



**BROOKE-ALVINSTON WIND FARM
DESIGN AND OPERATIONS REPORT**

Stantec File No. 160960567
February 2011

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1.0 Introduction

1.1 PROJECT OVERVIEW

Zephyr Farms Limited (Zephyr Farms) is proposing to develop the Brooke-Alvinston Wind Farm (the Project) in the Township of Brooke-Alvinston, Lambton County, Ontario. The Project has been awarded a Power Purchase Agreement with the Ontario Power Authority (RESOP 11836). The basic components of the Project include four Samsung Heavy Industries 2.5 MW wind turbine generators for a total installed nameplate capacity of 10 MW, transformers at each turbine, electrical collector lines and fibre optic data lines, a switchyard with associated control room, a meteorological tower (met tower) and associated power and data cabling, and turbine access roads. The electrical transmission system would transport the electricity generated from each turbine to Hydro One Networks Inc.'s (HONI's) distribution network. The Project also includes interconnection equipment and installations specified by HONI. All Project components will be situated on private land and municipal road allowance. A Site Plan map is provided in Appendix A.

Zephyr Farms has retained Stantec Consulting Ltd. (Stantec) to prepare a Renewable Energy Approval (REA) Application, as required under Ontario Regulation 359/09 - Renewable Energy Approvals under Part V.0.1 of the Act of the *Environmental Protection Act* (O. Reg. 359/09). According to subsection 6(3) of O.Reg.359/09, the Project is classified as a Class 4 Wind Facility and would follow the requirements identified in O.Reg.359/09 for such a facility.

1.2 REPORT REQUIREMENTS

The Design and Operations Report is the principal document where the details of a renewable energy project are presented. Aspects of the Project outside of the operation phase such as construction and decommissioning are addressed within separate reports as part of the REA package.

The Design and Operations Report has been prepared in accordance with Item 4, Table 1 of O.Reg.359/09 and the Ministry of the Environment's (MOE's) draft guidance document *Technical Bulletin Two: Guidance for preparing the Design and Operations Report* (MOE, 2010).

O.Reg.359/09 sets out specific content requirements for the Design and Operations Report as provided in the following table (Table 1.1).

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Table 1.1: Design and Operations Report Requirements: O.Reg. 359/09

Required Documentation	Requirement Met	Location in Submission
1. Set out a site plan of the Project Location at which the renewable energy Project will be engaged in, including, <ul style="list-style-type: none"> i. one or more maps or diagrams of, 		
A. all buildings, structures, roads, utility corridors, road allowances and easements required in respect of the renewable energy generation facility and situated within 300 m of the facility,	Ü	Appendix A
B. any ground water and surface water supplies used at the facility,	N/A	N/A
C. any things from which contaminants are discharged into the air,	N/A	N/A
D. any works for the collection, transmission, treatment and disposal of sewage,	N/A	N/A
E. any areas where waste, biomass, source separated organics and farm material are stored, handled, processed or disposed of,	N/A	N/A
F. the Project Location in relation to any of the following within 125 m: properties described in Column 1 of the Table to section 19, heritage resources, archaeological resources, the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Conservation Plan, the area of the Niagara Escarpment Plan, the Protected Countryside, the Lake Simcoe watershed, and	Ü	Appendix A
G. any noise receptors or odour receptors that may be adversely affected by the use or operation of the facility,	Ü	Appendix A
ii. a description of each item diagrammed under subparagraph i, and	Ü	3.0, 5.0
iii. one or more maps or diagrams of land contours, surface water drainage and any of the following, if they have been identified in complying with this Regulation: properties described in Column 1 of the Table to section 19, heritage resources, archaeological resources, water bodies, significant or provincially significant natural features and any other natural features identified in the Protected Countryside or in the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Plan.	Ü	Appendix A
2. Set out conceptual plans, specifications and descriptions related to the design of the renewable energy generation facility, including a description of,		
i. any works for the collection, transmission, treatment and disposal of sewage, including details of any sediment control features and storm water management facilities,	N/A	N/A
ii. any things from which contaminants are discharged into the air, and	N/A	N/A
iii. any systems, facilities and equipment for receiving, handling, storing and processing any waste, biomass, source separated organics, farm material and biogas.	N/A	N/A
3. Set out conceptual plans, specifications and descriptions related to the operation of the renewable energy generation facility, including,		

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Table 1.1: Design and Operations Report Requirements: O.Reg. 359/09

Required Documentation	Requirement Met	Location in Submission
i. in respect of any water takings,		
A. a description of the time period and duration of water takings expected to be associated with the operation of the facility,	N/A	N/A
B. a description of the expected water takings, including rates, amounts and an assessment of the availability of water to meet the expected demand, and	N/A	N/A
C. an assessment of and documentation showing the potential for the facility to interfere with existing uses of the water expected to be taken,	N/A	N/A
ii. a description of the expected quantity of sewage produced and the expected quality of that sewage at the Project Location and the manner in which it will be disposed of, including details of any sediment control features and storm water management facilities,		
iii. a description of any expected concentration of air contaminants discharged from the facility,	N/A	N/A
iv. in respect of any biomass, source separated organics and farm material at the facility,		
A. the maximum daily quantity that will be accepted,	N/A	N/A
B. the estimated annual average quantity that will be accepted,	N/A	N/A
C. the estimated average time that it will remain at the facility, and	N/A	N/A
D. the estimated average rate at which it will be used, and	N/A	N/A
v. in respect of any waste generated as a result of processes at the Project Location, the management and disposal of such waste, including,		
A. the expected types of waste to be generated,	ü	Section 5.7
B. the estimated maximum daily quantity of waste to be generated, by type,	ü	Section 5.7
C. processes for the storage of waste, and	ü	Section 5.7
D. processes for final disposal of waste.	ü	Section 5.7
4. Include an environmental effects monitoring plan in respect of any adverse environmental effects that may result from engaging in the renewable energy Project, setting out,		
i. performance objectives in respect of the adverse environmental effects,	ü	Section 6.0, Appendix D
ii. mitigation measures to assist in achieving the performance objectives mentioned in subparagraph i,	ü	Sections 5.0 and 6.0, Appendix D
iii. a program for monitoring adverse environmental effects for the duration of the time that the Project is engaged in, including a contingency plan to be implemented if any mitigation measures fail.	ü	Sections 5.0 and 6.0, Appendix D
5. Include a response plan setting out a description of the actions to be taken while engaging in the renewable energy Project to inform the public, aboriginal communities and municipalities, local roads boards and Local Services Boards with respect to the Project, including,		

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Table 1.1: Design and Operations Report Requirements: O.Reg. 359/09

Required Documentation	Requirement Met	Location in Submission
i. measures to provide information regarding the activities occurring at the Project Location, including emergencies,	ü	Section 8.0
ii. means by which persons responsible for engaging in the Project may be contacted, and	ü	Section 8.0
iii. means by which correspondence directed to the persons responsible for engaging in the Project will be recorded and addressed.	ü	Section 8.0
6. If the Project Location is in the Lake Simcoe watershed, a description of whether the Project requires alteration of the shore of Lake Simcoe, the shore of a fresh water estuary of a stream connected to Lake Simcoe or other lakes or any permanent or intermittent stream and,		
i. how the Project may impact any shoreline, including the ecological functions of the shoreline, and	N/A	N/A
ii. how the Project will be engaged in to,		
A. maintain the natural contour of the shoreline through the implementation of natural shoreline treatments, such as planting of natural vegetation and bioengineering, and	N/A	N/A
B. use a vegetative riparian area, unless the Project Location is used for agricultural purposes and will continue to be used for such purposes.	N/A	N/A

The MOE's Draft Technical Bulletin Two further elaborates on content requirements for the Design and Operations Report, as provided in the following table (Table 1.2).

Table 1.2: Design and Operations Report Requirements: MOE Draft Technical Bulletin Two

Required Documentation	Requirement Met	Location in Submission
1. Report Introduction	ü	Section 1.0
2. Site Plan	ü	Section 2.0
3. Facility Design Plan	ü	Section 3.0
4. Facility Operations Plan	ü	Section 4.0
5. Environmental Effects Monitoring Plan	ü	Section 6.0, Appendix D
6. Emergency Response and Communications Plans	ü	Sections 6.3.5 and 8.0

2.0 Site Plan

2.1 SITE PLAN CONTENT

Site Plan information is provided in Appendix A. The Site Plan provides the following information:

- Facility components, including: turbine locations, access roads, underground collector lines (with associated fibre optic data lines), a switchyard (with associated control room), and a met tower (with associated power and data cabling);
- Project Location Boundary: the outer limit of all components of the Project, including temporary work areas during construction. The Project Location Boundary is used for defining setback and site investigation distances;
- Roads, utility corridors, road allowances, and easements within 300 metres (m) of the Project Location;
- Location of property lines;
- Location of protected properties and heritage resources within 125 m of the Project Location;
- Cultural and natural features and water bodies including topographic contours, surface water drainage, land uses, heritage and archaeological resources, and natural features and water bodies;
- Noise receptors (non-participating and vacant lots); and
- Visual representation of setback distances from the Project Location to protected properties, heritage resources, water bodies, and significant or provincially significant natural features.

A detailed description of the Project components and cultural and natural features is provided in Sections 3.0, 4.0 and 5.0.

2.2 SETBACK DISTANCES

O.Reg. 359/09 provides setback distances between the Project Location and:

- Significant and provincially significant natural features;
- Provincial parks and conservation reserves; and
- Water bodies.

O.Reg.359/09 also provides setback distances between wind turbine base and:

- Property lines (see Appendix C);
- Public road right-of-ways;
- Railway right-of-ways; and
- Noise receptors.

O.Reg. 359/09 also provides setbacks between transformers and noise receptors.

Visual representation of the setback distances are illustrated on the Site Plan (Appendix A).

3.0 Facility Design Plan

This section provides a description of the key facility design components identified on the Site Plan (Appendix A). A detailed description of each Project component is provided in the Project Description Report.

The key mitigation strategy used to address potential environmental effects from operation of the facility was avoidance of significant natural features and water bodies to the extent possible during siting of the Project.

3.1 FACILITY COMPONENTS OVERVIEW

The basic components of the Project include four Samsung Heavy Industries 2.5 MW wind turbine generators for a total installed nameplate capacity of 10 MW, transformers at each turbine, electrical collector lines and fibre optic data lines, a switchyard with associated control room, a meteorological tower (met tower) and associated power and data cabling, and turbine access roads. The electrical transmission system would transport the electricity generated from each turbine to Hydro One Networks Inc.'s (HONI's) distribution network. The Project also includes interconnection equipment and installations specified by HONI.

No equipment in the facility design relate to water taking, sewage or stormwater management, air discharges and/or water and biomass management.

3.1.1 Wind Turbine Generators

The Project would include 4 Samsung 25xc 2.5 MW wind turbines. Each wind turbine consists of eight key components:

- Concrete tower foundation;
- Four steel tower sections;
- Nacelle (comprised of gearbox, electrical generator, step-up transformer and housing);
- Three rotor blades;
- Hub (the structure to where the blades attach);
- Power convertor;
- Step-up transformer; and
- Electrical wiring and grounding.

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A summary of the basic specifications of the turbine model is provided below in Table 3.1. Detailed specifications for the turbine are provided in the Wind Turbine Specifications Report. That report forms part of the REA application and is provided under separate cover.

Table 3.1 Basic Wind Turbine Specifications

Manufacturer	Samsung
Model	25xc
Name plate capacity (MW)	2.5 MW
Hub height above grade	80 m
Blade length	48.7 m
Rotor diameter	99.8 m
Blade sweep area	7,823 m ²
Nominal revolutions (rotational speed)	14.35 rpm
Frequency Spectrum	57.5 Hz – 61.5 Hz
Sound power*	4 m/s – 89 dBA 5 m/s – 94.6 dBA 6 m/s – 99.1 dBA 7 m/s – 102.9 dBA 8 m/s – 106.2 dBA

The tower would be supported by a concrete foundation, which is approximately 3 m deep, depending upon subsurface conditions.

Turbine tower lighting would be in accordance with Transport Canada Regulations and Standards as described in Section 5.6.5.

3.1.2 Electrical Infrastructure

Electrical Collector Lines

A step-up transformer located at each turbine is required to transform the electricity created in the nacelle (i.e. 690 V to 27.6 kV). From each step-up transformer, underground collector lines would carry the electricity to the Project's switchyard. Underground collector lines would be incorporated into the design of the access roads to reduce the area required for construction and minimize potential construction impacts. The cables would be installed immediately to one side of the access road, just off the gravelled surface. Fibre optic communication lines would run with the collector lines.

