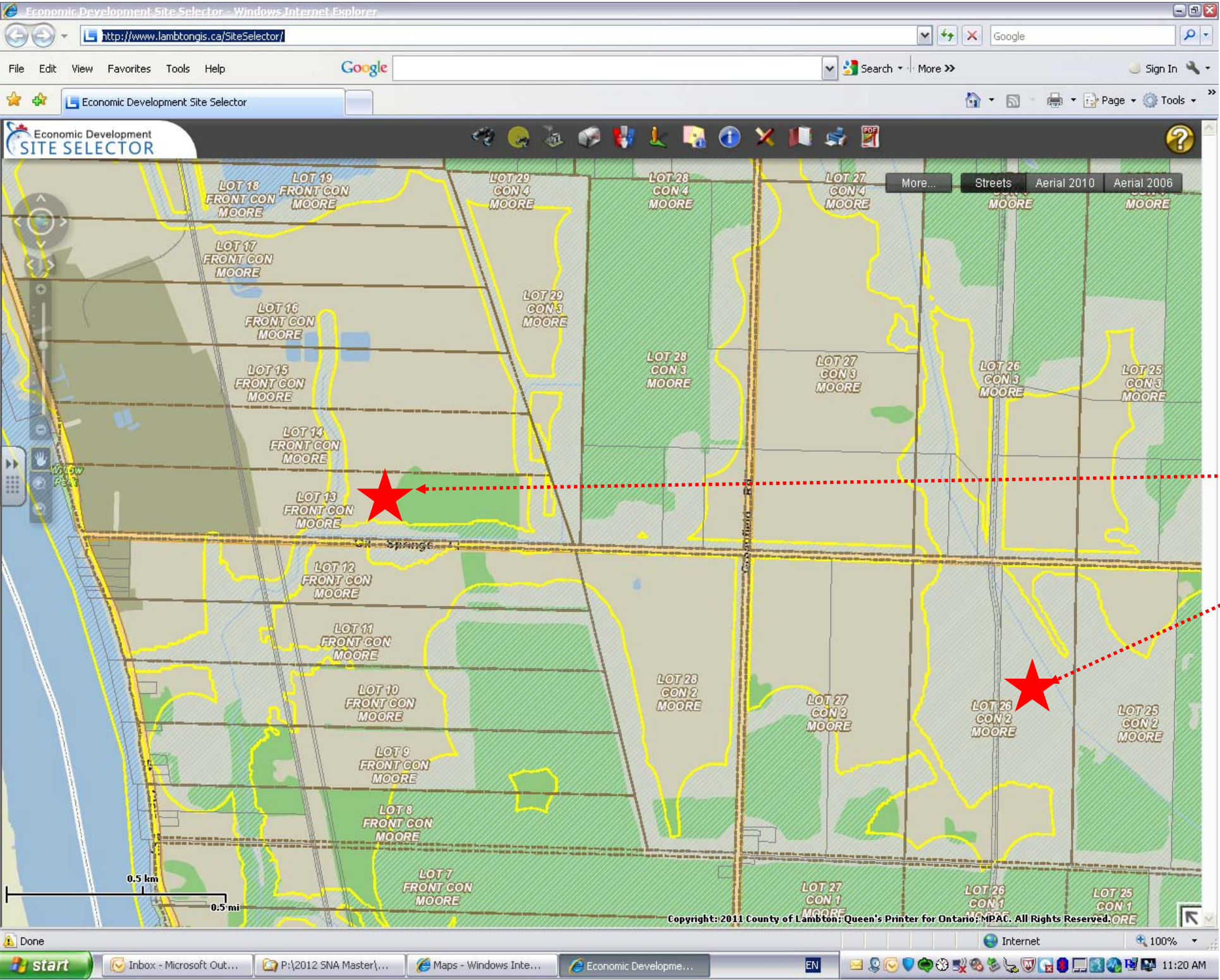


Figure 2-1 : St Clair Region Conservation Authority Regulated Lands

Approximate location of the West Site

Approximate location of the East Site



3 DESIGN CRITERIA

Stormwater on the site will be managed in accordance with current MOE guidelines as defined in the Stormwater Management Planning and Design Manual (SMPDM) (MOE, 2003). The stormwater will be collected in the “cooling tower basin” and stored on site for use in the cooling towers. As the majority of stormwater will be consumed as part of the plant operations there will be very little discharge to the natural drainage courses. As such, stormwater ‘quality’ control features are not considered necessary for this SWM Plan.

The natural soils within the area generally consist of clays. A characteristic of the existing soils on the site is very low percolation rates, which preclude the use of any practical infiltration stormwater best management practices (BMP’s).

The post-development peak flows will be controlled to pre-development peak flows based on the original pre-development areas discharging to the local watercourse in recognition of the increased imperviousness in the catchment area created by the proposed development.

The following design elements have been incorporated into the SWM Plan to address the MOE SMPDM 2003 water control requirements:

- The facility will have sufficient active storage to detain runoff from the contributing drainage area for up to the 100-year storm event. As well, a target retention time of 24 hours for the 25mm event is required.
- The cooling tower basin will limit the peak discharge from the post-developed site to the peak discharge of the pre-developed site for 2-year through 100-year design storm events.
- Storm runoff from the developed site area will be conveyed to the cooling tower basin via a network of storm sewers. The storm sewers have been sized to ensure the site is protected from short term flooding during severe storm events and that sufficient on site temporary storage exists to retain peak flows in excess of those conveyed into the cooling tower basin.
- The cooling tower basin will also incorporate an emergency overflow bypass for flows in excess of the design storage capacity or in the event of a blockage of the primary discharge device.



4 HYDROLOGIC MODELLING

Single event hydrologic modelling has been used to obtain quantitative estimates of stormwater runoff rates and volumes for pre-development and post-development conditions for the Sites.

4.1 MODEL SELECTION

The surface runoff has been calculated using the computer model Visual OTTHYMO v2.0. OTTHYMO is a successful hydrologic management model that has been used for: Watershed Studies, Sub-watershed Studies, Master Drainage Plans, Functional Stormwater Management Plans, Site Plans, and Stormwater Management Pond Design. Visual OTTHYMO v2.0 (VO2) is the second version of the INTERHYMO – OTTHYMO hydrologic model simulation software package designed for Microsoft Windows OS. VO2 has been accepted by the MOE, the Ministry of Natural Resources, the Ministry of Transportation, the Ministry of Municipal Affairs, the Association of Conservation Authorities of Ontario, and most municipal governments, as a valid hydrologic simulation model.

