RE BREEN 2
SOLAR PROJECT

Waterbodies Environmental Impact Study

August 19, 2011

RECURRENT ENERGY

RE Breen 2 ULC

Waterbodies Environmental Impact Study

RE Breen 2 Solar Project

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Project Report

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RE Breen 2 ULC
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1. Introduction

RE Breen 2 ULC is proposing to develop and operate a 10-megawatt (MW) solar photovoltaic (Solar PV) facility, on an approximately 32-hectare (ha) parcel of land, located in the Municipality of Thames Center, County of Middlesex, approximately 8.5 km southwest of the City of Ingersoll (Figure 1.1); herein referred to as "RE Breen 2" or the "Project".

As stated in Sections 39 and 40 of Ontario Regulation (O. Reg.) 359/09 *Renewable Energy Approvals Under Part V.0.1 of the Act*, (herein referred to as the "REA Regulation"), an Environmental Impact Study (EIS) is required for all waterbodies determined to be within a specified setback in order to obtain a Renewable Energy Approval (REA). The EIS identifies the potential negative environmental effects, documents the proposed mitigation measures, and describes the environmental effects monitoring plan for the waterbodies.

1.1 Renewable Energy Approval Legislative Requirements

As per Section 4 of the REA Regulation, ground mounted solar facilities with a name plate capacity greater than 10 kilowatts (kW) are classified as Class 3 solar facilities and require an REA.

The REA process requires the preparation of several reports with respect to waterbodies on and adjacent to the Project location, including the Records Review Report, Site Investigations Report and, if necessary, the EIS. The legislative requirements for these reports are summarized in the following sections.

1.1.1 Records Review Report

Section 30 of the REA Regulation requires proponents of Class 3 solar projects to undertake a water body records review to identify "whether the project is

1. in a water body
2. within 120 m of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity
3. within 300 m of the average annual high water mark of a lake trout lake that is at or above development capacity
4. within 120 m of the average annual high water mark of a permanent or intermittent stream, or
5. within 120 m of a seepage area." (O. Reg. 359/09, s. 30, Table).

Subsection 2 of Section 30 of the REA Regulation requires the proponent to prepare a report "setting out a summary of the records searched and the results of the analysis" (O. Reg. 359/09). The Water Body Records Review Report (Hatch Ltd., 2010a) was prepared to meet these requirements.

1.1.2 Site Investigation Report

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

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

The REA Regulation has specific requirements if designated lake trout lakes are present within 300 m of the Project area. No such lakes were found during the Water Body Records Review (Hatch Ltd., 2010a).

The Water Body Site Investigations Report (Hatch Ltd., 2010b) was prepared to meet these requirements.

1.1.3 Environmental Impact Study Report

Section 39(1) of the REA Regulation prohibits the construction, installation or expansion of any component of a solar Project within the following locations:

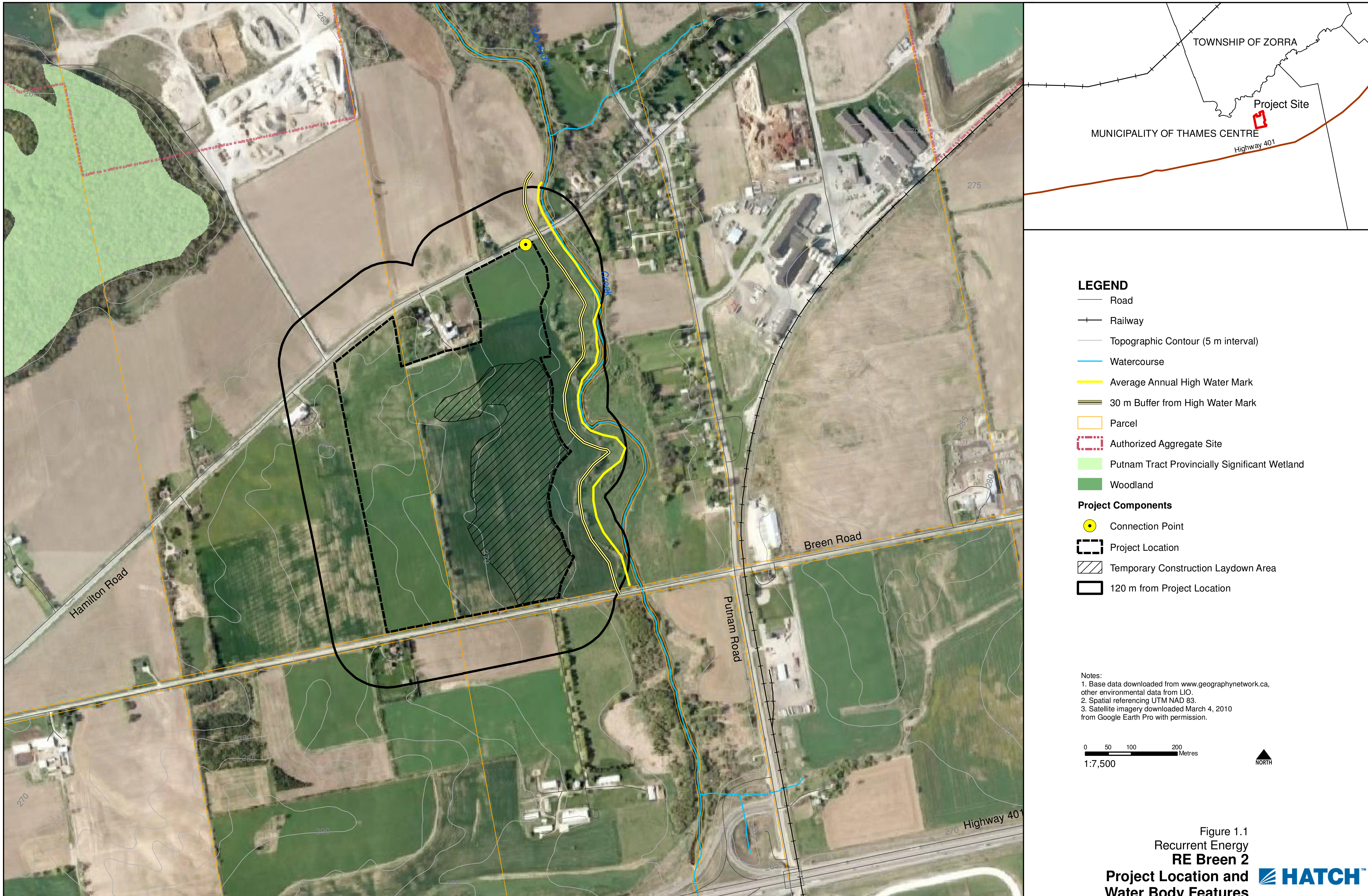
- a lake or within 30 m of the average annual high water mark of a lake
- a permanent or intermittent stream or within 30 m of the average annual high water mark of a permanent or intermittent stream
- a seepage area or within 30 m of a seepage area.

However, Section 39(2) allows proponents to construct Project components other than solar panels or transformers (e.g., access roads or distribution lines) within the locations noted above, subject to the completion of an EIS to assess negative effects and required mitigation and monitoring measures.

Section 40(1) of the REA Regulation prohibits construction, installation or expansion of any component of a solar Project within the following locations:

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

However, Section 40(2) allows proponents to construct Project components within the locations noted above, subject to the completion of an EIS.



LEGEND

- Road
- Railway
- Topographic Contour (5 m interval)
- Watercourse
- Average Annual High Water Mark
- 30 m Buffer from High Water Mark
- Parcel
- Authorized Aggregate Site
- Putnam Tract Provincially Significant Wetland
- Woodland

Project Components

- Connection Point
- Project Location
- Temporary Construction Laydown Area
- 120 m from Project Location

Notes:
1. Base data downloaded from www.geographynetwork.ca, other environmental data from LIO.
2. Spatial referencing UTM NAD 83.
3. Satellite imagery downloaded March 4, 2010 from Google Earth Pro with permission.

