Invenergy

Sandringham Solar Farm

ENVIRONMENTAL IMPACT STUDY REPORT

Natural Heritage Assessment

November 2011

DILLON CONSULTING

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Table of Contents

Page

1. Introduction 1
2. The Proponent 3
3. Project Location 4
4. Environmental Impact Study Purpose 7
5. Description of Natural Features 8
   - 5.1 Provincially Significant Wetland 8
   - 5.2 Significant Woodland 11
   - 5.3 Significant Wildlife Habitat 13
6. Description of Project Activities 15
   - 6.1 Construction Phase 15
   - 6.2 Operational Phase 19
     - 6.2.1 Land Management 19
     - 6.2.2 Periodic Maintenance 19
     - 6.2.3 Staffing and Training 19
     - 6.2.4 Other 19
   - 6.3 Decommissioning Phase 20
     - 6.3.1 Overview 20
     - 6.3.2 Decommissioning During Construction (Abandonment of Project) 20
     - 6.3.3 Decommissioning After Ceasing Operation 21
     - 6.3.4 Restoration of Lands Negatively Affected by the Facility 22
     - 6.3.5 Managing Excess Materials and Waste 22
     - 6.3.6 Emergency Response and Communications Plan 23
7. Environmental Effects of the Project 24
8. Mitigation Measures 26
   - 8.1 Erosion and Sediment Control 26
   - 8.2 Shrubland Habitat Restoration and Enhancement Plan 27
   - 8.3 Grassland Habitat Maintenance 27
   - 8.4 Compliance with the Federal Migratory Bird Convention Act 28
9. Environmental Effects Monitoring Plan 30
10. Negative Environmental Effects, Design and Operations 34
11. Negative Environmental Effects, Construction 35
12. Conclusion 36

List of Figures

Figure 1: General Location of the Sandringham Solar Farm in Ontario 2
Figure 2: Sandringham Solar Farm, Project Location 5
Figure 3: Sandringham Solar Farm, Evaluation of Significance Map 6
Figure 4: Sandringham Solar Farm, Shrubland Habitat Restoration & Enhancement Plan. 29

List of Tables

Table 1: Description of the Assumed Provincially Significant Wetland within 120 m of the Project Location 9
Table 2: Description of the Significant Woodland within 120 m of the Project Location 12
Table 3: Description of the Significant Wildlife Habitats within 120 m of the Project Location 14
Table 4: Summary of Construction Phase Project Activities 16
Table 5: Summary of Potential Negative Environmental Effects 25
Table 6: Environmental Effects Monitoring Plan..... 31

List of Appendices

Appendix A Supplementary Information
Appendix B Detailed Shrubland Habitat Restoration and Enhancement Plan Drawing

1. Introduction

Invenergy Solar Canada ULC (Invenergy Canada) proposes to develop a solar farm with a maximum name plate capacity of 10 MW (AC), located near the Hamlet of Argyle in the City of Kawartha Lakes (**Figure 1**). The total capacity will be less than 15 MWp (DC). The renewable energy facility will be known as the Sandringham Solar Farm and will be rated as a Class 3 Solar Facility.

Invenergy Solar Canada ULC has received a contract from the Ontario Power Authority (OPA) for the purchase of electricity generated by photovoltaic solar panels from this solar farm through the Province's Feed-in-Tariff (FIT) program (enabled by the Green Energy and Green Economy Act). The project will require approval under Section 24 of *Ontario Regulation 359/09* (*O. Reg. 359/09*) – Renewable Energy Approval (REA) under Section V.0.1 of the *Ontario Environmental Protection Act*.

Ontario Regulation 359/09 requires that all renewable energy projects prepare an Environmental Impact Study (EIS) Report to address any natural features that have been evaluated to be significant or provincially significant in the Evaluation of Significance Report (*REA* Section 38). This EIS Report was completed to address the regulatory requirements for the *REA* process and is the fourth and final report in a series that fulfills the requirements of the natural heritage assessment. It is intended that this report will be submitted to the Ministry of Natural Resources (MNR) for review and comment as required in *Ontario Regulation 359/09*. Species at risk, fish habitat and other information needs, as outlined in the MNR's Approval and Permitting Requirements Document for Renewable Energy (MNR 2009), are discussed in a separate report, under direction from the MNR and in compliance with the *REA* process.

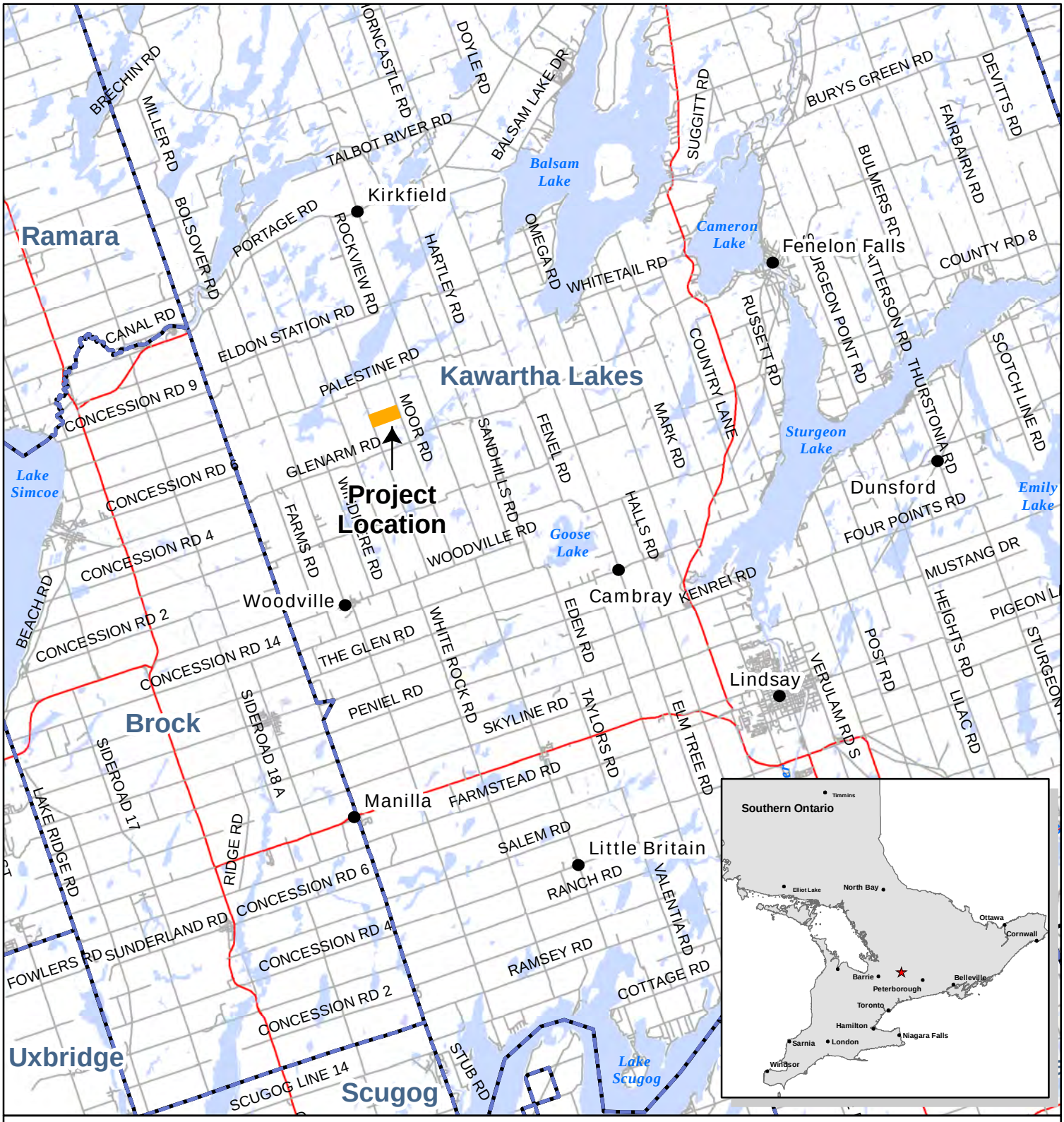

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Figure 1: Sandringham Solar Farm, General Location of the Sandringham Solar Farm in Ontario

Legend

- Roads
- Highway
- Project Location
- Water Body
- Municipal Boundaries

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2. The Proponent

Invenergy Canada is an experienced developer, owner and operator of power generation and energy delivery assets. Company activities include developing, building, owning and operating renewable energy facilities. In the course of developing renewable energy projects, Invenergy Canada satisfies various environmental approval requirements and obtains regulatory approvals that vary depending on the jurisdiction, project capacity and site location. In addition, Invenergy Canada builds long-term relationships with the communities that host its projects and is committed to the health and welfare of the community of Sandringham and the City of Kawartha Lakes. Contact information for Invenergy Canada is as follows:

Full Name of Company:	*Invenergy Solar Canada ULC*
Address:	*120 Front Street, Toronto, Ontario, M5A 4L9*
Telephone:	*(416) 901-9463*
Fax:	*(416) 546-9905*
Prime Contact:	*Ryan Ralph, Development Manager*
Email:	*RRalph@invenergyllc.com*

Dillon Consulting Limited is the prime contractor for the preparation of this *Environmental Impact Study*. The Dillon contact is:

Full Name of Company:	*Dillon Consulting Limited*
Address:	*235 Yorkland Boulevard, Suite 800, Toronto, Ontario, M2J 4Y8*
Telephone:	*Office: (416)-229-4646 ext 2355*
Prime Contact:	*Don McKinnon, REA Project Manager*
Email:	*DPMckinnon@dillon.ca*

3. Project Location

The proposed Class 3 solar facility is located at 764 Sandringham Road, near the Hamlet of Argyle, in the City of Kawartha Lakes. **Figure 1** shows the general location of the project. The solar resource quality in this region is very good and the site was selected by considering daily average solar radiation, ease of access to the local electrical system and environmental considerations. **Figure 2** shows the project location, as defined in Ontario Regulation 359/09, to the location encompassing all project components and includes a 120 m setback for adjacent natural features. The final layout of project components planned for this facility is also outlined on **Figure 2**. Project components, including solar modules and electrical facilities such as inverters, transformers, substations and electrical lines, will be located on private land or municipal rights-of-way. The tie-in for the transmission of energy to the grid is being undertaken by Hydro One and is therefore not included as a project component within this facility. **Figure 3** is the result of the natural heritage assessment work completed for this project and identifies natural features within the project location and surrounding 120 m, including those that have been identified as significant or provincially significant during the natural heritage assessment process.

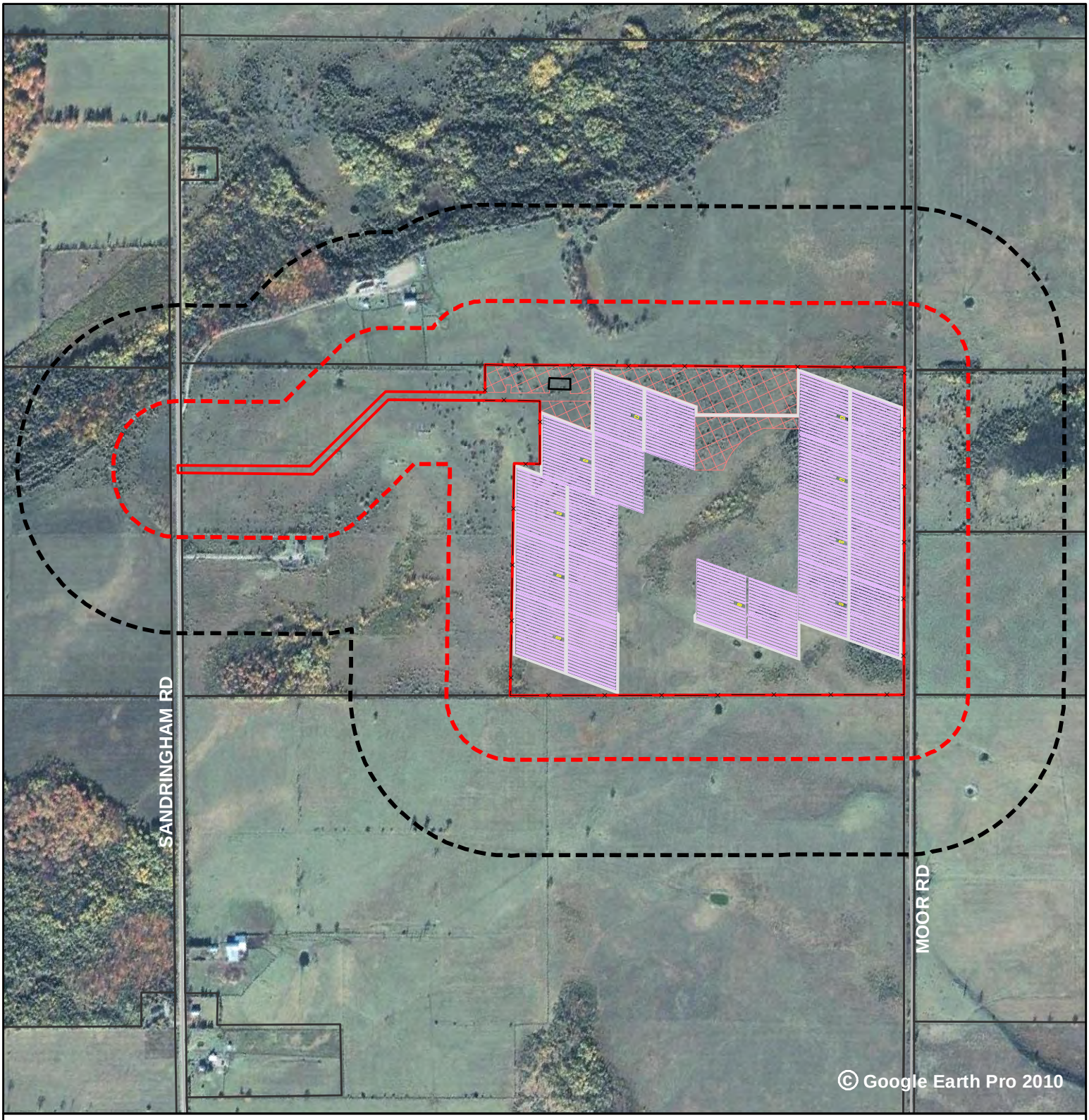

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Figure 2: Project Location

Legend

- Roads
- Project Location
- 120 m Project Location Setback
- 300m Project Location Setback
- Parcels