Switchyard

The Project switchyard is proposed to be located where the access road interconnects with Ebenezer Road. The switchyard would house the switching, control, protection, communication and metering system required to support the operation of the Project. A chain link fence would enclose the yard and would be equipped with a locked vehicle gate to allow for maintenance access. The high voltage side of the switchyard would be connected to the HONI distribution network via installation equipment and installations specified by HONI.

The wind farm would be operated, monitored and controlled 24-hours a day. To facilitate this monitoring, fibre optic cable would be installed in conjunction with the collector line system, from each wind turbine to the switchyard control room, where it can be monitored from the building or from a remote location.

3.1.3 Met Tower

One permanent met tower would be installed for use during the operation phase of the Project. Power and data cabling for the tower would be trenched in from the nearest collector line system. The met tower would be a steel lattice climbable tower approximately 80 m high. The tower foundation, depending on ground conditions, is typically a steel reinforced concrete-filled tubular pile of approximately 50 centimetres (cm) diameter and 3 m in depth. No guy-wires would be required for the foundation.

3.1.4 Access Roads

Access roads are required to access each turbine from existing roads during the operation phase of the Project to complete turbine maintenance activities. The access roads to be used during operations are the same access roads that were installed during the construction phase of the Project. Access roads would be approximately 5 m wide.

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4.0 Facility Operations Plan

Operation activities include daily monitoring of the wind turbines, maintenance activities, and monitoring of meteorological data.

4.1 SITE SUPERVISION AND STAFF TRAINING

Zephyr Farms may hire a specialized Operation and Maintenance Contractor for specific operation and maintenance tasks. Zephyr Farms and/or the Operation and Maintenance Contractor would carry out the various on-going activities, including daily operation, associated with the facility.

During pre-operational mobilization, Zephyr Farms and/or the Operation and Maintenance Contractor would develop an operation and maintenance program. The program would be designed to ensure compliance with any applicable municipal, provincial, and/or federal requirements. As appropriate, the program would cover staff training, predictive/preventive maintenance, routine maintenance, unscheduled maintenance (including appropriate environmental mitigation measures), annual overhauling, inspection of equipment and components, procurement of spare parts, and maintenance of optimum inventory levels in order to reduce inventory carrying costs and working capital costs. It would also include a schedule for regular inspections of the turbines and ancillary facilities.

4.2 PLANNED MAINTENANCE

The maintenance of the turbines would also be the responsibility of Zephyr Farms and/or the Operation and Maintenance Contractor. Through use of a SCADA system that is connected to the fibre optic cables installed with the collector lines, the maintenance staff would be able to monitor the performance of all turbines on-line in real time basis. Monitoring of the turbines would occur within the control room. The SCADA system would identify any potential problems so that pro-active inspection and maintenance can be undertaken. Potentially damaged turbines would be shut down until maintenance staff can perform a site inspection, since damaged turbines may have increased noise emissions and a higher risk of fire or structural instability. Regular maintenance of the equipment would be a key method of mitigating these potential effects. Scheduled maintenance that would occur depending on operation hours would cover the following:

- Visual inspection;
- Inspection of mechanical components;
- Inspection of electrical components; and
- Greasing and general maintenance.

Initial visits for planned maintenance are more frequent, slowing to once every six months or more as the Project matures.

Although the exact oil and grease requirements for the Project are not known at this time, based on projects of a similar size and scope, it is estimated that the amounts of oil and grease used for semi-annual maintenance would be approximately 70 litres and 40 kg, respectively. Oil changes would be completed in accordance with oil analysis recommendations. New oil would be brought on-site as required by the Operation and Maintenance Contractor. No oil would be stored on-site. Used oil would be removed from the site by a certified contractor with the appropriate manifests in place.

4.3 UNSCHEDULED MAINTENANCE

Zephyr Farms and/or the Operation and Maintenance Contractor would also provide unscheduled maintenance for the turbine units when required. Maintenance and inspection related to the electrical collector system would be sub-contracted.

Temporary crane pads would be constructed adjacent to individual turbine sites as required to facilitate turbine maintenance. The crane pads would be located in the same location as the crane pads used during construction of the Project. The design and construction process used to construct the crane pads during the construction phase would be used to construct the crane pads during the operations phase. As a result, any potential effects from construction of the crane pads would be the same as those identified during the construction phase which was described in the Construction Plan Report. Disturbed areas would be restored immediately following completion of the maintenance activities in the same manner as described in the Construction Plan Report.

4.4 MONITORING METEOROLOGICAL DATA

Each turbine would have sensors to measure wind speed and direction. This data would be used to determine when the turbines are operating as well as to control the pitch of the blades and the orientation of the nacelle.

Monitoring of meteorological data would be completed using the met tower. The wind farm's SCADA system would use this data to:

- Provide additional parameters such as wind direction, air temperature, air pressure and wind shear to better manage the operational performance of the equipment; and
- Provide a backup source of wind speed data should a wind turbine's own sensors prove unreliable.

The Independent Electrical System Operator would require Zephyr Farms to provide real-time weather data from a met tower, along with real-time generation data to provide input to their central generation forecasting model.

More information on monitoring activities during operation of the Project can be found in Section 6.0.

4.5 OTHER ACTIVITIES

The facility would generate waste lubricating and hydraulic oils associated with turbine maintenance and operation.

No equipment in the facility design relate to water taking, sewage or stormwater management, air discharges and/or water and biomass management.

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5.0 Potential Environmental Effects

O. Reg. 359/09 requires that any adverse environmental effects that may result from operations activities be described within a 300 m radius of those activities (known as the zone of investigation). This section describes the potential effects, mitigation measures (if required) and net effects that may result from operations activities within the zone of investigation.

Descriptions of the existing natural heritage, water, archaeological and heritage environments near the Project Location can be found within the Natural Heritage Assessment Report, Water Report, Stage I Archaeological Assessment Report, Stage 2 Archaeological Assessment Report and Heritage Resource Assessment Report. These reports form part of the REA application and are provided under separate cover.

The map in Appendix A shows the 300 m zone of investigation, Project Location, and existing features described in the following section, including setbacks specified by O. Reg. 359/09.

For some natural environment and socio-economic features, mitigation measures are anticipated to eliminate all effects. The need, assessment, and selection of protection and mitigation measures discussed in the following sections have been predicated on the hierarchical principles of:

- avoidance – the elimination of adverse environmental effects by siting, scheduling, and design considerations;
- minimization – reduction or control of adverse environmental effects through Project modifications or implementation of protection and mitigation measures; and
- compensation – enhancement or rehabilitation of affected areas.

The application of these principles has greatly reduced the potential for adverse environmental effects from the Project as demonstrated in the following subsections.

Where net effects remain, they are characterized as either positive or adverse. Adverse net effects were assessed in consideration of the following nine descriptors, as applicable:

- **Direction:** the degree to which an effect may be positive or adverse;
- **Duration:** the period of time until the element returns to baseline conditions;
- **Ecological/Social Context:** the nature of the area in which the effect may occur;
- **Frequency:** the number of times that an effect may occur;
- **Magnitude:** the degree to which an effect may occur;
- **Permanence:** the degree to which an effect will not return to baseline conditions;

- **Probability:** the likelihood that an effect may occur;
- **Reversibility:** the likelihood that an element will recover from an effect; and
- **Spatial Extent:** the area within which an effect may occur.

The key performance objective for each of the features discussed below is avoiding and/or minimizing potential effects (through the use of appropriate mitigation measures) to the features throughout the operation phase of the Project. The proposed mitigation measures would assist in achieving this performance objective. Additional information related to specific performance objectives is provided in Table 7.1.

5.1 HERITAGE AND ARCHAEOLOGICAL RESOURCES

5.1.1 Protected Properties and Heritage Resources

In accordance with O. Reg. 359/09, a Heritage Resource Assessment was undertaken for the Project, and is included under separate cover as part of the REA application.

The Heritage Resource Assessment determined that:

- There are no protected properties in the Project Study Area (as defined in Section 19 of Ontario Regulation 359/09);
- None of the built heritage features near the Project Study Area have sufficient Cultural Heritage Value or Interest to merit designation under the *Ontario Heritage Act*. However, some of the properties may be worthy of inclusion on a Municipal Heritage Inventory, should it be created; and
- The local landscape in the Project area does not meet the criteria necessary to be considered a significant Cultural Heritage Landscape.

Potential Effects

As operational facilities and maintenance activities would not occur on properties containing built heritage features, no adverse effects on protected properties and/or heritage resources are anticipated during operations. As no potential effects would occur as a result of the Project on protected properties and heritage resources, no mitigation measures are necessary and no net effects are anticipated.

5.1.2 Archaeological Resources

In accordance with O. Reg. 359/09, a Stage 1 Archaeological Assessment and Stage 2 Archaeological Assessment were completed, and are included under separate cover as part of the REA application.

The archaeological assessments did not recover any materials with significant cultural heritage value or interest.

Local aboriginal communities have been and continue to be consulted with regarding the Project, including the archaeological studies in the Project Location area.

Potential Effects

There are no areas that would be excavated during the operation phase that will not have been assessed by the archaeological assessments, and therefore no potential effects are anticipated to archaeological resources. As no potential effects would occur as a result of the Project on archaeological resources, no mitigation measures are necessary and no net effects are anticipated.

5.2 NATURAL HERITAGE RESOURCES

In accordance with O. Reg. 359/09, a Natural Heritage Assessment was undertaken for the Project and is included under separate cover as part of the REA application. The following provides a summary of the potential effects and the associated mitigation measures as described in that report in relation to facility operation. In addition, potential effects and mitigation measures are identified for regulated features outside the natural heritage setbacks, and unregulated natural heritage features, which are therefore not considered in the Natural Heritage Assessment.

5.2.1 Wetlands

There were no wetlands, or coastal wetlands, identified within 120 m of the Project Location through the records review. The site investigation did not identify the presence of wetlands. One swamp vegetation community within a woodlot was identified through the site investigation as being located within 300 m of the Project Location. Indirect impacts to the woodlot and associated vegetation community are discussed in Section 5.2.4.

Mitigation Measures

Mitigation measures related to indirect impacts are listed in Section 5.2.4.

Net Effects

Provided that all mitigation measures are implemented, any indirect adverse net effects on woodlands and associated vegetation communities from maintenance activities are anticipated to be short-term in duration and intermittent.

5.2.2 Areas of Natural and Scientific Interest (ANSIs)

There were no life science or earth science ANSIs identified within 120 m of the Project Location through the records review. The site investigation did not identify the presence of life science or earth science values. As no ANSI features are present, no potential effects would occur and no mitigation measures are necessary.

5.2.3 Valleylands and Hazard Lands

There were no valleylands identified in the Project Study Area through the records review. The site investigation confirmed the absence of valleylands in the Project Study Area. As no such features are present, no potential effects would occur and no mitigation measures are necessary.

Hazard lands within 120 m of the Project Location have been confirmed by the St. Clair Region Conservation Authority. Follow-up with the Authority, and associated aquatic site investigations, determined that such hazard land mapping was not accurate. As no hazard land features are present, no potential effects would occur and no mitigation measures are necessary.

5.2.4 Woodlands

Potential Effects

One small, isolated woodlot that experiences some disturbance from active logging is found within 120 m of the Project Location. The evaluation of significance determined the woodlot was not significant from a natural heritage perspective.

Indirect impacts to the woodlot, and two additional woodlots located within 300 m of the Project Location, may occur during maintenance activities, such as dust generation, sedimentation and erosion. During maintenance there would be the potential for accidental spills. Improper disposal of wastes (fluids, containers, cleaning materials) could also have a negative impact on the features.

Mitigation Measures

As appropriate and prior to maintenance activities the Project Location limits would be staked in the field. The Operation and Maintenance Contractor would ensure that no disturbance occurs beyond the staked limits and that edges of sensitive areas adjacent to the work areas are not disturbed. Regular monitoring of the limits would be employed to ensure the objective of minimal disturbance. Should monitoring reveal that activities are occurring beyond defined limits, mitigation action would be taken that could include rehabilitation of the disturbed area.

Mitigation measures related to dust are listed in Section 5.4.2, to sedimentation and erosion are listed in Section 5.3.2, and to spills and waste are listed in Section 5.7.