0 50 100 200 Metres

1:7,500

NORTH

Figure 1.1
Recurrent Energy
RE Breen 2
Project Location and Water Body Features

HATCH

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Sections 39 and 40 of the REA Regulation indicate that the EIS report must

- identify and assess any negative environmental effects of the projects on the waterbodies and on land within 30 m of the water body
- identify mitigation measures in respect of any negative environmental effects
- describe how the environmental effects monitoring plan in the Design and Operations Report (RE Breen 2 ULC, 2010a) addresses any negative environmental effects
- describe how the Construction Plan Report (RE Breen 2 ULC, 2010b) addresses any negative environmental effects.

This EIS has been prepared to address these requirements for the construction of Project components between 30 and 120 m from the waterbodies noted in Section 1.2. The EIS has been prepared in accordance with the Ministry of Environment's DRAFT Technical Bulletin – Guidance for Preparing the Water Assessment and Water Body Reports (dated January 28, 2011).

1.2 Background Information on Waterbodies

The Water Body Records Review (Hatch Ltd., 2010a) and Water Body Site Investigations Report (Hatch Ltd., 2010b) confirmed that the Project will be constructed between 30 and 120 m away from the average annual high water mark of Reynolds Creek.

This water body and the Project development area are shown in Figure 1.1.

1.3 Environmental Impact Study Format

Section 1 of this EIS has identified the legislative requirements for an EIS under the REA Regulation and identified the reasons why an EIS is required for the Project. Section 2 summarizes the methodology that was used to prepare the EIS. Section 3 summarizes the activities associated with Project construction, operation and decommissioning. Section 4 identifies and assesses negative environmental effects and mitigation measures to prevent/minimize the potential effects. Section 5 describes the environmental effects monitoring plan from the Design and Operations Report (RE Breen 2 ULC, 2010a) and Section 6 describes how the Construction Plan Report (RE Breen 2 ULC, 2010b) addresses the potential negative environmental effects. Section 7 summarizes the results of the EIS. References are included in Section 8.

2. Methodology

The following steps outline the methodology that was used to prepare this EIS:

1. Documentation of Project components and activities during all Project phases, including construction, operations and decommissioning, including identification of temporal and spatial boundaries.
2. Background data collection on the water bodies within 120 m of the Project location through the Records Review and Site Investigation processes.
3. Identification of the effects that is likely to occur on the environmental components as result of implementing the Project.

4. Development of mitigation measures to eliminate, alleviate or avoid the identified negative effects.
5. Design of an environmental effects monitoring program to confirm the predicted effects and the effectiveness of mitigation measures.

3. Project Components and Activities

The following sections briefly describe the construction, operation and decommissioning phases of the Project. More detailed information can be found in the Construction Plan Report (RE Breen 2 ULC, 2010b), Design and Operations Report (RE Breen 2 ULC, 2010a) and Decommissioning Plan Report (RE Breen 2 ULC, 2010c). The Site Layout from the Construction Plan Report is provided in Appendix A to show the detailed components of the facility including solar panel, inverter, transformer and access road locations.

3.1 Construction

Construction is anticipated to occur over an approximately 6 to 10 month period. The activities associated with construction are summarized in Table 3.1.

Table 3.1 General Description of Construction Activities (From RE Breen 2 ULC, 2010b)

Activity	Description
Temporary Power Installation	A temporary connection to the existing electrical system will be constructed to supply power for construction activities.
Survey and Stake Facility	The site will be surveyed and staked to delineate the outline of excavations, roads and foundation locations.
Laydown Area Preparation and Setup	Construction of the construction laydown/long-term parking area (~30 m by 50 m) will include • clear and grub laydown area • strip and remove all topsoil • shape and proof-roll subgrade • shape ditches and swales • place, shape and compact granular sub-base and base materials • revegetate ditches and swales.
Access Road Construction	Activities associated with construction of ~3700 m of internal access roads will include • clear and grub laydown area • strip and remove all topsoil • shape and proof-roll subgrade • shape ditches and swales • place, shape and compact granular sub-base and base materials • revegetate ditches and swales • no crossings of watercourses or drains will be required for the internal access road network.
Water Well Installation	A water well will be installed to supply water for construction purposes. Water extracted is anticipated to be around 10,000 L/d but it will not exceed 45,000 L/d. Water will be temporarily stored in a bladder tank on site.

Activity	Description
Solar PV Field Preparation	Hedgerows in the solar PV field will be cleared. Larger trees will be felled by chainsaw, smaller brush will be removed by a bulldozer with a brush rake. Material will be re-used on site or managed in accordance with regulatory requirements. Minor grading will be undertaken as required.
Substation Preparation	The substation area (~20 m by 20 m) will be excavated for the transformer foundation and oil containment area. The substation site will be prepared and excavated for the footings required for the termination equipment and control house foundation pad.
Access from Public Roads	Culverts will be installed across the ditch from the public roadway.
Array Foundation Installation	Array foundations will consist of structural footings (e.g., steel piles, screw piles, concrete piers or direct bolting to bedrock) designed and installed depending on the geotechnical conditions.
Foundations for Substation, Transformer and Inverters	Foundations will be formed with plywood and reinforced with structural steel. Concrete will be poured from a ready-mix concrete truck to create foundations.
Cable Trench and Conduit Installation	Cable trench and conduits will be installed for the PV collection and aggregation system. Activities include • trench excavation by backhoe • installation of levelled layer of compacted stone on base of trench • installation of conduit within trench • installation of cables within the conduit • burying of conduit a minimum of 46 cm below grade.
Dead End Structures	Wood pole dead end structures consisting of wood poles and associated insulators and connectors will be installed to connect the substation to the distribution line.
Control House Installation	A pre-fabricated control house (approximately 6 m by 9 m) will be installed on the foundation pad in the substation area.
Fencing	A 2.7-m (9-ft) high chain-link security fence, with provision for topping with barbed wire will be erected around the perimeter of the Project location.
PV Array Installation	Activities include • installation of outdoor transformers and inverter units on the foundation pads • erection of PV support structures • installation of PV modules in the support structures • installation of combiner boxes on the rear of the finished PV arrays.
Substation Installation	Installation of main power transformer, switchgear cells, metering, service transformer and disconnect switches in the substation area.
Commissioning	The substation equipment, inverters, collector system and PV array systems will be tested and commercial operations will commence. Activities will include testing, calibration and troubleshooting.
Rehabilitate Site	Once major construction has been completed, the site will be reseeded/revegetated.

3.2 Operation

The facility will operate 365 d/yr when sufficient solar radiation exists to generate electricity. The facility will be remotely monitored with no regular on-site employees. Inspections will be conducted periodically during the operations phase, with maintenance conducted as required. Operations and maintenance requirements are summarized in Table 3.2. It is anticipated that the facility will operate for 30 years.

Table 3.2 General Description of Operating Activities

Activity	Description
Expected Commercial Operation Date	February 2013
On-Site Employees	Zero (0) on-site employees
Periodic Inspection and Minor Maintenance	Monthly inspections will be conducted with minor maintenance undertaken as required. Activities may include vegetation control, panel washing, transformer inspection, inspection of primary system components, replacement of air filters and other minor adjustments or maintenance as needed.
Major Maintenance	In the event of a component failure, all major maintenance can be performed utilizing existing roads and site access.
Cleaning of Panels	Approximately three times per year on average, utilizing water from the on-site well. A total of ~25,700 L of water over a 4 to 5 day period is anticipated for each of the three cleaning events. Water only is used for cleaning – no cleaning solutions of any kind are used to wash the panels.
Fuel Consumption	None.
Solid Waste	None – the system does not produce waste of any type. All debris as a result of maintenance or cleaning will be removed from the site immediately by the contracted party.