Project Components

- Solar Panel Layout
- Access/Gravel Roads
- Substation
- Inverters
- Construction Laydown Area
- Project Security Fence

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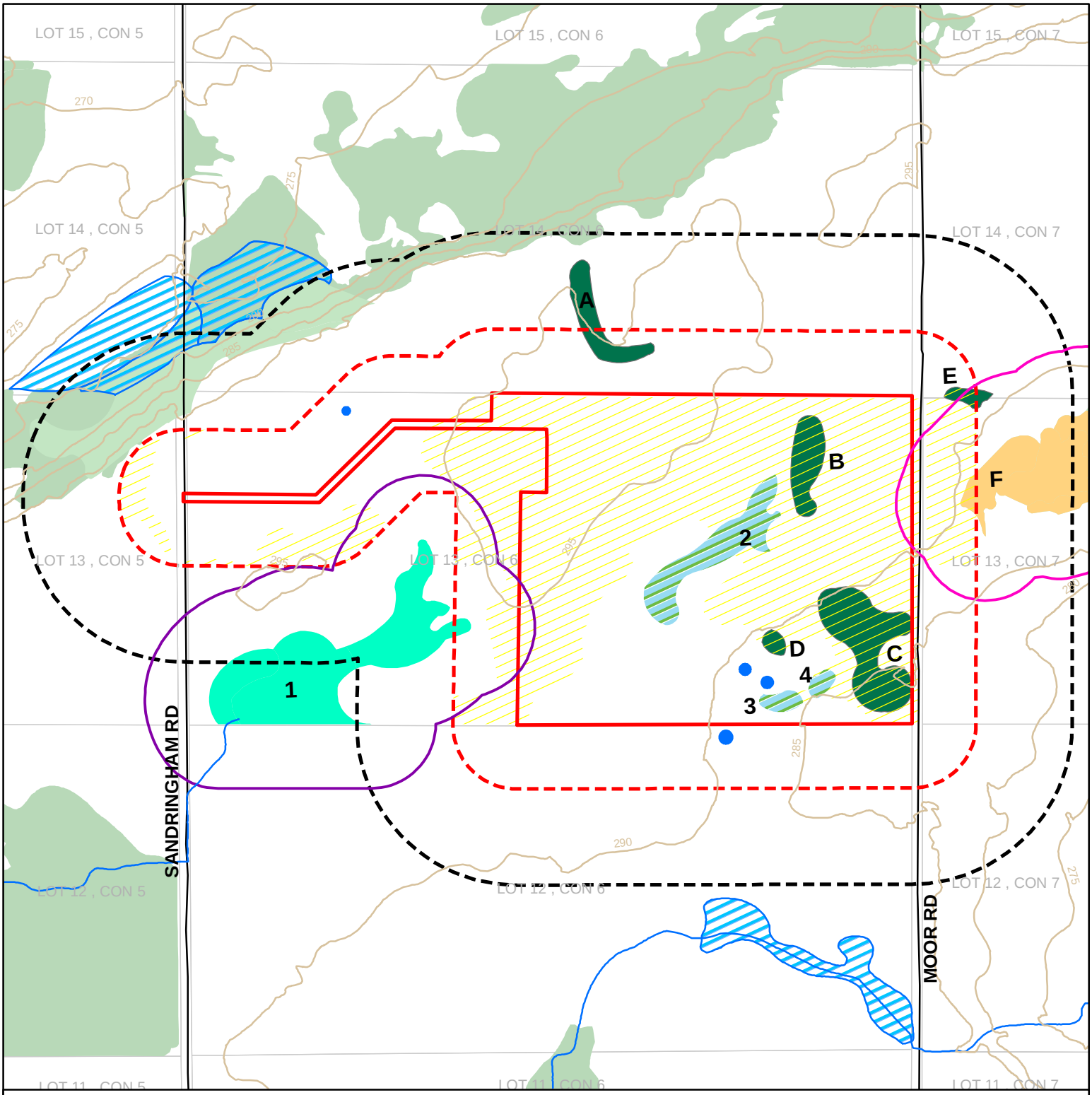

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Figure 3: Sandringham Solar Farm, Evaluation of Significance Map

Legend

- Watercourse
- 5 m Contours
- Roads
- Project Location
- 120 m Project Location Setback
- 300m Project Location Setback
- 120m Assumed Provincially Significant Wetland Setback
- 120m Significant Woodland Setback
- Assumed Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetlands
- Significant Woodland
- Non-Significant Woodland
- Unevaluated Woodlands
- Shrub/Early Successional Breeding Bird Significant Wildlife Habitat
- Pond
- Lots/Concessions
- A Woodland ID
- 1 Wetland ID

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4. Environmental Impact Study Purpose

By completing an EIS Report, project components may be constructed and installed within 120 m of a significant or provincially significant natural feature. This report is consistent with Section 38 of Ontario Regulation 359/09, which details that an EIS Report must include the following:

- Identification and assessment of any negative environmental effects of the project on a natural feature, provincial park or conservation reserve;
- Identification of mitigation measures in respect of any negative environmental effects;
- Description of how the environmental effects monitoring plan in the Design and Operations Report addresses any negative environmental effects; and,
- Description of how the construction plan report addresses any negative environmental effects.

As previously stated in the Records Review Report, Site Investigation Report and Evaluation of Significance Report, no provincial parks, conservation reserves, Areas of Natural and Scientific Interest, or significant valleylands occur within the project location or surrounding 120 m. Therefore, the focus of this EIS Report will be to fulfill the requirements of Section 38 for one woodland and one wildlife habitat identified in the Evaluation of Significance Report as being significant, and one wetland assumed to be provincially significant and evaluated using the wetland characteristics and ecological functions rapid assessment protocol provided by the MNR for renewable energy projects within 120 m of the project location (**Figure 3**).

5. Description of Natural Features

5.1 Provincially Significant Wetland

The 5.79 hectare assumed Provincially Significant Wetland (**Figure 3**) is comprised of two vegetation communities: a Poplar Deciduous Swamp and a Willow Tall Shrub Deciduous Thicket Swamp. A summary of the wetland characteristics and ecological functions for this wetland is provided in **Table 1**.

Table 1: Description of the Assumed Provincially Significant Wetland within 120 m of the Project Location

Characteristic/ Ecological Function	Value	OWES Manual Section (South)	OWES Name	Field Visit	Details
Actual Wetland Size	5.79 ha		SIZE1	Yes	Wetland boundaries confirmed during the site investigation
Wetland Type	Swamp	1.1.2	WLTYPE	Yes	Treed and thicket swamp; Score = 8; Swamp Fractional Area – 1.00
Site Type	Palustrine	1.1.3	SITE	Yes	Score = 2; Fractional Area – 1.00
Vegetation Communities	1. h; ts, gc, 2. ts; h, re, ne, gc Score = 3.5	1.2.2	VEG	Yes	1. h - *Populus tremuloides*, *Populus balsamifera*; ts – *Cornus stolonifera*, gc – *Rubus pubescens*, *Onoclea sensibilis* 2. ts – *Salix exigua*; h - *Populus tremuloides*, *Populus balsamifera* re – *Scripus atrovirens* ne – *Carex bebbii*, *Carex vulpinoidea* gc – *Prunella vulgaris*, *Ranunculus acris*
Proximity to Other Wetlands	330 m	1.2.4	WPROX	Yes	Distance to wetland to the east (in adjacent watershed)
Interspersion	63	1.2.5	INTER	n/a	Score = 12
Open Water Types	Type 1	1.2.6	OPWAT	Yes	Open water occupies <5% of wetland area; Score = 8
Flood Attenuation (Total)	Total Score = 100	3.1	FLOOD	n/a	Upstream Catchment Area (19.3 ha) determined using digital elevation model; headwater area.
Water Quality Improvement (Total)	Total Score =	3.2	WQI	n/a	Catchment basin determined to be >50% agricultural because surrounded by pastureland

Characteristic/ Ecological Function	Value	OWES Manual Section (South)	OWES Name	Field Visit	Details
	37				
Shoreline Erosion Control	Score = 0	3.4	SEC	n/a	Wetland entirely palustrine
Groundwater Recharge (Total)	Total Score = 57	3.5	TGR	n/a	Wetland entirely palustrine
Species Rarity (Total)	Total Score = 0	4.1.2	RTOT2	Yes	No species at risk habitat or provincially significant animal and plant species were observed; no region or local significant species lists are known
Significant Features and Habitats (Total)	Total Score = 0	4.2	SGFT	Yes	No significant features or habitats were observed.
Fish Habitat (Total)	Total Score = 0	4.2.6	FISHAB	Yes	No fish habitat or migration and staging habitat was observed within the wetland.

5.2 Significant Woodland

One woodland unit within 120 m of the project location has been evaluated as significant on the basis of its probable linkage function, proximity to significant shrub/early successional bird breeding habitat and potential function as a headwater area (see **Figure 3**). A summary description of this woodland, including its known ecological functions, is provided in **Table 2**.

Table 2: Description of the Significant Woodland within 120 m of the Project Location

Significant Woodland Location	Size Criterion	Ecological Functions Criteria					Woodland Uncommon Characteristics	Project Component within 120 m
	Woodland Size (hectares)	Woodland Interior	Proximity to other significant woodland or habitats	Linkages	Water Protection	Woodland Diversity Representation		
	Size Threshold (hectares)							
	20	2	4	4	2	4	2	
East of Project Location	5.06	none	Within 30 m of Significant Shrub/Early Successional Bird Breeding Habitat	Probable linkage function	- Potential function as a headwater area - Not a known groundwater discharge/recharge area	- Identified as Black Ash Mineral Swamp (SWDM2-1), Poplar Mineral Deciduous Swamp community (SWDM4-5), Fresh-Moist White Cedar Coniferous Thicket Type (THCM2-1)	Not uncommon in terms of species composition, cover type, age or structure	-solar panels -access road

5.3 Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) within 120 m of the project location includes Shrub/Early Successional Bird Breeding Habitat. A summary description of this habitat is provided in **Table 3**.

Table 3: Description of the Significant Wildlife Habitats within 120 m of the Project Location

Significant Wildlife Habitat	Attributes	Composition	Function	Natural Features Associated with Wildlife Habitat	Project Components within 120 m	Distance from attribute to project location
		Species Recorded During Site Investigations*				
Shrub/Early Successional Bird Breeding Habitat	44.98 ha deciduous shrub thicket units overlap the project location and 120 m setback 4.54 ha of cedar thicket inclusions overlap the project location and 120 m setback	Breeding Birds - MODO, BBCU, SOSP, CCSP, FISP, AMGO, GRCA, BRTH, YEWA, HOWR, EAKI	Breeding bird habitat; Vegetative cover	Dry-Fresh Deciduous Shrub Thicket – THDM2 Fresh-Moist White Cedar Coniferous Thicket – THCM2-1	All project components	Within project location

* Bird Codes are according to Ontario Breeding Bird Atlas, 2001 (See **Appendix A1**)

6. Description of Project Activities

Subject to the receipt of the necessary permits and approvals, site construction work for the Sandringham Solar Farm is expected to begin as early as March 2012 and last for approximately 8 months. No special housing, healthcare or food facilities will be required during the construction period. Complete details of the project activities, construction, design, operations and decommissioning of this project can be found in the respective REA reports (i.e. Construction Report, Design and Operations Report, Decommissioning Report) being submitted to the Ministry of the Environment. Below, a summary of key construction schedule dates and details of the construction operations and decommissioning phases of the project relative to the evaluation of impacts is provided.