4.2 DESIGN STORMS

Precipitation data from the Atmospheric Environment Services' IDF90 publication for the Sarnia Airport (Ontario) weather station were used to develop the design storms used in this assessment. Design storms with return periods of 2, 5, 10, 25, 50, and 100-years were developed to determine design hydrographs to enable evaluation of the flow capacity/conveyance requirements for the grass swales and culverts. The Soil Conservation Service (SCS) Type II storm distribution was selected for the design storms due to its applicability in rural and urban settings and to maintain consistency with other hydrologic calculations, such as the effective rainfall and overland routing calculations. A time increment of 15 minutes was selected for all design storms. A 24-hour duration was selected since this provides a more conservative estimate of volume storage and flow capacity requirements. Table 4-1 is the summary of total rainfall depth for the SCS 24-hour 2, 5, 10, 25, 50, and 100 year storm events.

Table 4-1: Total Rainfall Depth

Return Period	Depth (mm)
2 year	52.5
5 year	67.6
10 year	77.6
25 year	90.2
50 year	99.6
100 year	108.9

The MNR Flood Plain Management in Ontario, Technical Guidelines indicate the site is located within Regulatory Flood Zone 1. As such, The Hurricane Hazel design storm was used as the Regional (extreme) design rainfall event for this site. The Regional design rainfall event has a total depth of 285 mm and a duration of 48 hours.

4.3 HYDROLOGIC MODELLING RESULTS

The proposed development plan for the East and West Site would involve the construction of approximately 2.28 ha of impervious surfaces on existing undeveloped area. The post development plan for the East and West Sites are illustrated in Figures 4-1 and 4-2, respectively.