3.3 Decommissioning

Decommissioning would occur when the decision has been made that it is no longer economically feasible to continue operation or refurbish generating equipment. It is anticipated that decommissioning would not occur until at least 2043.

All decommissioning and site restoration activities would adhere to the requirements of appropriate regulatory authorities and would be conducted in accordance with all applicable federal, provincial and municipal permits and other requirements. The decommissioning and restoration process comprises the following activities:

- removal of above-ground structures (i.e., solar panels, upper racking, inverters, distribution line and interconnection equipment and access road materials)
- removal of below ground structures to a depth of at least 1.2 m (i.e., below ground racking/piers, transformer/inverter pads and footings)
- site grading (to remove ditches, access road, etc) and restoration of topsoil to facilitate a return to agricultural conditions.

4. Potential Negative Environmental Effects and Proposed Mitigation Measures

This section describes the anticipated negative environmental effects on Reynolds Creek and land within 30 m that could occur as a result of construction, operation and decommissioning phases of the Project (as described in Section 3).

Potential negative effects are discussed under each environmental component associated with waterbodies and adjacent lands, where effects on the land could negatively affect Reynolds Creek. Mitigation measures are proposed to minimize, eliminate or alleviate any negative effects. Relevant environmental components include

- surface water runoff (patterns and rates)
- surface water quality
- groundwater
- aquatic biota
- aquatic and riparian habitat.

4.1 Surface Water Runoff

Surface water runoff occurs when snow melts and/or precipitation hits the ground and runs along the surface of the land, following the path of least resistance, typically toward a watercourse or other stormwater conveyance feature. Descriptors of runoff can include the pattern that runoff takes en route to its discharge to water features (i.e., the overland runoff routes) and the rate at which runoff leaves the land (e.g., the volume of runoff per unit area per unit time, such as m^3/m^2/minute).

Surface water runoff affects a number of other environmental components and biophysical processes occurring on land and in water. Examples include

- recharge of groundwater supplies due to infiltration into the land
- uptake of water by vegetation (either through the roots or by interception on the plant)
- erosion of land due to changes in runoff patterns or rates
- alterations in watercourse hydrology
  - higher peak flows if surface water runoff rates increase (e.g., if more water leaves the land and enters the watercourse) or lower peak flows if runoff rates decrease (e.g., if more water infiltrates the land and is taken up by vegetation)
  - alterations in the rate of change in watercourse flows (e.g., flows increase at a higher rate if water runs off the land faster) including increase in 'flashiness' of watercourses
- alterations in watercourse geomorphology (e.g., channel conditions) due to changes in flows or water levels resulting in changes in sediment transport (bed and bank erosion or sediment deposition).

Surface water runoff can potentially be affected by a number of activities including

- changes in land topography
- changes in infiltration to the land
- changes in vegetation surface water uptake via interception or in-ground uptake.

4.1.1 Construction Phase

Activities that could occur during the construction phase that would have the potential to affect surface water runoff patterns and rates include

- land grading and ditching
- soil compaction due to heavy equipment or stockpiling
- vegetation removal.

The potential negative effects and proposed mitigation measures associated with these activities are discussed in the following sections.

4.1.1.1 Land Grading and Ditching

All construction activities will take place in existing agricultural fields, so no major grading works are anticipated to be required to install any of the temporary or permanent Project components. Minor, localized grading may be required for the temporary laydown area, inverter/transformer pads and access roads. This minor grading may locally alter runoff patterns compared to the existing diffuse runoff from the agricultural fields. However, the size of the graded area will be very small relative to the size of the Project location, so no measurable effect on surface water runoff is anticipated to occur.

Drainage features including ditching and cross culverts will be required to maintain site drainage across access roads traversing the Project location. These drainage features will serve to concentrate site runoff at discharge points into the adjacent undisturbed agricultural fields (on the majority of the Project location) or into the 30-m buffer adjacent to Reynolds Creek in the northeastern corner of the Project location (e.g., from the parking area). Therefore, surface runoff at these discharge points may be at a higher rate than runoff from the existing agricultural fields, since runoff from the fields is more diffuse and not concentrated in ditch/culvert network.

This higher rate of runoff from the Project location could potentially result in negative effects at the receiving water body. RE Breen 2 ULC is proposing to undertake a number of measures, including the following:

- At the discharge point near the 30-m setback adjacent to Reynolds Creek, flow dissipation measures (e.g., rock check dams or enhanced vegetated swales) will be installed to temporarily retain water and decrease flow velocity on the Project location (outside the setback), and offshoot ditches will be installed from the main ditch, to promote diffuse overland flow through the vegetated buffer area (where grades allow) or swales, so flow is dissipated prior to entering the water body.

- All ditches constructed for the Project will be planted with suitable grass species to enhance the runoff dissipation capacity of the vegetation in the buffer. Vegetation assists with slowing runoff, reducing the amount of runoff through uptake and interception and enhancing the quality of runoff by uptake of chemical constituents in the runoff.
- Runoff in the ditches will be slowed through the use of rock flow check dams and/or straw bale flow checks to promote minor ponding and water retention, as well as sedimentation to reduce turbidity in ditches.

Therefore, surface water runoff from the site may be increased at ditch discharge areas compared to more diffuse runoff from the existing fields. However, the mitigation noted above to control runoff entering the water body downstream from the ditch discharge locations will prevent negative effects on Reynolds Creek.

4.1.1.2 Soil Compaction

Soil compaction may result from the use of heavy equipment (e.g., tracked bulldozers and backhoes), and stockpiling of heavy materials (e.g., soils). Soil compaction occurs when heavy equipment or material causes the soil particles to be pushed together, thereby increasing soil density and reducing the pore space within the soil structure (DeJong-Hughes et. al., 2001). Excessive soil compaction can result in inhibited water infiltration due to decreased pore space within the soil structure (DeJong-Hughes et. al., 2001). Decreased water infiltration into the soil could also potentially result in an increase in surface runoff.

Prior to site rehabilitation following construction, disturbed areas will be visually monitored to assess if compaction has occurred, as noted by rutting or flattened areas beneath stockpiles. Restoration efforts (e.g., discing or other soil loosening methods) will be undertaken as required to prevent long-term impacts due to excessive amounts of compaction occurring during construction. Soil compaction will likely occur in localized areas within the zone of disturbance during the short-term construction period. However, no significant long-term change in soil structure is anticipated following implementation of site restoration and associated mitigation to remediate significantly compacted areas, although minor amounts of compaction may persist in localized areas.

Therefore, no measurable change in surface water runoff is anticipated to occur due to minor, localized soil compaction occurring during the construction phase.

4.1.1.3 Vegetation Removal

Existing agricultural crops on the site include corn and hay, with some pastureland. These crops are typically harvested in the fall with corn being replanted in the spring (~May). Therefore, at the beginning of the construction phase some minor vegetation removal may be required on the agricultural fields and in the hedgerow crossing the Project location. There will be no adverse effect on surface water runoff due to this minor vegetation removal.

It is anticipated that, instead of planting the agricultural crops as they normally would be, the long-term ground cover that will be used in and around the solar panels will be planted in spring, once construction activities have ceased and conditions are suitable for planting. This will likely have enhanced surface water runoff control functions compared to the existing row crops on the site, so no negative effects are anticipated due to changes in vegetation on the Project location during the construction phase.

