

June 6, 2013

Hali Zigomanis,
Environmental Manager, East
Versen Inc. .
Suite 502, 216 Chrislea Road,
Woodbridge, Ontario, L4L 8S5

RE: EEMP for GrandValley Wind Farms, Phase 3 Wind Project

Dear Hali Zigomanis:

The Ministry of Natural Resources (MNR) has reviewed the Environmental Effects Monitoring Plan for Grandvalley Wind Farms, Phase 3 Wind Project in the Town of Grand Valley and Township of Amaranth, Dufferin County submitted on June 5, 2013.

In accordance with Section 23.1 of the Ministry of the Environment's (MOE's) Renewable Energy Approvals regulation (O.Reg.359/09), applicants proposing to engage in Class 3, 4 or 5 wind power facility are required to prepare an Environmental Effect Monitoring Plan (EEMP) in respect of birds and bats.

This letter confirms that the EEMP was prepared in respect of birds and bats in accordance with the Ministry of Natural Resources':

- *Birds and Bird Habitats: Guidelines for Wind Power Projects(2011)*
- *Bats and Bat Habitats: Guidelines for Wind Power Projects (2011)*

In accordance with Section 28(3)(c) and 38(2)(c), MNR also offers the following comments in respect of the project.

1) The potential for ongoing risk of negative environmental effects has been identified in the Natural Heritage Assessment report (NHA) as confirmed by our office on May 31, 2013. The project and potential effects will be monitored as outlined in the Environmental Impact Study Report and have been further detailed within the Environmental Effect Monitoring Plan to ensure that proposed mitigation strategies are effective and contingency measures have been included for instances where performance objectives are not met.

Where specific commitments have been made by the applicant in the NHA/EIS with respect to project design, construction, rehabilitation, operation, mitigation, or monitoring, MNR expects that these commitments will be considered in MOE's Renewable Energy Approval decision and, if approved, be implemented by the applicant.

Please be aware that your project may be subject to additional legislative approvals as outlined in the Ministry of Natural Resources' *Approvals and Permitting Requirements Document*. These approvals are required prior to the construction of your renewable energy facility.

If you wish to discuss any part of this confirmation or additional comments provided, please contact Eric Prevost at 705-755-3134 or eric.prevost@ontario.ca.

Sincerely,

A handwritten signature in blue ink, appearing to read 'a. fleischhauer', followed by a horizontal line extending to the right.

Andrea Fleischhauer
Andrea Fleischhauer
A/Renewable Energy Coordinator
Southern Region Resources Section
Ministry of Natural Resources

CC Eric Prevost, Planning Ecologist, Peterborough District, MNR
Narren Santos, Environmental Assessment and Approvals Branch, MOE
Sandra Guido, Environmental Assessment and Approvals Branch, MOE
Sean Spisani, Senior Ecologist, Stantec Consulting Ltd



Stantec

**GRAND VALLEY WIND FARMS – PHASE 3 WIND
PROJECT**
ENVIRONMENTAL EFFECTS MONITORING PLAN

File Number: 160960698
May 2013

Prepared for:

Grand Valley Wind Farms Inc.
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1.0 Introduction

Grand Valley Wind Farms Inc. (GVWF) is proposing to develop, construct, operate and decommission the 40 megawatt (MW) Grand Valley Wind Farms - Phase 3 Wind Project (the Project) in the Town of Grand Valley and Township of Amaranth, Dufferin County in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The Project Study Area is generally bordered on the north by Highway 89, on the south by County Road 109, on the east by 9th Line and on the west by East West Luther Townline. The proposed Project Location includes all parts of the land in, on or over which the Project is proposed (the 'construction area' for the Project).

The basic components of the Project include:

- Between 14 and 17 wind turbine generators (Siemens SWT-2.3-113 and/or SWT 3.0-113 turbine) with a total maximum installed nameplate capacity of 40MW. The turbine models are identical in structure, and would be 'de-rated', generating less electricity per turbine to meet the contract nameplate capacity. Noise Assessment Reports have been completed for both turbine models as part of the Renewable Energy Approval (REA) process;
- A 34.5 kV underground power line collector system that would transport the electricity generated from the Project to the Hydro One Networks Inc. (HONI) transmission system;
- Fibre optic cabling laid with the underground collector lines;
- Turbine access roads;
- Crane pads;
- One connection point to the existing HONI electrical transmission system;
- Existing operations and maintenance facilities to be leased by the Project (joining the current facilities for the operation of the Grand Valley Phase 1 and 2 Wind Projects). The currently municipally-serviced office facility is located at 35A Main Street South, Grand Valley and the currently unserviced warehouse facility is located at 27 Mill Street West, Grand Valley;
- Existing parking (owned) and gravel quarry (leased) sites to be used for employee parking and temporary construction trailer sites (174321 and 173395 County Road 25, Grand Valley);
- A 34.5 kV/230 kV 45 MVA transformer station; and,
- Meteorological equipment, including an approximately 100 m MET tower or a ground mounted SoDAR unit.

Temporary components include:

- Work and storage areas during construction at the turbine locations and along the underground power line collector system; and,
- Office, parking and storage areas during construction for the work crews during the construction phase of the Project.

This Post-Construction Monitoring Program is one component of the Mitigation and Environmental Effects Monitoring Plan (EEMP) of the REA Application for the Project, and has been prepared in accordance with O. Reg. 359/09, the Ontario Ministry of Natural Resources' (MNR's) *Approval and Permitting Requirements Document for Renewable Energy Projects* (September 2009), the Ministry of the Environment's (MOE's) *Technical Guide to Renewable Energy Approvals* (MOE 2012), MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011).

As discussed in the Project's Natural Heritage Assessment (NHA; Stantec, 2013), primary data was collected in the Project Study Area pre-construction. This data was augmented with secondary data from published and unpublished sources to generate a dataset from which to assess the potential effects of the Project.

All Project components, including all Turbines and blade sweeps, access roads and temporary construction areas, are located outside candidate wildlife habitat features as documented in Section 4.0 of the NHA (Stantec, 2013). Regardless of potential impacts, post-construction mortality surveys are required for all Class 3 and 4 wind power projects (MNR 2011a and b).