The anticipated construction schedule for the Proposed Sandringham Solar Farm project is as follows:

- Surveying and Geo-technical Investigations: Ongoing
- Clearing Ground Leveling and Grading: March 2012
- Installation of Perimeter Fences: April 2012
- Construction of Access Roads: April 2012
- Installation of PV Panel Racking: May – September 2012
- Installation of PV Modules: May – September 2012
- Construction of Inverters and Substation: June – September 2012
- Wiring and Connection to the Provincial Grid: October 2012
- Remediation and Clean-up of Work Areas: October 2012
- Site Landscaping: Spring 2013

6.1 Construction Phase

A summary of the construction phase project activities is provided in **Table 4.**

Table 4: Summary of the Construction Phase Project Activities

Construction: Physical Works/Activities	Description of Activity
Surveying and Geo-technical Investigations	Stage 2 archaeological surveys have been completed, which involved site sampling and visual inspections. A legal boundary and topographical survey by an Ontario Land Surveyor has also been conducted. The land survey activities are to include staking the boundaries of the construction areas, temporary workspace, access roads, as well as marking the location of existing underground pipelines and cables. Areas to be avoided will be fenced and/or flagged and avoided. A geotechnical investigation was conducted to determine the subsurface soil and groundwater conditions at the site and involved bore samples being taken in proposed development locations.
Clearing Ground Leveling and Grading	Small trees, shrubs and other vegetation will be cleared from the construction area as required. Graders, bulldozers, scrapers, and backhoes will be used to prepare the site. Topsoil removed from the permanent access road will be feathered out on lands adjacent to the access road. Following topsoil stripping and salvage, grading will be conducted on irregular ground surfaces to provide a safe and clean work surface. Grading will be done in such a manner to maintain the general drainage patterns of the site while creating appropriate slopes for the safe construction and operation of the solar field. Grading plans are provided in the Construction Plan Report.
Installation of Perimeter Fences	To protect the public, as well as to prevent trespassing and vandalism, a minimum 2.0 m chain link fence will be erected around the perimeter of the project location with a gate at the access road entrance on Sandringham Road. The fence will be a steel chain link fence and installation will require the use of a skid steer and an auger.
Construction of Access Roads	A 14 m wide access road will be constructed off of Sandringham Road. The length of the access road is approximately 860 m in length (entering from the West) and the total land area occupied by the road is approximately 1.26 ha. Crushed gravel will be used for the road surface and would be applied to a depth of approximately 350 mm. The subgrade should be free of depressions and sloped (at a minimum grade of 2%) to

Construction: Physical Works/Activities	Description of Activity
	provide effective drainage. During construction of the road the topsoil will be stripped and spread on-site and some cut and fill is expected. Access road subgrades are expected to consist of the existing native granular deposits. The subgrade will be cut as cleanly as possible to minimize disturbance and be proofrolled with heavy rollers to locate any loose or disturbed areas. Should weak areas or other incompatible material be detected during proofrolling, further excavation and subsequent backfill with approved native deposits (moisture content within 3 percent of optimum moisture content) or imported granular materials may be required. The replacement granular materials should be compacted to at least 95 percent SPMDD. The depth of the roadbed will be constructed as required to transport loads associated with construction and maintenance of the solar farm. No materials will be removed from the site.
Installation of PV Panel Racking	To provide support for the PV modules, it is expected that the PV module rack will be made of steel or aluminum. The foundations will likely be steel beams vibrated or driven into the soil. Alternatively, a ground screw may be used in place of the steam beam.
Installation PV Modules	Up to 68,220 crystalline silicon modules are planned for the project contained in a series of arrays. The modules will be attached to fixed tilt steel or aluminum racks.
Construction of Inverters and Substation	Inverters will be constructed to perform the conversion of the variable DC output of the PV cells into alternating current (AC) suitable for supplying the electrical grid. Transformers will be constructed at each inverter location to “step-up” the generated voltage from 208 or 480 volts to 27.6-35 kV. The aggregated output will be further increased by the construction of a substation transformer to 44 kV to allow connection to Hydro-One’s electrical distribution system.
Operation and Maintenance Building	There is no Operations and Maintenance building located at this facility.
Wiring and Connection to the Provincial Grid	The output of the solar panels is connected by DC wiring mounted to the back side of the racks. These cables are connected to a combined box at the end of each row of racks. Buried electrical collection cables will connect the combiner boxes to the inverters. Buried cables will connect the inverter AC output to the substation transformer. The buried lines will be contained within the project location and would be buried to a minimum depth of 1 m. The cable will be installed by cable trenching machine or laid in trenches

Construction: Physical Works/Activities	Description of Activity
	created by an excavator. The cable is then dropped into the trench from a spool pulled by a truck. The material removed from the trench will be used as backfill in the trench. Topsoil and subsoil will be excavated, stored and replaced separately on agricultural lands. Equipment used in cable installation may include a backhoe or track mounted excavator, and trenching/boring equipment. From the on-site transformer/substation, an overhead 44 kV distribution line would extend along the access road to Sandringham Road (a distance of approximately 1.7 km). Hydro One will construct a new 44 kV overhead distribution line within the Sandringham Road right-of-way allowance to connect with the existing Hydro One distribution line located near the intersection of Glenarm Road and Sandringham Road. As Hydro One will build, own, and maintain the 44kV line, they will be responsible for any permits associated with this distribution line.
Remediation and Clean-up of Work Areas	After major construction activities are completed, the work areas will be remediated (e.g., re-seeded). All debris and materials brought to the site will be removed. Trucks will be used to remove non-permanent equipment from the project location, along with any debris. The majority of site clean-up works will occur prior to site landscaping.
Site Landscaping/ Habitat Restoration and Enhancement	Landscaping is the final construction activity at the Sandringham Solar Farm. It is expected that heavy machinery or equipment will be required for the planting. Seeding would be completed in a seasonally appropriate time period (i.e., spring) to maximize the success of the plantings. A low maintenance, native seed mix will be used within the project location. The selected vegetation would need to grow to low heights only so that the panels are not blocked or be planted at a sufficient distance to avoid shading.

6.2 Operational Phase

6.2.1 Land Management

It will be necessary to maintain the land in such a way that vegetation does not shade or in other ways impact the solar panels. However, the site will be planted with mostly native ground cover plant species, which will not only limit the need for regular maintenance, but will also maintain the nutrient quality of the soil and manage weed growth. No pesticides or herbicides will be used. Grassland areas will be maintained in an area northwest of the project location, predominantly north of the access road, and also within an extensive section of the project location. The maintenance of these grassland areas, including guidelines for a maintenance schedule is discussed in **Section 8.3**.

6.2.2 Periodic Maintenance

The renewable energy facility will be remotely monitored via internet access, which will limit the required site visits. In addition, site visits will occur approximately every month to ensure that the facility is in proper working order. Activities that will occur during these visits may include data collection, regular maintenance and any necessary repairs that may arise. Unforeseen, large repairs may occur rarely and could potentially include replacement of broken modules, electrical equipment breakdowns or other systems failures.

6.2.3 Staffing and Training

The facility will be managed offsite through remote monitoring of the facility. A project SCADA system will be installed to alert the operations staff to potential issues. Invenergy Canada maintains a 24 hour remote operations center (ROC) to monitor the operation of its renewable energy generation fleet. The SCADA system will alert the ROC to potential issues, and most issues can be remotely diagnosed so the correct individual can be dispatched to the facility to correct any problems.

6.2.4 Other

The project will not require the handling, storage or processing of waste/sewage/biomass, nor will it discharge contaminants to the air. No stormwater management facilities will be required during operation of the project.

6.3 Decommissioning Phase

6.3.1 Overview

Properly maintained solar panels have an expected life of thirty (30) years, with an opportunity for a lifetime of fifty (50) years or more with equipment replacement and repowering. This report, however, assumes that the decommissioning process will initiate upon the termination of the leases with the landowners. The primary reason for the leases to be terminated would be the completion of the project's useful life or the lack of a power purchase agreement with the Ontario Power Authority (or legal successor) or another green energy power purchaser.

The decommissioning involves removing the perimeter fences, any concrete foundations, the cutting of any steel piles at a depth of about 1 m below grade, and removal of all metal structures (mounting racks and trackers), removing all PV modules, above-ground and underground cables, transformers, inverters, fans, switch boxes, fixtures, and otherwise restoring the premises to its original condition. If it is agreed upon with the landowner, access roads may be left in place for their continued use.

Invenergy Canada agrees to meet with the landowner prior to the lease expiration date to ensure that Invenergy Canada performs its obligations to remove its property and restore the premises. Within twelve (12) months of initiating the decommissioning, Invenergy Canada will have removed the relevant components from the leased land.

The decommissioning of the project components will follow the Ontario Health and Safety Act along with any applicable municipal, provincial and federal regulations and standards. As with the construction, a manager responsible for safety will be present on site for the duration of the work.

6.3.2 Decommissioning During Construction (Abandonment of Project)

While not expected and considered to be extremely unlikely, in the event that construction or operation activities cease prior to facility completion, with no expectation of construction re-start, the installed components will be removed and recycled and the site restored in accordance with Equipment Dismantling and Removal, and Site Restoration procedures and in accordance with all applicable regulations. Decommissioning activities such as removal of cables and access roads will be conducted in consultation with the landowner.

6.3.3 Decommissioning After Ceasing Operation

In the event that the operation of the solar farm closes down, the installed components will be removed and recycled and the site restored in accordance with Equipment Dismantling and Removal, and Site Restoration procedures described below and in accordance with all applicable regulations. This decommissioning plan is based on current procedures and experience. These procedures may be subject to revision based on new experiences and requirements.

6.3.3.1 Above-ground Structure Decommissioning

In the event that the project requires decommissioning, the following sequence for the removal of the components will be used:

PV Sites:

- Disconnect PV facility from the utility power grid;
- Disconnect all aboveground wirings, cables and electrical interconnections and recycle off-site by an approved recycling facility;
- Remove concrete foundations (if required). Electric rooms and their foundations will be removed and recycled off-site by a concrete recycler;
- Remove PV modules and ship to recycling facilities for recycling and material reuse.
- Remove all waste; and,
- Remove the perimeter fence and recycle off-site by an approved metal recycler.

Electrical Rooms:

- Disconnect all electrical equipment;
- Remove inverters, transformers, meters, fans, lighting fixtures and other electrical components and recycle off-site by an approved recycler;
- Demolish the electrical room; and,
- Removal of all waste.

Access Road:

- Consult with the landowner to determine if the access roads should be left in place for their continued use; and,
- If the access roads are deemed unnecessary, remove the access roads and restore the access road locations as near as practical to its original condition with native soils and seeding.

This decommissioning plan is based on current procedures and experience. These procedures may be subject to revision based on new experiences and requirements.

6.3.3.2 Below-ground Structure Decommissioning

Below-ground structure decommissioning will involve:

- Disconnecting all underground cables and transmission lines;
- Recycle these components off-site by an approved recycling facility; and,
- Dig up and removal of steel PV panel racking.

This decommissioning plan is based on current procedures and experience. These procedures may be subject to revision based on new experiences and requirements over time.

6.3.4 Restoration of Lands Negatively Affected by the Facility

Once all of the solar components and ancillary facilities are removed, the remaining work to complete the decommissioning of the Project will consist of restoring the areas as near as practical to their original condition with native soils, seed and shrub plantings (unless these areas are to be reverted back to pastureland use as per the landowner's request). Similar to the construction phase, decommissioning will ensure proper steps are followed to mitigate erosion and silt/sediment runoff.

6.3.5 Managing Excess Materials and Waste

During the construction phase, the only waste produced will be typical construction waste, such as packaging materials. Any PV modules damaged or broken during construction will recycled into new modules or other products. Other construction waste will be removed in accordance

with applicable local requirements, at a minimum, however, it is the goal of Invenergy Canada to recycle all construction debris, as much as possible, and to work with local subcontractors and waste firms to segregate material to be recycled.

Invenergy Canada will be responsible for the logistics of collecting and recycling of PV modules and to minimize the potential for modules to be discarded as municipal waste. The module recycling program includes the glass and the encapsulated semiconductor material, which will be collected by Invenergy Canada and recycled either into new PV modules or other products.

Since the mounting racks and trackers are made of manufactured metal, it is anticipated that nearly 100% of the above grade metal structures are recyclable.

6.3.6 Emergency Response and Communications Plan

The *Emergency Response and Communications Plans* are included in Section 6.0 of the *Design and Operations Report* prepared as part of the Renewable Energy Approval application for the proposed Sandringham Solar Farm Project.

7. Environmental Effects of the Project

The boundaries of a significant woodland feature, one significant wildlife habitat, and one assumed Provincially Significant Wetland feature have been identified within 120 m of the project location (see **Figure 3**). These significant features are the focus of this EIS Report.

Approximately 0.12 hectares of the 5.06 hectare significant woodland identified to the east of the project location falls within 120 m of where solar panel installations and an access road are planned. To the southwest, approximately 0.08 hectares of the 5.79 hectare assumed Provincially Significant Wetland falls within 120 m of solar panel installations and the access road. The planned solar energy development is located 90 m from the identified significant woodland and 85 m from the assumed Provincially Significant Wetland, and as such, there will be no direct impacts to these features and indirect impacts are expected to be minor and short-term (i.e., no loss in size, health, form, diversity or functionality).

An estimated 49.52 hectares of shrubland evaluated to be significant shrub/early successional bird breeding habitat is located within the project location and surrounding 120 m.

The potential direct and indirect negative environmental effects on these features are detailed in **Table 5**. The project location does not function as a significant wildlife corridor. Therefore, from a landscape ecology perspective, the proposed development will not alter the ecological connectivity of the natural heritage system. Moreover, the ecological linkages from the significant and provincially significant natural features within 120 m of the project location to the greater natural heritage system will be maintained.