4.1.2 Operations Phase

Long-term site alterations associated with the operational phase of the Project that could potentially affect surface water runoff include

- long-term changes in land grading and ditches
- presence of impervious or less pervious surfaces
- changes in vegetation structure and density.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.1.2.1 Long-Term Changes in Land Grading and Ditches

As discussed in Section 4.1.1.1, the ditches and drainage conveyance features installed during the construction period will likely remain in place throughout the operations period. Mitigation measures also discussed in Section 4.1.1.1 (e.g., diffuse runoff patterns, flow retention features in ditches) will also remain in place for the duration of the operations phase. These measures are anticipated to be effective in preventing localized changes in surface water runoff from impacting the receiving water body. Maintenance as required will be undertaken.

4.1.2.2 Impervious or Less Pervious Surfaces

Inverter/Transformer Pads

Each of the ten inverter concrete pads and the single transformer pad will be an impervious surface that will not allow infiltration of surface water into the soil. However, the size of these impervious areas will be negligible compared to the overall size of the Project location. Therefore, no overall effect on surface water runoff from the Project location is anticipated to occur as a result of these concrete pads.

Solar Panels

Each of the solar panels will also be an impervious surface. Due to the tilt of the solar panels, all precipitation landing on the panel surface will run off the lower edge of the panel onto the ground. Therefore, discharge from each individual panel to the ground surface will be concentrated at the base of each panel. However, given that rows of panels will be separated from each other, panels effectively function as temporary interceptors of precipitation with only minor concentration at the point where water runs off their surface. Once the water reaches the ground surface, there will be no impacts on surface drainage due to the presence of the panel. Therefore, the impervious panels will not have any effects on overall surface drainage (rate and quantity) from the Project location. Erosion potential is discussed in Section 4.2.2.1.

Access Roads

Access road surfaces may be less pervious than the existing agricultural fields. Therefore, more surface runoff per unit area may occur on the access roads compared to the existing conditions. This runoff will likely enter the road side ditches and drain toward the water body. However, the mitigation noted in Section 4.1.2.1 will be sufficient to prevent any long-term effects due to this minor change in local runoff.

Parking Area

The long-term parking area will be located in the northeastern corner of the Project location. It will consist of a 300-mm thick layer of Granular B sub-base, overlaid by a 150-mm thick layer of Granular A material. These granular materials will be permeable, but likely less so than the existing agricultural soils in this location. Therefore, it is anticipated that a slightly higher rate of runoff will occur from the parking area compared to existing conditions. Runoff from the parking area will enter the field adjacent to the 30-m setback from Reynolds Creek. However, due to the presence of the dense vegetated cover within the 30-m setback, it is anticipated that any additional runoff due to the parking area will infiltrate or be otherwise retained through vegetation uptake or temporarily ponded in the buffer area before it reaches Reynolds Creek. Therefore, no adverse effects on the hydrology of Reynolds Creek are anticipated to occur due to the less pervious parking area.

Summary

Overall, the total area that will be occupied by access roads, transformer pads and parking areas will only be 9% of the total Project location (RE Breen 2 ULC, 2010a). RE Breen 2 ULC (2010a) indicates that this small increase in impervious area on the Project location will result in an approximately 4.7% increase in total peak flow and less than a 4% increase in the total volume of stormwater generated from the Project location. Given that this stormwater will be discharged to adjacent undisturbed fields and the vegetated buffer next to Reynolds Creek, where it will be subject to infiltration, uptake and retention, a negligible overall change in hydrology of Reynolds Creek is anticipated.

4.1.2.3 Changes in Vegetation

As noted in Section 4.1.1.3, existing vegetation on the Project location consists of row crops (corn) and hay. During the operational period, the row crop and hay will be replaced with a native ground cover of various grasses and forbs. It is likely that this ground cover will be of a higher density with enhanced stormwater management functions compared to row crop and hay. This includes better interception of precipitation and surface water runoff, as well as increased uptake from the soil.

In addition to the Project location, the 30-m buffer around Reynolds Creek is densely vegetated and will not be affected due to Project development and operation. The buffer will therefore continue to provide stormwater management functions similar to the vegetation on the Project location.

Overall, these changes in vegetation community on the Project location and the presence of the existing naturally occurring buffer around watercourse will improve stormwater management on the site, resulting in a more natural surface water runoff pattern from these vegetated areas, compared to the existing agricultural crops. This may result in lower discharge rates to the water body.

4.1.3 Decommissioning Phase

Short-term activities and long-term site alterations associated with the decommissioning of the Project that could potentially affect surface water runoff include

- long-term changes in land grading
- changes in vegetation structure and density.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.1.3.1 Long-Term Changes in Land Grading

The decommissioning process will revert the Project location as close as possible back to the existing agricultural conditions. Access roads and ditches will be removed and grading will be conducted to restore the natural grades of the agricultural fields where they have been affected by Project features.

This is anticipated to restore existing surface water runoff patterns with no negative effects on surface water runoff compared to existing conditions.

4.1.3.2 Changes in Vegetation

Decommissioning will result in the restoration of the land to existing agricultural conditions with removal of the ground cover below the solar panels and reinstatement of agricultural crops to the satisfaction of the landowner. This will restore existing surface water runoff patterns, but may result in a minor negative effect on surface runoff, since, as noted in Section 4.1.2.3, the proposed ground cover beneath the panels may result in improved surface water runoff retention. However, this is an acceptable negative effect, since the long-term land use of this area will be agricultural.

4.2 Surface Water Quality

Surface water quality includes both the physical characteristics of the watercourse and any overland flow (e.g., clarity, turbidity, pH, temperature) and chemical characteristics (e.g., dissolved oxygen, metals, nutrients and other potentially hazardous contaminants). Surface water quality affects a number of other natural environmental components and biophysical processes in watercourses, including the receiving water body that can be located substantial distances from the watercourse where the initial change was effected. This includes

- adverse effects on aquatic biota (e.g., fish and benthic invertebrates)
- adverse effects on aquatic habitat (e.g., due to deposition of sediment from turbid water).

4.2.1 Construction Phase

Activities that could occur during the construction phase that would have the potential to affect surface water quality in ditches and nearby watercourses include

- increased erosion and sedimentation
- dust generation
- accidental spills of fuels
- accidental spills of concrete.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.2.1.1 *Increased Erosion and Sedimentation*

Disturbance of the Project location due to vegetation clearing, topsoil and subsoil stripping, grading, use of heavy machinery, stockpiling and concentration of flow in drainage features (e.g., ditches) has the potential to increase soil erosion due to exposure of bare soil (not protected by vegetation) to the effects of surface water (e.g., rain, overland flow due to rain/snow melt). Erosion is defined as the process where individual soil particles are detached from the ground, whereas sedimentation is defined as the subsequent transport and deposition of the detached soil particles. Erosion and sedimentation have the potential to affect surface water quality by resulting in higher levels of turbidity and possibly contaminants associated with the soil surface in the receiving water body.

In order to mitigate this potential, a conceptual erosion and sediment control (ESC) plan is proposed below which should be supplemented by an ESC drawing prepared by the proponent's engineer or contractor. Additional information on the sediment and erosion control plan is also provided in the Construction Plan Report (RE Breen 2 ULC, 2010b). The ESC plan will be prepared in accordance with the guidance provided in the *Erosion & Sediment Control Guideline for Urban Construction* (GGHACA, 2006).

Preventing erosion from occurring in the first place is the primary goal of the ESC plan and measures such as proper construction phasing, minimizing the size and duration of soil disturbance and exposure and revegetating or stabilization as soon as possible after disturbance are all identified as effective erosion control measures. Sediment control measures are the last line of defence and are implemented to ensure that eroded soil particles are not transported off the Project location or to watercourses. Sediment control measures include measures such as silt fence barriers to trap and retain sediments.

