Attachment M

Cumulative Effects Considerations

OSTRANDER POINT WIND ENERGY PARK
CUMULATIVE EFFECTS ASSESSMENT REPORT

File No. 160960369
May 2011

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1.0 Introduction

Gilead Power Corporation ("Gilead") is an Ontario-based private, renewable energy development company dedicated to providing renewable energy for Ontario. In response to the Government of Ontario's initiative to promote the development of renewable, pollution-free electricity in the province, Gilead is proposing to develop the Ostrander Point Wind Energy Park (the Project) in Prince Edward County, Ontario.

The basic components of the Project include nine (9) GE xl 2.5 MW wind turbine generators with a total installed nameplate capacity of 22.5 MW, transformers included within each turbine, one on-site substation including transformer and electrical collector lines. This system will transport the electricity generated at the wind farm to Hydro One Networks Inc.'s (Hydro One's) Distribution Network. The Project also includes roads that provide access to the turbines for ongoing maintenance as well as electrical equipment and systems required for interconnection to the Hydro One grid. The turbines will be situated exclusively on Crown land, known as the Ostrander Point Crown Land Block.

Gilead 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). The REA application includes the Natural Heritage Assessment/Environmental Impact Statement (NHA/EIS) that examines Project-specific effects, mitigation and monitoring activities related to the natural environment. Consideration of cumulative effects is not specifically required by O. Reg. 359/09, with the exception of the noise assessment completed and contained within the Design and Operations Report.

This report considers potential cumulative effects of the Project. It has been produced in response to public interest in how other nearby wind projects that exist or may exist in the future could, in combination with the Project, act cumulatively on the environment.

2.0 Scope of Cumulative Effects Assessment

Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions (Hegmann et al. 1999). To assess cumulative effects, it is necessary to determine whether a project has an effect on the environment and whether there are other projects or activities within a defined study area that have a similar effect on the environment. If effects of the Project have potential to combine with effects of existing or planned projects, a cumulative effect is possible. Cumulative effects assessment (CEA) determines how much of the change is attributable to the project under consideration and how much of the change occurs or has occurred because of other activities.

Scoping is used to identify temporal and spatial boundaries, valued ecosystem components (VECs) and key issues or effects to be considered in the analysis phase in an effort to focus the assessment of cumulative effects.

The scoping exercise builds on the potential effects identified as part of the Project-specific effects assessment [these were assessed as part of the NHA/EIS and other REA reports]. In this case, information and conclusions from the NHA/EIS have assisted in scoping of the CEA, including: activity descriptions, environmental baseline, identification of issues and VECs, types of effects caused, mitigation measures and residual or net effects.

Setting boundaries is the process of establishing limits to the area and period of time examined in an assessment. There are two types of boundaries: spatial (i.e., how far?), and temporal (i.e., how long into the past and into the future?).

It is well established that activities such as overhead power lines, tall buildings, communication towers, windows, cars and cats have higher mortality impacts on avian populations than do wind turbines (Erickson et al., 2005; NWCC, 2010; NAS, 2007; Drewitt and Langston, 2008). Though wind turbines have lower impacts, Drewitt and Langston (2008) note that the effects of wind turbines on birds have been subject to more extensive and detailed study than any other type of structure. Other anthropogenic facilities contributing to bird mortality within a reasonable distance of the CEA Study Area are existing roads, residential windows, recreational uses (i.e. ATVs, hunting) of public lands, buildings and the Point Petre Antennae site. Given the long history of colonization and regional habitat modification within Prince Edward County (and indeed, in Southern Ontario), this scale of assessment is logistically impractical for this CEA. In addition, these past and present activities have been taken into account as inherent to the existing baseline environmental conditions against which the project-specific effects and this CEA are based. These types of large-scale, new projects within the CEA Study Area are not known to be planned for in the near future.