As indicated in the Environmental Impact Study (EIS; Stantec, 2013), prepared in accordance with section 38(2) of the Renewable Energy Approvals Regulation (O.Reg 359/09), the following wildlife habitat features will receive post-construction monitoring:

- Amphibian breeding habitat (wetland): ABWE-2
- Amphibian breeding habitat (woodland): ABWO-1 to ABWO-9, and ABWO-13 to ABWO-15
- Bat Maternity Colonies: BMC-1 and BMC-2
- Marsh breeding bird habitat: MBB-1
- Waterfowl nesting area: WNA-3 and WNA-4

Habitat use surveys are planned for 2013 in all wildlife habitats carried forward to the EIS to confirm or deny significance as per the Draft SWH Ecoregion 6E Criterion Schedule (MNR, 2012b).

The purpose of this EEMP is to assess the effectiveness of the proposed mitigation measures and to verify compliance of the Project with applicable provincial and federal legislation and guidelines. This monitoring plan provides details on the post-construction wildlife monitoring program for mortality monitoring birds and bats, and all wildlife habitats carried forward to the EIS.

2.0 Post-Construction Monitoring Program

2.1 PURPOSE AND TIMING

The purpose of the wildlife post-construction monitoring program is to identify performance objectives, assess the effectiveness of the proposed mitigation measures and to identify contingency measures that will be implemented if performance objectives cannot be met. Furthermore, any unanticipated potentially significant adverse environmental effects discovered during the post-construction monitoring program will be mitigated as described in **Section 3.0**.

Post-construction monitoring for wildlife and wildlife habitat includes the following:

- *mortality monitoring for birds and bats*: twice weekly (3-4 day intervals) mortality monitoring at 10 turbines from May 1 to October 31, and weekly monitoring for raptors during November, for a period of three years. Searcher efficiency and scavenger trials will be conducted each year according to current guidance documents.

Additional monitoring may occur to address the following habitats, depending on findings of pre-construction surveys as described by the NHA (Section 5):

- *potential disturbance to amphibian breeding habitat (wetland and woodland)*: pre-construction anuran call surveys will be conducted in April, May, and June to determine significance of thirteen features (ABWO-1 to ABWO-9, AWBO-13-15, and ABWE-2); surveys will continue for 1-3 years post-construction in any habitats confirmed as significant wildlife habitat, following the same protocols.
- *potential disturbance to bat maternity colonies*: pre-construction exit surveys will be conducted in June to determine significance of feature BMC-1; surveys will continue for 3 years post-construction in any habitats confirmed as significant wildlife habitat, following the same protocols.
- *potential disturbance to waterfowl nesting areas*: pre-construction surveys (areas searches and point counts) will be conducted (three rounds) in May-July to determine significance of two features (WNA-3 and WNA-4); surveys will continue for 1-3 years post-construction in any habitats confirmed as significant wildlife habitat, following the same protocols.
- *potential disturbance to marsh breeding bird habitat*: pre-construction surveys (point count) will be conducted (three rounds) in May-July to determine significance of feature MBB 1; surveys will continue for 1-3 years post-construction in any habitats confirmed as significant wildlife habitat, following the same protocols.

2.2 PRIMARY DATA COLLECTION – MORTALITY MONITORING

Detailed monitoring methods, including duration and frequency, are discussed below.

2.2.1 Birds

Background

Data from wind projects currently operating in Ontario and around the world indicates that very low numbers of bird fatalities occur as a result of wind power projects (MNR 2011a). Data from Ontario and the United States indicates that approximately two birds per year are killed by individual turbines, which is very low compared to other existing sources of human caused avian mortality (MNR 2011a). Birds can be killed through collisions with turbine blades and towers, guy wires, meteorological towers and maintenance vehicles. Mortality rates and patterns are affected by density and behavior of birds found in the area, the presence of landscape features such as ridges, valleys, peninsulas and shorelines and weather conditions.

Monitoring

Bird mortality monitoring will be conducted according to MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (MNR, 2011a).

Mortality monitoring within minimally-vegetated portions (i.e., Visibility Classes 1 and 2 [MNR, 2011a and b]) of a 50 m search area radius from the base of ten wind turbines will be conducted twice-weekly (3-4 day intervals) between May 1 and October 31 for a period of three years. A weekly mortality survey will be conducted at all turbines in November to assess raptor mortality.

Although all reasonable effort will be made to conduct surveys as scheduled, surveys will not be conducted if weather (e.g. lightning, severe fog) presents safety concerns. Weather conditions will be noted when surveys were not conducted as scheduled, and every attempt will be made to complete the missed survey(s) as soon as possible.

Searcher efficiency and scavenger trials will be conducted in accordance with Environment Canada (EC) and MNR guidelines. Searcher efficiency trials will typically be conducted once in each of spring, summer and fall, but will be repeated if searchers change during the year. Searcher efficiency trials are designed to correct for carcasses that may be overlooked by surveyors during the survey periods. Searcher efficiency trials involve a "tester" that places bird and bat carcasses under turbines prior to the standard carcass searches to test the searcher's detection rate. These trials are considered 'blind' trials; the testers are unaware when or where they are being tested. Each trial will consist of a minimum of 10 carcasses per searcher per visibility class. No more than three trial carcasses would be placed at any one time.

Searcher efficiency (Se) is calculated for each searcher as follows:

$$Se = \frac{\text{number of test carcasses found}}{\text{number of test carcasses placed} - \text{number of test carcasses scavenged}}$$

A weighted average, or “overall Se”, will be calculated to account for varying survey effort between searchers. The overall Se will be calculated as follows:

$$Se_o = Se_1(n_1/T) + Se_2(n_2/T) + Se_3(n_3/T) + Se_4(n_4/T)$$

- where:
- Se_o is the overall searcher efficiency;
 - $Se_1 - Se_4$ are individual searcher efficiency ratings;
 - $n_1 - n_4$ is quantity of search days completed by each searcher; and
 - T is the total number of search days completed by all searchers.