Net Effects

Provided that all mitigation measures are implemented, any indirect adverse net effects on woodlands from maintenance activities are anticipated to be short-term in duration and intermittent.

5.2.5 Provincial Parks and Conservation Reserves

The Project Study Area does not contain any provincial parks or conservation reserves, nor is it adjacent to such areas. As no provincial parks or conservation reserves are present, no potential effects would occur and no mitigation measures are necessary.

5.2.6 Other Designated Natural Areas

The Project Study Area does not contain any other designated natural areas, nor is it adjacent to such areas. As no other designated natural areas are present, no potential effects would occur and no mitigation measures are necessary.

5.2.7 Significant Wildlife Species

No wildlife species of conservation concern were noted during the records review or observed during the site investigation. As no significant wildlife species are present, no potential effects would occur and no mitigation measures are necessary.

5.2.8 Significant Wildlife Habitat

No candidate significant wildlife features were observed within the Project Location or Project Study Area during the site investigation. As no significant wildlife habitat is present, no potential effects would occur and no mitigation measures are necessary.

5.2.9 Other Wildlife and Wildlife Habitat

Potential Effects

Direct effects of Project operation to wildlife habitat are not expected. The Project is sited within agricultural fields, which provide limited wildlife habitat. One woodlot is located within 120 m of the Project Location. The Project does not contain any significant wildlife habitat (see Natural Heritage Assessment). The site layout does not involve direct habitat loss to the woodlot and minimizes disturbance. No anticipated loss of function to this feature is associated with the Project. One frog species was heard vocalizing during site investigations, likely coming from a nearby woodlot. Indirect impacts to the woodlot and associated wildlife are discussed in Section 5.2.4.

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There are potential indirect disturbance effects of operation of wind turbines to wildlife. Some large mammals may avoid wind facilities if there is high level of human activity relative to baseline conditions (Arnett et al., 2007). Noise from operational turbines could mask the calls of breeding frogs. However, given the limited amount of natural habitat found in the Project Study Area and the active use of land for agricultural activities, it is likely that resident wildlife will adapt to the presence of operational turbines.

Birds

The effects of wind turbine operation on birds can be either direct, through collision, or indirect, through loss, alteration, or fragmentation of habitat and through disturbance. The risk of direct collision varies between species and is most likely a function of abundance and behavioural characteristics (National Academy of Sciences, 2007).

No significant wildlife habitat features for birds were identified within the Project Location (refer to the Natural Heritage Assessment). The Project is sited within agricultural land, which generally supports a low diversity of breeding birds. Stantec studies conducted for several proposed wind facilities indicate that the majority of birds observed in cropland habitats are active on the ground or below the height of blade sweep (Stantec, 2005; Stantec, 2006; and Stantec, 2007).

Siting of turbines outside natural habitat features (i.e., woodlands), and the implementation of setbacks to natural habitat features will minimize direct and indirect impacts to birds. Impacts of the Project to birds within the Project Study Area are expected to be low and not significant at the population level.

Bats

Based upon data collected during the site investigation and the information presented in background sources, it is unlikely that bats are present in large numbers within the Project Study Area. The Project Location does not contain known bat hibernacula or maternity roosts. The Project is located in farmland, which typically results in the lowest bat mortality rates (Ministry of Natural Resources (MNR), 2010); it is not located near forested ridge tops or lakeshores of major waterbodies, factors which have been found to result in higher mortality rates. Turbines have been sited away from buildings and woodlots, which may be used as roosting areas.

Amphibians

An assessment of potential impacts, mitigation measures and net effects to amphibians are outlined in Section 5.5.7.

Mitigation Measures

The following mitigation measures would be implemented:

- In the event of an accidental spill, the MOE Spills Action Centre would be contacted as appropriate and emergency spill procedures implemented immediately. Any fuel storage and activities with the potential for contamination would occur in properly protected and sealed areas. As appropriate, records of waste generation and disposal would be maintained. Where waste disposal monitoring is undertaken it would include a periodic review of all waste records. The purpose of the inspection is to ensure that wastes are properly recycled and/or disposed of, consistent with provincial standards and good industry practices. Where a third party's activities are identified as non-compliant or insufficient, the Operation and Maintenance Contractor would seek out an alternative recycling or disposal solution;
- Turbine lighting would conform to Transport Canada standards. Although there is no evidence that bird and bat mortality is influenced by turbine lighting (Arnett et al., 2007), lights with the shortest possible flash durations and the longest possible pause between flashes would be utilized;
- Turbine setbacks as specified in O. Reg. 359/09 from blade tip to natural features to mitigate direct mortality and disturbance effects to wildlife; and
- Post-construction mortality monitoring consisting of regular bat and bird mortality surveys would be conducted in accordance with current MNR guidance. The post-construction monitoring plan has been developed and is provided in Section 6.4.

The siting of the Project within agricultural lands with a minimum distance of 120 m between the turbines and natural features is considered sufficient to reduce or preclude many effects to local wildlife. In addition, a post-construction monitoring plan has been developed and is provided in Section 6.4.

Net Effects

The project may result in limited disturbance and mortality to birds and bats. Provided that all mitigation and monitoring measures are implemented, any indirect adverse net effects on wildlife from operations are anticipated to be short-term in duration and intermittent.

5.2.10 Significant Flora Species and Vegetation Communities

The records review noted eight species of conservation concern potentially within the Study Area. No plant species of conservation concern were observed during the site investigation; all species recorded are ranked secure or apparently secure in Ontario. One rare vegetation

community, a black walnut lowland deciduous forest, was observed during the site investigation. Indirect impacts to the woodlot and rare vegetation community are discussed in Section 5.2.4.

Mitigation Measures

Mitigation measures related to indirect impacts are listed in Section 5.2.4.

Net Effects

Provided that all mitigation measures are implemented, any indirect adverse net effects on woodlands and associated vegetation communities from maintenance activities are anticipated to be short-term in duration and intermittent.

5.2.11 Other Flora Species and Vegetation Communities

The Project Study Area does not contain any other flora species or vegetation communities not previously discussed, and as such no potential effects would occur and no mitigation measures are necessary.

5.3 WATER BODIES

5.3.1 Groundwater

Potential Effects

Some materials, such as fuel, lubricating oils and other fluids associated with turbine maintenance have the potential for discharge to the on-site environment through accidental spills.

Mitigation Measures

Mitigation measures for accidental spills are listed in Section 5.7.

Net Effects

Accidental spills would be spatially limited and of short duration and protocols to minimize their impact would be provided in the Emergency Response Plan. See Section 6.4.5 for more information on the Emergency Response Plan.

5.3.2 Surface Water, Fish and Fish Habitat

The following provides an assessment of potential effects and mitigation measures for all surface water features within 300 m of the Project Location. In accordance with O. Reg. 359/09, a Water Report was undertaken to determine the presence of water bodies as defined by O.

Reg. 359/09 and associated setbacks. The Water Report is included under separate cover as part of the REA application.

Potential Effects

There are no features that meet the definition of a water body as set out in O. Reg. 359/09 within 120 m of the Project Location. Within 300 m of the Project Location are four depressional areas in agricultural fields that direct overland flow of water away from the fields and into drains outside of the Project Study Area, thus providing indirect fish habitat. Indirect impacts resulting from maintenance activities may occur as a result of sedimentation from erosion, and accidental spills.

Mitigation Measures

Erosion and sediment control measures would be implemented during maintenance activities where excavation is required. The Operations and Maintenance Contractor would obtain adequate quantities of materials in order to control erosion and sediment deposition. Erosion and sediment control measures would be installed and additional measures may be installed at the discretion of the Operations and Maintenance Contractor. Barriers would be inspected regularly to ensure proper functioning and maintenance. Materials removed or stockpiled (e.g. excavated soil, backfill material, etc.) would be deposited and contained in a manner to ensure sediment does not enter a watercourse. Erosion and sediment control measures would remain securely installed until permanent vegetation measures are successful and areas are stabilized, as determined by the Operations and Maintenance Contractor.

Even with properly installed erosion and siltation control measures, extreme runoff events could result in collapse of silt fencing and other problems which could lead to siltation. If siltation to a watercourse occurs, activities in the vicinity would cease immediately until the situation is rectified. The Emergency Response Plan (Section 8.0) would contain procedures for spill contingency and response plans, spill response training, notification procedures, and necessary cleanup materials and equipment. As per S.13 of the *Environmental Protection Act*, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of prescribed regulatory levels would be reported to the MOE's Spills Action Centre.

Net Effects

Provided that all mitigation measures are implemented, no adverse net effects on surface water are anticipated during operation of the Project. There remains the potential for adverse net effects to fish and fish habitat due to spills, sedimentation and erosion. With the implementation of the mitigation measures listed above, and given the lack of fish and fish habitat in the Project Location, any associated effects would be infrequent, of low probability, of short duration and of limited spatial extent.

5.4 AIR QUALITY AND ENVIRONMENTAL NOISE

5.4.1 Air Emissions

Potential Effects

During operations minor localized air emissions would occur from the periodic use of maintenance equipment to repair the wind turbines over the life of the Project and from vehicles travelling to and from the switchyard property during regular business hours.

Mitigation Measures

To reduce emissions from equipment and vehicles, several mitigation measures would be employed:

- Multi-passenger vehicles would be utilized to the extent practical;
- Company and maintenance personnel would avoid idling of vehicles when not necessary for operations activities;
- Equipment and vehicles would be turned off when not in use unless required for operations activities and/or effective operation of the equipment or vehicle;
- Equipment and vehicles would be maintained in good working order with functioning mufflers and emission control systems as available;
- All vehicles would be fitted with catalytic converters as required;
- All operations equipment and vehicles would meet the emissions requirements of the MOE and/or Ministry of Transportation (MTO);
- As appropriate, records of vehicle maintenance would be retained and made available for periodic review by the Operation and Maintenance Contractor; and
- All vehicles identified through the monitoring program that fail to meet the minimum emission standards would be repaired immediately or replaced as soon as practicable.

Net Effects

The application of the recommended mitigation measures during operations should limit air emissions to the work areas and limit the magnitude of combustion emissions. As a result, any adverse net effects to air quality from air emissions during operation of the Project are anticipated to be short-term in duration and highly localized.

5.4.2 Dust and Odour Emissions

Potential Effects

Operations related traffic and maintenance activities have the potential to create nuisance dust effects in the immediate vicinity of the Project. Unpaved road surfaces exposed to wind can also be a source of fugitive dust emissions.

No odour emissions are anticipated during operation of the Project. Therefore, no mitigation measures are required.

Mitigation Measures

To protect adjacent receptors from potential off-site dust concerns, the Operations and Maintenance Contractor would implement good site practices during operations which may include:

- Maintaining equipment in good running condition and in compliance with regulatory requirements;
- Dust suppression (e.g. water and/or calcium chloride) of source areas as necessary; and
- Covering loads of friable materials during transport.

Net Effects

The application of the recommended mitigation measures during operations would limit fugitive dust emissions to the work areas. As a result, any adverse net effects to air quality from dust emissions during operation of the facility are anticipated to be short-term in duration and highly localized.

5.4.3 Environmental Noise

Potential Effects

During operations of the Project, sound would be generated by the periodic use of maintenance equipment to repair the wind turbines over the life of the Project. In addition, vehicles would travel to and from the switchyard property during regular business hours. The audible sound at receptors beyond the turbine siting areas and switchyard property is expected to be a minor, short-term in disruption.

Mechanical and aerodynamic sound would be emitted from the wind turbines in addition to sound from transformers. All turbines proposed as part of the Project are located at a distance of at least 550 m from the nearest non-participating noise receptor. Based upon the Project design, the analysis carried out in the Noise Assessment Reports indicates that sound produced

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by the Project was found to be within the acceptable limits established by the MOE at all noise receptors (see Appendix B for a report siting the turbines to meet required setbacks, and a supplementary noise report to address concerns regarding noise raised during the consultation process). The analysis includes other wind turbines within a three kilometre radius.

Mitigation Measures

To minimize inconvenience brought on by noise during the use of vehicles during the operations phase of the Project, all engines associated with maintenance equipment would be equipped with mufflers and/or silencers in accordance with MOE and/or MTO guidelines and regulations. Noise levels arising from maintenance equipment would also be compliant with sound levels established by the MOE.

Routine facility maintenance to ensure infrastructure is operating properly and efficiently would be performed as required.