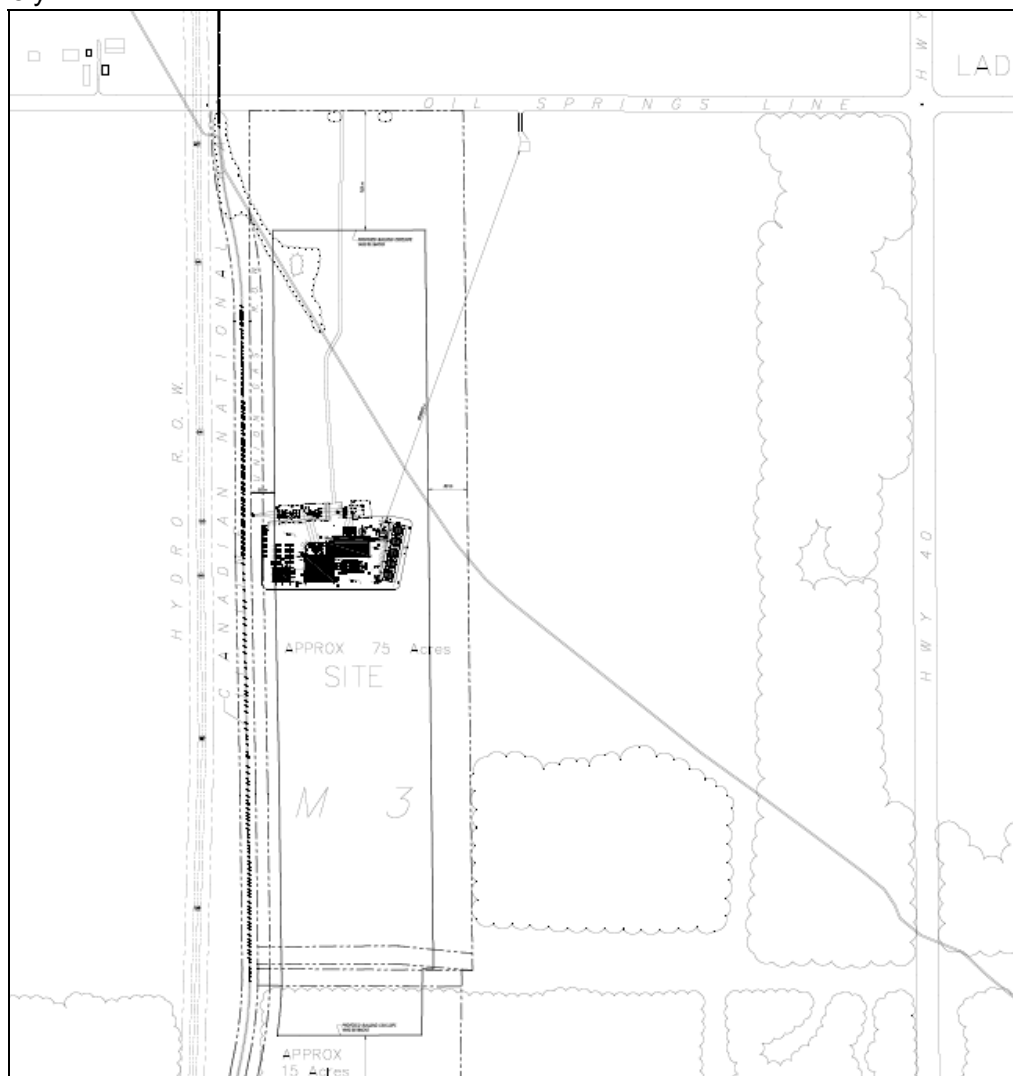


Figure 4-1: Development Plan for East Site

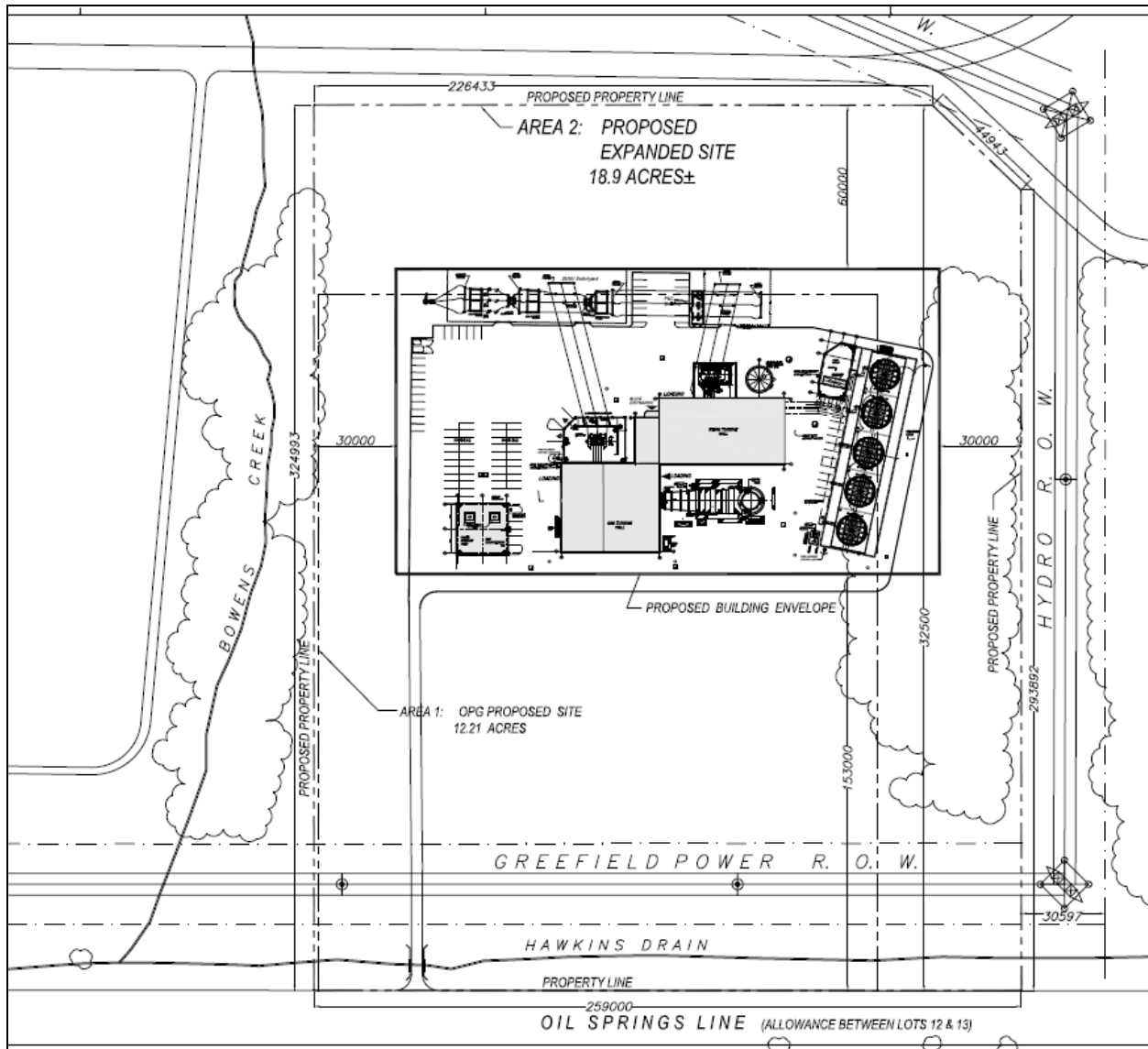


Figure 4-2: Development Plan for West Site



Modelling notes:

- A single catchment with an area of 2.28 ha was used to represent the area of the proposed development under pre and post development conditions
- For pre-development modelling, the entire site was assumed to be pervious.
- For post development modelling, the entire site was assumed to be 95% impervious.
- Based on the silty clay nature of the native soils in the area (Hydrologic Hydrologic Soil Group D), a Curve Number (CN) of 80 was used to describe pervious areas for modeling purposes.
- No external drainage areas were assumed to drain onto the site.

The computed peak flows discharging the site are summarized in Table 4-2.

Table 4-2: Post Development Comparison to Pre-Development Conditions with no SWM Controls (SCS 24 hr Rainfall Distribution)

Return Period	Pre-Development (m ³ /s)	Post-Development, no SWM (m ³ /s)
2 year	0.114	0.378
5 year	0.177	0.493
10 year	0.222	0.569
25 year	0.281	0.666
50 year	0.327	0.739
100 year	0.373	0.811

Notes:

Due to the very small computed flows, the peak flows have been documented above to three decimal places as a means of illustrating computed changes from pre-development to post-development. This level of detail is provided for information purposes only and should not be construed as an indication of the accuracy of the simulation model computations.

As indicated in the Table above, stormwater quantity measures will be required to control post development peak flows to pre-development levels. In order to attenuate post development peak flows, all runoff will be directed to the cooling tower basin.



5 PROPOSED COOLING TOWER BASIN

When the site is constructed, all runoff will be conveyed to the cooling tower basin. No external runoff has been considered in this analysis. It is assumed that external runoff would be ditched around the proposed site. The previous design (Greenfield South Power Corporation, 2007) indicated that when the plant is in operation all runoff will be consumed in the plant process. A sluice gate on the outlet from the cooling tower basin will ensure that all runoff is retained on site. In the unlikely event that the plant ceases to operate, the cooling tower basin will have available storage capacity to attenuate post development peak flows to pre development levels. In this scenario the sluice gate would be opened and the cooling tower basin will act as a stormwater management pond. The previously designed basin had a storage capacity of 3730 m³ and the outlet was controlled by a 160 mm diameter orifice. This design was modified based on the site specific design rainfall (for the current East and West Sites proposal) to attenuate the post development peak flows to the pre development levels. Table 5-1 details the post development peak flows and the associated storage requirements within the cooling tower basin.

Table 5-1: Post Development Comparison to Pre-Development Conditions with SWM Controls (SCS 24 hr Rainfall Distribution)

Return Period	Pre-Development (m ³ /s)	Post-Development, with SWM (m ³ /s)	Required Storage (m ³)
2 year	0.114	0.096	359
5 year	0.177	0.111	482
10 year	0.222	0.121	565
25 year	0.281	0.132	672
50 year	0.327	0.140	754
100 year	0.373	0.147	836

Notes:

Due to the very small computed flows, the peak flows have been documented above to three decimal places as a means of illustrating computed changes from pre-development to post-development. This level of detail is provided for information purposes only and should not be construed as an indication of the accuracy of the simulation model computations.

Based on the updated hydrologic modeling, a maximum storage volume of 836 m³ is required to match most development flows to pre development levels. A 300 mm diameter orifice plate was used as the outlet control from the cooling tower basin. The same length and width of the cooling tower basin that were specified in the Mississauga plan were used to develop the available storage for the current assessment. The 836 m³ can be accommodated in the cooling tower basin with a depth of approximately 0.6 m. The Mississauga plan required about 3730 m³ of storage which corresponds to a depth of 2.6 m in the cooling tower basin. The key factor in



the differences between the two analyses is that the City of Mississauga required all post development flows to be attenuated to the pre-development level of the 2-year storm event, whereas the updated analysis in this report attenuates all post development flows to pre development levels for the given storm event. The Mississauga plan also included additional external drainage area to the cooling tower basin which increased its size.

The results of the updated analysis indicate that the cooling tower basin could be reduced in depth, although it is not known how this reduction in depth would impact other design features (ie. cooling tower pumps and piping). Another analysis was completed to determine post development peak flow rates based on the previously designed cooling tower basin. The computed post development flows from the site were routed through the previously developed storage – outflow tables. Table 5-2 details the post development peak flows and the associated storage requirements within the previously designed cooling tower basin.

Table 5-2: Post Development Comparison to Pre-Development Conditions with Previously Designed SWM Controls (SCS 24 hr Rainfall Distribution)

Return Period	Pre-Development (m³/s)	Post Development, with SWM (m³/s)	Required Storage (m³)
2 year	0.114	0.033	706
5 year	0.177	0.044	889
10 year	0.222	0.047	1027
25 year	0.281	0.051	1208
50 year	0.327	0.054	1339
100 year	0.373	0.057	1473

Notes:

Due to the very small computed flows, the peak flows have been documented above to three decimal places as a means of illustrating computed changes from pre-development to post-development. This level of detail is provided for information purposes only and should not be construed as an indication of the accuracy of the simulation model computations.