Scavenger trials will be conducted once a month (May-Oct) and will involve 10 carcasses of bird and bat turbine fatalities, if available, or dark-coloured poultry chicks. If available, at least one raptor carcass will be used for some trials. Test carcasses will be placed out singly at turbines and distributed across the project area. Scavenger trials are designed to correct for carcasses that are removed by predators before the search period. These trials involve the distribution of carcasses in habitat types being searched, at known locations at each wind turbine generator, followed by periodic checking to determine the rate of removal. Proportions of carcasses remaining after each search interval are pooled to calculate the overall scavenger correction factors:

$$Sc = \frac{n_{visit1} + n_{visit2} + n_{visit3} + n_{visit4}}{n_{visit0} + n_{visit1} + n_{visit2} + n_{visit3}}, \text{ where}$$

Sc is the proportion of carcasses not removed by scavengers over the search period

n_{visit0} is the total number of carcasses placed

$n_{visit1} - n_{visit4}$ are the numbers of carcasses remaining on visits 1 through 4

There are numerous published and unpublished approaches to incorporating these corrective factors into an overall assessment of total bird and bat mortality. The estimated mortality will be calculated as follows:

$$C = c / (S_{eo} \times S_c \times P_s), \text{ where}$$

C is the corrected number of bird or bat fatalities

c is the number of carcasses found

S_{eo} is the proportion of carcasses expected to be found by searchers (overall searcher efficiency)

S_c is the proportion of carcasses not removed by scavengers over the search period

P_s is the percent of the area searched.

Most birds and bats will fall within 50 m of the turbine base (MNR 2011a). This value will be used to determine the percent of area searched (P_s). When the entire 50 m radius search area is searched, P_s will equal 100%. If portions of the 50 m radius search area are impossible or futile to search due to site conditions, P_s will be adjusted accordingly based on the searchers' ongoing estimates of the proportion of the search area that was physically searched. If feasible, a GPS will be used to delineate the search area and calculate the P_s .

The area searched will be determined for each turbine by mapping searchable areas on a grid (by visibility class) and counting the number of searched grid cells within 50 m. Maps of the varying search areas will be made available to review agencies. The summed area of those cells will be divided by the total area within a 50 m radius circle to determine the percent area searched for that turbine (Ps_x , where x is the turbine number).

$$Ps_x = \frac{\text{area searched within 50 m radius circle}}{7854 \text{ m}^2}$$

The overall P_s for the facility will be calculated as the average of Ps_1 through Ps_{10} .

Observed fatalities will be photographed, and the species, GPS coordinates, substrate, carcass conditions, possible injuries, sex (if possible) and distance and direction to the nearest turbine will be recorded along with the date, time, weather conditions and searcher. This approach to mortality monitoring will facilitate any potential correlation between mortality occurrences, turbine location, habitat/land use features, weather conditions and season.

Bird carcasses in good condition may be collected and stored in a freezer for future use in searcher efficiency and/or scavenger removal trials. Persons handling bird carcasses will take reasonable precautions (e.g. gloves, tools etc.) to protect their personal health. Bird carcasses will be placed in heavy-duty plastic bags and transported that day to a freezer, where they will be stored until required for the trials. Carcasses of any species covered under the *Endangered Species Act, 2007* ("ESA") or the federal *Species at Risk Act* ("SARA") will be collected in a manner consistent with the conditions of applicable permits (see below).

As of 30 June 2008, species that are extirpated, endangered, or threatened are protected under the *ESA*. Consequently, unless otherwise authorized, possession and transport of species at risk is prohibited under the *ESA*. Therefore, in order to carry out the various activities contemplated in this Plan, a permit under clause 17(2)b of the *ESA* is necessary to allow GVWF and its agents to collect, possess, and transport species at risk as obtained from the Project Study Area. Any conditions attached to the permit relating to handling of injured birds, including raptors and species at risk, will be adhered to.

Additionally, in support of the activities contemplated in this Plan, GVWF or its agents will apply for a scientific collector's permit under the *Fish and Wildlife Conservation Act* ("FWCA") from the MNR that would allow the possession or transport of a species protected by this legislation.

Finally, GVWF or its agents will apply to EC (Canadian Wildlife Service) for a scientific collector's permit under the *Migratory Bird Convention Act, 1994* (MBCA) that would allow GVWF and its agents to collect, possess, and to utilize for scientific research purposes deceased specimens of migratory birds obtained from the study area.

Other permits, approvals, authorizations, etc., are not likely to be required from the MNR or EC to permit the monitoring activities contemplated in this Plan.

If an injured bird is found, the local MNR District will be contacted, and the injured bird will be brought to a near-by wildlife rehabilitation facility.

2.2.2 Bats

Background

Bat mortality has been documented at wind power facilities in a variety of habitats across North America. Nearly every monitored wind power facility in the United States and Canada has reported bat mortality with minimum annual mortality varying from < 1 to 50 bat fatalities/turbine/year (MNR 2006). The majority of bat fatalities at wind power facilities occur in the late summer and fall, and the long-distance migratory bats (i.e., hoary bat, eastern red bat, silver-haired bat) appear to be most vulnerable to collisions with moving turbine blades. Specific factors causing bat mortality and affecting species vulnerability to wind turbine mortality remain unclear, although recent evidence from Alberta suggests that air pressure differences in the blade vortices may contribute to bat mortality. Ontario specific data is relatively sparse at this time. Current evidence from operating facilities in Ontario suggests that bat mortality is lowest in open farmland away from forests and major waterbodies (MNR 2011b).

Monitoring

Bat mortality monitoring will be conducted according to MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (2011b). In general, the mortality monitoring requirements for bats will be captured in conjunction with bird mortality monitoring (described above).