Wind energy projects have unique physical, construction and operational characteristics. As such, they have unique cause and effect relationships with VECs. In addition, expressed public interest in cumulative effects related to the Ostrander Point Wind Energy Park is predominately

directed at the potential interaction of multiple wind projects within and immediately surrounding Prince Edward County.

For these reasons this CEA will examine the potential cumulative effects among existing and proposed wind energy projects within the regional landscape (i.e., the CEA Study Area).

2.1.1 Determination of Valued Ecosystem Components

VECs (assessed components of the environment) have the potential to interact with project components. They are the environmental element that is identified as having importance. Within the NHA/EIS and other REA Reports, the Project's effect on VECs was assessed (however, the term "VEC" was not used in the REA process).

Generally, a screening for cumulative environmental effects is conducted to determine if there is potential for a cumulative environmental effect. A series of three factors is used to screen cumulative environmental effects. In order for a VEC to be assessed for potential cumulative effects, it must normally meet the following criteria:

- There must be a Project-related residual or net environmental effect.
- The Project-related environmental effect must overlap with those of other past, present and future activities that have been or will be carried out.
- The Project contribution to cumulative environmental effects is substantive and measurable or discernible such that there is some potential for substantive cumulative environmental effects that are attributable to the Project.

The VECs assessed within the REA process were identified based on the requirements of O. Reg. 359/09, the Ministry of Natural Resources (MNR) APRD document, public input and professional judgement. The Project was assessed for the potential effects it may have on these VECs. For example, the Project's potential effects on migratory landbirds, congregatory species, waterfowl and colonial waterbirds/seabirds were assessed.

To mitigate potential effects to VECs, the Project was modified to avoid the potential effect and/or methods were identified to mitigate the potential effect. This analysis and its results are detailed in the NHA/EIS and other REA reports. It was concluded in the NHA/EIS that construction and operation of the Project would not have a significant residual environmental effect after implementation of mitigation measures.

The conclusions of the NHA/EIS and REA reports do not suggest that a CEA would be required for the Project. Notwithstanding these conclusions, there are a number of VECs in which there is continuing public interest. As a result, these VECs have been subjected to additional construction or post-construction monitoring as described in the Project's *Environmental Effects Monitoring Plan.*

Several of the VEC's are assessed under additional legislation such as the *Endangered Species Act* (ESA). This legislation requires an assessment of potential effects to the VEC prior to approvals/permits being granted. For example, for projects proposed in the area of a species listed under the ESA, it must be demonstrated that there will be an "Overall Benefit" to the listed species before the ESA permit can be granted. The outcome of the overall benefit proposal must be to improve the relative standing of a species after taking into account the residual adverse effects to the species and/or its habitat. For any species listed under the ESA (such as Blanding's turtle or Whip-poor-will), the ESA permitting process ensures that effects to listed species will be mitigated and/or compensated. As such, these species are not assessed within this CEA.

In consideration of the VECs that were assessed under the REA process, the decision-making process described above, and public interest, the VECs that are examined further in this CEA include:

- migratory landbirds;
- shrubland/successional breeding birds; and
- bats.

As described in Section 2.0 above, this CEA includes the assessment of cumulative effects among existing and proposed wind energy projects within the regional landscape.

With respect to birds, results of the extensive site investigation work program have concluded that the Project site does not support concentrations of waterfowl and colonial waterbirds/seabirds. These types of birds do not use the site in large numbers for staging, feeding, or breeding and nesting. As such, these groups of birds are not anticipated to be directly impacted by the Project. Therefore, the Project, in conjunction with others in the CEA Study Area, will not act cumulatively on these types of birds.

Furthermore, with implementation of the mitigation measures described in the Project's NHA/EIS, the Project is not expected to have a measureable effect on populations of migratory landbirds, shrubland/successional breeding birds, and bats. However, due to public interest in these VECs, they have been brought forward within the CEA.

The amount and type of habitat to be directly affected by the Project has been described and assessed within the NHA/EIS and other REA reports. This level of information is not available for all of the other proposed activities assessed for this CEA.