As anticipated, the post development peak flows are even further reduced when routed through the previously designed cooling tower basin. The previously developed cooling tower basin design could also be utilized for the current development plan in either of the Sites in Lambton County.

The runoff volume produced by the 24 hour 100-year storm is 2,360 m³, whereas the available storage within the cooling tower basin is approximately 4,200 m³ when the plant is in operation and 3,730 m³ if the plant ceases to operate. Based on the previous SWM design, the water usage of the cooling tower basin is approximately 314 m³/hour when the system is in operation.



The entire runoff volume produced by the 24 hour 100 year storm could be consumed by the cooling tower in 7.5 hours. The plant is expected to operate at least 12 hours per week, so the cooling tower would be able to consume all the runoff associated with the 100 year event within normal operations to ensure there is available capacity within the cooling tower basin for future storm events.

The cooling tower basin was also assessed for the Regional Storm event. The rainfall distribution, runoff volume, storage on site, and volume conveyed to the local drainage feature is presented in Table 5-3. A total drainage area of 2.28 ha was used and a runoff coefficient of 0.98 (from VO2) was used in the analysis. The total available storage on site is comprised of the cooling tower basin, the catchbasin system and local ponding available on site (Greenfield, 2007).

Table 5-3: Regional Storm Data

Rainfall Amount (mm)	Duration	Cumulative Runoff Amount (m ³)		
		Total	Storage on Site	Discharge to Creek
73	First 36 hr	1631	1631	0
6	37th hr	1765	1765	0
4	38th hr	1855	1855	0
6	39th hr	1989	1989	0
13	40th hr	2279	2279	0
17	41st hr	2659	2659	0
13	42nd hr	2949	2949	0
23	43rd hr	3463	3463	0
13	44th hr	3754	3754	0
13	45th hr	4044	4044	0
53	46th hr	5228	4500	728
38	47th hr	6078	4500	1578
13	48th hr	6368	4500	1868

The site will store approximately 70% of the total runoff volume from a Regional Storm event, with the remaining amount discharged to the local watercourse. The peak flow generated by the Regional Storm event is 0.33 m³/s, which can be adequately conveyed to the local drainage feature via the previously designed overflow from the cooling tower basin (11 m long depressed curb). The emergency overflow was previously designed to convey a peak flow of 0.57 m³/s (Greenfield, 2007).

The previously detailed SWM plan utilized pumps and emergency overflow pipes to convey runoff from the site to the cooling tower basin. The capacity of the emergency overflow pipes is



1.22 m³/s (assuming pump failure), and the peak flow generated from the 24 hour 100 year storm is 0.81 m³/s. Therefore the peak flow generated on site can be successfully conveyed to the cooling tower basin and all runoff will be contained on-site. The previously detailed SWM plan also documented additional storage areas of 490 m³ in ponding areas and 280 m³ in the storm sewer system (Greenfield, 2007).

The previously detailed SWM plan also incorporated a small wall (0.57 m high) within the cooling tower basin for erosion control. The wall also contained a 75 mm diameter orifice (minimum recommended orifice size to avoid clogging). Based on the reduced area (no external drainage area) to the cooling tower basin, the wall could be reduced in size to approximately 0.4 m high, and would still provide a 25 hour drawdown time for the 25 mm storm event. The typical requirement for erosion control is to retain the 25 mm storm event for 24 hours. Once the small wall is overtopped the larger (160 mm diameter orifice) controls the water level within the cooling tower basin.

It should be noted that due to the additional capacity within the previously designed cooling tower basin, some external drainage area could be directed towards the cooling tower basin in an attempt to reduce the amount of make-up water required from other sources. Additional analysis would be required to determine the extent of impact of these external drainage areas on the functioning of the cooling tower basin.



6 SUMMARY

The proposed development sites are located in Courtright, Ontario. The proposed development consists of a new clean natural gas powered electrical generating station on either the East or West Site. The proposed development would involve the construction of approximately 2.28 ha of impervious surfaces on existing undeveloped area. The SWM plan, as summarized below, has been developed in conformance with the MOE design manual (2003) and relevant SCRCA guidelines and requirements.

- The proposed use of the cooling tower basin will capture the runoff from all storm events up to and including the 24 hour 100-year design storm. Runoff will be consumed by the cooling tower process. Under normal operations there would be no discharge of runoff from the site.
- In the unlikely event that the facility would be shut down for an extended period of time, the cooling tower basin would act as a SWM pond and attenuate all storm events to pre-development levels. The previously designed cooling tower basin (at the Mississauga site) would adequately attenuate post development peak flows to pre development levels also. The cooling tower basin would also provide a drawdown time of 25 hours for the 25 mm storm event
- Major flows in excess of the runoff from the 100-year storm event will be conveyed overland via an emergency overflow weir.



7 REFERENCES

- MOE, 2003** **Stormwater Management Planning and Design Manual**, Ontario Ministry of the Environment, March 2003.
- OGS, 1991** Ontario Geological Survey (OGS). 1991. **Bedrock Geology of Ontario, Southern Sheet, Ontario Geological Survey, Map 2544, scale 1:1,000,000.**
- SCRCA, 2009** St. Clair Region Conservation Authority (SCRCA). 2009. **St. Clair River Watershed Plan**, AOC Area 1-A. Cited online:
[http://www.scrca.on.ca/Publications/St%20Clair%20River%20Watershed%20Plan_Web.pdf]. Accessed September 2012.
- Greenfield, 2007** **Greenfield South Power Project, Stormwater Management Plan**, Mississauga, Ontario, May 2007. Greenfield South Power Corporation.



APPENDICES

APPENDIX A - Visual OTTTHYMO Output



APPENDIX A

Visual OTTHYMO Output

EP PRE. out

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=====
V      V      I      SSSSS  U      U      A      L
V      V      I      SS      U      U      A A     L
V      V      I      SS      U      U      AAAAA  L
V      V      I      SS      U      U      A      A  L
VV      I      SSSSS  UUUUU  A      A  LLLLLL

000      TTTTT  TTTTT  H      H      Y      Y      M      M      000      TM
0      0      T      T      H      H      Y      Y      MM  MM  0      0
0      0      T      T      H      H      Y      M      M      0      0      Company