- Bat mortality monitoring will be conducted twice-weekly (3-4 day intervals) within minimally-vegetated portions (i.e., Visibility Classes 1 and 2 [MNR, 2011b]) of a 50 m search area radius from the base of 10 turbines between May 1 and October 31st for a three-year period in accordance with MNR guidelines. This time period includes the core season when resident and migratory bats are active. Bat mortality monitoring will be conducted in conjunction with other monitoring activities (birds) for efficiency.
- Searcher efficiency trials will be conducted seasonally and carcass removal trials will be conducted monthly between May 1 and October 31st. Searcher efficiency and carcass removal rates are known to be more variable for bats than for birds throughout the year and depending on habitat (in part due to the relative size of the species).

As with birds, trial carcasses will be discreetly marked so they can be identified as study carcasses. Each trial will consist of a minimum of 10 carcasses per searcher per visibility class (for searcher efficiency trials) or per trial (for scavenger removal trials). At least one-third of the trial carcasses should be bats.

Bat carcasses in good condition may be collected and stored in a freezer for future use in searcher efficiency and/or scavenger removal trials. Persons handling bat carcasses will take reasonable precautions (e.g., gloves, tools etc.) to protect their personal health. All searchers will ensure they have updated rabies pre-exposure vaccinations. Biological material will be disposed of in a way to ensure that it does not pose a public or environmental health risk and in accordance with any applicable federal, provincial, and municipal laws.

If an injured bat is found, the local MNR District will be contacted, and the injured bat will be brought to a near-by wildlife rehabilitation facility.

2.2.3 Mortality Search Areas

Based on MNR guidelines and on industry standards, the search area will be 50 m from a wind turbine base. Since it may not always be possible to search the entire radius because of the presence of thick or tall vegetation, steep slopes, active cultivation, etc. the actual area searched during the mortality surveys will be calculated at each turbine, using a GPS. A map of the actual search area for each turbine searched, and a description of areas deemed to be unsearchable (e.g. vegetation height, type, slope, etc.), will be provided in the mortality report.

Given the proposed turbines have 55m blade length, consideration will be given to carcasses that may fall beyond the 50m search radius. Additional carcass searching will be conducted in a 10m wide search area (i.e. 50-60m from turbine base) to determine if and to what extent bird and bat carcasses fall beyond the 50m radius. The search area correction factor will be modified if required.

2.3 PRIMARY DATA COLLECTION – POTENTIAL ADDITIONAL MONITORING PLAN COMPONENTS

Detailed monitoring methods, including duration and frequency, for potential additional wildlife factors are discussed below.

2.3.1 Significant Wildlife Habitat

All wildlife habitat areas carried forward to the EIS are treated as significant and will be investigated prior to construction. Pre-construction surveys will document the baseline condition and determine if any features qualify as significant wildlife habitat as per evaluation methods described in the NHA (Section 5.0). Any confirmed areas of significant wildlife habitat may be subject to a post-construction monitoring program to assess any actual operational effects to wildlife use. The program will incorporate pre-construction methods and supplemental surveys

where appropriate. **Table 1, Appendix A** provides a summary of these potential monitoring components by feature type. Complete methods are provided in **Appendix B**.

MNR, along with the proponent and other relevant agencies, will collectively review the results of the post-construction monitoring to determine if an ecologically significant disturbance/avoidance effect is occurring, and whether such an effect is attributable to the wind turbines and not external factors. These discussions will determine if and when contingency measures will be undertaken. The best available science and information should be considered when determining appropriate mitigation.

2.4 REPORTING AND REVIEW OF RESULTS

Annual post-construction monitoring reports will summarize and analyze the results of all wildlife surveys. Reports will be submitted to the MOE within three months of the conclusion of the November mortality monitoring.

The monitoring program will be reassessed by MNR and GVWF at the end of each monitoring year. Pending the reassessment results, the program methods, frequencies, and duration may be reasonably modified to better reflect the findings.

3.0 Adaptive Management Program

The adaptive management program described in this section outlines performance objectives, and contingency measures that will be implemented should the performance objectives not be met.

Contingency measures may include an adaptive management approach. An adaptive management program allows mitigation measures to be implemented in the event that unanticipated potentially significant adverse environmental effects are observed. Potentially significant adverse effects will be assessed through review of the annual report.

The following sections describe the procedures for notifications, reporting and adaptive management for mortality and disturbance effects monitoring. An additional section describes a contingency plan for both birds and bats if mass mortality occurs/continues after implementation of the mitigation measures discussed below.

3.1 MORTALITY MONITORING

All bird and bat mortality will be reported in the annual report submission. Mortality rate is expressed as the number of fatalities per turbine per year (e.g. from May 1 to November 30). Mortality of priority species in Bird Conservation Region (“BCR”) 13 and mortality of all species of conservation concern, such as raptors and declining woodland breeding bird species, will be highlighted in the annual post-construction monitoring reports. A threshold approach will be used to identify and mitigation potential negative effects resulting from the operation of wind turbines.

3.1.1 Birds

Post-construction mitigation, including operational controls, will be considered if annual mortality (e.g. from May 1 to November 30) of birds exceeds any of the following thresholds defined by the MNR (2011a):

- 14 birds/ turbine/year at individual turbines or turbine groups;
- 0.2 raptors /turbine/year across a wind power project; or
- 0.1 raptors of provincial conservation concern/turbine/year across a wind power project.

Or if bird mortality during a single mortality monitoring survey exceeds:

- 10 or more birds at any one turbine; or
- 33 or more birds (including raptors) at multiple turbines.

Mortality levels maintained below these thresholds are considered unlikely to affect bird populations (MNR 2011a).

Any and all observed mortality of species at risk (i.e., a species listed as Endangered, Threatened or Special Concern under Schedule 1 of the federal SARA or a species listed on the Species at Risk in Ontario list as Extirpated, Endangered, Threatened, or Special Concern under the provincial ESA) that occurs will be reported immediately to EC and/or the MNR.

If with due consideration of seasonal abundance and species composition, annual mortality levels at turbines located outside 120 m of bird SWH exceed the thresholds noted above, two years of subsequent scoped mortality and cause and effects monitoring will be conducted. Following scoped monitoring, post-construction mitigation (e.g., operation mitigation) and effectiveness monitoring may be required at individual turbines where a mortality effect has been identified or significant annual mortality persists (MNR 2011a).