The main mitigation measures that will form the basis for the ESC plan will include the following:

- Minimize the size of the cleared and disturbed areas at the construction site. Install limit of work devices to prevent the contractor from operating outside the defined construction area [e.g., silt fence barriers at the edge of the Reynolds Creek valley (where construction is in close proximity to the 30-m setback in the northeast corner of the site) or at the edge of the development area where it is substantially set back from Reynolds Creek].
- Phase construction to minimize the time that soils are exposed.
- Limit vegetation removal to existing agricultural fields. Limit of work devices should be installed outside the drip line of residual trees adjacent to the site, where possible.
- An adequate supply of erosion control devices (e.g., geotextiles, revegetation materials) and sediment control devices (e.g., silt fence barriers) to be provided on site to control erosion and sedimentation and respond to unexpected events.
- Sediment control fencing may be installed along the periphery of the Project location where there is the potential for sedimentation off site (e.g., in the northeast corner where construction will occur in proximity to the 30-m setback from Reynolds Creek). These silt fence barriers should remain in place until construction is complete and site vegetation and other long-term protection measures, are stabilized and adequate to prevent further erosion.

- Divert runoff from the temporary and permanent access roads or laydown areas through vegetated areas or into a properly designed and constructed drainage collection system to ensure that exposed soils are not eroded. Runoff velocities in ditches or other drainage routes, or along slopes, to be kept low via proper installation of flow velocity control measures such as rock flow check dams, to minimize erosion potential. Runoff discharge locations to be protected with erosion resistant material, if required. Ditches should be vegetated as soon as possible following installation to provide erosion protection.
- Grade stockpiles to a stable angle as soon as possible after disturbance to eliminate potential slumping. Revegetation (if during the growing season) or some other means of stabilization (e.g., tarping) should occur for any disturbed surface that is to be left exposed for longer than 30 days.
- Revegetate or stabilize exposed sites as soon as possible after they have been disturbed, using quick growing grasses or other native vegetation species approved by the Upper Thames River Conservation Authority (UTRCA). Where revegetation is not possible other erosion protection methods, such as erosion matting may be used.
- Excavated erodible material stockpiles to be placed in suitable designated areas away from the water body (i.e., outside the 30-m buffer and the UTRCA Regulated Area boundary) and properly constructed silt fences should be installed around the stockpiles to limit the transport of sediment.
- Monitoring the tracking of mud onto Hamilton Road during construction. If mud on streets occurs, the contractor will be required to implement a system to prevent transfer of this material to local ditches and the water body. This could potentially include wheel-washing areas at the exit from the construction site or end-of-day street sweeping/scraping to remove accumulated materials from local streets.

Implementation of these mitigation measures is anticipated to be effective in minimizing soil erosion and off-site transport from the construction area, such that the water body is not negative affected. Monitoring will be conducted throughout the construction period to ensure ESC measures are functioning as designed (see Section 5).

4.2.1.2 Dust Generation

Dust may be mobilized due to vehicular traffic and heavy machinery use, drilling and soil moving activities. If unmitigated, excessive dust levels could adversely impact surface water quality and aquatic habitat if it were to be deposited in Reynolds Creek.

However, it is not anticipated that dust generation will be a significant problem since the potential impacts can be substantially mitigated through the use of standard construction site best management practices and mitigation measures. In this regard, the document entitled “Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities” (Cheminfo Services Inc., 2005) will be used as a guideline for contractors. Mitigation measures to be used, as required, to control dust include

- use of approved dust suppression materials (i.e., water or other materials that will not adversely affect water quality or vegetation growth) on exposed areas, including access roads, stockpiles and works/laydown areas as necessary

- hard surfacing (addition of coarse Granular A material free of fine soil particles) of access roads or other high-traffic working areas
- phased construction, where possible, to limit the amount of time soils are exposed
- avoid earth moving works during excessively windy weather. Stockpiles to be worked (e.g., loaded/unloaded) from the downwind side to minimize wind erosion
- stockpiles and other disturbed areas to be stabilized as necessary (e.g., tarped, mulched, graded, revegetated or watered to create a hard surface crust) to reduce/prevent erosion and escape of fugitive dust.

Visual monitoring of dust generation will occur during the construction period and it dust is observed to be of concern, additional mitigation will be implemented. Given the mitigation and monitoring proposed, it is anticipated that dust generation will be relatively low in magnitude and limited in duration and geographical area, such that no negative effects on the water body is expected to occur as a result of dust.

4.2.1.3 Accidental Spills

Fuels, lubricants and other hazardous materials will be used on the construction site. Activities during the construction phase that could potentially result in transport of these materials to the watercourse, with subsequent negative impacts on water quality, include

- refuelling and maintenance
- use of equipment containing fuels, lubricants or other materials within, or in the vicinity of watercourse
- storage of hazardous materials.

In most areas, construction activities will be occurring a substantial distance (>120 m) from Reynolds Creek. However, some activities in the northeastern corner of the Project location (e.g., laydown area construction and use, access road construction and use) will be less than 120 m from Reynolds Creek.

There are a number of general mitigation practices to be followed by the contractor during construction to minimize the potential for negative environmental impacts associated with the scenarios above which could be caused by the storage, use and disposal of fuels, lubricants and other hazardous materials. These include the following:

- Establish designated refuelling and maintenance areas within the proposed laydown area, which is located outside the 1:250-yr Flood Hazard identified by UTRCA.
- Locate designated hazardous material storage areas in the laydown area described above. Storage areas should be above ground and enclosed by an impervious secondary containment structure (e.g., berm or container) capable of holding the entire volume of the stored material, as well as some additional volume of rainwater. The area should be equipped with a drain so that it can be cleared of any spilled material or accumulated rainwater, which would be disposed of in a suitable manner. Secondary containment areas should be monitored throughout the construction period to ensure their integrity.

- A barrier will be erected around the storage area to prevent accidental damage to containers.
- Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
- An emergency spill kit will be kept on site in case of fluid leaks or spills from machinery.
- Provide adequate spill clean-up materials/equipment (e.g., absorbents) on site. The contractor must have a spill clean-up procedure/emergency contingency plan in place prior to commencement of work at the site. All site staff should be trained in implementation of the procedure.

Given this mitigation, no adverse effects on surface water quality due to use of fuels, lubricants and other hazardous materials during Project construction is anticipated to occur.

4.2.1.4 Accidental Spills of Concrete

Concrete will be used to construct the inverter and transformer pads, and depending on soil strength conditions, may also be used as ballast for the solar panel racking. Concrete will be brought on site by a ready-mix concrete supplier in concrete trucks and poured directly into the form for each transformer/inverter pad. If concrete ballast is required for the panel racking structures, it would likely consist of pre-fabricated structures brought to the site. No cement is anticipated to be stored or mixed on site.

Concrete, grout and associated materials (e.g., cement, mortars) typically have high pH values (i.e., highly basic or alkaline), which, if they enter a watercourse, could create adverse surface water quality conditions that are toxic to aquatic biota (Province of British Columbia, 2007).

Although the use of concrete during Project construction is relatively limited and will not occur within 30 m of any water body, mitigation measures are proposed to prevent negative effects. The Province of British Columbia (2007) has identified a number of construction best management practices to prevent adverse impacts on surface water quality and biota due to the use of concrete. Therefore, in order to mitigate potential adverse effects due to concrete and cement use, the following mitigation measures are to be implemented:

- No alkaline cement products will be deposited directly or indirectly into or adjacent to any watercourse.
- Concrete truck rinsing will occur at a designated area at least 120 m from any waterbodies or drainage routes in a manner to contain the rinse water and concrete residue to prevent off-site transport. However, if all wastewater arising from truck rinsing will be contained and treated to meet pH requirements before discharge or transported off-site with no on-site discharge, then the truck rising may occur within the laydown area.
- No cement is anticipated to be stored on site. However, if some cement bag storage is required, bags are to be stored indoors, where possible. If outdoor storage is required, cement bags should be covered with waterproof sheeting and raised off the ground (e.g., on wooden palates) to ensure no contact with surface water runoff. Impervious material will be placed under the elevating mechanism to collect any spills (e.g., due to ripped bags). Empty cement bags are to be collected as soon as possible after use and spills of cement or concrete cleaned up as appropriate.