Table 5: Summary of Potential Negative Environmental Effects

Natural Feature	Location of Natural Feature	Distance to Nearest Project Component	Potential Negative Environmental Effect [1]	Magnitude of Effect	Frequency of Effect	Duration of Effect
Significant Woodland	East of project location	90 m	Loss of edge vegetation due to the deposition of silt and/or overland release of silt derived from site grading activity	Low; indirect	Periodic during site grading	Short-term
Assumed Provincially Significant Wetland	Southwest of project location	85 m	Loss of edge vegetation due to the deposition of silt and/or overland release of silt derived from site grading activity	Low; indirect	Periodic during site grading	Short-term
Significant Shrub/Early Successional Bird Breeding Habitat	Within project location and 120 m setback	0 m	Temporary usage of 4.38 ha of habitat for construction laydown/parking	Low; direct	Once	Short-term
	Within project location and 120 m setback	0 m	Removal of 20.70 ha of habitat for solar panels, substation and access roads	Medium; direct	Once	Long-term
	Within project location and 120 m setback	0 m	Potential behavioural displacement of shrub/early successional breeding birds within 120 m of the project location	Medium; indirect	Seasonal and during operational phase	Long-term
	Within project location and 120 m setback	0 m	Potential disturbance to migratory breeding birds	Low; indirect	Seasonal during site preparation and construction	Short-term
	Within project location and 120 m setback	0 m	Potential Injury or mortality of migratory breeding birds	Medium; direct	Seasonal during site preparation and construction	Short-term

1. The potential negative environmental effect assumes a scenario with no mitigation. Through mitigation, the effects will be avoided or minimized in most cases.

8. Mitigation Measures

In this section of the report, the mitigation measures proposed in response to the environmental effects described in **Table 5** are summarized. The objective of the implementation of mitigation measures is to maintain the size, diversity, health, form and function of significant and assumed provincially significant natural features identified within 120 m of the project location.

8.1 Erosion and Sediment Control

For the potential loss of edge vegetation due to the deposition of silt derived through construction grading activities:

- Minimize the area and duration of soil exposure;
- Minimize the clearing of vegetation;
- Prohibit the clearing of vegetation outside of the project location;
- Install erosion and sediment control (E&SC) structures (e.g., straw bales barriers and/or filter cloth barriers) in/around existing swales, drains, wetlands or at critical downstream flow points until lands with exposed soil have stabilized in order to intercept suspended solids carried by overland flow and to prevent runoff from directly entering surface water drainage features southeast of the project location (see **Appendix A2**);
- Use appropriate grading techniques (e.g., allow stormwater runoff to drain adequately, prevent and/or mitigate ponding, etc.) to prevent increased runoff potential and maintain positive drainage;
- Wet exposed soils and access roads as required to control dust; and
- Restrict equipment lay-down to the project location and access roads.

In addition to construction mitigation, it should be noted that during operations, stormwater will be allowed to infiltrate into the ground naturally to maintain a runoff coefficient consistent with pre-development conditions. By maintaining the runoff coefficient during the operations phase, the runoff potential will not be increased from pre-development levels.

8.2 Shrubland Habitat Restoration and Enhancement Plan

The shrubland habitat restoration and enhancement plan has been developed in consultation with the MNR. The objective of the shrubland habitat restoration and enhancement plan will be to maintain the approximate size, connectivity and ecological form and function of shrubland habitat. To that end, the mitigate the removal of 20.70 ha of significant shrub/early successional bird breeding habitat within the project location, the Proponent is committed to restoring 1.5 ha of shrub/early successional habitat through planting native shrubs and enhancing 24.6 ha of shrub/early successional habitat through natural regeneration (see **Figure 4**). Natural regeneration will involve the exclusion of cattle grazing from the restoration and enhancement area, which will allow existing and planted shrub species to propagate the natural regeneration area. A detailed shrubland habitat restoration and enhancement plan drawing is provided in **Appendix B**.

In addition, an environmental effects monitoring plan will be developed to verify the survivorship of shrub plantings and identify if the project has a long-term, localized habitat displacement effect on the shrub/early successional breeding bird species observed within 120 m of the project location (see **Section 9**).

8.3 Grassland Habitat Maintenance

A total of 18.2 ha of grassland habitat will be maintained in an existing pasture northwest of the project location predominantly north of the access road and within an extensive section of the project location, including the temporary construction laydown area (see **Figure 4** and **Appendix B**). The Proponent is committed to maintaining, or in the case of the temporary construction laydown area, re-establishing and maintaining this grassland habitat using native grasses and herbaceous species suitable to the area. The maintenance of these grassland areas will include a maintenance (cutting) schedule to prevent the growth of woody vegetation and avoid injury to grassland breeding birds. Grass-cutting will be prohibited during the breeding period for Bobolink (*Dolichonyx oryzivorus*) (i.e., May 20th to July 15th), the target grassland bird species, and restricted during the broader breeding bird period (i.e., April 15th to August 1st). If grassland cutting must take place during the broader breeding bird period outside of the prohibited window, the Proponent will complete a bird nest search to verify that no active nests are present in or immediately adjacent to the cutting area. In the event that bird nesting

activity is observed during a nest search, appropriate mitigation will be employed (e.g., use of buffers) until it has been determined that the breeding attempt is complete (i.e., young are fully fledged).

8.4 Compliance with the Federal Migratory Bird Convention Act

In order to avoid disturbance, injury and/or mortality of breeding birds protected under the federal *Migratory Bird Convention Act* (MBCA), 1994 (e.g., shrub/early successional species), the Proponent will plan vegetation clearing activities outside of the breeding bird period (i.e., April 15th to August 1st), where possible. If vegetation clearing must take place during the breeding bird period, the Proponent will complete a bird nest search to verify that no active nests are present in or immediately adjacent to the project location. In the event that bird nesting activity is observed during a nest search, appropriate mitigation will be employed (e.g., use of buffers) to ensure compliance with the MBCA.

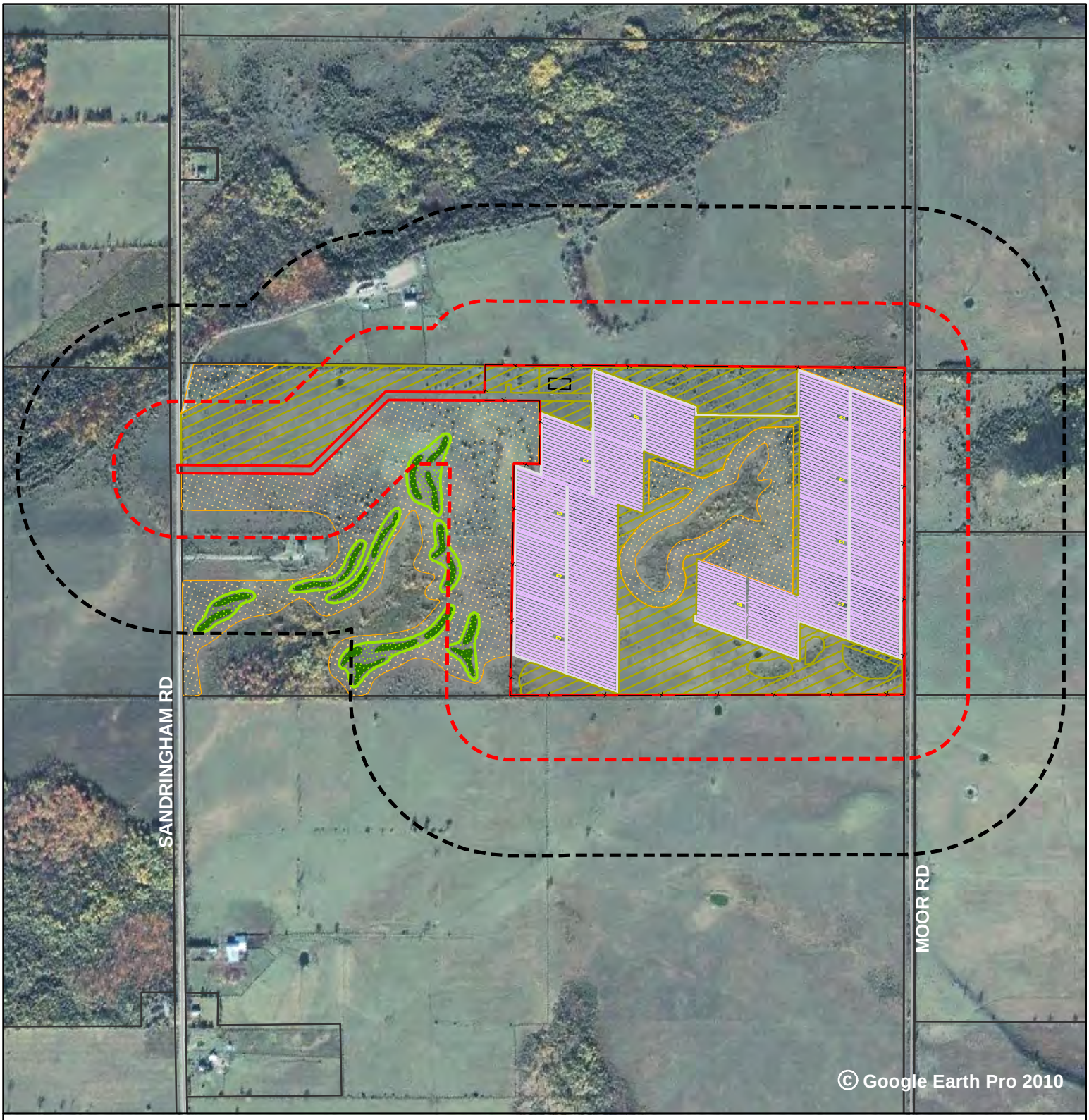

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Figure 4: Sandringham Solar Farm, Shrubland Habitat Restoration and Enhancement Plan

Legend

- Roads
- Project Location
- 120 m Project Location Setback
- 300m Project Location Setback
- Parcels

Project Components

- Solar Panel Layout
- Access/Gravel Roads
- Substation
- Inverters
- Construction Laydown Area
- Project Security Fence

Revegetation

- Natural Regeneration Areas
- Grassland Areas
- Restoration Cells
- New Shrubland

N W E S

1:10,000

0 100 200 300 m

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Date Modified: 06/17/2011
File Path: I:\GIS\103523 - Simcoe Solar Energy Centre (Woodville)\Mapping\Records Review - Sandringham\Figure 4 Shrubland Habitat Restoration 061711.mxd

9. Environmental Effects Monitoring Plan

The environmental effects monitoring plan (EEMP) prepared for the Sandringham Solar Farm project is targeted towards environmental effects that have potential to occur during the construction, operation, and decommissioning phases of the facility. The potential negative environmental effects outlined in **Table 6** are specific to the identified significant woodlands, assumed Provincially Significant Wetlands, and significant wildlife habitat, and will form part of the overall EEMP for the project in the Design and Operations Report and the Construction Plan Report, as applicable. **Table 6** also summarizes the monitoring plan and monitoring frequency during operation of the facility, as well as contingency measures that will be undertaken if performance objectives are not achieved.

Table 6: Environmental Effects Monitoring Plan

Potential Negative/Positive Effect(s)		Significant Natural Feature Affected by Activity	Performance Objective	Mitigation Measures	Residual Effects	Monitoring Strategy & Methods	Monitoring Locations	Frequency & Duration	Reporting Requirements	Contingency Measures[1]
Physical	Functional									
SITE PREPARATION & CONSTRUCTION										
Loss of edge vegetation in Significant Woodland and assumed Provincially Significant Wetland due to the deposition of dust and/or overland release of silt derived from site grading	n/a	Significant Woodland & assumed Provincially Significant Wetland	No negative effects on woodland /wetland vegetation as indicated by excessive mortality of edge species	▪ Minimize soil exposure ▪ Install E&SC measures (e.g., silt fence) ▪ Use appropriate grading techniques ▪ Restrict vegetation clearing and construction lay-down areas to the project location	None	Visual assessment of edge vegetation Monitor deficiencies in E&SC measures	Along edge of woodlands and wetland Along silt fence and at other E&SC structures	At the end of the construction phase Monthly and/or after 10 mm rain events	Submit annual monitoring report to the MNR	Replace vegetation lost as a result of excessive dust deposition and/or siltation with appropriate native species, as permitted by landowner(s)
Temporary usage of 4.38 ha of shrubland habitat for construction laydown and parking	Temporary loss of breeding & foraging habitat	4.38 ha of Shrub Early/Successional Bird Breeding Habitat	Restore and maintain 4.38 ha of grassland habitat	▪ Restore 4.38 ha of grassland habitat ▪ Maintain overall site drainage patterns ▪ Maintain habitat patch size ▪ Maintain habitat ecological form, function and connectivity	Possible colonization of exotic invasive flora species	Botanical surveys to estimate the survivorship of seed mixes and determine the extent of invasive species colonization	Grassland habitat	After year 1, 2 and 3 post-construction	Submit annual monitoring report to the MNR	▪ Additional seed mix application if 80% plant survivorship is not attained after 3 years
Removal of 20.7 ha of shrubland for solar panels, substation and access roads	Loss of breeding & foraging habitat	20.7 ha of Shrub Early/Successional Bird Breeding Habitat	▪ Restore/ enhance 26.1 ha of shrubland habitat ▪ Maintain shrubland indicator/ common bird species richness at predevelopment levels	▪ Restore 1.5 ha of shrubland habitat with new plantings ▪ Enhance 24.6 ha of shrubland habitat through natural regeneration and excluding cattle from the site ▪ Maintain overall site drainage patterns	Possible colonization of exotic invasive flora species	▪ Botanical surveys to estimate the survivorship of plantings, percent cover of shrubland habitat and determine the extent of invasive species colonization ▪ Breeding bird surveys to determine species richness	Shrubland habitat	After year 1, 2 and 3 post-construction	Submit annual monitoring report to the MNR	▪ Additional plantings if 80% plant survivorship is not attained after 3 years ▪ Offsite habitat restoration or establish partnership and/or funding program with stewardship groups if shrubland