If significant annual mortality persists, MNR will be engaged to initiate an appropriate response plan as set out in the MNR's Bird Guidelines (2011a). The response plan would include an analysis of the species, timing and distribution of fatalities to determine potential risk factors leading to mortality. The analysis may include an evaluation of the mortality data and/or behavioral studies to better refine when and where species are most at risk of collision. The results of this analysis will be used to develop mitigation measures, which may include some or all of the following mitigation measures (or alternate plan reasonably agreed to between GWWF and the MNR¹):

- Periodic shut-down of select turbines at specific times of year (MNR 2011a)
- Blade feathering at specific times of year (MNR 2011a)

In the unlikely event of a mass mortality occurrence, a contingency plan is discussed below in Section 3.2.1.

3.1.2 Bats

Operational mitigation is required where annual post-construction mortality monitoring exceeds 10 bats per turbine per year (MNR, 2011b).

Operational mitigation to be implemented includes increasing cut-in speed to 5.5 m/s or feathering wind turbine blades when wind speeds are below 5.5 m/s between sunset and sunrise, from July 15 to September 30. This mitigation should continue for the duration of the project, as set out in the MNR's Bat Guidelines (2011b).

¹ An alternate plan maintains flexibility within the Plan to consider alternative response ideas that may arise over the course of the Plan (e.g., new technologies that may reduce bird or bat fatalities).

In the event of continued significant bat mortality occurrence, a contingency plan is discussed below in Section 3.3.2.

Where post-construction mitigation is applied for either birds or bats, an additional 3 years of effectiveness monitoring is required (MNR 2011b).

3.2 CONTINGENCY PLAN

3.2.1 Contingency Plan for Mass Mortality of Birds

To date, there have been no recorded events of mass mortality of birds at wind farms in Ontario. The various post-construction monitoring projects in Ontario typically record between 0 to 2 bird fatalities at individual turbines during any one survey, with only a single record of 3 birds fatalities observed at one turbine during a single visit (Friesen, 2011). As such, the risk of a mass mortality event for birds is anticipated to be very low.

In the event of a mass mortality event, defined as 10 or more bird fatalities at any one turbine, or 33 or more bird fatalities at multiple turbines on a single survey, the following steps will be implemented:

1. MNR will be notified of the event immediately and will be provided with any available details (e.g. species, number and distribution of turbines involved).
2. An emergency search of all turbines in the project will be conducted as soon as feasibly possible to determine the extent and the distribution of the mortality event.
3. An analysis of the results of the emergency search will be completed to identify potential risk factors (e.g., weather conditions, proximity to natural heritage features) leading to the mortality event.
4. Based on the risk factors identified, additional mitigation and scoped monitoring recommendations will be developed in conjunction with MNR with the goal of avoiding future mortality events.

3.2.2 Contingency Plan for Continued Significant Bat Mortality

Additional mitigation measures may be implemented in the event of continued significant bat mortality (i.e., more than 10 bats/turbine/year) after the mitigation measures outlined in Section 3.1.2 have been implemented. Should the cut-in speed mitigation be implemented and the bat mortality threshold continues to be exceeded, GVWF will work with the MNR to determine additional mitigation and scoped monitoring requirements.

3.2.3 Contingency Plan for Significant Wildlife Habitat

MNR along with the proponent will be asked to collectively review the results of the post-construction monitoring to determine if an ecologically significant disturbance/avoidance effect has occurred and whether such an effect is attributable to the wind turbines and not external factors.

Should performance objectives not be met for the potential additional monitoring components identified in Section 2.2.3, the following actions will be implemented:

- Compare declines to population trends noted through local or province-wide monitoring;
- Develop additional control/impact studies to assess whether decline is due to turbine disturbance, and determine extent of disturbance effect; and/or
- Investigate habitat management means to improve trend.

Additional monitoring and/or mitigation may be required where post-construction monitoring identifies ecologically significant disturbance/avoidance effects associated with the habitat. Mitigation techniques may include (but are not limited to) operational controls, such as periodic shut-down and/or blade feathering as per MNR's Bird and Bird Habitat Guidelines (2011). Results will be reviewed collectively by the proponent, MNR and other relevant agencies to determine if and when additional monitoring and/or mitigation is required. The best available science and information should be considered when determining appropriate mitigation.

Contingency measures are summarized by features type in **Table 1, Appendix A**.

4.0 Best Management Practices

GVWF will include the following best management practices as part of the post-construction monitoring program (as outlined in MNR, 2011a and 2011b).

4.1 DATA MANAGEMENT

All pre- and post-construction data, collected in accordance with MNR guidance and reported to the MOE, will be submitted to the joint Canadian Wildlife Service – Canadian Wind Energy Association – Bird Studies Canada – Ontario Ministry of Natural Resources Wind Power and Birds Monitoring Database.

4.2 WHITE-NOSE SYNDROME

Carcasses of the following species found during bat mortality searches may be sent to the Canadian Cooperative Wildlife Health Centre for analysis of White-nose Syndrome and should not be used in carcass removal or searcher efficiency trials:

- *Myotis septentrionalis*
- *Myotis lucifugus*
- *Myotis leibii*
- *Perimyotis subflavus*
- *Eptesicus fuscus*

4.3 BAT TISSUE SAMPLES

Tissue samples from bat carcasses may be used in a number of DNA analyses to provide insight into population size and structure, as well as the geographic origin migrants. GVWF will contact the local MNR office prior to disposing bat carcasses, to determine if this type of research is occurring in the area.

5.0 Closure

This Environmental Effects Monitoring Plan for Wildlife for the Grand Valley Wind Farms - Phase 3 Wind Project has been prepared by Stantec for GVWF in accordance with Ontario Regulation 359/09.

This report has been prepared by Stantec for the sole benefit of GVWF, and may not be used by any third party without the express written consent of GVWF. 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.