However, generally based on the amount of land occupied by the Project and the other activities, the amount of habitat loss is not anticipated to significantly increase cumulative effects from that which are already occurring from other actions (i.e. roads, agricultural and residential land uses) occurring within the CEA Study Area and the greater region. The CEA Study Area

(see **Section 2.1.2**) is proposed to contain 166 turbines in total; however the Project constitutes only 9 turbines (5% of the total).

Given this very small amount of habitat modification relative to the larger area, sufficient habitat suitable for migrating landbirds will remain available within the CEA Study Area. Opportunities for migrating landbird movement and stopovers along this part of eastern Lake Ontario shoreline will be maintained and unaffected by the Project and other activities. Therefore, the amount of habitat loss, cumulative with that caused by the other activities, is not further evaluated within this CEA.

2.1.2 CEA Study Area

The CEA Study Area is comprised of the geographical extent within which the certain and reasonably foreseeable activities could have an effect on a VEC. The VECs could be acted upon in a cumulative manner in the event that they travel within the CEA Study Area and experience an effect from more than one activity.

The CEA Study Area is shown on **Figure 1**. Selection of a CEA Study Area was based on the location of the reasonably foreseeable or certain activities that may have an observable interaction with the Ostrander Point Wind Energy Park on the selected VECs, thus potentially resulting in a cumulative effect. The CEA Study Area also takes into consideration how the VECs could potentially move and come into contact with the Ostrander Point Wind Energy Park and the others. For example, the movement of the front of migratory landbirds or bats and how this population could interact with the projects. This contrasts with shrubland/successional breeding birds, which have relatively compact (1 ha or less) home ranges in proximity to their nests. These biological behaviours have a direct bearing on the potential interaction of these species between the Ostrander Point Wind Energy Park and other wind projects within the CEA Study Area. There is a higher likelihood of migratory landbird or bat fronts coming into contact with multiple projects than there is with shrubland/successional breeding birds. These potential interactions are described later in this report.

2.1.3 Temporal Boundaries

The assessment of cumulative effects is based on current conditions as identified in the assessment baseline completed for the NHA/EIS and other REA documents.

This CEA considers future activities that are certain or reasonably foreseeable, specifically wind energy projects that have potential to interact with the Ostrander Point Wind Energy Park VECs. These projects are defined as follows:

- *Certain* activities are those that exist or have a high probability of proceeding (i.e. a wind energy project with provincial environmental approval under the *Environmental Assessment Act* or O. Reg. 359/09 under the *Environmental Protection Act*, and a power purchase agreement such as a Feed-in-Tariff contract with the Ontario Power Authority).

- *Reasonably foreseeable* activities are likely to proceed, but there may be some uncertainty about this conclusion (i.e. a wind energy project with a power purchase agreement, but which is in the early stages of the provincial environmental approvals process). This is based on information available at the time of the assessment and recognizes that there is a reduced ability to predict potential effects at points further into the future. For example, these projects may undergo changes to their design or location before they reach commercial operation.

As noted above, *reasonable foreseeable* or *certain* activities were considered to include those wind projects where the Ontario Power Authority has issued a Power Purchase Agreement (such as a Feed-in-Tariff or Renewable Energy Supply contract) and the project is undergoing or has completed the provincial environmental assessment/permitting process. Given this definition, the activities listed below, and shown on **Figure 1**, have been included in this cumulative effects assessment. Where specific wind turbine locations are known through publically available information, they have been shown on the map. Where a project's wind turbine locations are unknown, only the projects study area is shown, as available through publically released notices or reports.

The CEA addresses the period after which these activities become commercially operational, which is expected to occur in approximately 2014 or 2015.

2.1.3.1 Certain Activities

The following activity is currently in existence and is operational within the CEA Study Area:

- Wolfe Island Wind Farm – 197.8 MW – 86 turbines (Siemens SWT-2.3-93 Mark II) – nearest turbine is approximately 47 km from the Project.