Potential Negative/Positive Effect(s)		Significant Natural Feature Affected by Activity	Performance Objective	Mitigation Measures	Residual Effects	Monitoring Strategy & Methods	Monitoring Locations	Frequency & Duration	Reporting Requirements	Contingency Measures[1]
Physical	**Functional**									
										indicator/ common bird species richness is not maintained at predevelopment levels
Disturbance, injury or mortality of a migratory breeding bird	Nest disturbance and/or abandonment	Shrub Early/Successional Bird Breeding Habitat	No disturbance, injury or mortality of birds protected under the *Migratory Birds Convention Act* (1994)	▪ Restrict vegetation clearing to the project location ▪ Timing restriction for vegetation clearing during breeding period (April 15th and August 1st). ▪ Complete a bird nest search prior to vegetation clearing conducted during the breeding period.	None	Monitoring plan required if active nest is found during vegetation clearing activity	In areas of active clearing if clearing activity includes the disturbance of an active nest location	Active nests will be monitored weekly or as appropriate until chicks have fledged	Submit annual monitoring report to the Environment Canada (if required)	Establish nest buffer(s) and prohibitions on cutting, as required.
OPERATIONS PHASE										
n/a	Behavioural Displacement of Shrub Early/Successional Birds	Shrub Early/Successional Bird Breeding Habitat	Maintain shrubland indicator/ common bird species richness at predevelopment levels	▪ Restore 1.5 ha of shrubland habitat with new plantings ▪ Enhance 24.6 ha of shrubland habitat through natural regeneration and excluding cattle from the site ▪ Maintain overall site drainage patterns	Change in habitat type and species composition within restoration/ enhancement areas	▪ Breeding bird surveys to determine species richness	Shrubland habitat	After year 1, 2 and 3 post-construction	Submit annual monitoring report to the MNR	▪ Offsite habitat restoration or establish partnership and/or funding program with stewardship groups if shrubland indicator/ common bird species richness is not maintained at predevelopment levels

Potential Negative/Positive Effect(s)		Significant Natural Feature Affected by Activity	Performance Objective	Mitigation Measures	Residual Effects	Monitoring Strategy & Methods	Monitoring Locations	Frequency & Duration	Reporting Requirements	Contingency Measures[1]
Physical	**Functional**									
DECOMISSIONING PHASE										
▪ Loss of edge vegetation in Significant Woodland and assumed Provincially Significant Wetland due to the deposition of dust and/or overland release of silt derived from site grading	n/a	Significant Woodlands & assumed Provincially Significant Wetlands	No negative effects on woodland /wetland vegetation as indicated by excessive mortality of edge species	▪ Minimize soil exposure ▪ Install E&SC measures (e.g., silt fence ▪ Use appropriate grading techniques ▪ Restrict vegetation clearing and construction lay-down areas to the project location	None	Visual assessment of edge vegetation	Along edge of woodlands and wetlands	At the end of the decommission phase	Submit annual monitoring report to the MNR	Replace vegetation lost as a result of excessive dust deposition and/or siltation with appropriate native species, as permitted by landowner(s)
						Monitor deficiencies in E&SC measures	Along silt fence and at other E&SC structures	Monthly and/or after 10 mm rain events		

1. Contingency measures will be developed in consultation with the MNR.

10. Negative Environmental Effects, Design and Operations

The REA regulation requires that an environmental effects monitoring plan be included as part of the Design and Operations Report to demonstrate how negative environmental effects of the project will be mitigated, and to set out a program for ongoing monitoring of the effectiveness of the mitigation measures. **Table 6** above provides a description of: performance objectives with respect to each negative environmental effect; mitigation measures planned to achieve performance objectives; how the project is to be monitored; and, a contingency plan to be implemented should monitoring reveal that mitigation measures have failed. **Table 6** has been prepared for inclusion in the Sandringham Solar Farm project Design and Operations Report. Additional mitigation measures proposed to minimize impacts of the facility and not related to natural features are also summarized in the Design and Operations Report.

11. Negative Environmental Effects, Construction

The REA regulation requires that a Construction Plan Report be prepared to demonstrate how negative environmental effects of construction activities will be mitigated including modifications to construction activities, use of treatment technologies (e.g. Erosion and Sediment Control structures), and scheduling of activities. **Table 6** above provides a description of: performance objectives with respect to each negative environmental effect; mitigation measures planned to achieve performance objectives; how the project is to be monitored; and, a contingency plan to be implemented should monitoring reveal that mitigation measures have failed. **Table 6** has been prepared for inclusion in the Sandringham Solar Farm project Construction Plan Report. Additional mitigation measures proposed to minimize impacts of the facility and not related to natural features are also summarized in the Construction Plan Report.

12. Conclusion

Through a records review, site investigation and natural features evaluation of significance, it was determined that the aforementioned significant and provincially significant features discussed in this report (**Figure 3**) required an EIS that summarized potential negative environmental effects, mitigation measures and an environmental effects monitoring plan. This fourth and final report satisfies the requirements under *Ontario Regulation 359/09* with respect to a natural heritage assessment.

This EIS Report demonstrates how negative environmental effects of the project will be mitigated, and sets out a program for ongoing monitoring of the effectiveness of the mitigation measures. **Table 6** above provides a description of performance objectives with respect to each negative environmental effect, mitigation measures planned to achieve performance objectives, how the project is to be monitored, and, a contingency plan to be implemented should monitoring reveal that mitigation measures have failed.

The EIS Report was completed to mitigate any potential negative environmental effects to the significant natural features located within 120 m of the planned Sandringham Solar Farm renewable energy project. **Table 6**, **Figure 4** and **Appendix B** outline how the activities related to the construction, operations and decommissioning of the facility affect these natural features and the appropriate mitigation and monitoring work to be implemented to mitigate or avoid the potential negative environmental effects of the project.

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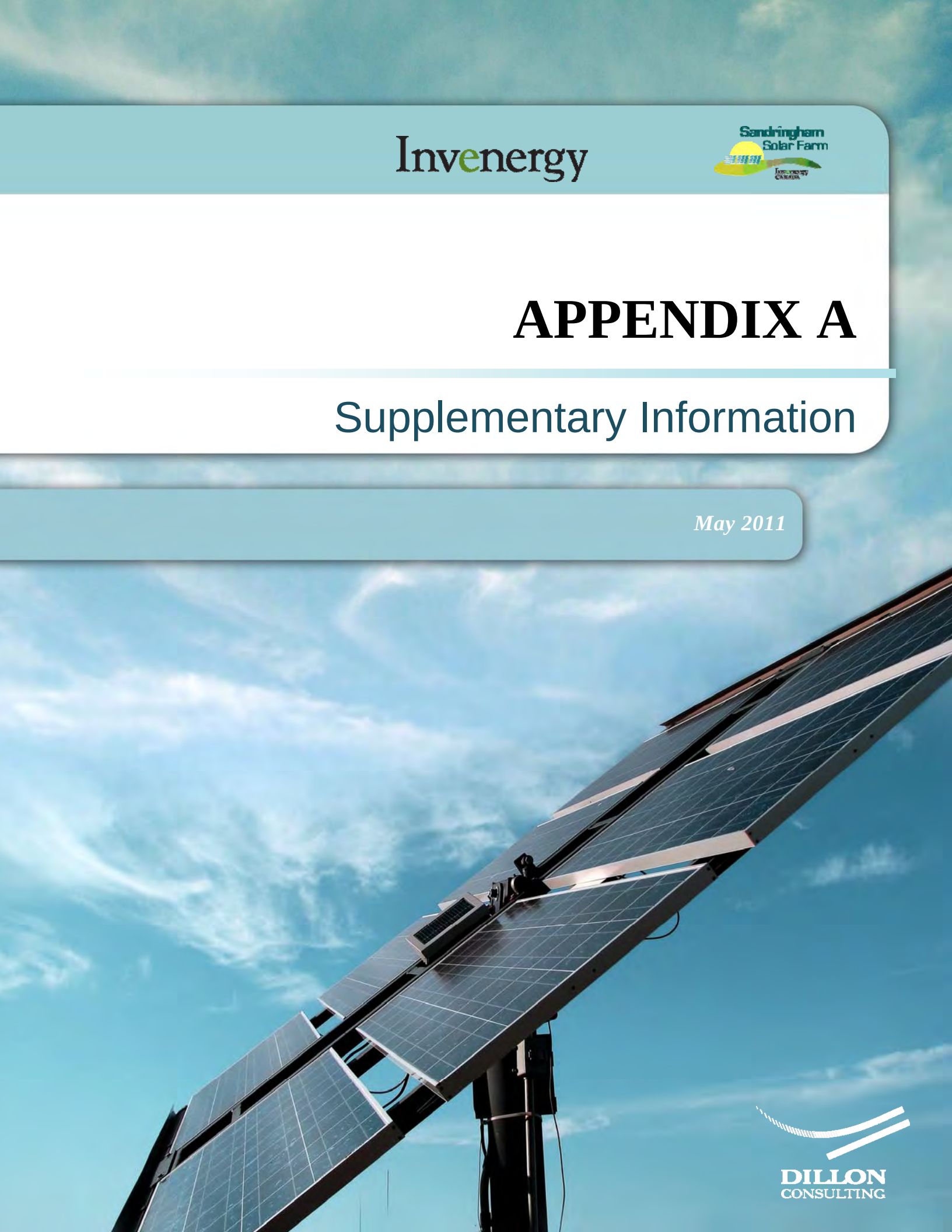
Sandringham Solar Farm

APPENDIX A

Supplementary Information

May 2011



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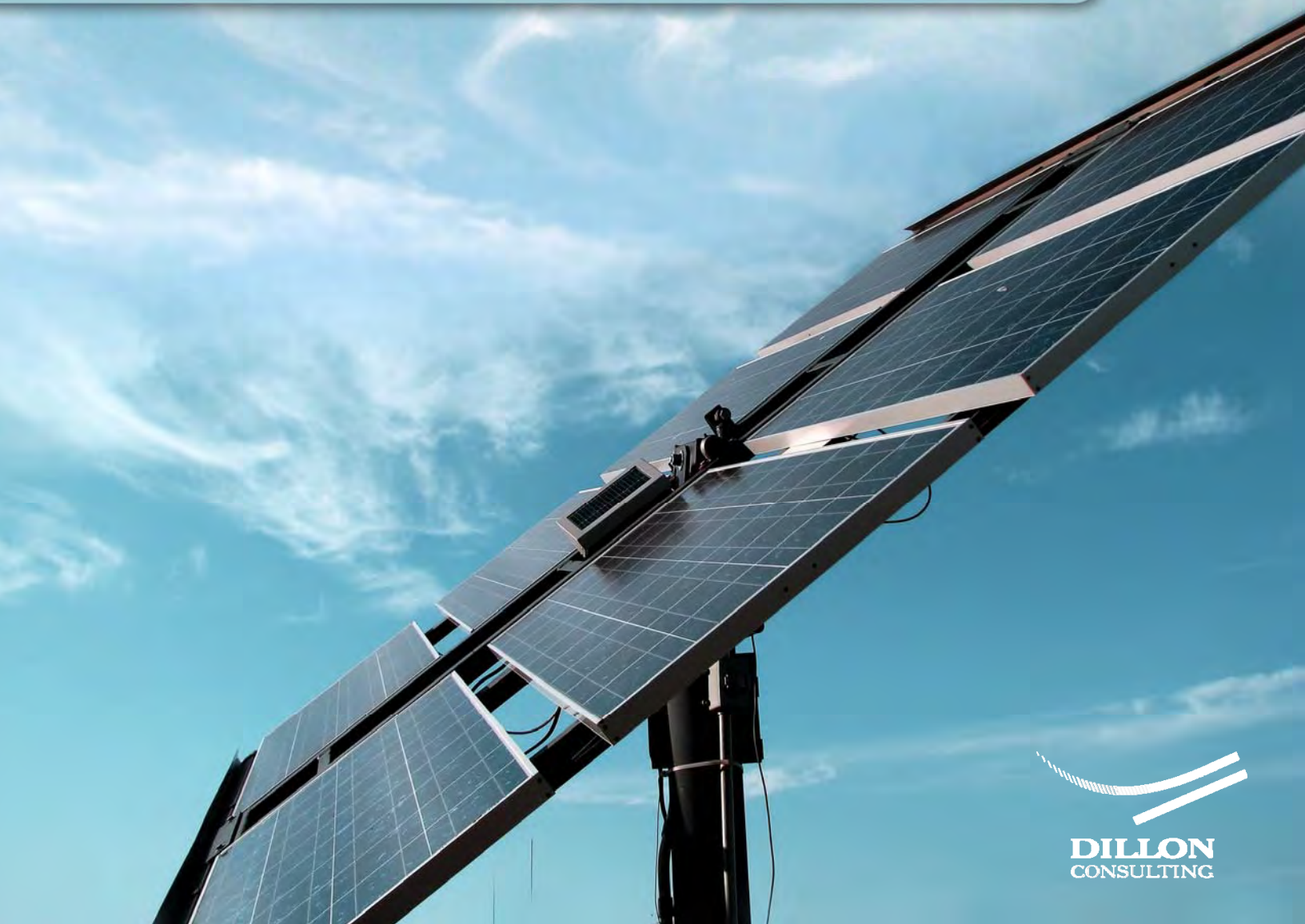
APPENDIX A