000      T      T      H      H      Y      M      M      000      Serial

```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual Otthymo 2.4\VO2\vojn.dat

Output filename:
 C:\Users\mark.sullivan\AppData\Local\Temp\45dc37cc-f66c-4c39-b294-9249ad32730c\Scenario.out

Summary filename:
 C:\Users\mark.sullivan\AppData\Local\Temp\45dc37cc-f66c-4c39-b294-9249ad32730c\Scenario.sum

DATE: 09/13/2012

TIME: 03:59:30

USER:

COMMENTS: _____

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*****
** SIMULATION NUMBER: 1 **
*****

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READ STORM

Ptotal = 52.50 mm

Filename: C:\Users\mark.sullivan\AppData\Local\Temp\45dc37cc-f66c-4c39-b294-9249ad32730c\80349ae5
 Comments: 24-Hour 2-Year SCS Type II Storm Sarnia

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	6.50	0.94	12.75	7.56	19.00	0.84
0.50	0.58	6.75	0.94	13.00	3.99	19.25	1.05
0.75	0.58	7.00	0.94	13.25	3.78	19.50	0.84
1.00	0.58	7.25	0.94	13.50	2.94	19.75	1.05
1.25	0.58	7.50	1.26	13.75	2.73	20.00	0.84

EP PRE. out							
1.50	0.57	7.75	1.05	14.00	2.31	20.25	1.05
1.75	0.59	8.00	1.26	14.25	2.10	20.50	0.63
2.00	0.57	8.25	1.05	14.50	1.68	20.75	0.63
2.25	0.59	8.50	1.47	14.75	1.47	21.00	0.63
2.50	0.67	8.75	1.26	15.00	1.47	21.25	0.63
2.75	0.69	9.00	1.47	15.25	1.68	21.50	0.63
3.00	0.67	9.25	1.47	15.50	1.47	21.75	0.63
3.25	0.69	9.50	1.68	15.75	1.68	22.00	0.63
3.50	0.67	9.75	1.68	16.00	1.47	22.25	0.63
3.75	0.69	10.00	1.89	16.25	1.68	22.50	0.63
4.00	0.69	10.25	1.89	16.50	0.84	22.75	0.63
4.25	0.67	10.50	2.52	16.75	1.05	23.00	0.63
4.50	0.84	10.75	2.31	17.00	0.84	23.25	0.63
4.75	0.84	11.00	3.36	17.25	1.05	23.50	0.63
5.00	0.84	11.25	3.15	17.50	0.84	23.75	0.63
5.25	0.84	11.50	5.04	17.75	1.05	24.00	0.63
5.50	0.84	11.75	5.04	18.00	0.84	24.25	0.63
5.75	0.84	12.00	15.54	18.25	1.05		
6.00	0.84	12.25	64.26	18.50	0.84		
6.25	0.84	12.50	7.56	18.75	1.05		

CALIB NASHYD (0001) ID= 1 DT=15.0 min	Area (ha)= 2.28 Ia (mm)= 5.00 U. H. Tp(hrs)= 0.23	Curve Number (CN)= 80.0 # of Linear Res. (N)= 3.00
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Unit Hyd Qpeak (cms)= 0.385

PEAK FLOW (cms)= 0.114 (i)
 TIME TO PEAK (hrs)= 12.250
 RUNOFF VOLUME (mm)= 18.919
 TOTAL RAINFALL (mm)= 52.500
 RUNOFF COEFFICIENT = 0.360

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ** SIMULATION NUMBER: 2 **

READ STORM	Filename: C:\Users\mark.sullivan\AppData\Local\Temp\45dc37cc-f66c-4c39-b294-9249ad32730c\7d647cf8
Ptotal = 67.60 mm	Comments: 24-Hour 5-Year SCS Type II Storm Sarnia

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	6.50	1.22	12.75	9.73	19.00	1.08
0.50	0.74	6.75	1.22	13.00	5.14	19.25	1.35
0.75	0.74	7.00	1.22	13.25	4.87	19.50	1.08
1.00	0.74	7.25	1.22	13.50	3.79	19.75	1.35
1.25	0.74	7.50	1.62	13.75	3.52	20.00	1.08
1.50	0.73	7.75	1.35	14.00	2.97	20.25	1.35
1.75	0.76	8.00	1.62	14.25	2.70	20.50	0.81
2.00	0.73	8.25	1.35	14.50	2.16	20.75	0.81
2.25	0.76	8.50	1.89	14.75	1.89	21.00	0.81
2.50	0.87	8.75	1.62	15.00	1.89	21.25	0.81

EP PRE. out							
2.75	0.89	9.00	1.89	15.25	2.16	21.50	0.81
3.00	0.87	9.25	1.89	15.50	1.89	21.75	0.81
3.25	0.89	9.50	2.16	15.75	2.16	22.00	0.81
3.50	0.87	9.75	2.16	16.00	1.89	22.25	0.81
3.75	0.89	10.00	2.43	16.25	2.16	22.50	0.81
4.00	0.89	10.25	2.43	16.50	1.08	22.75	0.81
4.25	0.87	10.50	3.24	16.75	1.35	23.00	0.81
4.50	1.08	10.75	2.97	17.00	1.08	23.25	0.81
4.75	1.08	11.00	4.33	17.25	1.35	23.50	0.81
5.00	1.08	11.25	4.06	17.50	1.08	23.75	0.81
5.25	1.08	11.50	6.49	17.75	1.35	24.00	0.81
5.50	1.08	11.75	6.49	18.00	1.08	24.25	0.81
5.75	1.08	12.00	20.01	18.25	1.35		
6.00	1.08	12.25	82.74	18.50	1.08		
6.25	1.08	12.50	9.73	18.75	1.35		

CALIB			
NASHYD (0001)	Area (ha)=	2.28	Curve Number (CN)= 80.0
ID= 1 DT=15.0 min	Ia (mm)=	5.00	# of Linear Res. (N)= 3.00
	U. H. Tp(hrs)=	0.23	

Unit Hyd Qpeak (cms)= 0.385

PEAK FLOW (cms)= 0.177 (i)
 TIME TO PEAK (hrs)= 12.250
 RUNOFF VOLUME (mm)= 28.924
 TOTAL RAINFALL (mm)= 67.600
 RUNOFF COEFFICIENT = 0.428

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ** SIMULATION NUMBER: 3 **

READ STORM	Filename: C:\Users\mark.sullivan\AppData\Local\Temp\45dc37cc-f66c-4c39-b294-9249ad32730c\1d16d696
Ptotal = 77.60 mm	Comments: 24-Hour 10-Year SCS Type II Storm Sarnia

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	6.50	1.40	12.75	11.17	19.00	1.24
0.50	0.85	6.75	1.40	13.00	5.90	19.25	1.55
0.75	0.85	7.00	1.40	13.25	5.59	19.50	1.24