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6.0 References

- Friesen, L. 2011. No evidence of large-scale fatality events at Ontario wind projects in *Ontario Birds*, Volume 29, No. 3, December 2011: pages 149- 155.
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- Ontario Ministry of Natural Resources. 2009. Approval and Permitting Requirements Document for Renewable Energy Projects. 200 pp.
- Ontario Ministry of Natural Resources. 2011a. Birds And Bird Habitats: Guidelines For Wind Power Projects. 32 pp.
- Ontario Ministry of Natural Resources. 2011b. Bats And Bat Habitats: Guidelines For Wind Power Projects. 25 pp.

Appendix A

Table 1. Summary Of EEMP For Significant Natural Features

Table 1. Summary of the Environmental Effects Monitoring Plan for significant/provincially significant natural features

Unique Feature ID	Potential Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
Significant Wetlands	Potential disturbance effects to wetland hydrology and potential sedimentation. Indirect impacts such as dust generation, sedimentation and erosion and spills, are mitigated via measures described in Table B8, Appendix B.	Maintain hydrological flows to significant wetlands.	Infrastructure sited outside of all candidate significant bat maternity colonies. Installation of culverts to maintain hydrological conditions. See Table BA, Appendix B for complete mitigation measures.	Inspection of culverts to ensure flow maintained.	The periphery of significant wetlands.	Hydrological conditions will be monitored once seasonally in each of spring and summer during the first year post-construction.	Determine if there is a disturbance to hydrological conditions that could impact provincially significant wetland features.	Notify MNR of hydrological issues and actions taken to resolve the issue. Any negative impacts that occurred to the provincially significant wetland will also be reported to MNR and where necessary will be restored.	Contingency measures will be determined in consultation with MNR.
Significant Woodlands	Indirect impacts related to infrastructure maintenance, such as dust generation, sedimentation and erosion, spills, accidental damage to trees, and noise/light disturbances to wildlife are mitigated via measures described in Table B8, Appendix B.	Minimize potential indirect impacts to the extent possible.	Infrastructure sited outside of all candidate significant bat maternity colonies. Implement mitigation strategies as described in Table B8, Appendix B.	Not required.	Not required.	Not required.	Not required.	Not required.	Not required
Amphibian Breeding Habitat (Woodland and Wetland): ABWO-1 to ABWO-9, AWBO-13-15, and ABWE-2 (Pre-construction survey required to verify significance of these features. If significant the following mitigation measures, monitoring plan and contingency measures will be implemented)	Loss of species diversity and abundance through habitat damage.	Continued use of the habitat by breeding amphibians. No amphibian mortality on access roads.	Infrastructure sited outside of all candidate significant amphibian breeding habitats (woodland and wetlands) Speed limit signage will be erected to restrict vehicle speeds to 30km/hr Restrict vehicle traffic to daytime hours, and limit speeds to 30 km or less on roads near woodland amphibian breeding ponds (including signage). Limit maintenance activity within 120 m of significant amphibian habitats to daylight hours between March 15 and June 30 (for significant frog breeding habitats) to avoid excessive noise and vehicle caused mortality. See Table BA, Appendix B for complete mitigation measures.	Anuran call surveys in April, May, and June. Pre-construction monitoring protocol is detailed in the EIS. Call surveys will be conducted following Bird Studies Canada's <i>Marsh Monitoring Protocol (BSC 2003)</i> . See Section 5.3.3.1 of the report for full details. Post-construction monitoring will follow the same methods.	Within features listed. Post-construction monitoring locations will be the same as pre-construction monitoring locations.	Pre-construction Survey (baseline): • Spring 2013 Post-construction Survey: • Spring 2015 (for all significant features) Post-construction Survey if required based on results of Spring 2015 survey and consultation with MNR: • Spring 2016 (for all significant features) • Spring 2017 (for all significant features)	Determine if there is a loss of species abundance through displacement or avoidance effect caused by infrastructure located in proximity to habitat.	Annual Reports submitted to MNR. Estimated Report Submission Dates: 1. Summer 2013 (preconstruction data) 2. Summer 2015 (yr 1 post-construction) If required based on results of Spring 2015 survey and consultation with MNR: 3. Summer 2016 (yr 2 post-construction) 4. Summer 2017 (yr 3 post-construction)	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken. Because no operational impacts to this habitat are anticipated, if no impacts are observed after one year of post-construction monitoring, monitoring will not continue after one year.
Bat Maternity Colonies (BMC-1 and BMC-2)	Habitat Avoidance/disturbance potentially caused by turbines within 120m:	Continued use of the habitat by the species (Little brown	Infrastructure sited outside of all candidate significant bat maternity colonies.	All features deemed significant will be surveyed post-	A map illustrating selected survey	Exit surveys will be conducted in all significant bat maternity	Determine if there is a displacement or avoidance	Pre-construction: September 2013 (pre-	Upon submission of annual post-construction monitoring reports to MNR it will be

Table 1. Summary of the Environmental Effects Monitoring Plan for significant/provincially significant natural features