A1 Bird Species 4-Letter Codes

May 2011



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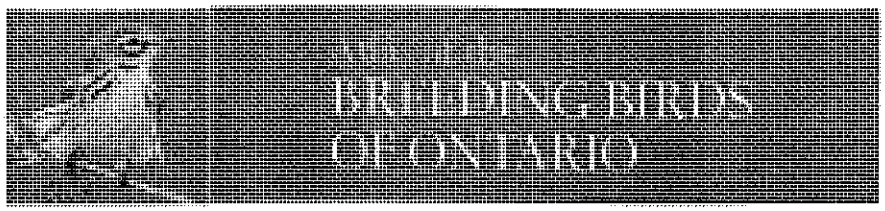


Atlas Coding Sheets

Select the reference sheet you would like to display: Species 4-letter Codes

Display in ◉ Taxonomic order (AOU) ○ Alphabetic order (species codes)

SNGO	Snow Goose
ROGO	Ross's Goose
BRAN	Brant
CACG	Cackling Goose
CAGO	Canada Goose
MUSW	Mute Swan
TRUS	Trumpeter Swan
TUSW	Tundra Swan
WODU	Wood Duck
GADW	Gadwall
AMWI	American Wigeon
ABDU	American Black Duck
MALL	Mallard
MBDH	Mallard x Am. Black Duck Hybrid
BWTE	Blue-winged Teal
CITE	Cinnamon Teal
NSHO	Northern Shoveler
NOPI	Northern Pintail
GWTE	Green-winged Teal
CANV	Canvasback
REDH	Redhead
RNDU	Ring-necked Duck
GRSC	Greater Scaup
LESC	Lesser Scaup
KIEI	King Eider
COEI	Common Eider
SUSC	Surf Scoter
WWSC	White-winged Scoter
BLSC	Black Scoter
LTDU	Long-tailed Duck
BUFF	Bufflehead
COGO	Common Goldeneye
BAGO	Barrow's Goldeneye
HOME	Hooded Merganser
COME	Common Merganser
RBME	Red-breasted Merganser
RUDU	Ruddy Duck
GRPA	Gray Partridge
RIPH	Ring-necked Pheasant
SIPH	Silver Pheasant
RUGR	Ruffed Grouse
SPGR	Spruce Grouse
WIPT	Willow Ptarmigan
STGR	Sharp-tailed Grouse
GPCH	Greater Prairie-Chicken
WITU	Wild Turkey
HELG	Helmeted Guineafowl
NOBO	Northern Bobwhite
RTLO	Red-throated Loon
PALO	Pacific Loon
COLO	Common Loon
PBGR	Pied-billed Grebe
HOGR	Horned Grebe
SESA	Semipalmated Sandpiper
LESA	Least Sandpiper
WRSA	White-rumped Sandpiper
BASA	Baird's Sandpiper
PESA	Pectoral Sandpiper
PUSA	Purple Sandpiper
DUNL	Dunlin
STSA	Stilt Sandpiper
BBSA	Buff-breasted Sandpiper
SBDO	Short-billed Dowitcher
COSN	Common Snipe
AMWO	American Woodcock
WIPH	Wilson's Phalarope
RNPH	Red-necked Phalarope
BOGU	Bonaparte's Gull
BHGU	Black-headed Gull
LIGU	Little Gull
LAGU	Laughing Gull
FRGU	Franklin's Gull
RBGU	Ring-billed Gull
CAGU	California Gull
HERG	Herring Gull
ICGU	Iceland Gull
LBBG	Lesser Black-backed Gull
GLGU	Glaucous Gull
GBBG	Great Black-backed Gull
CATE	Caspian Tern
BLTE	Black Tern
COTE	Common Tern
ARTE	Arctic Tern
FOTE	Forster's Tern
PAJA	Parasitic Jaeger
LTJA	Long-tailed Jaeger
BLGU	Black Guillemot
ECDO	Eurasian Collared-Dove
WWDO	White-winged Dove
MODO	Mourning Dove
BUDG	Budgerigar
YBCU	Yellow-billed Cuckoo
CUCK	Black/Yellow-billed Cuckoo
BBCU	Black-billed Cuckoo
BNOW	Barn Owl
EASO	Eastern Screech-Owl
GHOW	Great Horned Owl
SNOW	Snowy Owl
NHOW	Northern Hawk Owl
BUOW	Burrowing Owl
BDOW	Barred Owl
GGOW	Great Gray Owl
LEOW	Long-eared Owl
SEOW	Short-eared Owl
BOOW	Boreal Owl
NSWO	Northern Saw-whet Owl
BGGN	Blue-gray Gnatcatcher
NOWH	Northern Wheatear
EABL	Eastern Bluebird
MOBL	Mountain Bluebird
VEER	Veery
GCTH	Gray-cheeked Thrush
SWTH	Swainson's Thrush
HETH	Hermit Thrush
WOTH	Wood Thrush
AMRO	American Robin
GRCA	Gray Catbird
NOMO	Northern Mockingbird
SATH	Sage Thrasher
BRTH	Brown Thrasher
EUST	European Starling
AMPI	American Pipit
SPPI	Sprague's Pipit
BOWA	Bohemian Waxwing
CEDW	Cedar Waxwing
BWWA	Blue-winged Warbler
GWWA	Golden-winged Warbler
BGWW	Blue or Golden-winged Warbler
LAWA	Lawrence's Warbler
BRWA	Brewster's Warbler
TEWA	Tennessee Warbler
OCWA	Orange-crowned Warbler
NAWA	Nashville Warbler
NOPA	Northern Parula
YWAR	Yellow Warbler
CSWA	Chestuut-sided Warbler
MAWA	Magnolia Warbler
CMWA	Cape May Warbler
BTBW	Black-throated Blue Warbler
YRWA	Yellow-rumped Warbler
BTNW	Black-throated Green Warbler
BLBW	Blackburnian Warbler
YTWA	Yellow-throated Warbler
PIWA	Pine Warbler
KIWA	Kirtland's Warbler
PRAW	Prairie Warbler
PAWA	Palm Warbler
BBWA	Bay-breasted Warbler
BLPW	Blackpoll Warbler
CERW	Cerulean Warbler
BAWW	Black-and-white Warbler
AMRE	American Redstart
PROW	Prothonotary Warbler
WEWA	Worm-eating Warbler
SWWA	Swainson's Warbler
OVEN	Ovenbird
NOWA	Northern Waterthrush
LOWA	Louisiana Waterthrush
KEWA	Kentucky Warbler

RNGR	Red-necked Grebe
EAGR	Eared Grebe
ASTK	American Swallow-tailed Kite
AWPE	American White Pelican
DCCO	Double-crested Cormorant
AMBI	American Bittern
LEBI	Least Bittern
GBHE	Great Blue Heron
GREG	Great Egret
SNEG	Snowy Egret
TRHE	Tricolored Heron
CAEG	Cattle Egret
GRHE	Green Heron
BCNH	Black-crowned Night-Heron
YCNH	Yellow-crowned Night-Heron
GLIB	Glossy Ibis
BLVU	Black Vulture
TUVU	Turkey Vulture
OSPR	Osprey
BAEA	Bald Eagle
NOHA	Northern Harrier
SSHA	Sharp-shinned Hawk
COHA	Cooper's Hawk
NOGO	Northern Goshawk
HRSH	Harris's Hawk
RSHA	Red-shouldered Hawk
BWHA	Broad-winged Hawk
RTHA	Red-tailed Hawk
FEHA	Ferruginous Hawk
RLHA	Rough-legged Hawk
GOEA	Golden Eagle
AMKE	American Kestrel
MERL	Merlin
PEFA	Peregrine Falcon
YERA	Yellow Rail
KIRA	King Rail
VIRA	Virginia Rail
SORA	Sora
PUGA	Purple Gallinule
COMO	Common Moorhen
AMCO	American Coot
MOOT	Am. Coot/C. Moorhen
SACR	Sandhill Crane
BBPL	Black-bellied Plover
AMGP	American Golden-Plover
SEPL	Semipalmated Plover
PIPL	Piping Plover
KILL	Killdeer
RODO	Rock Pigeon
BNST	Black-necked Stilt
AMAV	American Avocet
SPSA	Spotted Sandpiper
SOSA	Solitary Sandpiper
GRYE	Greater Yellowlegs
WILL	Willet
LEYE	Lesser Yellowlegs
UPSA	Upland Sandpiper
WHIM	Whimbrel
HUGO	Hudsonian Godwit
MAGO	Marbled Godwit
RUTU	Ruddy Turnstone
REKN	Red Knot
SAND	Sanderling
CONI	Common Nighthawk
COPO	Common Poorwill
CWWI	Chuck-will's-widow
WPWI	Whip-poor-will
CHSW	Chimney Swift
RTHU	Ruby-throated Hummingbird
RUHU	Rufous Hummingbird
BEKI	Belted Kingfisher
RHWO	Red-headed Woodpecker
RBWO	Red-bellied Woodpecker
YBSA	Yellow-bellied Sapsucker
DOWO	Downy Woodpecker
HAWO	Hairy Woodpecker
TTWO	Three-toed Woodpecker
BBWO	Black-backed Woodpecker
NOFL	Northern Flicker
PIWO	Pileated Woodpecker
OSFL	Olive-sided Flycatcher
EAWP	Eastern Wood-Pewee
YBFL	Yellow-bellied Flycatcher
ACFL	Acadian Flycatcher
ALFL	Alder Flycatcher
WIFL	Willow Flycatcher
LEFL	Least Flycatcher
EAPH	Eastern Phoebe
GCFL	Great Crested Flycatcher
WEKI	Western Kingbird
EAKI	Eastern Kingbird
FTFL	Fork-tailed Flycatcher
LOSH	Loggerhead Shrike
NSHR	Northern Shrike
WEVI	White-eyed Vireo
YTVI	Yellow-throated Vireo
BHVI	Blue-headed Vireo
WAVI	Warbling Vireo
PHVI	Philadelphia Vireo
REVI	Red-eyed Vireo
GRAJ	Gray Jay
BLJA	Blue Jay
BBMA	Black-billed Magpie
AMCR	American Crow
CORA	Common Raven
HOLA	Horned Lark
PUMA	Purple Martin
TRES	Tree Swallow
NRWS	Northern Rough-winged Swallow
BANS	Bank Swallow
CLSW	Cliff Swallow
BARS	Barn Swallow
BGGH	Black-capped Chickadee
BOCH	Boreal Chickadee
TUTI	Tufted Titmouse
RBNU	Red-breasted Nuthatch
WBNU	White-breasted Nuthatch
BRCR	Brown Creeper
CARW	Carolina Wren
BEWR	Bewick's Wren
HOWR	House Wren
WIWR	Winter Wren
SEWR	Sedge Wren
MAWR	Marsh Wren
GCKI	Golden-crowned Kinglet
RCKI	Ruby-crowned Kinglet
CONW	Connecticut Warbler
MOWA	Mourning Warbler
COYE	Common Yellowthroat
HOWA	Hooded Warbler
WIWA	Wilson's Warbler
CAWA	Canada Warbler
YBCH	Yellow-breasted Chat
EATO	Eastern Towhee
ATSP	American Tree Sparrow
CHSP	Chipping Sparrow
CCSP	Clay-colored Sparrow
FISP	Field Sparrow
VESP	Vesper Sparrow
LASP	Lark Sparrow
SAVS	Savannah Sparrow
GRSP	Grasshopper Sparrow
HESP	Henslow's Sparrow
LCSP	Le Conte's Sparrow
NSTS	Nelson's Sparrow
FOSP	Fox Sparrow
SOSP	Song Sparrow
LISP	Lincoln's Sparrow
SWSP	Swamp Sparrow
WTSP	White-throated Sparrow
HASP	Harris's Sparrow
WCSP	White-crowned Sparrow
DEJU	Dark-eyed Junco
MCLO	McCown's Longspur
LALO	Lapland Longspur
SMLO	Smith's Longspur
SNBU	Snow Bunting
SUTA	Summer Tanager
SCTA	Scarlet Tanager
WETA	Western Tanager
NOCA	Northern Cardinal
RBGR	Rose-breasted Grosbeak
BLGR	Blue Grosbeak
INBU	Indigo Bunting
DICK	Dickcissel
BOBO	Bobolink
RWBL	Red-winged Blackbird
EAME	Eastern Meadowlark
WEME	Western Meadowlark
YHBL	Yellow-headed Blackbird
RUBL	Rusty Blackbird
BRBL	Brewer's Blackbird
COGR	Common Grackle
BHCO	Brown-headed Cowbird
OROR	Orchard Oriole
BAOR	Baltimore Oriole
PIGR	Pine Grosbeak
PUFI	Purple Finch
HOFI	House Finch
RECR	Red Crossbill
WWCR	White-winged Crossbill
CORE	Common Redpoll
HORE	Hoary Redpoll
PISI	Pine Siskin
AMGO	American Goldfinch
EVGR	Evening Grosbeak
HOSP	House Sparrow