Given this mitigation, no negative effects on surface water quality due to use of concrete during construction is anticipated to occur.

4.2.2 Operations Phase

Long-term site alterations associated with the operations phase that would have the potential to affect surface quality in Reynolds Creek include

- erosion and sedimentation from the Project area
- maintenance activities such as panel cleaning
- accidental spills.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.2.2.1 Erosion and Sedimentation from the Project Area

Given the mitigation associated with long-term stormwater management on the site as discussed in Section 4.1.2, no erosion is anticipated to occur throughout the operations period. Precipitation running off each solar panel face will be concentrated at the point where it intercepts the ground surface and therefore, could potentially have more erosive force than normal diffuse precipitation patterns. However, the dense ground cover vegetation beneath the solar panel will be sufficient to prevent erosion of the underlying soils due to this concentrated impact. Precipitation will then drain from the site in a similar manner as presently occurs. Therefore, no erosion is anticipated due to runoff from the solar panels.

General site monitoring will be conducted during the general site inspections throughout the life of the Project to determine if erosion is occurring on or adjacent to the site, including in the runoff area from the panels. Remediation would be undertaken as necessary to prevent any further erosion.

Given this mitigation and monitoring, no adverse effects on surface water quality are anticipated to occur during the operations period.

4.2.2.2 Maintenance Activities

As noted in Section 3.2, normal maintenance activities will include inspection of components, replacement of air filters and panel washing. Normal maintenance and inspection are not anticipated to have any negative effects on the water body. It is anticipated that panel washing will occur approximately three times per year. During each washing event, up to ~25,700 L of groundwater will be withdrawn from the on-site well over a 4 to 5 day period. Water will be discharged to the ground surface adjacent to the panels. Given that the volume of water utilized will be less than that which would occur during a normal rain storm and that no cleaning agents will be used, no adverse effects on surface water quality are anticipated to occur due to panel washing maintenance activities.

4.2.2.3 Accidental Spills

Use of fuels, lubricants and other potentially hazardous materials during the operations phase will be limited to those materials brought on site during the periodic maintenance activities. This would include fuel and other lubricants in maintenance vehicles and that are used to maintain the solar facilities. All maintenance vehicles will be equipped with a spill kit and a spill contingency and response plan will be in place for the duration of the operational period. Given this mitigation, and the limited quantity of material on site and the limited frequency and duration that it will be on site, no adverse effects due to accidental spills are anticipated to occur.

The main station transformer will contain a small volume of transformer oil that could potentially be transferred to the water body in the event of a leak. In order to mitigate this potential, a containment structure with an oil-water separator will be installed around the transformer. Therefore, in the event of a leak, spilled fluid will be contained within the concrete pad surrounding the transformer. It would then be removed and disposed of in accordance with regulatory requirements. More details on the proposed containment system are provided in the Design and Operations Report (RE Breen 2 ULC, 2010a). No adverse effects on surface water are anticipated to occur due to presence of transformer oil on site.

4.2.3 Decommissioning Phase

Short-term activities and long-term site alterations associated with the decommissioning phase that would have the potential to affect surface quality in nearby watercourses include

- increased erosion and sedimentation from the facility
- accidental spills during decommissioning.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.2.3.1 Erosion and Sedimentation

Standard construction site erosion and sedimentation measures will be installed during the decommissioning process, since heavy equipment may be needed, which will result in some exposure of soil. However, decommissioning is anticipated to be a relatively quick process with minimal amounts of ground disturbance required to remove panels and other features. Once the field is returned to its existing agricultural condition, erosion will be similar as it is today. Therefore, given the mitigation that will be implemented during decommissioning and the fact that the site will be restored to existing agricultural conditions, no negative effects on water quality are anticipated to occur.

4.2.3.2 Accidental Spills

Equipment associated with the decommissioning process could potentially result in accidental spills and/or leaks. The mitigation noted in Section 4.2.1.3 for use during the construction process, would also be implemented during the decommissioning process. It is anticipated that this mitigation will be effective in preventing spills and minimizing the magnitude and extent of any small spills that do occur. Therefore, no adverse effects on surface water quality are anticipated to occur due to small leaks or spills during decommissioning.

4.3 Groundwater

Groundwater will likely be present in the subsoils underneath the site at various depths throughout the year. As discussed in the Water Body Records Review Report (Hatch Ltd., 2010a), no groundwater seepage areas were identified within 120 m of the Project location.

Impacts on groundwater could potentially occur due to excavations below the groundwater table (e.g., for transformer pad footings), withdrawals from a new on-site well for construction or operational maintenance purposes, or due to accidental spills during construction, operations or decommissioning. Those potential effects and associated mitigation is discussed by Project phase in the following sections.

Given the mitigation proposed in Section 4.1 to prevent any changes in soil structure that may affect infiltration, the Project is not anticipated to have any effect on groundwater recharge that may occur during precipitation or snow melt events.

4.3.1 Construction Phase

During construction, groundwater could potentially be affected by any Project excavation if it is deep enough to intersect the groundwater table. Groundwater could also be affected by withdrawals from the new on-site well for construction water purposes. Groundwater quality could also be affected by any spills that infiltrate the soil and enter the groundwater table. Potential negative effects and proposed mitigation measures are discussed in the following sections.

4.3.1.1 Effects on Groundwater Due to Project Excavations

The only Project excavation anticipated to be potentially deep enough to intersect the groundwater table would be the excavation for the main transformer pads. Should this excavation intersect the groundwater table, some pumping of groundwater may be required to keep the excavation area dry to facilitate construction. This pumping could potentially result in a minor localized decrease in groundwater levels.

Any groundwater entering Project excavations, as well as any accumulated precipitation, is to be pumped out of the excavated area, treated, if required to meet MOE water quality discharge criteria, and discharged to a vegetated buffer area.

Given the very small size of the excavation required for the transformer pad and the limited duration that pumping will be required (2 weeks or less), it is not anticipated that pumping of groundwater at these sites will have any measurable effect on the local groundwater table. No negative effects at the identified seepage area are anticipated.

4.3.1.2 Effects Due to Well Withdrawals for Construction Purposes

Water for construction purposes will be withdrawn from a new on-site water well installed during the construction period. Water will be extracted at a rate not to exceed 45,000 L/d in order to minimize changes in the local groundwater table and groundwater availability. It is anticipated that the amount of water required will be approximately 10,000 L/d. Water extracted from the well will be stored in an on-site bladder tank prior to use.

Therefore, construction water withdrawals could potentially result in a localized decrease in the groundwater table around the well, although given the small volume to be utilized, no significant changes in groundwater supplies are anticipated to occur.

4.3.1.3 Accidental Spills

Mitigation proposed in Section 4.2.1.3 is anticipated to be effective in minimizing the potential for accidental spills and in the event of a spill, minimizing the magnitude of that spill. Accordingly, it is not anticipated that spills would be large enough to have any noticeable effect on groundwater supplies. However, if spills do occur, the spill response and contingency plan protocol will be implemented and this will involve notifying the MOE Spills Action Centre. If the spill is determined to have the potential to impact groundwater, remedial measures will be taken, such as excavated the soil that was contaminated by the spill, in order to prevent infiltration of contaminants into the groundwater table.