To the greatest extent possible, operations activities that could create excessive noise would be restricted to regular business hours, when residents are less sensitive to noise, and adhere to any local noise by-laws. If maintenance activities that cause excessive noise must be carried out outside of these time frames, adjacent residents would be notified in advance and by-law conformity would occur, as required.

The Project would be required to operate according to the terms and conditions of the REA. In the event the Project does not operate according to the terms and conditions of the REA, the non-compliant turbine(s) may be shut down until the problem is resolved. A regular maintenance program, as described in Section 6.3.1, would largely mitigate potential effects related to noise from damaged turbines.

Net Effects

Application of the recommended mitigation measures during operations would limit noise emissions to the general vicinity of the turbine locations and switchyard property. Intermittent noise would increase during regular business hours at the turbine locations and switchyard property. Any adverse net effects due to noise during operation of the Project are anticipated to be short-term in duration and intermittent.

5.5 LAND USE AND RESOURCES

5.5.1 Areas Protected Under Provincial Plans and Policies

No areas protected under specified Provincial Plans and Policies are located within the Project Location. No potential effects would occur and therefore no mitigation measures are necessary.

5.5.2 Existing Land Uses

Potential Effects

During the operation phase of the Project, the lands which are occupied by facility components would be removed from their present agricultural land-use; however, existing surrounding land uses would remain unchanged.

During operations there would be a temporary increase in noise and dust around the work and haul areas used by maintenance and personnel vehicles, resulting in a potential effect to adjacent land uses, including the use of local businesses.

There is potential for a minor increase of traffic during operations on roadways within the Project Study Area due to the commuting workforce and maintenance vehicles. No adverse effects on existing land uses, including local businesses, are anticipated from increased traffic during operations of the Project. Therefore, no mitigation measures are required.

No local businesses would be expected to be displaced as a result of operations of the Project.

Mitigation Measures

Mitigation measures have been identified for noise in Section 5.4.3 and dust in Section 5.4.2. The Project is considered to be compatible with existing land use; therefore no other mitigation measures are required to address effects to the existing land use. Siting of turbines and access roads are completed with the approval of the participating landowner.

Net Effects

Although some disturbance to adjacent land uses from noise and dust is unavoidable, it is expected to be short-term in duration, temporary, highly localized, and would be minimized through the implementation of site practices, transportation planning, and communication with the community.

5.5.3 Recreation Areas

The Project Location does not contain any recreation areas, nor is it adjacent to such areas. As no recreation areas are present, no potential effects would occur and no mitigation measures are necessary.

5.5.4 Agricultural Lands and Operations

Potential Effects

Crane pads

Construction of crane pads may temporarily displace areas of agricultural land. Since the crane pads would be installed in the same location as during the construction phase, potential effects would be the same as described in the Construction Plan Report.

Dust

Dust emissions from operations activities are associated with vehicular traffic from maintenance and personnel vehicles. Dust emissions are expected to be short-term in duration and highly localized. No potential physical effects are anticipated on agricultural lands and operations from dust during operations of the Project, and therefore no mitigation measures are required.

Mitigation Measures

Crane pads

To the greatest extent possible, efforts would be made to locate the crane pads in such a way as to minimize disturbances to existing agricultural lands and operations. As appropriate, crane pads would be rehabilitated following maintenance activities and restored to agricultural use. Mitigation measures for crane pad areas and restoration of these areas would be implemented as described in the Construction Plan Report.

Net Effects

Disturbances to agricultural lands and operations are expected to be temporary and spatially limited.

5.5.5 Mineral, Aggregate, and Petroleum Resources

The Project Location does not contain mineral, aggregate or petroleum resources, nor is it directly adjacent to such areas. As no mineral, aggregate or petroleum resources are present, no potential effects would occur and no mitigation measures are necessary.

5.5.6 Forest Resources

The Project Location contains one woodlot within 120 m; however operations activities would not impact forest resources within the woodlot. As such, no potential effects would occur and no mitigation measures are necessary.

5.5.7 Game and Fishery Resources

Potential Effects

Since the Project has been sited entirely on agricultural lands, most potential indirect effects to wildlife and their habitats would be temporary until the Project becomes part of the environmental “background”. The mammals present on the agricultural lands are common in southern Ontario and tend to be well-adapted to human-influenced landscapes and disturbance.

Investigations by the German Institute for Wild Animal Research (Institute für Wildtierforschung) show that no permanent adverse effects can be determined for game animals (Austrian Wind Power, 2007). A three-year study by the Institut für Wildtierforschung at the Veterinary University of Hanover showed that no adverse effects by wind turbines could be determined on the occurrence and behaviour of animals such as common hares, deer, red foxes, partridges and carrion crows. A survey conducted in parallel of the owners of hunting shoots in Lower-Saxony showed that the majority of hunters did not view the wind turbines as a source of disturbance for smaller game animals (Austrian Wind Power, 2007). Sixty-six percent of hunters stated that the game did not stay away from the immediate vicinity of the wind plants. Almost 60 percent of the interviewees were of the opinion that all species in their corresponding territories became accustomed to the presence and operation of the turbines, whereby the periods required for this varied from one month to five years. This study demonstrates the tolerance of various wildlife populations to the presence of wind turbines (Austrian Wind Power, 2007).

Sensory disturbance to game species may occur during the operations phase due to noise. A certain level of sensory disturbance to wildlife in the Project Study Area already exists from ongoing agricultural, rural and domestic activities.

From the few studies that are available, mammals were able to adapt to various noises. Noise and its effects on wildlife appear to be habitat and species specific. If species are able to adapt easily to human-modified habitats, generally they do not seem to be adversely affected by noise.

Mitigation Measures

Masking of auditory environmental signals, such as mammal warning cries or amphibian calls, may be significant immediately underneath the turbine (Rabin et al., 2006), but the effects rapidly decline with distance from the turbine. A study of low frequency noise and vibration at a modern wind farm determined that vibration is 1/5th to 1/100th of the limit of human perception within 25 m of the turbine base (Legerton et al., 1996). While other mammals and amphibians may be more perceptive of vibration, vibration magnitude drops off significantly as distance increases (K. Smith, Aercoustics, pers. comm.). Turbines would be placed in agricultural lands away from woodlands, and within the REA setback requirements. Siting the Project on agricultural land has largely precluded disturbance to local flora, small mammals and amphibians, natural habitat, and corridor functions. No further mitigation measures are required.

Net Effects

Once the Project is operating human activity around the facilities would decrease, thus allowing local wildlife movement patterns to quickly re-establish.

Considering the periodic nature of maintenance activities, it is likely that resident game species would adapt to the Project quickly. Consequently, no net adverse effects are anticipated during the Project to game and fishery resources.

5.5.8 Local Traffic

Potential Effects

There is potential for an increase of traffic during operations on roadways within the Project Study Area due to the commuting workforce and maintenance vehicles. The number of vehicles required during operation would be minimal. A small number of light trucks would be required for typical maintenance activities, however occasionally larger vehicles would be required to transport turbine and transformer components. The increase in traffic may result in short-term, localized disturbance to traffic patterns or increases in traffic volume, and/or create potential traffic safety hazards. Project related traffic would be restricted to a limited to a small, defined workforce.

Mitigation Measures

There may be instances during maintenance activities where excess loads (e.g. turbine and transformer components) would require special traffic planning. In addition, widening turning radiuses and road widths and the creation of new ingress/egress nodes from the work areas may be required. As appropriate, permits would be obtained to implement these activities. As appropriate, for public safety all non-conventional loads would have front and rear escort or "pilot" vehicles accompany the truck movement on public roads.

Although there are no requirements for formal public notification of wind turbine component load movements, Zephyr Farms may provide notification of non-conventional load movements that may interfere with local traffic, with potential methods of notification including postings on the Project website. This notification would be provided in the interest of public safety, minimization of disruption of other road users, and good community relations.

Net Effects

Road safety is not expected to be an issue during operations; however, the potential for accidents along the haul routes and on-site cannot be totally disqualified. Truck traffic would increase on some roads during maintenance activities and from personnel vehicles; however this traffic would be short-term in duration and intermittent.

The effect of operating the wind farm is anticipated to have a limited, short term effect on traffic.

5.5.9 Local Economy

Potential Effects

No local businesses or facilities, other than agricultural land uses, are located within the Project Location or adjacent to the area. The operation and maintenance of the Project would result in direct, indirect and induced benefits in terms of business income and employment.

Mitigation Measures

Zephyr Farms would make all reasonable efforts, to the extent possible, to source required services and materials from local suppliers where these items are available in sufficient quantity and quality and at competitive prices.

Net Effects

The Project provides positive benefits to the local area, including the Township of Brooke-Alvinston through ongoing property tax income with no increased demands for municipal services that cannot readily be met.

5.5.10 Viewscape

Potential Effects

Siting of the facility would alter the visual landscape. However, visibility of the facility would vary from receptor to receptor based upon the following factors:

- Surficial patterns: landform – largely determined by physiography and tree cover;
- Topography: slope – the greater the slope the greater the visibility of the turbines and other project infrastructure from more vantage points;
- Observer position: viewing – distance from the facility reduces scale and the apparent size of a project is directly related to the angle between the viewer's line-of-sight and the slope upon which the project is to take place
- Atmospheric conditions: clarity – air pollution, natural haze, fogging, snow affect daytime and nighttime visibility; and
- Turbine marking: lighting – primarily affecting nighttime visibility.

A shadow flicker assessment has also been completed, at the request of a comment received during the consultation process, to assess potential for shadow flicker to occur (see Appendix E).

Mitigation Measures

Landscaping at the switchyard property may include the planting of various trees and shrubs where appropriate, while still ensuring that the site visibility and building security are maintained.

There are limited opportunities for potential mitigation strategies given the height of the wind turbines and met tower, and the landscape patterns.

Net Effects

Some disturbance to the viewscape is unavoidable due to the height of the turbines and met tower. The changed visual landscape would be present during the life of the facility.

5.6 EXISTING INFRASTRUCTURE

5.6.1 Provincial and Other Major Infrastructure

The only Provincial infrastructure near the Project Location is two parallel electricity transmission lines. Highway 402 is located north of the Project Location. No potential effects would occur to the electricity transmission lines, as they would be located outside of the Project Location. As no potential effects would occur, no mitigation measures are necessary

5.6.2 Navigable Waters

No navigable waters are located within the Project Location. As such, no potential effects would occur and no mitigation measures are necessary.

5.6.3 Municipal Infrastructure

Potential Effects

Municipal infrastructure in the Project Study Area includes Ebenezer Road and Old Walnut Road. Churchill Line is located to the north of the Project Study Area. Potential effects on local traffic are outlined in Section 3.5.8.

Mitigation Measures

Mitigation measures for local traffic are outlined in Section 3.5.8.

Net Effects

Net effects on local traffic are analyzed in Section 3.5.8.

5.6.4 Telecommunication and Radar Systems

Potential Effects

Wind turbines have the potential to interfere with radio, TV or internet signals as a result of a turbine being in the “line-of-sight” between a receiver and the signal source (AWEA, 2006). Studies have shown that the rotating blades and support structure of a wind turbine can impact AM (amplitude modulated) and RF (Radio Frequency) signals. FM (frequency modulated) signals are much more immune to this phenomena and may only become impaired in very close proximity to the wind turbines (RABC, 2005).

Signal interference from turbines may potentially occur in three ways:

1. **Static Ghosting:** This occurs when a broadcast signal is reflected off the support towers of the wind turbines and results in the signal being delayed to the television receiver (Polisky, 2005).
2. **Signal Blockage:** A signal may become blocked from reaching a receiver as a result of the turbine being located directly between the television station and the reception point (Polisky, 2005). Similarly, wireless internet could be blocked if a turbine is located within the path of point to point communications.
3. **Dynamic Interference/Pulsing:** This occurs when the receiver picks up an interference signal, in addition to the direct signal, as a result of the signal reflecting off of the blades of one or more

of the wind turbines. This results in periodic variations in a TV's picture brightness and/or colour occurring in time with the rotation of the blades (Levert and Munro, 2006).

HDTV receivers have built-in ghost-cancelling circuits not found in regular NTSC receivers. Thus, HDTV greatly reduces or even eliminates static interference created by wind turbines.

The greatest number of interference problems occurs when the wind turbine is positioned directly between the signal source and the point of reception (Polisky, 2005).