Unique Feature ID	Potential Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
(Pre-construction survey required to verify significance of BMC-1. If significant the following mitigation measures, monitoring plan and contingency measures will be implemented). No access to BMC-2, assumed significant	T102 (BMC-1) T105 (BMC-2)	bat, Eastern Small-footed bat, Northern Long-eared bat, Tricolored Bat, or Silver-haired Bat) that currently inhabit the feature. White nose syndrome may have an impact on the abundance of bats, specifically Northern long-eared and Little Brown bats.		construction using the same methods (exit counts). See Section 5.3.3.2 of the report for full details.	trees within candidate significant bat maternity colony habitat will also be provided to MNR.	colony features for a period of 3 years beginning the first year of operation: <ul style="list-style-type: none"> Year 1 - June 2015 Year 2 - June 2016 Year 3 - June 2017 	effect caused by turbines located within 120m of bat maternity colonies.	construction exit survey results) <p>Post-construction Reports:</p> <ol style="list-style-type: none"> Year 1 - September 2015 Year 2 – September 2016 Year 3 – September 2017 	determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken.
Waterfowl Nesting Areas (WNA-3 and WNA-4) (Pre-construction survey required to verify significance of these features. If significant the following mitigation measures, monitoring plan and contingency measures will be implemented)	Habitat Avoidance/disturbance potentially caused by turbines within 120m: T110 (WNA-3) T112 (WNA-4)	Continued use of the habitat by breeding waterfowl.	Infrastructure sited outside of all candidate significant waterfowl nesting habitats. See Table BA, Appendix B for complete mitigation measures.	All features deemed significant will be surveyed post-construction monitoring (brood rearing surveys) using the same methods. See Section 5.3.3.4 of the report for full details.	Within features listed. Post-construction monitoring locations will be the same as pre-construction monitoring locations.	Pre-construction Survey (baseline): <ul style="list-style-type: none"> Spring 2013 Post-construction Survey: <ul style="list-style-type: none"> Spring 2015 (for all significant features) Post-construction Survey if required based on results of Spring 2015 survey and consultation with MNR: <ul style="list-style-type: none"> Spring 2016 (for all significant features) Spring 2017 (for all significant features) 	Determine if there is a loss of species abundance through displacement or avoidance effect caused by infrastructure located in proximity to habitat.	Annual Reports submitted to MNR. Estimated Report Submission Dates: <ol style="list-style-type: none"> Summer 2013 (preconstruction data) Summer 2015 (yr 1 post-construction) If required based on results of Spring 2015 survey and consultation with MNR: <ol style="list-style-type: none"> Summer 2016 (yr 2 post-construction) Summer 2017 (yr 3 post-construction) 	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken. Because no operational impacts to this habitat are anticipated, if no impacts are observed after one year of post-construction monitoring, monitoring will not continue after one year.
Marsh Bird Breeding Habitat (MBB-1) (Pre-construction survey required to verify significance of these features. If significant the following mitigation measures, monitoring plan and contingency measures will be implemented)	Habitat Avoidance/disturbance potentially caused by turbines within 120m: T104 (MBB-1)	Continued use of the habitat by marsh breeding birds	Infrastructure sited outside of all candidate significant marsh bird breeding habitats. See Table BA, Appendix B for complete mitigation measures.	All features deemed significant will be surveyed post-construction monitoring (breeding bird surveys) using the same methods. See Section 5.3.3.3 of the report for full details.	Within features listed. Post-construction monitoring locations will be the same as pre-construction monitoring locations.	Pre-construction Survey (baseline): <ul style="list-style-type: none"> Spring 2013 Post-construction Survey: <ul style="list-style-type: none"> Spring 2015 (for all significant features) Post-construction Survey if required based on results of Spring 2015 survey and consultation with MNR: <ul style="list-style-type: none"> Spring 2016 	Determine if there is a loss of species abundance through displacement or avoidance effect caused by infrastructure located in proximity to habitat.	Annual Reports submitted to MNR. Estimated Report Submission Dates: <ol style="list-style-type: none"> Summer 2013 (preconstruction data) Summer 2015 (yr 1 post-construction) If required based on results of Spring 2015 survey and consultation with MNR: <ol style="list-style-type: none"> Summer 2016 (yr 2 post-construction) Summer 2017 (yr 3 post-construction) 	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken. Because no operational impacts to this habitat are anticipated, if no impacts are observed after one year of post-construction monitoring, monitoring will not continue after one year.

Table 1. Summary of the Environmental Effects Monitoring Plan for significant/provincially significant natural features									
Unique Feature ID	Potential Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
						(for all significant features) • Spring 2017 (for all significant features)			

Appendix B

Post-Construction Monitoring Methods

Post-Construction Survey Methods: Anuran Call Surveys (ABWE2, AMBO1-9, and ABWO1-5)

Anuran call surveys will be conducted within all features, with evaluation methods to follow the 'Marsh Monitoring Protocol' (BSC, 2003). Amphibian call surveys will be conducted three times in 2013 between April, May, June. In some areas of the province, primarily southern Ontario, surveys may need to begin in March, with at least 15 days between each survey. Monitoring stations will be established a minimum of 500 m apart and 3 minute surveys were performed at each station, listening for all amphibian calls within a semi-circular sampling area. The locations of these surveys were determined in the field where vernal pooling is present at the first survey, incorporating pre-construction survey locations described in the NHA (Stantec 2012) and on accompanying figures. The surveys will be conducted in the same locations for all three surveys. Surveying will begin one half-hour after sunset and end by midnight during evenings with little wind and minimum night air temperatures of 5^oC, 10^oC and 17^oC for each of the three respective survey periods. These temperature requirements are in place because amphibian calling intensity is strongly associated with season, time of day, and weather conditions.

Additional information that will be recorded on the appropriate data forms include:

- Weather conditions (temperature, wind speed (on a Beaufort scale), % cloud cover, and presence of any precipitation should be recorded).
- Date, time of day, and duration.
- Description of habitats or areas scanned during the surveys
- GPS coordinates of the call stations.
- Name of the observer(s) doing field work.
- Complete list of all amphibian species observed

Call abundance codes for each amphibian species detected as outlined below:

- Code 1: individual calls do not overlap and calling individuals can be discretely counted; NOTE: individual frogs need to be counted if Code 1 is assigned.
- Code 2: calls of individuals sometimes overlap, but numbers of individuals can still be estimated; NOTE: individual frogs need to be counted if Code 2 is assigned.
- Code 3: overlap among calls seems continuous (full chorus), and a count estimate is impossible; NOTE: individual frogs cannot be counted if Code 3 is assigned.

Post-Construction Survey Methods: Exit Surveys (BMC-1 and BMC-2)

Exit surveys will be conducted in the month of June within bat maternity colony BMC-1 (property access is not permitted to BMC-2). Each of a minimum 10 selected snag/cavity trees (i.e., BMC-1 is <10ha) will be monitored from 30 minutes before dusk until 60 minutes after dusk in

order to observe evidence of bats exiting the candidate snag/cavity tree. Each candidate roost tree will be monitored once.