2.1.3.2 Reasonably Foreseeable Activities

The following projects possess a Power Purchase Agreement and are undergoing the provincial environmental approval process (i.e., REA):

- White Pines Wind Project – 60 MW – 29-30 turbines (REpower 2.05) – adjacent to the Project.

- Amherst Island Wind Project – 75 MW – 30-35 turbines (make and model unknown) – approximately 27 km from the Project.

- Ernestown Wind Park – 10 MW – 4-6 turbines (make and model unknown) – approximately 40 km from the project.

3.0 Potential Cumulative Effects Analysis

The following describes the potential cumulative effects to the VEC's identified through the scoping process (see **Section 2.0**).

Mitigating potential effects at the source is the best way to reduce the potential for cumulative environmental change. For example, the implementation of contingency plans such as period turbine shutdown in the event of high bird mortality levels during migration will minimize/eliminate the potential for a cumulative effect. The majority of biological and physical change is anticipated to occur over a dispersed spatial area and is best mitigated at each project site. For the purposes of this assessment, it is assumed that all activities listed above have undergone, are in the process of, or will undergo, some form of environmental impact or planning assessment including the identification of mitigation measures prior to being approved for development.

3.1 MIGRATORY LANDBIRDS

3.1.1 Environmental Setting

The NHA/EIS and REA Reports prepared in accordance with O. Reg. 359/09 address the project-specific impacts of the Project. For purposes of this CEA report, to gain further information about general usage of the CEA Study Area by birds, information from BirdLife International's Important Bird Area mapping was used. As defined by BirdLife International (2011), IBAs do one (or more) of the following criteria:

- Hold significant numbers of one or more globally threatened species
- Are one of a set of sites that together hold a range of restricted-range or biome-restricted species
- Have large numbers of migratory or congregatory species

The CEA Study Area encompasses all or part of four areas denoted by BirdLife International as Important Bird Areas (IBAs). These areas, and their individual IBA criteria (as determined by BirdLife International), are as follows:

- Prince Edward County South Shore – congregatory species (waterfowl concentration, migratory landbird concentrations and colonial waterbird/seabird concentrations)

- Amherst Island –congregatory species (waterfowl concentrations and wintering owl/raptors and staging). Also noted for concentrations of staging swallows.

- Wolfe Island - congregatory species (waterfowl concentrations and wintering owl/raptors and staging). Also noted for concentrations of staging swallows.

- Napanee Limestone Plain - congregatory species (grassland and alvar birds) and threatened species (Loggerhead Shrike)

The Wolfe Island Wind Farm is located within the spatial boundaries of the Wolfe Island IBA. The Ostrander Point Wind Energy Park and the White Pines Wind Project are proposed within the Prince Edward South Shore IBA. The Amherst Island Wind Project is proposed within the Amherst Island IBA, and the Ernestown Wind Park is proposed within the Napanee Limestone Plain IBA.

3.1.2 Effects

Because landbirds typically migrate in broad fronts (Drewitt and Langston, 2008; Diehl et al., 2003; Ewert et al., 2006) a single wind project may affect a restricted portion of the population while multiple wind projects may each affect multiple portions of the population. Migrating landbirds crossing eastern Lake Ontario have the potential to intercept the activities assessed within this CEA.

The total number of migratory landbirds that would pass over the CEA Study Area or stage in the CEA Study Area during migration is unknown. Daily peak numbers recorded at Prince Edward Point (through daily censuses) have recorded 200-500 individuals of common migrants (IBA, undated). When conditions cause particularly large fallouts of migrating birds, numbers exceeding 2,000 birds have been recorded. Numbers as high as 10,000 individuals have been recorded of Tree Swallow, Yellow-rumped Warber, and White-throated Sparrow, while up to 70,000 Dark-eyed Junco have also been recorded (IBA, undated; Wilson and Cheskey, 2001).