Site hosted by Bird Studies Canada

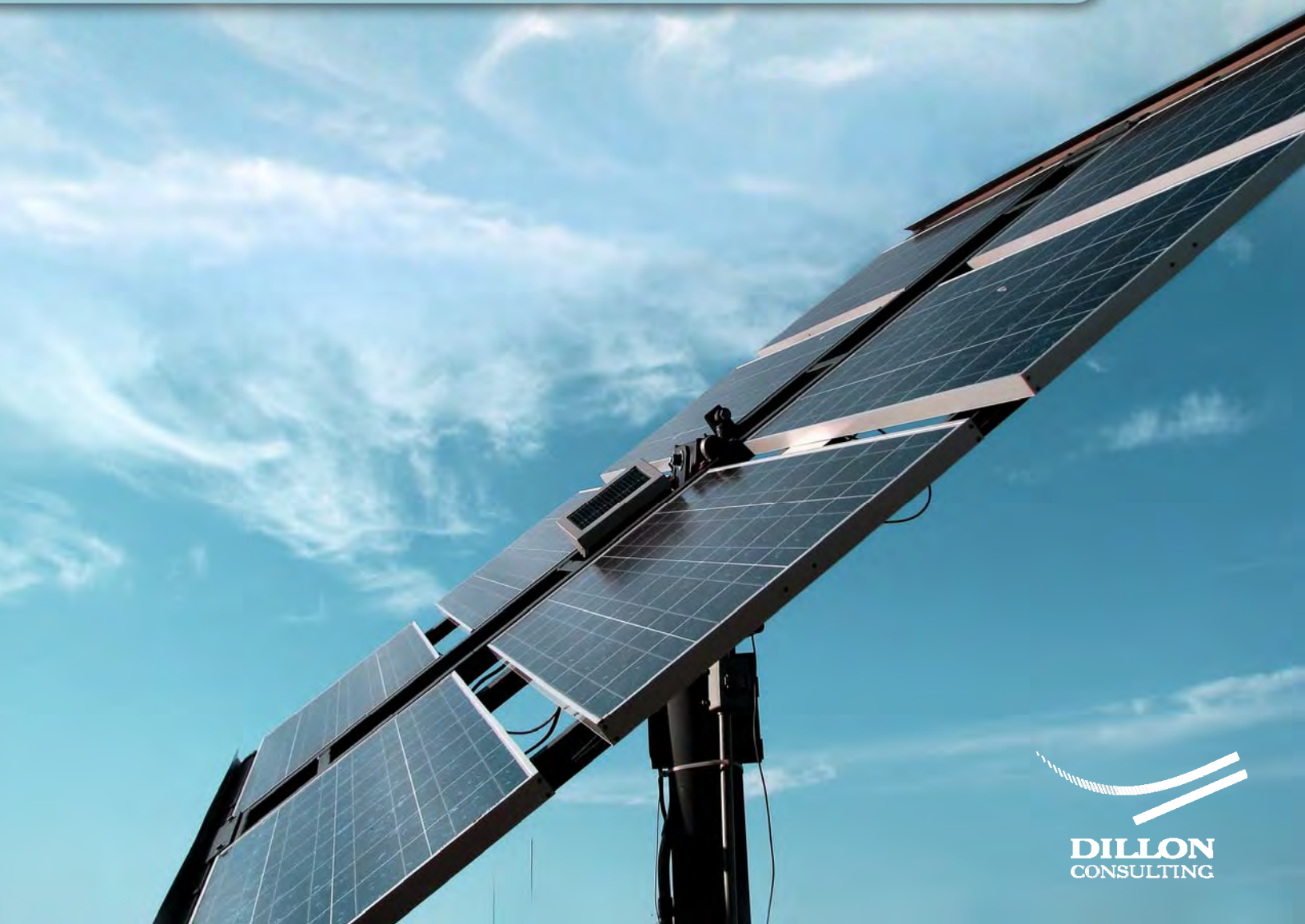
Invenergy

Sandringham Solar Farm

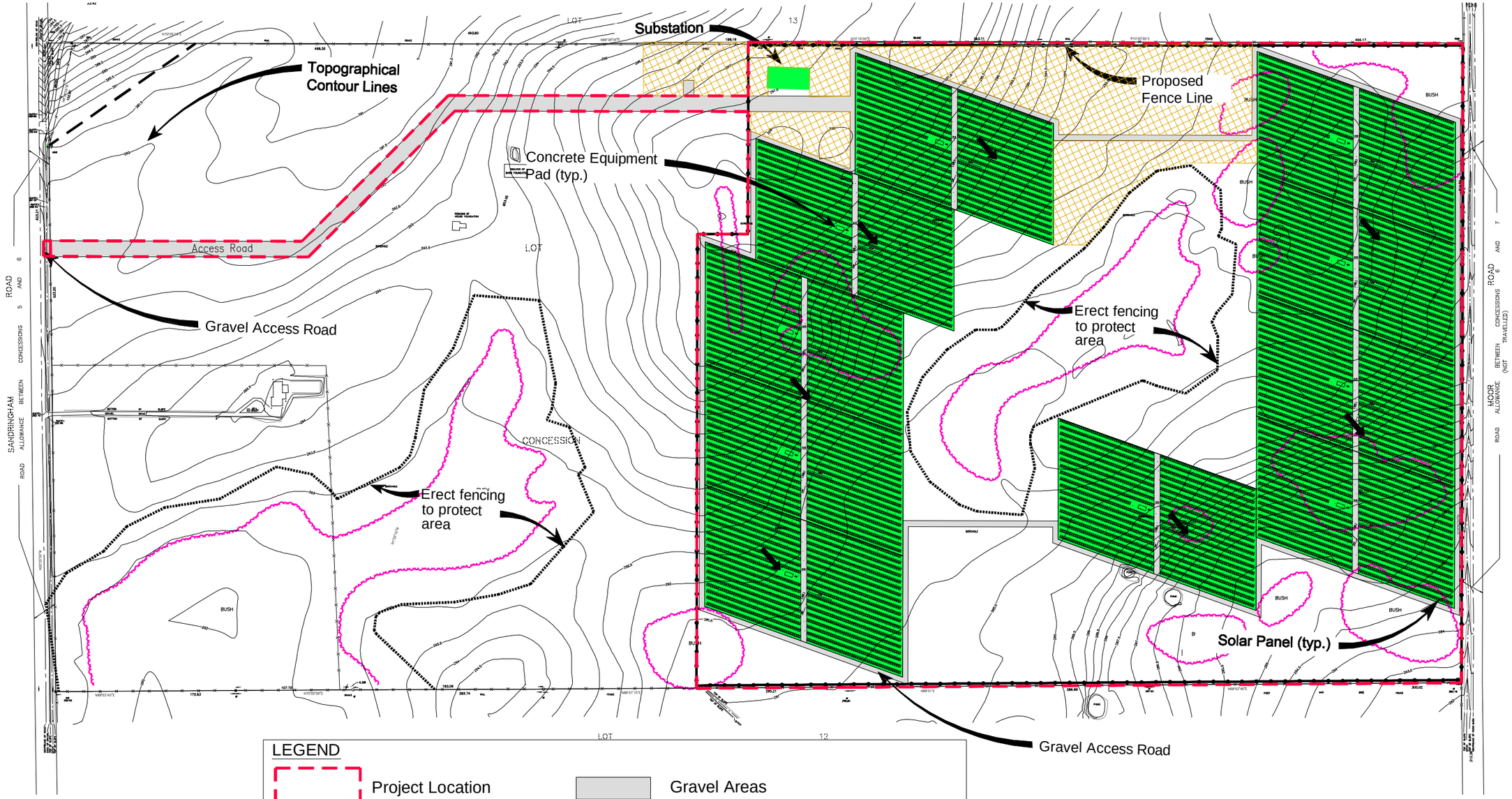
APPENDIX A

A2 Stormwater Management Plan

May 2011



DILLON CONSULTING



LEGEND

- Project Location
- Drainage Route
- Proposed Security Fence
- Existing Property Fence
- Silt Fencing
- Tree Lines/Bush Area
- Gravel Areas
- Grass Areas
- Temporary Construction Laydown Area (to be restored post-construction)

NOTE:

1. Contractor will shape site as required to provide positive drainage.

2. The perimeter of the solar panels/gravel roads will match existing grades.

DILLON CONSULTING

Scale 1:4000
January 2011
Project No.10-3523-1000

Invenergy Solar Canada ULC
Sandringham Solar Farm
Stormwater Management Study

in the City of Kawartha Lakes

FIGURE 2.0
Sandringham Solar Farm

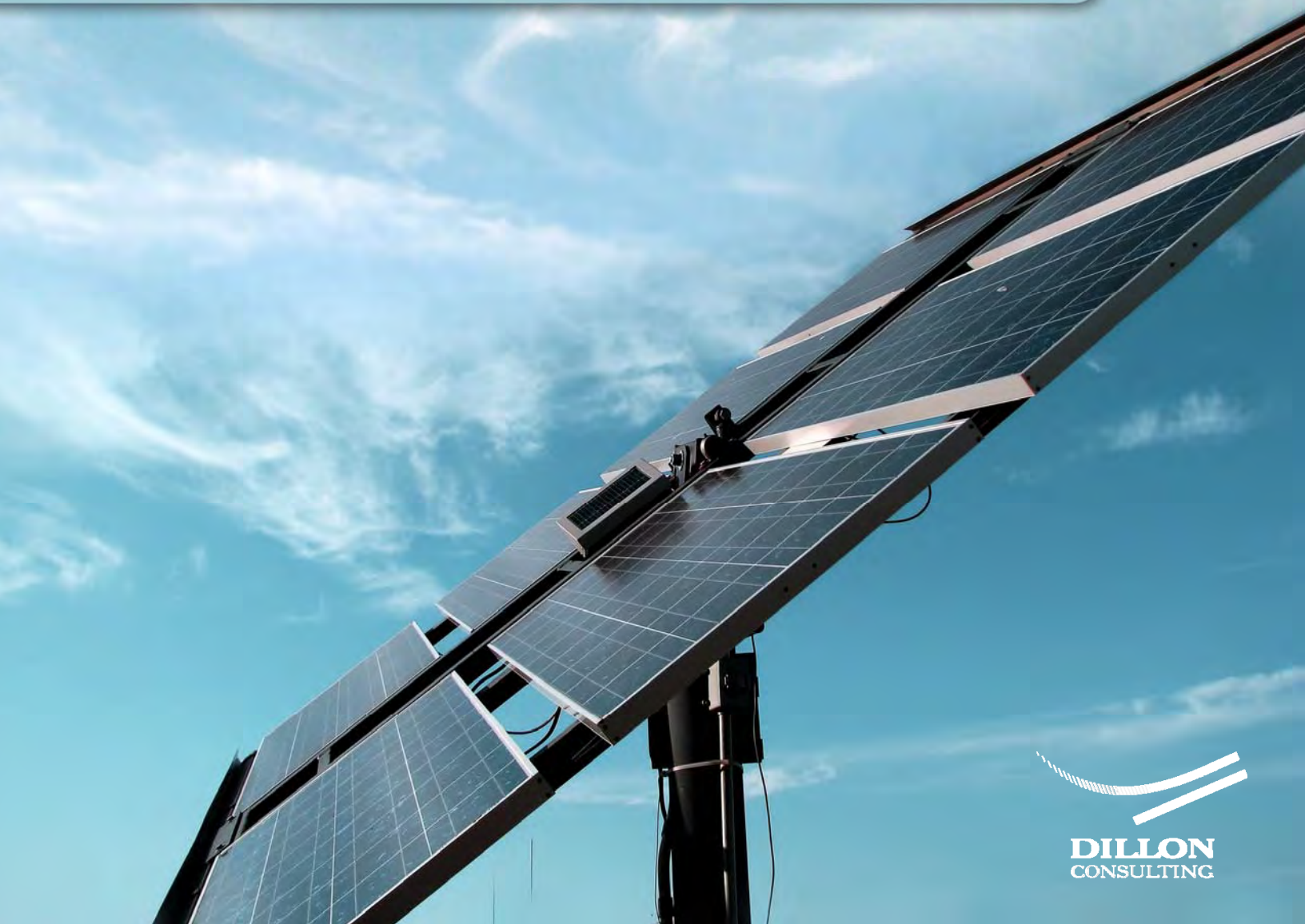
Invenergy

Sandringham Solar Farm

APPENDIX B

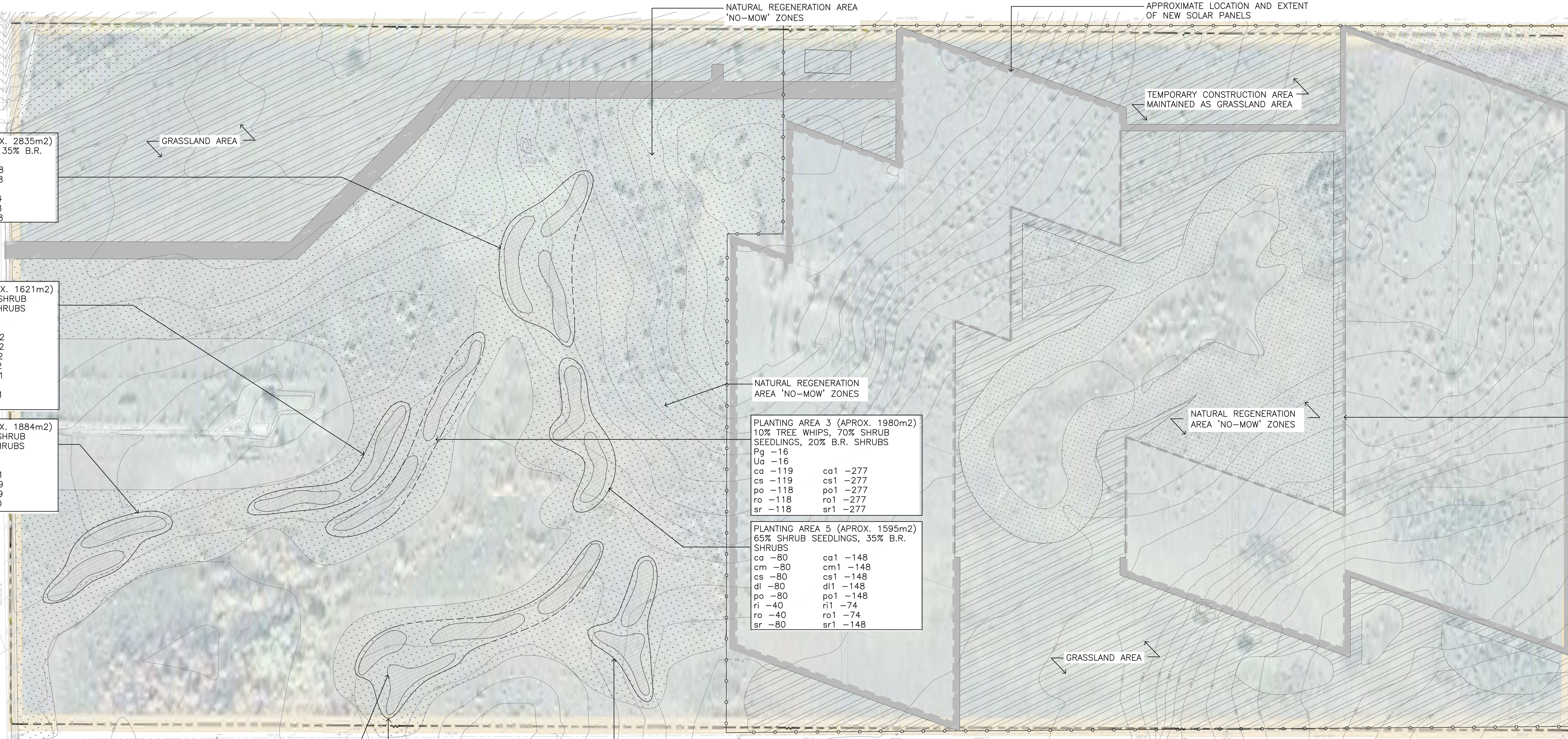
Detailed Shrubland Habitat Restoration & Enhancement Plan Drawing

May 2011



DILLON CONSULTING

DILLON CONSULTING LIMITED 3200 DEZIEL DRIVE, SUITE 608, WINDSOR, ONTARIO, N8W 5K8, PHONE (519) 948-5000, FAX (519) 948-5054



NOTES

1. PLANTINGS SHOULD BE IN AN ASYMMETRICAL, RANDOM MIX.
2. WHEN PLANTING A MIX OF SHRUBS AND TREES, SPECIES SHOULD BE PLANTED TOGETHER IN GROUPS OF 3-4.

TYPICAL PLANT SPACING

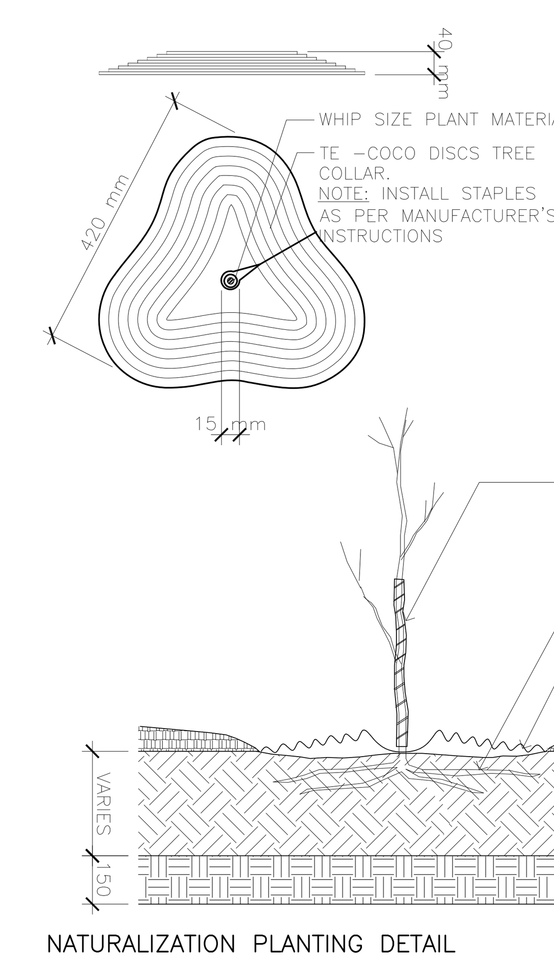
TREE AND LARGE SHRUB WHIPS	2.5M
BARE ROOT SHRUB	1.0M
SHRUB SEEDLINGS	1.0M

LEGEND

- AREAS OF NATURAL REGENERATION 'NO-MOW' ZONES (246,168m2) ≈ 24.6 ha
- AREAS TO BE MAINTAINED AS GRASSLAND (182,199m2) ≈ 18.2 ha
- NEW SHRUBLAND RESTORATION CELLS (15,343m2) ≈ 1.5 ha

PLANT LIST

Key	Botanical Name	Common Name	Size	Condition	Qty.
DECIDUOUS					
Ca	*Cornus alternifolia*	Alternate-leaf Dogwood	Whip (100-125)	B.R.	41
Ua	*Ulmus americana*	American Elm	Whip (125-150)	B.R.	29
Pg	*Populus grandentiata*	Large Tooth Aspen	Whip (125-150)	B.R.	16
Sa	*Salix amygdaloides*	Peachleaf Willow	Whip (100-125)	B.R.	12
Sd	*Salix discolor*	Pussy Willow	Whip (100-125)	B.R.	12
CONIFEROUS					
To	*Thuja occidentalis*	Eastern White Cedar	Whip (100-125)	B.R.	65
SHRUBS					
ca	*Cornus alternifolia*	Alternate-leaf Dogwood	50-75 cm (shrub)	B.R.	159
ca1	*Cornus alternifolia*	Alternate-leaf Dogwood	Seedling (20-40cm)	B.R.	425
cp	*Crataegus punctata*	Dotted Hawthorn	50-75 cm (shrub)	B.R.	326
cp1	*Crataegus punctata*	Dotted Hawthorn	Seedling (20-40cm)	Plugs	685
cm	*Crataegus mollis*	Downy Hawthorn	50-75 cm (shrub)	B.R.	167
cm1	*Crataegus mollis*	Downy Hawthorn	Seedling (20-40cm)	Plugs	323
cr	*Cornus racemosa*	Grey Dogwood	50-75 cm (shrub)	B.R.	247
cr1	*Cornus racemosa*	Grey Dogwood	Seedling (20-40cm)	Plugs	977
cs	*Cornus stolonifera*	Red-osier Dogwood	50-75 cm (shrub)	B.R.	732
cs1	*Cornus stolonifera*	Red-osier Dogwood	Seedling (20-40cm)	Plugs	905
dl	*Diervilla lonicera*	Bush Honeysuckle	50-75 cm (shrub)	B.R.	208
dl1	*Diervilla lonicera*	Bush Honeysuckle	Seedling (20-40cm)	Plugs	465
jc	*Juniperus communis*	Common Juniper	50-75 cm (shrub)	B.R.	0
jc1	*Juniperus communis*	Common Juniper	Seedling (20-40cm)	Plugs	0
po	*Physocarpus opulifolius*	Ninebark	50-75 cm (shrub)	B.R.	245
po1	*Physocarpus opulifolius*	Ninebark	Seedling (20-40cm)	Plugs	598
pv	*Prunus virginiana*	Chokecherry	50-75 cm (shrub)	B.R.	40
pv1	*Prunus virginiana*	Chokecherry	Seedling (20-40cm)	Plugs	141
ri	*Ribes odoratum*	Golden Currant	50-75 cm (shrub)	B.R.	179
ri1	*Ribes odoratum*	Golden Currant	Seedling (20-40cm)	Plugs	399
ro	*Rubus occidentalis*	Black Raspberry	50-75 cm (shrub)	B.R.	258
ro1	*Rubus occidentalis*	Black Raspberry	Seedling (20-40cm)	Plugs	674
rt1	*Rhus typhina*	Staghorn sumac	Seedling (20-40cm)	Plugs	316
sd	*Salix discolor*	Pussy willow	50-75 cm (1-2 stem)	B.R.	333
sd1	*Salix discolor*	Pussy willow	Seedling (20-40cm)	Plugs	1000
se	*Salix exigua*	Sandbar willow	50-75 cm (1-2 stem)	B.R.	333
se1	*Salix exigua*	Sandbar willow	Seedling (20-40cm)	Plugs	1000
sc	*Shepherdia canadensis*	Soapberry	50-75 cm (shrub)	B.R.	325
sc1	*Shepherdia canadensis*	Soapberry	Seedling (20-40cm)	Plugs	368
sr	*Sambucus racemosa var. pubens*	Red-berried Elder	50-75 cm (shrub)	B.R.	691
sr1	*Sambucus racemosa var. pubens*	Red-berried Elder	Seedling (20-40cm)	Plugs	1236



NATURALIZATION PLANTING DETAIL

A BRIEF DESCRIPTION

The protective collars for seedlings are manufactured from recycled paper and bio-degrade into the soil in approx. 3 - 4 years.

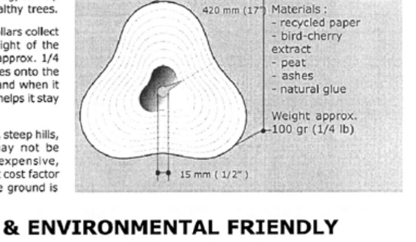
The collars are installed around the base of the seedling and protect the seedling against grass and other competing vegetation and reduces competition for root space. By reducing competing vegetation the protective collars improve the growth and survival conditions of the seedling in terms of temperature, water and nutrients and help create an open space around the seedling.

The design of the collars encourage successful growth and survival < without chemical plant protection > and protect the seedling for the decisive first 3 - 4 years after planting, to help the seedlings grow into tall and healthy trees.

Channels on top (surface) of the collars collect water, if it becomes moist the weight of the collars goes from 100 to 500 gr (approx. 1/4 to 1 lb). When wet, the collar settles onto the ground and stays tightly in place, and when it dries the impregnated natural glue helps it stay in place.

In some difficult sites such as gravel, steep hills, very dry and windy, bonding may not be possible and may require an inexpensive, biodegradable anchor. An important cost factor is that pegging of the collars to the ground is only required under conditions as above. The protective collars for seedling collars are impregnated with "Bird Cherry" (prunus padus) extract which is a natural vole repellent from renewable sources. With the help of the natural vole repellent the collars substantially eliminate damage from voles. Scientific controlled tests have shown the collars to be quite successful against voles, especially when applied to untreated soil.

By (optionally) impregnating the collars with the precise amount of Boron a cost-effective micro-nutrient distribution evenly around the seedling improves its growth.

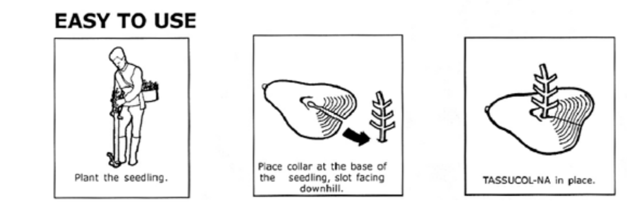


COST-EFFECTIVE & ENVIRONMENTAL FRIENDLY

This collar is a patented, proven alternative to chemical plant protection. Installation is simple, requiring somewhat less time than the planting of a seedling.

The collars improve the growth and survival rate of the seedlings and are quite successfull to eliminate damage from voles. Foresters now have a choice how to renew their forests < without chemical plant protection > and help protect the environment.

EASY TO USE



The suggested information and procedures should be suitable for most operations using our products. Our information and suggestions are based upon scientific studies and commercial experience. However, there may be factors, over which we have no control, which may affect your application requirements.
Successful utilization of any UNITED COLLOIDS products depends on proper evaluation in the customer's process.

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY

DESIGN KP	REVIEWED BY DR
DRAWN SG	CHECKED BY
DATE Jun-17-2011	
SCALE 1:2000	

INVENERGY SOLAR CANADA ULC

PROJECT NO. 10-3523

APPENDIX B
Detailed Shrubland Habitat Restoration and Enhancement Plan

SHEET NO. 1