Mitigation Measures

Zephyr Farms has consulted with relevant agencies and licensed providers to identify any likely effects to telecommunication and radar systems. Turbine siting (see Appendix B) also took into account setbacks required from telecommunication networks. Although no effects are anticipated, in the unlikely event that signal disruption is experienced, mitigation measures are available to alleviate the impact. This may include replacing the receiving antenna with one that has a better discrimination to the unwanted signals, relocating either the transmitter or receiver, or switching to an alternate means of receiving the information (fibre optic or other means). Zephyr Farms would review potential incidents of telecommunication or radar system interference on a case by case basis.

Net Effects

Any interference with telecommunication or radar systems would be limited and of short-term duration.

5.6.5 Aeronautical Systems

Potential Effects

The presence of wind turbines presents a potential hazard to low flying aircrafts. Aviation safety lighting and marking of the turbines is required by Transport Canada's Aerodrome Safety Branch as specified in the Canada Aviation Regulations and Standards. Aviation safety lights, which serve to increase night-time visibility of the turbines to aviators, are required at the top of turbines as part of the lighting requirements. These safety lights may also brighten the night sky. Transport Canada standards state that wind farms require a red obstruction lighting system consisting of fading on and off aviation red beacons. These are used for night marking of wind turbines between the heights of 90 m and 150 m (including blade length) above ground level and spaced approximately 900 m apart. Final aviation lighting requirements would be in accordance with Transport Canada Regulations and Standards and would be confirmed prior to construction.

Mitigation Measures

According to Transport Canada's Aerodrome Safety Branch guidelines, a wind turbine more than 900 m from another wind turbine with a light requires its own lighting. Turbine lighting must conform to Transport Canada standards. In order to reduce rural light pollution, lights would be selected with the minimal allowable flash duration, narrow beam, and would be synchronized.

Turbine marking and lighting are secondary safety measures for aircraft. The turbines are below the minimum flight floor of 500 feet above ground level. It is illegal for aircraft to fly below 500 feet unless they have been granted a special clearance for a low level flight. Low-level aircraft such as ultra-lights and crop dusters are to be familiar with the area they are flying over and are prohibited from night-time flights. Nav Canada would be responsible for updating all aeronautical charts with the turbine locations.

Net Effects

With the application of the above mitigation measures, no adverse net effects on aeronautical activities are anticipated during operation of the facility.

5.7 WASTE MANAGEMENT AND CONTAMINATED LANDS

Potential Effects

Waste Generation

Lubricating and hydraulic oils associated with turbine maintenance and operation would be used for the facility, and waste materials, such as oil, grease, batteries, and air filters and a minor amount of domestic waste (i.e. garbage, recycling, and organics), would be generated during standard operation and maintenance activities.

All waste materials would require reuse, recycling, and/or disposal at an appropriate off-site facility. Improper disposal of waste material generated during operations may result in contamination to soil, groundwater, and/or surface water resources on and off the Project Location. Litter generated during operations may also become a nuisance to nearby residences if not appropriately contained and allowed to blow off site. There would be no on-site disposal of waste during the operation of the Project. New oil would be brought on-site as required by the Operation and Maintenance Contractor. No oil would be stored on-site. Used oil would be removed from the site by a certified contractor with the appropriate manifests in place.

Spills

Some materials, such as fuel, lubricating oils and other fluids associated with turbine maintenance, have the potential for discharge to the on-site environment through accidental spills.

Mitigation Measures

During operations, Zephyr Farms and/or the Operation and Maintenance Contractor would implement a site-specific waste collection and disposal management plan, which may include good site practices such as:

- systematic collection and separation of waste materials within on-site storage areas in weather-protected areas;
- contractors would be required to remove all waste materials from the turbine locations during maintenance activities;
- all waste materials and recycling would be transported off-site by private waste material collection contractors licensed with a Certificate of Approval – Waste Management System;
- labelling and proper storage of liquid wastes (e.g. used oil, drained hydraulic fluid, and used solvents) in a secure area that would ensure containment of the material in the event of a spill. As per S.13 of the EPA, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of the prescribed regulatory levels would be reported to the MOE's Spills Action Centre;
- as appropriate, spill kits (e.g. containing absorbent cloths and disposal containers) would be provided on-site during maintenance activities;
- dumping or burying wastes within the Project sites would be prohibited;
- disposal of non-hazardous waste at a registered waste disposal site(s);
- if waste is classified as waste other than solid non-hazardous, a Generator Registration Number is required from the MOE and the generator would have obligations regarding manifesting of waste. Compliance with Schedule 4 of Regulation 347 is mandatory when determining waste category; and
- implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials.

In terms of accidental spills or releases to the environment, standard containment facilities and emergency response materials would be maintained on-site as required. Refuelling, equipment

maintenance, and other potentially contaminating activities would occur in designated areas, and as appropriate spills would be reported immediately to the MOE Spills Action Centre.

An Emergency Response Plan would be developed by Zephyr Farms and/or the Operation and Maintenance Contractor and would include protocols for the proper handling of material spills and associated procedures to be undertaken in the event of a spill. See Section 6.3.5 for more information on the Emergency Response Plan.

Net Effects

With the application of the mitigation measures outlined above, no net effects from waste material disposal would occur on-site during operation. However, as with all wastes, it is possible that disposal would have a minor incremental effect on soil, groundwater, and surface water at the waste disposal site(s) depending on municipal on-site containment practices and quality of the landfill protection mechanisms (e.g. use of geotextiles to contain leachate). It is assumed that licensed waste disposal sites are legally compliant.

With the application of the mitigation measures outlined above, no net effects from accidental spills or releases to the environment are anticipated.

5.8 PUBLIC HEALTH AND SAFETY

5.8.1 Turbine Blade and Structural Failure

Potential Effects

The potential exists for full or partial blade detachment from the turbine structure or met tower collapse, resulting in damage to the landing area from the impact. Garrad Hassan Canada undertook a review of publicly-available literature on turbine rotor failures resulting in full or partial blade throws (Garrad Hassan Canada, 2007). Such events were found to be very rare; therefore data describing these events are scarce.

Root causes of blade failure have been continuously addressed through developments in best practice in design, testing, manufacture and operation; much of these developments have been captured in the International Electrotechnical Commission (IEC) standards to which all current large wind turbines comply (Garrad Hassan Canada, 2007). There has been widespread introduction of turbine design certification and approval that certifies compliance with standards and requires a dynamic test that simulates the complete life loading on the blade (Garrad Hassan Canada, 2007). The certification body also performs a quality audit of the blade manufacturing facilities and performs strength testing of construction materials. This approach has effectively eliminated blade design as a root cause of failures (Garrad Hassan Canada, 2007).

The reported main causes of blade failure include:

- Human interference with the control system;
- A lightning strike; and
- A manufacturing defect in the blade.

Turbine control systems are subjected to rigorous specification in the design standards for wind turbines (IEC 61400-1) and exhaustive analysis in the certification process. Turbines with industry certification must have a safety system completely independent of the control system. In the event of a failure of one system, the other is designed to control the rotor speed.

Lightning protection systems for wind turbines have developed significantly over the past decade and best practices have been incorporated into the industry standards to which all modern turbines must comply. This has led to a significant reduction in events where lightning causes structural damage. A review of available literature, conducted by the Chatham-Kent Public Health Unit (2008), revealed only four documented turbine failure issues in Ontario due to lightning strikes that required the turbine to be shut down for repair.

The occurrence of structural manufacturing defects in rotor blades has also diminished significantly due to experience and improved quality control in the industry. Design practice has evolved to improve structural margins against any manufacturing deficiencies. Even in the rare event of a blade failure in modern turbines, it is much more likely that the damaged structure would remain attached to the turbine rather than separating (Garrad Hassan Canada, 2007). Reviews of available information did not find any recorded evidence of injury to the public as a result of turbine blade or structural failure (Garrad Hassan Canada, 2007; Chatham-Kent Public Health Unit, 2008).

Given that accidents or malfunctions of the turbines are considered to be infrequent events, and turbines would be located at least the minimum regulated setback distance from any residence, the event of a failure of the structure would likely not fall beyond the setback distance and not affect public health and safety.

Mitigation Measures

Modern wind turbines must meet strict international engineering standards. Standards include the ability to withstand the forces of a Level 2 tornado (i.e., wind speeds of approximately 55 m/s), and structures must be built to meet earthquake loads as per the Ontario Building Code. The structural integrity of the turbines is designed to withstand wind speeds of approximately 55 m/s. However, during high wind events (i.e., greater than 24 m/s) the turbines are designed to cease operation. Turbine braking is accomplished by aerodynamic (blade pitch) control and friction brakes. The wind turbines and met tower would be designed, installed, operated and maintained according to applicable industry standards/certifications.

Zephyr Farms and the Operation and Maintenance Contractor would aim to minimize accidents and malfunctions with proper training and education of staff operating the control system. In addition, the turbines would be equipped with lightning protection systems and located at least the minimum regulated setback distance from receptors. Claims of property damage to properties outside of the Project Location will be direct through Zephyr Farm's insurance policy.

Net Effects

As a result of the structural integrity and design features of the turbines and met tower, no adverse net effects from structural failure of the turbines or met tower are anticipated during operation of the facility.

5.8.2 Ice Fall and Shed

Potential Effects

Another potential public health and safety issue could result from the accumulation of ice on the turbine blades and/or met tower. This can occur when specific conditions of temperature and humidity exist. This condition is not unique to wind turbines and/or met towers and has the potential to occur on any structure that is exposed to the elements. In Ontario, this condition is most likely to occur in the winter months in extreme weather events. Under these conditions the turbines and/or met tower may be subject to ice coating from freezing rain or interception of low clouds containing super-cooled rain.

There are two potential hazards associated with ice accumulation on wind turbines and met towers:

- The danger of falling ice that may accumulate on the turbine itself or met tower as a result of freeze-thaw of snow and ice; and
- The throwing of ice from the moving turbine blades.

Falling ice from an immobile turbine or met tower does not differ from other tall structures like telecommunication towers, power lines, and antenna masts. The potential ground area affected by falling ice from wind turbines depends to a large extent on the blade position and the prevailing wind speed and direction. Garrad Hassan Canada (2007) estimated that only very high winds may cause ice fragments of any significant mass to be blown beyond 50 m of the base of a modern, stationary 2 MW turbine. Operating staff and landowners are briefed on this situation; therefore the risk is considered minimal (Garrad Hassan Canada, 2007).

Wind turbines typically operate when the wind speed is within the range of 4 m/s to 25 m/s; when turbines are in operation they can accumulate ice on the rotor blades. Ice fragments which detach from the rotor blades can be thrown from the wind turbine; any fragments would land in the plane of the wind turbine rotor or downwind (Garrad Hassan Canada, 2007). Throwing

distance varies depending upon the rotor azimuth, rotor speed, local radius, and wind speed. Also, the geometry of the ice fragments and its mass would affect the flight trajectory.

Observations have shown that the ice fragments do not maintain their shape and immediately break into smaller fragments upon detaching from a blade. This would decrease the ice fragment's drag and potentially allow the ice fragment to be thrown greater distances. For human injury to result from wind turbine ice shed from the Project, several conditions would have to exist simultaneously:

- Sustained weather condition conducive to icing;
- Ice dislodging from the turbine blade;
- Ice pieces large enough to remain intact through the air;
- Ice traveling in a particular direction past setback guidelines; and
- A person in the path of the ice as it lands (Garrad Hassan Canada, 2007).

A risk assessment methodology was developed by Garrad Hassan Canada and Partners, in conjunction with the Finnish Meteorological Institute and Deutsches Windenergie-Institut, as part of a research Project on the implementation of Wind Energy in Cold Climates (WECO). Guidelines produced in the WECO Project were based on a combination of numerical modelling and observations. The WECO database of observed ice fragments determined that recorded ice fragments are typically thrown to distances less than 125 m from the base of the turbine (Seifert et al., 2003).

Garrad Hassan Canada developed an Ontario-specific risk assessment methodology for ice shed based on the findings of the WECO Project. Modelling was undertaken to determine the probability of an ice fragment landing within one square metre of ground area, as a function of distance from the turbine. The model result determined that the critical ice shed distance would be approximately 220 m from a turbine. At distances greater than 220 m, the probability of ice shed reaching ground level at a mass that would cause injury decreases rapidly. The critical distance can effectively be regarded as a "safe" distance, beyond which there is a negligible risk of injury from ice shed (Garrad Hassan Canada, 2007).