Bat surveys and data analysis will be conducted by a biologist experienced in bat identification, monitoring. Acoustic analysis will also be conducted by experienced staff. A handheld GPS unit will be used to georeference trees where exit surveys are completed.

Candidate snag trees will incorporate trees identified during pre-construction surveys to the extent possible. The best candidate snag trees will be selected according to the following criteria (in order of importance):

- Tallest snag/cavity tree;
- Exhibits cavities or crevices most often originating as cracks, scars, knot holes or woodpecker cavities;
- Has the largest diameter breast height
- Is within the highest density of snags/cavity trees (e.g. clusters of snags);
- Has a large amount of loose, peeling bark;
- Cavity or crevice is high in snag/cavity tree (>10m);
- Tree species that provide good cavity habitat (e.g. white pine, maple, aspen, ash, oak);
- Canopy is more open (to determine canopy, determine the percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of the foliage of trees) and
- Exhibits early stages of decay (decay class 1-3; refer to Watt and Caceres 1999)

Candidate roosts trees should be monitored for evidence of maternity colonies through exit surveys as follows:

- Observers should choose a viewing station with a clear aspect of cavity opening or crevice (multiple observers may be required if multiple openings are present in one snag)
- Surveys will be completed with the use of either human visual observation and/or the use of a low light, night-vision, or infrared video recorders. For the use of video recorders, viewing stations will be set-up prior to the exit survey timing window and will be conducted in the same habitat as where there are also human visual exit surveys being conducted. Once an evening's monitoring is completed (60 minutes after sunset), the cameras will be collected by the field staff conducting visual surveys in the same habitat and the visual recordings for the each video recorder will be reviewed for evidence of significant bat roosting activity. After a suitable camera model has been identified, field staff will provide detailed camera specifications to the Ontario Ministry of Natural Resources prior to the onset of monitoring for confirmation that it will collect the information required.
- A bat detector should be used in conjunction with visual surveys to determine species. Microphones will be positioned to maximize bat detection (e.g. situated away from nearby obstacles to allow for maximum range detection, microphones angled slightly

away from the prevailing wind to minimize wind noise). The same broadband detector will be used throughout the survey. Information on the equipment used will be recorded, including information on all adjustable settings (e.g. gain level) and the position of the microphone. Audio data collected will be analyzed by biologists who are experienced in bat identification and monitoring.

Additional information that will be recorded on the appropriate data forms include:

- Weather conditions (temperature, wind speed (on a Beaufort scale), % cloud cover, and presence of any precipitation should be recorded);
- Date and time of day;
- GPS coordinates of the point location; and,
- Name of the observer doing field work

Post-Construction Survey Requirements: Breeding Bird Surveys (MBB-1)

Point count stations are located approximately 250 m apart throughout MBB1 as located in the NHA (Stantec 2012). Each station will be surveyed a minimum of 3 times: once early in the season (late May to early June); once in mid-season (mid to late June); and, once later in the season (July) with at least 10 days between surveys at a particular station. Each of the surveys will include a ten-minute point count at each location, conducted during the breeding season (May 1 to July 31). Point counts must be performed in the early morning, between dawn (one half hour before sunrise) and about 4 hours after sunrise. Surveys in late June and early July will be completed within 3 hours of sunrise. Surveys will be performed when the wind speed is 3 or less on the Beaufort scale and when there is no precipitation.

At each station, the surveyor will observe for ten minutes, recording all species seen or heard, along with an estimate of the number of individuals of each species and the highest level of breeding evidence observed. Surveyors will estimate the distance to each bird using a scale of 0–50 m, 50–100 m and further than 100 m. Birds that move during the survey will be recorded in the closest distance category that they entered during the survey. Data that will be reported are the number of birds of each species detected in each distance band. Birds that fly over without stopping should be recorded separately as 'fly-overs'.

Playback surveys will supplement standard point counts to target less conspicuous species including Pied-billed Grebe, American Bittern, American Coot, Common Moorhen, and Virginia Rail. Playback surveys will immediately succeed 10 minute point counts at each station as follows:

- Surveys will play series of three calls (20 seconds) for each species, followed by 30 seconds of silence, documenting all species heard during periods of silence.
- A minimum of one minute of silence will occur between playback calls of different species.

Additional information that will be recorded on the appropriate data forms include:

- Weather conditions (temperature, wind speed (on a Beaufort scale), % cloud cover, and presence of any precipitation should be recorded).
- Date and time of day.
- GPS coordinates of each point location (same location is to be used for each survey).
- Name of the observer doing field work.

Post-Construction Survey Requirements: Brood Rearing Surveys (WNA-1 and WNA-3)

Area searches will be conducted at all open aquatic portions of the features using a combination of point counts and area searches. Surveyors will walk along routes specified in the NHA (Stantec 2012) to flush any occurring waterfowl, stopping at point counts and visually scanning open water for 10 minutes to observe swimming waterfowl.

Point count stations are located approximately 250 m apart throughout WNA-3 and WNA-4 to allow the entire open aquatic features to be observed. Each of the surveys will include a 10-minute point count at each location, conducted during the breeding season (May 1 to July 31). Each station will be surveyed a minimum of 3 times: once early in the season (May); once in mid-season (June); and, once later in the season (July) with at least 10 days between surveys at a particular station. Surveys must be performed during morning hours, between sunrise and about 6 hours after sunrise. Surveys will be performed when the wind speed is 4 or less on the Beaufort scale and when there is no precipitation.

At each station, the surveyor will observe for 10 minutes, recording all species seen or heard, along with an estimate of the number of individuals of each species, including estimates of brood size. Data that will be reported are the number of birds of each species detected during each the area search and point counts. Birds that fly over without stopping should be recorded separately as 'fly-overs'. Additional information that will be recorded on the appropriate data forms include:

- Weather conditions (temperature, wind speed (on a Beaufort scale), % cloud cover, and presence of any precipitation should be recorded).
- Date and time of day.
- GPS coordinates of each point location (same location is to be used for each survey) and walking transect.
- Name of the observer doing field work.