1.00	0.85	7.25	1.40	13.50	4.35	19.75	1.55
1.25	0.85	7.50	1.86	13.75	4.04	20.00	1.24
1.50	0.84	7.75	1.55	14.00	3.41	20.25	1.55
1.75	0.87	8.00	1.86	14.25	3.10	20.50	0.93
2.00	0.84	8.25	1.55	14.50	2.48	20.75	0.93
2.25	0.87	8.50	2.17	14.75	2.17	21.00	0.93
2.50	0.99	8.75	1.86	15.00	2.17	21.25	0.93
2.75	1.02	9.00	2.17	15.25	2.48	21.50	0.93
3.00	0.99	9.25	2.17	15.50	2.17	21.75	0.93
3.25	1.02	9.50	2.48	15.75	2.48	22.00	0.93
3.50	0.99	9.75	2.48	16.00	2.17	22.25	0.93
3.75	1.02	10.00	2.79	16.25	2.48	22.50	0.93

EP PRE. out							
4.00	1.02	10.25	2.79	16.50	1.24	22.75	0.93
4.25	0.99	10.50	3.72	16.75	1.55	23.00	0.93
4.50	1.24	10.75	3.41	17.00	1.24	23.25	0.93
4.75	1.24	11.00	4.97	17.25	1.55	23.50	0.93
5.00	1.24	11.25	4.66	17.50	1.24	23.75	0.93
5.25	1.24	11.50	7.45	17.75	1.55	24.00	0.93
5.50	1.24	11.75	7.45	18.00	1.24	24.25	0.93
5.75	1.24	12.00	22.97	18.25	1.55		
6.00	1.24	12.25	94.98	18.50	1.24		
6.25	1.24	12.50	11.17	18.75	1.55		

CALIB NASHYD (0001) ID= 1 DT=15.0 min	Area (ha)= 2.28 Ia (mm)= 5.00 U. H. Tp(hrs)= 0.23	Curve Number (CN)= 80.0 # of Linear Res. (N)= 3.00
---	---	---

Unit Hyd Qpeak (cms)= 0.385

PEAK FLOW (cms)= 0.222 (i)
 TIME TO PEAK (hrs)= 12.250
 RUNOFF VOLUME (mm)= 36.046
 TOTAL RAINFALL (mm)= 77.600
 RUNOFF COEFFICIENT = 0.465

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ** SIMULATION NUMBER: 4 **

READ STORM	Filename: C:\Users\mark.sullivan\AppData Local\Temp\ 45dc37cc-f66c-4c39-b294-9249ad32730c\6b7e5e22
Ptotal = 90.20 mm	Comments: 24-Hour 25-Year SCS Type II Storm Sarnia

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	6.50	1.62	12.75	12.99	19.00	1.44
0.50	0.99	6.75	1.62	13.00	6.86	19.25	1.80
0.75	0.99	7.00	1.62	13.25	6.49	19.50	1.44
1.00	0.99	7.25	1.62	13.50	5.05	19.75	1.80
1.25	0.99	7.50	2.16	13.75	4.69	20.00	1.44
1.50	0.97	7.75	1.80	14.00	3.97	20.25	1.80
1.75	1.01	8.00	2.16	14.25	3.61	20.50	1.08
2.00	0.97	8.25	1.80	14.50	2.89	20.75	1.08
2.25	1.01	8.50	2.53	14.75	2.53	21.00	1.08
2.50	1.15	8.75	2.16	15.00	2.53	21.25	1.08
2.75	1.19	9.00	2.53	15.25	2.89	21.50	1.08
3.00	1.15	9.25	2.53	15.50	2.53	21.75	1.08
3.25	1.19	9.50	2.89	15.75	2.89	22.00	1.08
3.50	1.15	9.75	2.89	16.00	2.53	22.25	1.08
3.75	1.19	10.00	3.25	16.25	2.89	22.50	1.08
4.00	1.19	10.25	3.25	16.50	1.44	22.75	1.08
4.25	1.15	10.50	4.33	16.75	1.80	23.00	1.08
4.50	1.44	10.75	3.97	17.00	1.44	23.25	1.08
4.75	1.44	11.00	5.77	17.25	1.80	23.50	1.08
5.00	1.44	11.25	5.41	17.50	1.44	23.75	1.08

EP PRE. out							
5.25	1.44	11.50	8.66	17.75	1.80	24.00	1.08
5.50	1.44	11.75	8.66	18.00	1.44	24.25	1.08
5.75	1.44	12.00	26.70	18.25	1.80		
6.00	1.44	12.25	110.40	18.50	1.44		
6.25	1.44	12.50	12.99	18.75	1.80		

CALIB NASHYD (0001) ID= 1 DT=15.0 min	Area (ha)= 2.28 Ia (mm)= 5.00 U.H. Tp(hrs)= 0.23	Curve Number (CN)= 80.0 # of Linear Res. (N)= 3.00
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Unit Hyd Qpeak (cms)= 0.385

PEAK FLOW (cms)= 0.281 (i)
 TIME TO PEAK (hrs)= 12.250
 RUNOFF VOLUME (mm)= 45.437
 TOTAL RAINFALL (mm)= 90.200
 RUNOFF COEFFICIENT = 0.504

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ** SIMULATION NUMBER: 5 **

READ STORM Ptotal = 99.60 mm	Filename: C:\Users\mark.sullivan\AppData Local\Temp\ 45dc37cc-f66c-4c39-b294-9249ad32730c\A1e5d969 Comments: 24-Hour 50-Year SCS Type II Storm Sarnia
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TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.25	0.00	6.50	1.79	12.75	14.34	19.00	1.59
0.50	1.10	6.75	1.79	13.00	7.57	19.25	1.99
0.75	1.10	7.00	1.79	13.25	7.17	19.50	1.59
1.00	1.10	7.25	1.79	13.50	5.58	19.75	1.99
1.25	1.10	7.50	2.39	13.75	5.18	20.00	1.59
1.50	1.08	7.75	1.99	14.00	4.38	20.25	1.99
1.75	1.12	8.00	2.39	14.25	3.98	20.50	1.20
2.00	1.08	8.25	1.99	14.50	3.19	20.75	1.20
2.25	1.12	8.50	2.79	14.75	2.79	21.00	1.20
2.50	1.27	8.75	2.39	15.00	2.79	21.25	1.20
2.75	1.31	9.00	2.79	15.25	3.19	21.50	1.20
3.00	1.27	9.25	2.79	15.50	2.79	21.75	1.20
3.25	1.31	9.50	3.19	15.75	3.19	22.00	1.20
3.50	1.27	9.75	3.19	16.00	2.79	22.25	1.20
3.75	1.31	10.00	3.59	16.25	3.19	22.50	1.20
4.00	1.31	10.25	3.59	16.50	1.59	22.75	1.20
4.25	1.27	10.50	4.78	16.75	1.99	23.00	1.20
4.50	1.59	10.75	4.38	17.00	1.59	23.25	1.20
4.75	1.59	11.00	6.37	17.25	1.99	23.50	1.20
5.00	1.59	11.25	5.98	17.50	1.59	23.75	1.20
5.25	1.59	11.50	9.56	17.75	1.99	24.00	1.20
5.50	1.59	11.75	9.56	18.00	1.59	24.25	1.20
5.75	1.59	12.00	29.48	18.25	1.99		
6.00	1.59	12.25	121.91	18.50	1.59		