4.3.2 Operations Phase

During the operations phase, potential effects on groundwater could include reductions in the groundwater table due to withdrawals from the well for operational maintenance purposes (e.g., panel cleaning) and due to accidental spills associated with maintenance activities and the presence of transformer oil.

4.3.2.1 Withdrawal of Water for Maintenance Purposes

It is anticipated that panel washing will occur approximately three times per year. During each washing event, up to ~25,700 L of groundwater will be withdrawn from the on-site well over a 4 to 5 day period, for a daily total of approximately 5100 to 6400 L. There may be other periodic uses for water withdrawn from the on-site well during operations, including access road dust control. The amount of groundwater withdrawn for these uses in combination with any panel washing would be limited to a maximum of 45,000 L/d. Given this relatively small amount of water to be withdrawn from the well on the periodic basis, no significant effect on the local groundwater table is anticipated to occur.

4.3.2.2 Accidental Spills

Mitigation proposed in Section 4.2.2.3 is anticipated to be effective in minimizing the potential for accidental spills and in the event of a spill, minimizing the magnitude of that spill. Accordingly, it is not anticipated that spills would be large enough to have any noticeable effect on groundwater supplies. However, if spills do occur, the spill response and contingency plan protocol will be implemented and this will involve notifying the MOE Spills Action Centre. If the spill is determined to have the potential to impact groundwater, remedial measures will be taken, such as excavated the soil that was contaminated by the spill, in order to prevent infiltration of contaminants into the groundwater table.

4.3.3 Decommissioning Phase

Similarly, the only potential effect on groundwater during decommissioning would be due to accidental spills associated with decommissioning equipment (e.g., spills or leaks during equipment dismantling or from heavy equipment, vehicles or generators). However, given the mitigation proposed and the small volume of fluids that will actually be used on site, no negative effects on groundwater quality are anticipated to occur as a result of small accidental spills that may occur.

4.4 Aquatic Biota

Aquatic biota (e.g., fish and benthic invertebrates) residing in Reynolds Creek adjacent to the Project location will not be directly affected by any Project activity, since no activity will occur within 30 m of the average annual high water mark. Therefore, no in-water work will be required and no direct effects on biota will occur.

Aquatic biota could potentially be indirectly affected if changes in surface water runoff, surface water quality and groundwater quality or quantity were to occur as a result of any phase of the Project. However, the mitigation proposed in Sections 4.1, 4.2 and 4.3 is anticipated to be effective in preventing/minimizing negative effects associated with these other biophysical components of the environment, such that there are no adverse effects on aquatic biota with the water body adjacent to the site. Given this, no specific mitigation measures, other than those noted in the above-mentioned sections are required to prevent adverse effects to aquatic biota.

4.5 Aquatic Habitat

Aquatic habitat in Reynolds Creek adjacent to the Project location will not be directly negative affected by any Project activity or component since no construction will occur within 30 m of the average annual high water mark. Also, the mitigation proposed to prevent/minimize changes in surface water runoff, surface water quality and ground water levels and quality (as discussed in Sections 4.1, 4.2 and 4.3) is anticipated to be sufficient to prevent any negative effects to aquatic habitat in the water body. As noted above, aquatic habitat conditions may be sufficiently enhanced by the increase in density of vegetation in the Project area and cessation of agricultural activities on the adjacent lands.

Given this, no specific mitigation measures, other than those noted in the above-mentioned sections are required to prevent adverse effects to aquatic habitat.

5. Environmental Effects Monitoring Plan – Design and Operations Report

As discussed in the Design and Operations Report (RE Breen 2 ULC, 2010a) environmental effects monitoring is proposed in respect of any negative environmental effects that may result from engaging in the Project. As per the REA Regulation, the monitoring plan identifies

- performance objectives in respect of the negative environmental effects
- mitigation measures to assist in achieving the performance objectives
- a program for monitoring negative environmental effects for the duration of the time the Project is engaged in, including a contingency plan to be implemented if any mitigation measures fail.

For the purposes of this EIS report, the effects monitoring measures with respect to negative effects on the water body and lands within 30 m of the water body have been reproduced here, in Table 5.1.

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Table 5.1 Summary of Environmental Effects Monitoring Requirements with Respect to Waterbodies

Negative Effect	Mitigation Strategy	Performance Objective	Monitoring Plan					Contingency Measures
			Methodology	Monitoring Locations	Frequency	Rationale	Reporting Requirements	
Construction Phase								
Increases in surface water runoff from the construction site	Stormwater management measures including vegetation, ditch flow controls and riparian buffers.	Minimize changes to surface water runoff conditions to Reynolds Creek.	Visual assessment of structural stability of mitigation measures and identification of unintended impacts.	Throughout construction site.	Once per week.	Visual monitoring will confirm that stormwater management measures remain as designed (e.g., check dams, hay bales, ditches, etc) and identify deficiencies.	Reported in monthly environmental monitoring report during construction.	Stormwater management measures will be remediated as necessary to ensure that they are functioning as designed. Alternate measures may be required and will be determined based on on-site issues and conditions.
Soil compaction due to heavy equipment use and stockpiling	Remediation of compaction following construction.	No significant compaction that would inhibit vegetative growth.	Visual monitoring for signs of compaction.	Throughout construction site.	Once.	Visual monitoring will identify areas requiring remediation.	None.	Areas of compaction will be remediated as necessary to alleviate compaction (e.g., discing)
Erosion and sedimentation resulting in increased turbidity in site runoff	Erosion and sediment control measures.	No significant changes to surface water quality in Reynolds Creek.	Visual monitoring of sediment and erosion controls (e.g., silt fence barriers).	All ESC controls throughout work site.	Once per week and in advance and following major precipitation and snow melt events.	ESC measures to be monitored to ensure they are functioning as designed and in good working order to meet performance objectives.	Reported in monthly environmental monitoring report during construction.	ESC measures will be remediated as necessary to ensure that they are functioning as designed.
Dust generation and off-site transport	Standard construction site best management practices to prevent fugitive dust.	Minimize fugitive dust from the construction site.	Visual monitoring of visible dust plumes during construction.	Throughout construction site.	Periodically during all construction activities.	Visual dust monitoring would identify if dust plumes are an issue and where their source may be	Reported in monthly environmental monitoring report during construction.	Dust control measures implemented as necessary to prevent/minimize dust generation.
Potential for adverse water surface and groundwater quality due to accidental spills	Standard mitigation to prevent spills and minimize magnitude of spills that do occur.	No long-term environment effects due to spills.	Visual monitoring of spill prevention/ mitigation measures.	Throughout construction site.	Once per week.	Spill prevent and control measures to be monitored to ensure they are functioning as designed and protocols are being implemented as specified in plans to meet performance objectives.	Reported in monthly environmental monitoring report during construction.	Spill contingency measures implemented as necessary in the event of a spill. Following spill event, response will be reviewed to determine if additional or altered response protocols are necessary to meet performance objectives.
Operations Phase								
Increases in surface water runoff from Project location	Stormwater management measures including vegetation, ditch flow controls and riparian buffers.	Minimize changes to surface water runoff conditions to Reynolds Creek.	Visual assessment of structural stability of mitigation measures and identification of unintended impacts.	Throughout Project location.	Twice per year during annual maintenance visits.	Visual monitoring will confirm that stormwater management measures remain as designed (e.g., check dams, hay bales, ditches, etc) and identify deficiencies.	Reported in annual operational environmental monitoring report.	Stormwater management measures will be remediated as necessary to ensure that they are functioning as designed.
Erosion and sedimentation resulting in increased turbidity in site runoff	Vegetation to prevent erosion due to stormwater.	No long-term erosion from site over and above existing conditions.	Visual monitoring of Project area to identify areas of erosion (e.g., rills, gullies).	Throughout Project location.	Twice per year during annual maintenance visits.	Visual monitoring of erosion would identify potential areas of concern.	Reported in annual operational environmental monitoring report.	Erosion remediated as necessary to ensure no long erosion issues. Additional measures such as mulch, modified grass species etc could be considered.
Potential for adverse surface and groundwater quality due to accidental spills	Standard mitigation to prevent spills and minimize magnitude of spills that do occur.	No long-term environment effects due to spills.	Visual monitoring of spill prevention/ mitigation measures during maintenance activities.	Throughout Project location where maintenance occurs and at transformer locations.	Twice per year during annual maintenance visits.	Spill prevent and control measures to be monitored to ensure they are functioning as designed and protocols are being implemented as specified in plans to meet performance objectives.	Reported in annual operational environmental monitoring report.	Spill contingency measures implemented as necessary in the event of a spill. Following spill event, response will be reviewed to determine if additional or altered response protocols are necessary to meet performance objectives.