Example calculations were presented in the Garrad Hassan Canada (2007) report, using data representative of a typical wind farm Project in rural southern Ontario. These conditions would be considered representative of the Project. Risk to a fixed dwelling, vehicle travelling on a road, and individual person from being struck by an ice fragment thrown from an operating wind turbine were modelled, with the following results:

- Fixed dwelling: equivalent to 1 strike per 500,000 years;
- Vehicle travelling on a road: equivalent to 1 strike per 260,000 years; and

- Individual person: equivalent to 1 strike in 137,500,000 years.

These predictions seem markedly low; however, it is due to the fact that icing events are limited to only a few days per year. For example, Vestas Canada, which maintains turbines across Canada, has experienced no incidents related to falling ice in Canada (Jacques Whitford, 2006).

Mitigation Measures

Unlike telecommunication towers, the wind turbines proposed to be used for this Project would have a solid conical tower. This design reduces the potential for ice build up on the tower itself since there is no lattice or crevices where ice can accumulate.

In terms of ice shed, several control mitigation strategies are available to wind turbine operators. For example, when the rotor becomes unbalanced due to a change in blade weighting (e.g., caused by ice buildup), the turbine brake is automatically applied to stop the blades from turning (i.e., it shuts itself off). The blades would not restart their movement until the imbalance is removed (e.g., the majority of ice is removed). This design feature greatly reduces the potential ice shed from the turbines on the few days per year when icing is possible. Established protocols and procedures would make operational staff aware and take appropriate action when weather conditions could likely lead to ice accumulation on the blades. Signage would be posted in areas where icing potential exists. Claims of property damage to properties outside of the Project Location will be direct through Zephyr Farm's insurance policy.

Net Effects

Considering the design features of the turbines which act to reduce or eliminate the potential for ice accumulation, that the nearest receptors are located at minimum required setbacks from the turbines, and that there is no potential for ice throw from the met tower, no adverse net effects are expected due to ice fall and shed from turbines and/or the met tower during operation of the facility.

5.9 EXTREME WEATHER EVENTS

Potential Effects

Extreme weather events that could occur during operation of the Project include rain, hail, ice storms, fire, tornadoes, earthquakes, and lightning strikes.

Mitigation Measures

Project components have been designed to withstand the effects from extreme weather events as follows:

- Rain – surficial drainage patterns would remain intact and continue to convey rain water;

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- Hail – the turbine blades, nacelle, and tower are constructed of materials able to withstand damage from the impact of hail;
- Ice storms/freezing rain – as noted above, the turbines are designed to automatically shut down when ice load on the blades exceeds a predetermined threshold;
- Tornadoes –the blades would stop moving at wind speeds greater than 25 m/s, and generally, the structural integrity of turbines is designed to withstand gusts of greater than 59 m/s;
- Earthquakes – as noted above, structures would be designed to meet the earthquake loads as per the Ontario Building Code; and
- Lightning – The turbines are also equipped with sophisticated lightning protection. Lightning strikes are safely absorbed by lightning conductors and the lightning current is conducted via a spark gap and cables into the ground surrounding the foundation.

Net Effects

Considering the design features of the turbine which act to reduce or eliminate the potential for damage from extreme weather events, no adverse net effects from extreme weather events are anticipated during operation of the facility.

6.0 Environmental Effects Monitoring Plan

The environmental effects monitoring plan for the Project has been designed to monitor implementation of the proposed protection and mitigation measures and to verify compliance of the Project with O.Reg.359/09.

Environmental monitoring would provide data on key functions of natural environment and socio-economic features that may be affected during construction or operation of the Project, and on the effectiveness of mitigation measures implemented as part of the Project. The monitoring procedures noted herein are linked to the potential effects and protection and mitigation measures discussed throughout Section 5.0

6.1 GOALS AND OBJECTIVES

The goals of the monitoring plan are:

- Minimize environmental effects from the Project during the operation phase;
- Minimize conflicts in the communities affected by the execution of the works according to legal terms and to the proponent's policies;
- Avoid accidents and malfunctions;
- Minimize environmental effects on natural habitats, flora and fauna;
- Avoid levies or sanctions from the relevant government agencies for negligent environmental performance;
- Comply with environmental quality standards set by law; and
- Establish measures that enhance occupational health and safety.

6.1.1 Guiding Principles

The following guiding principles were considered in preparation of the monitoring plan:

- Focus upon environmental, health, and safety risk prevention;
- Conform to relevant standards, codes, and practices considered in the application of safe technologies;
- Perform all activities in a safe and effective manner, by trained personnel;
- Maintain all equipment in good operating condition for protection of worker health and safety, conservation of the environment, and protection of property;
- Implement all necessary precautions to control, remove, or otherwise correct any health and safety hazards; and

- Meet all relevant municipal, provincial, and federal standards that collectively ensure sufficient technical levels of safety during operation of the facility.

Building upon the above methodology, goals and objectives, and guiding principles, the monitoring plan is composed of three components: environmental management systems; programs, plans, and procedures; monitoring and contingency requirements. Each component is discussed below.

6.2 ENVIRONMENTAL MANAGEMENT SYSTEMS

As part of the environmental monitoring objectives outlined above, several programs, plans, and procedures would be developed by Zephyr Farms, the turbine manufacturer, and/or the Operation and Maintenance Contractor (see Section 6.3). They would guide the operation of the Project to optimize its environmental performance. However, for the programs, plans, and procedures to be effective, appropriate management structures and contract documents must be firmly established.

6.2.1 Management Structures

Zephyr Farms, the turbine manufacturer, and/or the Operation and Maintenance Contractor would take steps to ensure that they have appropriately skilled personnel to carry out the environmental responsibilities as defined in this document. All organizations associated with Project development and operational activities would develop responsive reporting systems that clearly assign responsibility and accountability. As appropriate, Zephyr Farms and/or the Operation and Maintenance Contractor would review these reporting documents.

6.2.2 Contract Documents

Zephyr Farms is committed to operating the Project in an environmentally responsible manner and in compliance with all applicable environmental laws, regulations, and guidelines. All of Zephyr Farms' contractors and subcontractors would be accountable for actions that have an adverse effect on the environment. As such, any contract documents executed by Zephyr Farms and/or the Operation and Maintenance Contractor would incorporate appropriate provisions from documents prepared for the REA application.

Additionally, all contractors, subcontractors, and other associates of the Project would follow the guiding principles of the program, plans and procedures (Section 6.3) and the monitoring and contingency plan (see Section 6.4). These organizations would also comply with all applicable municipal, provincial, and federal legislation.

6.2.3 Change Management

During the operation of the facility, changes to operational plans may be required to address unforeseen or unexpected conditions or situations. Zephyr Farms and/or the Operation and Maintenance Contractor would be responsible for ensuring environmental and safety issues are addressed for any such changes. Zephyr Farms would undertake any significant changes to the facility programs, procedures and plans throughout the operation of the Project with the goal of avoiding or minimizing environmental effects.

6.3 PROGRAMS, PLANS, AND PROCEDURES

As appropriate, Zephyr Farms, the turbine manufacturer, and/or the Operation and Maintenance Contractor would implement the programs, plans, and procedures discussed below.

6.3.1 Operation and Maintenance Program

The operation and maintenance program, including turbine maintenance, is described in Section 4.0.

6.3.2 Environmental Procedures

Zephyr Farms and/or the Operation and Maintenance Contractor would be responsible for implementing environmental procedures during the operation phase of the Project. Individual employee responsibilities would be assigned as necessary to support the full and effective implementation of the environmental procedures. As appropriate the following environmental procedures would address the following issues to prevent environmental contamination and injury to personnel:

- *Environmental calendar:* to establish the specific dates and times for environmental inspections of turbine facilities, monitoring events, and emergency notifications;
- *Hazardous waste management:* to outline the procedures for proper identification, storage, handling, transport, and disposal of hazardous waste. In addition, the procedures would outline specific requirements for personnel training, emergency response, product review and approval, and record keeping; and
- *Non-hazardous waste management:* to establish alternative procedures for the management and disposal of non-hazardous waste such as used lubricants, used drums, and general waste with specific provisions for reuse and recycling of waste materials.

These procedures would ensure internal and external risks are fully evaluated and the information communicated to personnel in advance of any accident or malfunction.

6.3.3 Occupational Health and Safety Procedures

Zephyr Farms and/or the Operation and Maintenance Contractor would ensure employee health and safety is maintained throughout their employment term and would also implement the following safety procedures and protocols as appropriate in an effort to ensure employee safety is addressed throughout operation and maintenance activities. Safety measures may include;

- Personal protective equipment, including non-slip footwear, eye protection, clothing, and hardhats, would be worn by operation and maintenance personnel when on duty;
- Elevated platforms, walkways, and ladders would be equipped with handrails, toe boards, and non-slip surfaces; and
- Electrical equipment would be insulated and grounded in compliance with the appropriate electrical code.

Incidents in the work place have the potential to cause personal injury and property damage. As appropriate, Zephyr Farms and/or the Operation and Maintenance Contractor would maintain a master Incident Report that documents illnesses and accidents. Incident reporting would follow the requirements of the *Occupational Health and Safety Act*.

6.3.4 Training Program

As appropriate, Zephyr Farms and/or the Operation and Maintenance Contractor would develop or have an existing operations training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental, health, and safety procedures, and the Emergency Response Plan. Training may cover the following issues:

Facility Safety

- Accident reporting;
- Chemical and hazardous materials handling;
- Fall and arrest protection;
- Eye, ear, head, hands, feet, and body protective equipment;
- First aid training and equipment;
- Equipment operation and hazards;
- Fire prevention and response;
- Lockout and tag out procedures; and
- Scaffolds and ladders.

Emergency Preparedness

- Fire preparedness and response;
- Natural disasters (i.e. extreme weather events);
- Hazardous materials and spill response;
- Medical emergencies; and
- Rescue procedures.

6.3.5 Emergency Response Plan

Zephyr Farms and/or the relevant Contractor would finalize a detailed Emergency Response Plan for each Project phase in collaboration with municipal emergency services personnel.

The Emergency Response Plan would include a plan for the proper handling of material spills and associated procedures to be undertaken during a spill event. The plan would also specify containment and clean-up materials and their storage locations. The plan would include general procedures for personnel training. As appropriate, the plan may cover response actions to high winds, fire preparedness, evacuation procedures, and medical emergencies. Developing this plan with local emergency services personnel would allow Zephyr Farms to determine the extent of emergency response resources and response actions of those involved.

The plan for each Project phase would include key contact information for emergency service providers, a description of the chain of communications and how information would be disseminated between Zephyr Farms and/or the Contractor and the relevant responders. The plan would also indicate how Zephyr Farms and/or the Contractor would directly contact (via phone or in-person) Project stakeholders who may be directly impacted by an emergency so that the appropriate actions can be taken to protect stakeholders health and safety.

6.3.6 Measurement of Performance

Once performance standards have been established and personnel have been trained (and are functional in procedural operations), the next step is to monitor the performance of the Project and individuals relative to the performance standards and programs.

Specific internal audits (e.g. management team and/or process team), and external audits against the plans, safety and environmental procedures, and other policies and procedures are all part of establishing performance standards necessary to minimize risks on a continuing basis.

As appropriate a formal audit program for the Project, with regard to loss control programs (i.e. health, safety, environment, and security) would be performed regularly.

6.4 MONITORING REQUIREMENTS AND CONTINGENCY PLANS

Building upon the environmental management measures recommended to minimize potentially adverse effects, while enhancing the positive effects associated with the operation of the facility (Section 6.2 and 6.3), the following operations monitoring and contingency planning program has been developed. The monitoring program is designed to allow Zephyr Farms and/or the Operation and Maintenance Contractor to monitor and assess the effectiveness of the proposed management measures/mitigation measures and to verify compliance of the Project with O.Reg.359/09.

Zephyr Farms and/or the Operation and Maintenance Contractor would be the primary organization responsible for the implementation of the operational monitoring and contingency planning measures. Implementation of the measures would be undertaken consistent with Zephyr Farms and/or the Operation and Maintenance Contractor standard environmental and engineering practices.

6.4.1 Terrestrial Habitats and Significant Natural Features

Operation activities that have the potential to affect terrestrial flora and fauna include equipment operation and accidental spills and/or leaks. Stringent monitoring of these activities is necessary to ensure terrestrial flora and fauna are protected.