6.25	1.59	12.50	14.34	18.75	1.99		

EP PRE. out

CALIB NASHYD (0001) ID= 1 DT=15.0 min	Area (ha)= 2.28 Ia (mm)= 5.00 U. H. Tp(hrs)= 0.23	Curve Number (CN)= 80.0 # of Linear Res. (N)= 3.00
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Unit Hyd Qpeak (cms)= 0.385

PEAK FLOW (cms)= 0.327 (i)
 TIME TO PEAK (hrs)= 12.250
 RUNOFF VOLUME (mm)= 52.685
 TOTAL RAINFALL (mm)= 99.600
 RUNOFF COEFFICIENT = 0.529

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ** SIMULATION NUMBER: 6 **

READ STORM	Filename: C:\Users\mark.sullivan\AppData ata\Local\Temp\ 45dc37cc-f66c-4c39-b294-9249ad32730c\bc37ea81
Ptotal=108.90 mm	Comments: 24-Hour 100-Year SCS Type II Storm Sarni

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	6.50	1.96	12.75	15.68	19.00	1.74
0.50	1.20	6.75	1.96	13.00	8.28	19.25	2.18
0.75	1.20	7.00	1.96	13.25	7.84	19.50	1.74
1.00	1.20	7.25	1.96	13.50	6.10	19.75	2.18
1.25	1.20	7.50	2.61	13.75	5.66	20.00	1.74
1.50	1.18	7.75	2.18	14.00	4.79	20.25	2.18
1.75	1.22	8.00	2.61	14.25	4.36	20.50	1.31
2.00	1.18	8.25	2.18	14.50	3.48	20.75	1.31
2.25	1.22	8.50	3.05	14.75	3.05	21.00	1.31
2.50	1.39	8.75	2.61	15.00	3.05	21.25	1.31
2.75	1.44	9.00	3.05	15.25	3.48	21.50	1.31
3.00	1.39	9.25	3.05	15.50	3.05	21.75	1.31
3.25	1.44	9.50	3.48	15.75	3.48	22.00	1.31
3.50	1.39	9.75	3.48	16.00	3.05	22.25	1.31
3.75	1.44	10.00	3.92	16.25	3.48	22.50	1.31
4.00	1.44	10.25	3.92	16.50	1.74	22.75	1.31
4.25	1.39	10.50	5.23	16.75	2.18	23.00	1.31
4.50	1.74	10.75	4.79	17.00	1.74	23.25	1.31
4.75	1.74	11.00	6.97	17.25	2.18	23.50	1.31
5.00	1.74	11.25	6.53	17.50	1.74	23.75	1.31
5.25	1.74	11.50	10.45	17.75	2.18	24.00	1.31
5.50	1.74	11.75	10.45	18.00	1.74	24.25	1.31
5.75	1.74	12.00	32.23	18.25	2.18		
6.00	1.74	12.25	133.29	18.50	1.74		
6.25	1.74	12.50	15.68	18.75	2.18		

CALIB

NASHYD (0001)		Area (ha)= 2.28		EP PRE. out		Curve Number (CN)= 80.0	
ID= 1	DT=15.0 min	Ia (mm)= 5.00				# of Linear Res. (N)= 3.00	
-----		U. H. Tp(hrs)= 0.23					

Unit Hyd Qpeak (cms)= 0.385

PEAK FLOW (cms)= 0.373 (i)

TIME TO PEAK (hrs)= 12.250

RUNOFF VOLUME (mm)= 60.022

TOTAL RAINFALL (mm)= 108.900

RUNOFF COEFFICIENT = 0.551

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

FINISH

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EP POST.out

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V      V      I      SSSSS  U      U      A      L
V      V      I      SS      U      U      A A     L
V      V      I      SS      U      U      AAAAA  L
V      V      I      SS      U      U      A      A  L
VV      I      SSSSS  UUUUU  A      A  LLLLLL

000      TTTTT  TTTTT  H      H      Y      Y      M      M      000      TM
0      0      T      T      H      H      Y      Y      MM  MM  0      0
0      0      T      T      H      H      Y      M      M      0      0      Company

000      T      T      H      H      Y      M      M      000      Serial

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual Otthymo 2.4\V02\vojn.dat

Output filename:
 C:\Users\mark.sullivan\AppData\Local\Temp\58d7a035-5c9b-4dcd-a8a9-886d29d4331d\Scenario.out

Summary filename:
 C:\Users\mark.sullivan\AppData\Local\Temp\58d7a035-5c9b-4dcd-a8a9-886d29d4331d\Scenario.sum

DATE: 09/14/2012

TIME: 09:19:29

USER:

COMMENTS: _____

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*****
** SIMULATION NUMBER: 1 **
*****

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READ STORM		Filename: C:\Users\mark.sullivan\AppData\Local\Temp\58d7a035-5c9b-4dcd-a8a9-886d29d4331d\80349ae5					
Ptotal = 52.50 mm		Comments: 24-Hour 2-Year SCS Type II Storm Sarnia					
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.25	0.00	6.50	0.94	12.75	7.56	19.00	0.84
0.50	0.58	6.75	0.94	13.00	3.99	19.25	1.05
0.75	0.58	7.00	0.94	13.25	3.78	19.50	0.84
1.00	0.58	7.25	0.94	13.50	2.94	19.75	1.05
1.25	0.58	7.50	1.26	13.75	2.73	20.00	0.84

EP POST.out							
1.50	0.57	7.75	1.05	14.00	2.31	20.25	1.05
1.75	0.59	8.00	1.26	14.25	2.10	20.50	0.63
2.00	0.57	8.25	1.05	14.50	1.68	20.75	0.63
2.25	0.59	8.50	1.47	14.75	1.47	21.00	0.63
2.50	0.67	8.75	1.26	15.00	1.47	21.25	0.63
2.75	0.69	9.00	1.47	15.25	1.68	21.50	0.63
3.00	0.67	9.25	1.47	15.50	1.47	21.75	0.63
3.25	0.69	9.50	1.68	15.75	1.68	22.00	0.63
3.50	0.67	9.75	1.68	16.00	1.47	22.25	0.63
3.75	0.69	10.00	1.89	16.25	1.68	22.50	0.63
4.00	0.69	10.25	1.89	16.50	0.84	22.75	0.63
4.25	0.67	10.50	2.52	16.75	1.05	23.00	0.63