Negative Effect	Mitigation Strategy	Performance Objective	Monitoring Plan					Contingency Measures
			Methodology	Monitoring Locations	Frequency	Rationale	Reporting Requirements	
Decommissioning Phase								
Erosion and sedimentation resulting in increased turbidity in site runoff	Erosion and sediment control measures.	No significant changes to surface water quality in watercourse.	Visual monitoring of sediment and erosion controls (e.g., silt fence barriers).	All ESC controls throughout work site.	Once per week and in advance and following major precipitation and snow melt events.	ESC measures to be monitored to ensure they are functioning as designed and in good working order to meet performance objectives.	Reported in monthly environmental monitoring report during construction.	ESC measures will be remediated as necessary to ensure that they are functioning as designed.
Potential for adverse surface and groundwater quality due to accidental spills	Standard mitigation to prevent spills and minimize magnitude of spills that do occur.	No long-term environment effects due to spills.	Visual monitoring of spill prevention/ mitigation measures.	Throughout construction site.	Once per week.	Spill prevent and control measures to be monitored to ensure they are functioning as designed and protocols are being implemented as specified in plans to meet performance objectives.	Reported in environmental monitoring report during decommissioning.	Spill contingency measures implemented as necessary in the event of a spill. Following spill event, response will be reviewed to determine if additional or altered response protocols are necessary to meet performance objectives.

The monitoring proposed in Table 5.1 will serve to verify if mitigation measures are functioning as designed to meet performance objectives. If monitoring shows that performance objectives are not being met, the contingency measures documented in Table 5.1 will be used to ensure that remedial action is undertaken as necessary to meet the performance objectives.

6. Construction Plan Report

The REA Regulation requires proponents of Class 3 solar projects to prepare a Construction Plan Report (CPR). RE Breen 2 ULC prepared the CPR with technical assistance from Wardrop Engineering and input from Hatch regarding potential negative effects and mitigation measures. The CPR is a stand-alone report (RE Breen 2 ULC, 2010b) that will be included as part of the REA application.

The CPR details the construction and installation activities, location and timing of construction and installation activities, any negative environmental effects that result from construction activities within 300 m of the Project and mitigation measures for the identified negative environmental effects. The CPR addresses all potential effects of construction on waterbodies within 300 m of the Project location in a general manner. The mitigation proposed in the CPR with respect to preventing/ minimizing negative effects on Reynolds Creek is the same as that discussed in this EIS. Additional mitigation is proposed to address negative effects during construction not related to waterbodies and associated features. Therefore, the CPR and this EIS should be read in conjunction with each other, although all negative effects and mitigation requirements with respect to waterbodies are contained within this EIS and duplicated in the CPR.

7. Summary and Conclusions

As discussed in the Water Body Records Review Report (Hatch Ltd., 2010a) and Water Body Site Investigations Report (Hatch Ltd., 2010b), some components of the Project will be located between 30 m and 120 m of the average annual high water mark of Reynolds Creek.

This EIS has been prepared to identify potential negative effects that all phases of the Project may have on the water body. Potential negative effects are associated with

- alterations in surface water runoff due to
  - changes in topography associated with land grading and ditching
  - soil compaction during construction
  - changes in vegetation structure and density
  - increase in impervious and less pervious surfaces
- alterations in surface water quality due to
  - erosion and sediment from Project location
  - dust generation during construction
  - accidental spills during construction, operations and decommissioning

    - use of concrete during construction
- alterations in groundwater levels and quality due to
    - project excavations below the groundwater table during construction
    - water takings during construction and operation
    - accidental spills during construction, operations and decommissioning
- adverse effects on aquatic biota
- adverse effects on aquatic habitat.

Mitigation measures have been proposed to prevent these effects from occurring or minimize the magnitude, extent, duration and frequency in the event that they do occur. The primary mitigation measure that will prevent adverse effects on the water body is adherence to the 30-m setback requirement. Monitoring measures have been proposed to confirm that mitigation measures are having the intended effect and that performance objectives are being met.

Overall, while the Project will result in some changes to the natural environment, no negative effects on the water body is anticipated to occur following implementation of the mitigation and monitoring measures proposed in this EIS.

8. References

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RE Breen 2 ULC. 2010c. RE Breen 2 Solar Project – Decommissioning Plan Report.

Appendix A

Site Layout
(RE Breen 2 ULC, 2010b)

NOTES:

1. AERIAL IMAGERY OBTAINED FROM GOOGLE EARTH PRO, IMAGERY DATE 2006

2. ROAD CONSTRUCTION PROCEDURES

- CLEAR & GRUB ALL AREAS PROPOSED FOR ROAD AND PARKING LOT CONSTRUCTION.
- STRIP & REMOVE ALL TOPSOIL.
- SHAPE & PROOF-ROLL SUBGRADE.
- SHAPE & GRADE DITCHES & SWALES.
- PLACE, SHAPE AND COMPACT GRANULAR SUBBASE AND BASE MATERIALS AS FOLLOW:

  TYPE 1 – 300mm GRANULAR "B" SUBBASE, 150mm GRANULAR "A" BASE.
  TYPE 2 – 200mm GRANULAR "B" SUBBASE, 150mm GRANULAR "A" BASE.
  TYPE 3 – 150mm TO 200mm GRANULAR "A".

- RE-VEGETATE DITCHES AND SWALES.

CULVERTS:

1. CULVERT SHALL BE CORRUGATED STEEL PIPE OR RIBBED PVC PIPE INSTALLED IN ACCORDANCE WITH OPSD.
2. MINIMUM CULVERT DIAMETER:
   300mm Min. Dia. FOR MINOR CULVERTS
   600mm Min. Dia. FOR MAIN CULVERTS
   REFER TO PLANS FOR CULVERT LOCATIONS.

APP. SCALE:

1:1500 — 30 0 20 40 60m

LEGEND:

- INVERTER / XFMR EQUIPMENT PAD
- SOLAR ARRAY
- LEASE BOUNDARY
- ACCESS ROAD
- PROPOSED FENCE
- ADDITIONAL CONSTRUCTIBLE AREA THAT MAY BE USED FOR THE FACILITY
- POTENTIAL TEMPORARY LAY-DOWN AND PARKING AREA

REFERENCE NO. 1088760100-E0001-05

REV.	DATE	DESCRIPTION	APPROVED BY
05	11.01.26	ISSUED FOR REVIEW	
04	11.01.24	ISSUED FOR REVIEW	ENERGY
03	10.09.30	ISSUED FOR REVIEW	ENVIRO.
02	10.06.21	ISSUED FOR REVIEW	INFRAS.
01	10.05.21	ISSUED FOR REVIEW	STRUCT.

RECURRENT ENERGY – BREEN 2
10MW AC

SOLAR GENERATION FACILITY – SITE LAYOUT

WARDROP | A TETRA TECH COMPANY