As appropriate, records of vehicle maintenance would be retained and made available for periodic review by Zephyr Farms and/or the Operation and Maintenance Contractor. All vehicles involved in maintenance activities must be maintained in good operating condition; all vehicles identified through the monitoring program that fail to meet the minimum emission standards would be repaired immediately or replaced as soon as practicable.

Monitoring would be required following the unlikely event of contamination from an accidental spill or leak (method for monitoring may be developed in consultation with the Spills Action Centre of the MOE). Contaminated soils would be removed and replaced as appropriate.

6.4.2 Birds and Bats

A post-construction monitoring study has been developed which is consistent with guidelines provided by regulatory agencies (Appendix D). The plan gives consideration to adaptive management and operational control options. Elements of the post-construction monitoring program include:

- Twice-weekly mortality monitoring at all turbines during May 1- September 30, for a period of three years. Searcher efficiency and scavenger trials would be conducted each year according to current guidance documents; and
- Regular reporting that includes analysis and submission of results to MNR and EC.

Mitigation techniques may include (but are not limited to) operational controls, such as periodic shut-down and/or blade feathering. Results would be reviewed collectively by the proponent, MNR and other relevant agencies to determine if and when additional monitoring and/or mitigation are required. The best available science and information would be considered when determining appropriate mitigation.

6.4.3 Surface Water Features and Aquatic Habitat

Operation activities that have the potential to affect surface and groundwater features and aquatic habitat include accidental spills and/or leaks. Proper storage of materials (e.g. maintenance fluids) at off-site storage containers would greatly reduce the potential for accidental spills and/or leaks.

Appropriate remedial measures may be completed as necessary and additional follow-up monitoring conducted as appropriate in the event of an accidental spill and/or leak. The level of monitoring and reporting would be based on the severity of the spill/leak and may be discussed with the MOE (Spills Action Centre) and MNR. Environmental inspection following spring run-off the year after construction (first year of operation) may be considered to ensure surface drainage has been maintained.

6.4.4 Environmental Noise and Public Health and Safety

The *Environmental Protection Act* requires that noise emissions for any new Project must not have adverse effects on the natural environment. The REA process is the mechanism through which the controls are administered under the *Environmental Protection Act*. Noise monitoring (if required), would be conducted in accordance with the REA for the Project. In the event of a malfunctioning turbine which is resulting in noise emissions that are above MOE requirements, the problematic turbine(s) would be shut down until corrective measures are taken. Routine turbine maintenance and monitoring would also help minimize the likelihood of malfunctioning turbines resulting in excessive noise emissions.

Turbines would be monitored electronically twenty-four hours a day, seven-days a week, to allow operational changes to be noted and assessed quickly. Turbine shut down would occur automatically upon detection of extreme weather. Inspections of turbines would occur after extreme weather events.

6.4.5 Local Expenditures

As was the case during the construction phase, to the extent possible Zephyr Farms would continue to encourage the use and procurement of local goods and services where they are available in sufficient quantities and qualities and at competitive pricing.

6.4.6 Stakeholder Relations

A Complaint Response Protocol (Section 8.3) has been developed to address any stakeholder concerns during operation of the facility.

7.0 Summary of Environmental Effects, Mitigation Strategies, and the Environmental Effects Monitoring Plan

Table 7.1 summarizes the potential adverse effects, performance objectives, mitigation strategies and the monitoring/contingency plan measures of the operational phase of the Project.

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Heritage and Archaeological Resources					
Protected Properties and Heritage Resources	· None	· N/A	· N/A	· N/A	5.1.1
Archaeological Resources	· None	· N/A	· N/A	· N/A	5.1.2
Natural Heritage Resources					
Wetlands	· Indirect effects on a swamp vegetation community through dust, erosion, accidental spills and improper disposal of waste	· Minimize dust generation · No erosion or sediment transport · No spills · Proper waste disposal	· Mitigation measures related to dust emissions are outlined in 'Dust and Odour Emissions' · Mitigation measures for erosion and sedimentation are outlined in 'Surface Water, Fish and Fish Habitat' · Mitigation measures for accidental spills and waste are outlined in 'Waste Management and Contaminated Lands'	· In the event of accidental spills, monitoring would be developed in consultation with the MOE Spills Action Centre. · Contaminated soils would be removed and replaced as appropriate	5.2.1
Areas of Natural and Scientific Interest	· None	· N/A	· N/A	· N/A	5.2.2
Valleylands and Hazard Lands	· None	· N/A	· N/A	· N/A	5.2.3

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Woodlands	<ul style="list-style-type: none"> Contamination through dust, erosion, accidental spills and improper disposal of waste 	<ul style="list-style-type: none"> Minimize dust generation No erosion or sediment transport No spills Proper waste disposal 	<ul style="list-style-type: none"> Mitigation measures related to dust emissions are outlined in 'Dust and Odour Emissions' Mitigation measures for erosion and sedimentation are outlined in 'Surface Water, Fish and Fish Habitat' Mitigation measures for accidental spills and waste are outlined in 'Waste Management and Contaminated Lands' 	<ul style="list-style-type: none"> The Operation and Maintenance Contractor would monitor the limits of disturbance In the event of accidental spills, monitoring would be developed in consultation with the MOE Spills Action Centre. Contaminated soils would be removed and replaced as appropriate 	5.2.4
Provincial Parks and Conservation Reserves	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.2.5
Other Designated Natural Areas	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.2.6
Significant Wildlife Species	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.2.7
Significant Wildlife Habitat	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.2.8

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Other Wildlife and Wildlife Habitat	<ul style="list-style-type: none"> Direct mortality, and indirect disturbance, to birds Direct mortality, and indirect disturbance, to bats Indirect effects to amphibians 	<ul style="list-style-type: none"> Minimize mortality and disturbance 	<ul style="list-style-type: none"> Spills response procedures, as appropriate Maintain and review records of waste disposal Utilize turbine lighting with the shortest possible flash durations and the longest possible pause between flashes Mitigation measures for amphibians are outlined in 'Game and Fishery Resources' 	<ul style="list-style-type: none"> Twice weekly mortality monitoring at all turbines from May 1st to September 31st, for a period of three years Operational mitigation, depending upon results of the mortality monitoring 	5.2.9
Significant Flora Species and Vegetation Communities	<ul style="list-style-type: none"> Indirect effects on a rare vegetation community through dust, erosion, accidental spills and improper disposal of waste 	<ul style="list-style-type: none"> Minimize dust generation No erosion or sediment transport No spills Proper waste disposal 	<ul style="list-style-type: none"> Mitigation measures related to dust emissions are outlined in 'Dust and Odour Emissions' Mitigation measures for erosion and sedimentation are outlined in 'Surface Water, Fish and Fish Habitat' Mitigation measures for accidental spills and waste are outlined in 'Waste Management and Contaminated Lands' 	<ul style="list-style-type: none"> In the event of accidental spills, monitoring would be developed in consultation with the MOE Spills Action Centre. Contaminated soils would be removed and replaced as appropriate 	5.2.10
Other Flora Species and Vegetation Communities	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.2.11

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Water Bodies and Aquatic Resources					
Groundwater	<ul style="list-style-type: none"> • Potential contamination from accidental spills 	<ul style="list-style-type: none"> • No spills 	<ul style="list-style-type: none"> • Mitigation measures for accidental spills are outlined in 'Waste Management and Contaminated Lands' 	<ul style="list-style-type: none"> • Monitoring would be developed in consultation with the MOE Spills Action Centre. • Contaminated soils would be removed and replaced as appropriate 	5.3.1
Surface Water, Fish, and Fish Habitat	<ul style="list-style-type: none"> • Potential contamination from accidental spills to indirect fish habitat • Potential sedimentation during maintenance activities to indirect fish habitat 	<ul style="list-style-type: none"> • No spills • No erosion or sediment transport 	<ul style="list-style-type: none"> • Use of erosion and sediment control measures • Siltation to a watercourse occurs, activities should cease immediately until the situation is rectified • Undertake appropriate procedures listed in the Emergency Response Plan • Notify MOE Spills Action Centre as appropriate 	<ul style="list-style-type: none"> • The level of monitoring and reporting would be based on the severity of the spill/leak and may be discussed with the MOE (Spills Action Centre) and MNR • Environmental inspection following spring run-off the year after construction (first year of operation) may be considered to ensure surface drainage has been maintained 	5.3.2

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Air Quality and Environmental Noise					
Air Emissions	<ul style="list-style-type: none"> · Emissions from equipment and vehicles 	<ul style="list-style-type: none"> · Minimize duration and magnitude of emissions 	<ul style="list-style-type: none"> · Operations staff would operate vehicles in a manner that reduces air emissions to the extent practical, including: <ul style="list-style-type: none"> ○ Using multi-passenger vehicles as possible ○ Avoid idling vehicles · Equipment and vehicles would be maintained in a manner that reduces air emissions, including: <ul style="list-style-type: none"> ○ Using mufflers and emission control systems as available ○ Using catalytic converters as required ○ Meet the emissions requirements of the MOE and/or MTO ○ As appropriate, records of vehicle maintenance would be retained and made available for periodic review by the Operation and Maintenance Contractor ○ All vehicles identified through the monitoring program that fail to meet the minimum emission standards would be repaired immediately or replaced as soon as practicable 	<ul style="list-style-type: none"> · None required 	5.4.1

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Dust & Odour Emissions	<ul style="list-style-type: none"> Dust emissions from operations and maintenance vehicles 	<ul style="list-style-type: none"> Minimize duration and magnitude of emissions 	<ul style="list-style-type: none"> Maintaining equipment in good running condition and in compliance with regulatory requirements Dust suppression (e.g. water and/or calcium chloride) of source areas as necessary Covering loads of friable materials during transport 	<ul style="list-style-type: none"> Adherence to Complaint Response Protocol 	5.4.2
Environmental Noise	<ul style="list-style-type: none"> Noise emitted from a turbine and/or transformer Noise emitted from traffic and/or vehicles 	<ul style="list-style-type: none"> Noise at all non-participating to meet MOE Guidelines 	<ul style="list-style-type: none"> Adherence to all noise setback requirements All engines associated with maintenance equipment would be equipped with mufflers and/or silencers in accordance with MOE and/or MTO guidelines and regulations Noise levels arising from maintenance equipment would also be compliant with sound levels established by the MOE Routine facility maintenance to ensure infrastructure is operating properly and efficiently To the greatest extent possible, operations activities that could create excessive noise would be restricted to regular business hours, when residents are less sensitive to noise, and adhere to any local noise by-laws 	<ul style="list-style-type: none"> Noise monitoring (if required), would be conducted in accordance with the REA for the Project Turbine shutdown in the event of a malfunctioning turbine or extreme weather event Turbine maintenance to ensure turbines are running properly and efficiently Adherence to Complaint Response Protocol 	5.4.3

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Land Use and Resources					
Areas Protected Under Provincial Plans and Policies	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.5.1
Existing Land Uses	<ul style="list-style-type: none"> Removal of land from agricultural production Temporary increase in noise and dust levels during maintenance 	<ul style="list-style-type: none"> Minimize disturbance to existing land uses, including local businesses 	<ul style="list-style-type: none"> Mitigation measures related to noise are outlined in 'Environmental Noise' Mitigation measures related to dust emissions are outlined in 'Dust and Odour Emissions' 	<ul style="list-style-type: none"> Adherence to Complaint Response Protocol 	5.5.2
Recreation Areas	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.5.3
Agricultural Lands and Operations	<ul style="list-style-type: none"> Inconvenience to operations from crane pad construction, traffic and dust 	<ul style="list-style-type: none"> Minimize disturbance to agricultural lands and operations 	<ul style="list-style-type: none"> Siting of crane pads to minimize land disturbance, and post-rehabilitation 	<ul style="list-style-type: none"> Adherence to Complaint Response Protocol 	5.5.4
Mineral, Aggregate, and Petroleum Resources	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.5.5
Forest Resources	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.5.6
Game And Fishery Resources	<ul style="list-style-type: none"> Disturbance to game species from noise 	<ul style="list-style-type: none"> Minimize disturbance to game and fishery resources 	<ul style="list-style-type: none"> Turbines would be placed in agricultural lands away from woodlands, and within the REA setback requirements 	<ul style="list-style-type: none"> None required 	5.5.7
Local Traffic	<ul style="list-style-type: none"> Negligible increase in traffic 	<ul style="list-style-type: none"> Minimize disturbance to local traffic 	<ul style="list-style-type: none"> Obtain permits for excess loads and road improvements As appropriate, utilize escort vehicles for non-conventional loads Potential for public notification of non-conventional load movements 	<ul style="list-style-type: none"> Adherence to Complaint Response Protocol 	5.5.8