4.50	0.84	10.75	2.31	17.00	0.84	23.25	0.63
4.75	0.84	11.00	3.36	17.25	1.05	23.50	0.63
5.00	0.84	11.25	3.15	17.50	0.84	23.75	0.63
5.25	0.84	11.50	5.04	17.75	1.05	24.00	0.63
5.50	0.84	11.75	5.04	18.00	0.84	24.25	0.63
5.75	0.84	12.00	15.54	18.25	1.05		
6.00	0.84	12.25	64.26	18.50	0.84		
6.25	0.84	12.50	7.56	18.75	1.05		

CALIB
STANDHYD (0001)
ID= 1 DT= 5.0 min

Area (ha)= 2.28
Total Imp(%)= 90.00 Di r. Conn. (%)= 90.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.05	0.23
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	123.29	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	6.167	0.84	12.250	64.26	18.33	0.84
0.167	0.00	6.250	0.84	12.333	7.57	18.42	0.84
0.250	0.00	6.333	0.94	12.417	7.56	18.50	0.84
0.333	0.58	6.417	0.94	12.500	7.56	18.58	1.05
0.417	0.58	6.500	0.94	12.583	7.56	18.67	1.05
0.500	0.58	6.583	0.94	12.667	7.56	18.75	1.05
0.583	0.58	6.667	0.94	12.750	7.56	18.83	0.84
0.667	0.58	6.750	0.94	12.833	3.99	18.92	0.84
0.750	0.58	6.833	0.94	12.917	3.99	19.00	0.84
0.833	0.58	6.917	0.94	13.000	3.99	19.08	1.05
0.917	0.58	7.000	0.94	13.083	3.78	19.17	1.05
1.000	0.58	7.083	0.94	13.167	3.78	19.25	1.05
1.083	0.58	7.167	0.94	13.250	3.78	19.33	0.84
1.167	0.58	7.250	0.95	13.333	2.94	19.42	0.84
1.250	0.58	7.333	1.26	13.417	2.94	19.50	0.84
1.333	0.57	7.417	1.26	13.500	2.94	19.58	1.05
1.417	0.57	7.500	1.26	13.583	2.73	19.67	1.05
1.500	0.57	7.583	1.05	13.667	2.73	19.75	1.05
1.583	0.59	7.667	1.05	13.750	2.73	19.83	0.84
1.667	0.59	7.750	1.05	13.833	2.31	19.92	0.84
1.750	0.59	7.833	1.26	13.917	2.31	20.00	0.84
1.833	0.57	7.917	1.26	14.000	2.31	20.08	1.05

EP POST.out							
1.917	0.57	8.000	1.26	14.083	2.10	20.17	1.05
2.000	0.57	8.083	1.05	14.167	2.10	20.25	1.05
2.083	0.59	8.167	1.05	14.250	2.10	20.33	0.63
2.167	0.59	8.250	1.05	14.333	1.68	20.42	0.63
2.250	0.59	8.333	1.47	14.417	1.68	20.50	0.63
2.333	0.67	8.417	1.47	14.500	1.68	20.58	0.63
2.417	0.67	8.500	1.47	14.583	1.47	20.67	0.63
2.500	0.67	8.583	1.26	14.667	1.47	20.75	0.63
2.583	0.69	8.667	1.26	14.750	1.47	20.83	0.63
2.667	0.69	8.750	1.26	14.833	1.47	20.92	0.63
2.750	0.69	8.833	1.47	14.917	1.47	21.00	0.63
2.833	0.67	8.917	1.47	15.000	1.47	21.08	0.63
2.917	0.67	9.000	1.47	15.083	1.68	21.17	0.63
3.000	0.67	9.083	1.47	15.167	1.68	21.25	0.63
3.083	0.69	9.167	1.47	15.250	1.68	21.33	0.63
3.167	0.69	9.250	1.47	15.333	1.47	21.42	0.63
3.250	0.69	9.333	1.68	15.417	1.47	21.50	0.63
3.333	0.67	9.417	1.68	15.500	1.47	21.58	0.63
3.417	0.67	9.500	1.68	15.583	1.68	21.67	0.63
3.500	0.67	9.583	1.68	15.667	1.68	21.75	0.63
3.583	0.69	9.667	1.68	15.750	1.68	21.83	0.63
3.667	0.69	9.750	1.68	15.833	1.47	21.92	0.63
3.750	0.69	9.833	1.89	15.917	1.47	22.00	0.63
3.833	0.69	9.917	1.89	16.000	1.47	22.08	0.63
3.917	0.69	10.000	1.89	16.083	1.68	22.17	0.63
4.000	0.69	10.083	1.89	16.167	1.68	22.25	0.63
4.083	0.67	10.167	1.89	16.250	1.68	22.33	0.63
4.167	0.67	10.250	1.89	16.333	0.84	22.42	0.63
4.250	0.67	10.333	2.52	16.417	0.84	22.50	0.63
4.333	0.84	10.417	2.52	16.500	0.84	22.58	0.63
4.417	0.84	10.500	2.52	16.583	1.05	22.67	0.63
4.500	0.84	10.583	2.31	16.667	1.05	22.75	0.63
4.583	0.84	10.667	2.31	16.750	1.05	22.83	0.63
4.667	0.84	10.750	2.31	16.833	0.84	22.92	0.63
4.750	0.84	10.833	3.36	16.917	0.84	23.00	0.63
4.833	0.84	10.917	3.36	17.000	0.84	23.08	0.63
4.917	0.84	11.000	3.36	17.083	1.05	23.17	0.63
5.000	0.84	11.083	3.15	17.167	1.05	23.25	0.63
5.083	0.84	11.167	3.15	17.250	1.05	23.33	0.63
5.167	0.84	11.250	3.15	17.333	0.84	23.42	0.63
5.250	0.84	11.333	5.04	17.417	0.84	23.50	0.63
5.333	0.84	11.417	5.04	17.500	0.84	23.58	0.63
5.417	0.84	11.500	5.04	17.583	1.05	23.67	0.63
5.500	0.84	11.583	5.04	17.667	1.05	23.75	0.63
5.583	0.84	11.667	5.04	17.750	1.05	23.83	0.63
5.667	0.84	11.750	5.04	17.833	0.84	23.92	0.63
5.750	0.84	11.833	15.54	17.917	0.84	24.00	0.63
5.833	0.84	11.917	15.54	18.000	0.84	24.08	0.63
5.917	0.84	12.000	15.54	18.083	1.05	24.17	0.63
6.000	0.84	12.083	64.25	18.167	1.05	24.25	0.63
6.083	0.84	12.167	64.26	18.250	1.05		
Max. Eff. Inten. (mm/hr)=		64.26		30.64			
over (min)		5.00		10.00			
Storage Coeff. (min)=		3.46	(ii)	6.95	(ii)		
Unit Hyd. Tpeak (min)=		5.00		10.00			
Unit Hyd. peak (cms)=		0.26		0.14			
TOTALS							
PEAK FLOW (cms)=		0.36		0.02		0.378	(iii)
TIME TO PEAK (hrs)=		12.25		12.25		12.25	
RUNOFF VOLUME (mm)=		51.50		20.33		48.38	
TOTAL RAINFALL (mm)=		52.50		52.50		52.50	
RUNOFF COEFFICIENT =		0.98		0.39		0.92	