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Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Local Economy	<ul style="list-style-type: none"> Increase in direct, indirect and induced business income and employment 	<ul style="list-style-type: none"> Create positive effects on local economy 	<ul style="list-style-type: none"> Zephyr Farms would make all reasonable efforts, to the extent possible, to source required services and materials from local suppliers where these items are available in sufficient quantity and quality and at competitive prices 	<ul style="list-style-type: none"> None required 	5.5.9
Viewscape	<ul style="list-style-type: none"> Disruption to viewscape from siting of project infrastructure 	<ul style="list-style-type: none"> Minimize potential for visual disturbance 	<ul style="list-style-type: none"> Landscaping at the substation property 	<ul style="list-style-type: none"> Adherence to Complaint Response Protocol 	5.5.10
Existing Infrastructure					
Provincial and Other Major Infrastructure	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.6.1
Navigable Waters	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A 	5.6.2
Municipal Infrastructure	<ul style="list-style-type: none"> See 'Local Traffic' 	<ul style="list-style-type: none"> See 'Local Traffic' 	<ul style="list-style-type: none"> See 'Local Traffic' 	<ul style="list-style-type: none"> See 'Local Traffic' 	5.6.3

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Telecommunication and Radar Systems	<ul style="list-style-type: none"> · Potential to interfere with telecommunication and radar systems 	<ul style="list-style-type: none"> · Minimize interference with telecommunication and radar systems 	<ul style="list-style-type: none"> · Zephyr Farms has consulted with relevant agencies and licensed providers to identify any likely effects to telecommunication and radar systems · Turbine siting took into account setbacks required from telecommunication and radar systems · In the unlikely event that signal disruption is experienced, mitigation measures may include: <ul style="list-style-type: none"> ○ Replacing the receiving antenna with one that has a better discrimination to the unwanted signals ○ Relocating either the transmitter or receiver, or ○ Switching to an alternate means of receiving the information 	<ul style="list-style-type: none"> · Adherence to Complaint Response Protocol · Zephyr Farms would review potential incidents of telecommunication interference on a case by case basis 	5.6.4
Aeronautical Systems	<ul style="list-style-type: none"> · Aeronautical obstruction 	<ul style="list-style-type: none"> · Minimize potential hazard to low flying aircraft 	<ul style="list-style-type: none"> · Turbine lighting must conform to Transport Canada standards. In order to reduce rural light pollution, lights would be selected with the minimal allowable flash duration, narrow beam, and would be synchronized · Nav Canada would be responsible for updating all aeronautical charts with the turbine locations 	<ul style="list-style-type: none"> · Routine maintenance of the turbines and replacement of safety lighting in the event of malfunction 	5.6.5

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Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Waste Management and Contaminated Lands					
Waste Generation	<ul style="list-style-type: none"> · Improper disposal of waste material may result in contamination to soil, groundwater, and/or surface water resources on and off the Project Location · Litter may become a nuisance to nearby residences if not appropriately contained and allowed to blow off the site 	<ul style="list-style-type: none"> · Ensure proper disposal of waste 	<ul style="list-style-type: none"> · Systematic collection and separation of waste materials within on-site storage areas in weather-protected areas · Contractors would be required to remove all waste materials from the turbine locations during maintenance activities · All waste materials and recycling would be transported off-site by private waste material collection contractors licensed with a Certificate of Approval – Waste Management System · Labelling and proper storage of liquid wastes (e.g. used oil, drained hydraulic fluid, and used solvents) in a secure area that would ensure containment of the material in the event of a spill. As per S.13 of the EPA, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of the prescribed regulatory levels would be reported to the MOE's Spills Action Centre · As appropriate, spill kits (e.g. containing absorbent cloths and disposal containers) would be provided on-site during maintenance activities 	<ul style="list-style-type: none"> · None required 	5.7

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			<ul style="list-style-type: none"> • Dumping or burying wastes within the Project sites would be prohibited • Disposal of non-hazardous waste at a registered waste disposal site(s) • If waste is classified as waste other than solid non-hazardous, a Generator Registration Number is required from the MOE and the generator would have obligations regarding manifesting of waste • Implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials 		
Spills	<ul style="list-style-type: none"> • Potential contamination from accidental spills 	<ul style="list-style-type: none"> • No spills 	<ul style="list-style-type: none"> • Standard containment facilities and emergency response materials would be maintained on-site as required • Refueling, equipment maintenance, and other potentially contaminating activities would occur in designated areas • Spills would be reported as appropriate to the MOE Spills Action Centre, and the Emergency Response Plan followed 	<ul style="list-style-type: none"> • Monitoring would be required following the unlikely event of contamination from an accidental spill or leak (method for monitoring may be developed in consultation with the Spills Action Centre of the MOE) • Contaminated soils would be removed and replaced as appropriate 	5.7

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Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Public Health and Safety					
Structural Failure	<ul style="list-style-type: none"> Public health and safety 	<ul style="list-style-type: none"> No structural failure of the turbines or ancillary equipment 	<ul style="list-style-type: none"> Adherence to required setbacks Design, install, operate, and maintain turbines according to applicable industry standards/certifications Use of lightning protection systems Insurance will exist for the facility 	<ul style="list-style-type: none"> Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage Turbine maintenance to ensure turbines are running properly and efficiently 	5.8.1

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Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Ice Fall and Shed	<ul style="list-style-type: none"> · Public health and safety 	<ul style="list-style-type: none"> · Limit potential for ice throw/shed to impact pedestrians 	<ul style="list-style-type: none"> · Adherence to required setbacks · Design of turbine tower reduces ice accumulation · Automatic turbine shutdown due to weight imbalances · Signage in areas where potential icing exists · Insurance will exist for the facility 	<ul style="list-style-type: none"> · Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage · Turbine maintenance to ensure turbines are running properly and efficiently 	5.8.2

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Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Extreme Weather Events					
Extreme Weather Events	<ul style="list-style-type: none"> Potential damage to Project infrastructure from extreme weather events 	<ul style="list-style-type: none"> No structural failure of the turbines or Project equipment 	<ul style="list-style-type: none"> Project components have been designed to withstand the effects from extreme events. Design, install, operate, and maintain turbines according to applicable industry standards/certifications Failsafe devices are capable of shutting down the turbine blades in the event of excessive wind conditions, imbalance, or malfunction of other turbine components 	<ul style="list-style-type: none"> Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage Turbine maintenance to ensure turbines are running properly and efficiently 	5.9

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8.0 Emergency Response and Communications Plan

The following sets out a description of the actions to be taken during all Project phases to inform the public, aboriginal communities, municipalities, the landowner and relevant Ministries of the Ontario Government regarding activities occurring at the Project site (including emergencies), means by which stakeholders can contact Zephyr Farms and/or the Operation and Maintenance Contractor, and means by which correspondence sent to Zephyr Farms and/or the Contractor would be recorded and addressed.

As appropriate, Zephyr Farms and/or the Operation and Maintenance Contractor would review the Emergency Response and Communications Plan prior to and during each phase of the Project. Notification of any changes to the Emergency Response and Communications Plan would be provided to stakeholders as outlined in Section 8.2.

8.1 COMMUNICATION PLAN FOR EMERGENCIES

In the event of an emergency, Zephyr Farms and/or the Contractor would initiate the Emergency Response Plan (Section 6.3.5).

The plan would include key contact information for emergency service providers, a description of the chain of communications and how information would be disseminated between Zephyr Farms and/or the Operation and Maintenance Contractor and the relevant responders. The plan would also indicate how Zephyr Farms and/or the Operation and Maintenance Contractor would directly contact (via phone or in-person) Project stakeholders who may be directly impacted by an emergency so that the appropriate actions can be taken to protect stakeholders health and safety. The communication plan for emergencies would be developed in collaboration with local emergency responders, and would be prepared following consultations with first responders, including the local fire department.

8.2 COMMUNICATION PLAN FOR PROJECT UPDATES AND ACTIVITIES

Zephyr Farms and/or the Contractor would engage with Project stakeholders (public, aboriginal communities, municipalities) during all phases of the Project including providing updates on the Project website. As a long-term presence in the Township of Brooke-Alvinston, Zephyr Farms would continue to develop contacts and to develop local relationships and channels of communication. Additional updates may be provided to stakeholders via letters/newsletters, newspaper notices, or direct contact.

8.3 COMMUNICATIONS AND COMPLAINT RESPONSE PROTOCOL

The following has been developed for all Project phases to address any reasonable concern from the public and would be implemented by Zephyr Farms and/or the Contractor.

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A telephone number for contacting Zephyr Farms and/or the Contractor along with the mailing/e-mail address would be posted on the Project website and provided directly to the municipalities and MOE. These would be the direct contact points for Zephyr Farms and/or the Contractor during all phases of the Project. As described in Section 6.3.5, the Emergency Response Plan would include key contact information for emergency service providers, a description of the chain of communications and how information would be disseminated between Zephyr Farms and/or the Contractor and the relevant responders. This information would be obtained during consultations with the municipalities.

The telephone number provided for the reporting of concerns and/or complaints would be equipped with a voice message system used to record the name, address, telephone number of the complainant, time and date of the complaint along with details of the complaint. All messages would be recorded in a Complaint Response Document. Zephyr Farms and/or the Contractor would endeavour to respond to messages within 48 hours. All reasonable commercial efforts would be made to take appropriate action as a result of concerns as soon as practicable. The actions taken to remediate the cause of the complaint and the proposed actions to be taken to prevent reoccurrences of the same complaint in the future would also be recorded within the Complaint Response Document. If appropriate, the MOE Spills Action Centre would be contacted to notify them of the complaint. Correspondence would be shared with other stakeholders, such as the MOE, as required and/or as deemed appropriate.

Ongoing stakeholder communication would allow Zephyr Farms and/or the Contractor to receive and respond to community issues on an ongoing basis.

8.4 PUBLIC SAFETY PLAN

In addition to the Public Safety Plan that would be developed by the Construction Contractor for the protection of public safety during the construction and decommissioning phases, Zephyr Farms and/or the Operation and Maintenance Contractor would prepare and implement a Public Safety Plan for operation of the Project. As previously noted and as appropriate, Zephyr Farms and/or the Operation and Maintenance Contractor would develop or have an existing operations training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental, health and safety procedures, and an Emergency Response and Communications Plan. Proper training would ensure operational safety for Project personnel.

Operational safety to minimize potential risks to the public would include:

- Site access restrictions (with the exception of maintenance and emergency personnel);
- Development of an Emergency Response and Communications Plan; and
- Turbine design and adherence to construction standards.

Signage may include, but would not be limited to, signs associated with potential risks at the Project. Signs may be posted in the vicinity of buried cables, high voltage equipment, and warning of the presence of maintenance vehicles along the access roads.

Access restrictions would include “No Trespassing” signs on the turbine access roads and turbine tower site or within the switchyard site. In addition, fencing would be placed around the switchyard to restrict unauthorized access. Access roads would not have restricted access (e.g. gates), thus allowing emergency vehicles to access the Project Location and all turbine locations in the event of an emergency.

As previously noted, during pre-operational mobilization Zephyr Farms and/or the Operation and Maintenance Contractor would finalize an Emergency Response and Communications Plan for the operational activities in collaboration with the municipalities. The development of and proper execution of the Emergency Response and Communications Plan would help ensure public safety is maintained throughout the operation of the facility.

Potential risk to public safety as a result of extreme events such as fire, lightning, and tornadoes were addressed in Section 5.9. The turbines have been designed with various protective measures to address extreme events to reduce the potential risk to public safety. The turbines would adhere to marking and lighting requirements of the Aerodrome Safety Branch of Transport Canada. In addition, construction of the turbines would be completed according to stringent national and international codes.

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9.0 Closure

The Brooke-Alvinston Wind Farm Design and Operations Report has been prepared by Stantec Consulting Ltd. for Zephyr Farms Limited in accordance with Item 4, Table 1 of O.Reg 359/09, and the MOE's draft guidance document *Technical Bulletin Two: Guidance for preparing the Design and Operations Report* (MOE, 2010).

This report has been prepared by Stantec for the sole benefit of Zephyr Farms Limited, and may not be used by any third party without the express written consent of Zephyr Farms Limited. The data presented in this report are in accordance with Stantec's understanding of the Project as it was presented at the time of reporting.

STANTEC CONSULTING LTD.



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