Examples of ways in which the Project, together with one or more other wind projects, may act cumulatively on migratory landbirds is as follows:

- Direct Mortality - Birds within migrating fronts have a higher probability of mortality as a result of passing through multiple projects; and

- Avoidance - The addition of multiple projects increases a disturbance effect or reduces available habitat, thereby displacing birds to lower quality habitat or reducing fitness levels.

3.1.2.1 Direct Mortality

Overall, an increase in the number of turbines within the CEA Study Area may result in an increase in bird mortality. Each turbine that is installed has an impact by directly adding to mortality rates (Masden et al., 2010). From a conservation perspective, and inherent within the cumulative effects analysis, the critical issue is whether or not this source of mortality is sufficiently great to impact populations.

To determine predictors of mortality rates for proposed, but not yet constructed, projects within the CEA Study Area known, mortality rates from existing projects are used.

Mortality rates are available for several operating wind projects located along the Lake Erie and Lake Huron shorelines, and from inland facilities located in Dufferin County and in New York State. Mortality rates can be regional and site specific meaning that mortality rates from other regions are not necessarily predictive of rates that will occur. As such, estimating mortality rates for the Project and other certain and reasonably foreseeable activities is difficult given there are no currently operating wind facilities within the Prince Edward County region.

Geographically, the Wolfe Island Wind Farm is the only operating project located within the CEA Study Area (Stantec, 2011). One full year of mortality monitoring is available for the Wolfe Island Wind Farm; detailed methods and results are available in Stantec (2011). To estimate cumulative mortality for all projects within the CEA Study Area it was assumed that mortality levels would be comparable to those found at the Wolfe Island Wind Project. While Wolfe Island does not contain habitat types that are found within the south shore of Prince Edward County it is located along a shoreline and is within the CEA Study Area. Amherst Island is comparable to Wolfe Island in terms of habitat and geography.

The annual mortality rate (July 2009 through June 2010) at the Wolfe Island Wind Project has been estimated at 13.4 birds per turbine (Stantec, 2011). This rate includes all species across all periods of the year. The annual mortality rate includes wintering and breeding birds in addition to migrating landbirds.

For this evaluation, the Wolfe Island Wind Farm mortality rate was applied to all projects within the CEA Study Area to indicate a projected mortality rate for all wind projects in the CEA Study Area for all types of birds. As the Wolfe Island Wind Farm mortality rate includes more than just migratory landbirds, it must be noted that the use of this rate for this evaluation overestimates the effects to migratory landbirds alone. Results of this evaluation are provided in **Table 3.1**.

Table 3.1: Projected Bird Mortality Rates for All Birds based on Observed Mortality at Wolfe Island

Wind Project	Number of Turbines	Percentage of Total Number of Turbines (%)	Mortality Rate[1] (Birds per turbine per year)	Estimated Annual Mortality	Percent Contribution to Total Annual Mortality (%)
Ostrander Park Wind Energy Park	9	5	13.4	120.6	5
Amherst Island Wind Project	35	21	13.4	469	21
White Pines Wind Project	30	18	13.4	402	18
Wolfe Island Wind Farm	86	52	13.4	1,152.4	52
Ernestown Wind Park	6	4	13.4	80.4	4
Total	**166**	**100**	**13.4**	**2,224.4**	**100**

1- Based on Wolfe Island mortality rate (Stantec, 2011). Note this is the annual mortality rate; though it includes winter and breeding mortality, the majority of mortalities were incurred during the spring and fall migration period.

For all birds combined, the estimated total annual mortality from existing or reasonably foreseeable activities within the CEA Study Area is 2,224. The Project contribution to this overall effect is approximately 5% (or 121 birds). This represents only a small contribution to the overall cumulative effect of all projects.

As discussed earlier, this mortality is likely to be spread across species. However it is anticipated that the majority of fatalities would be comprised of migrating landbirds. From a review of the available literature, it appears that most collisions are of nocturnal migratory songbirds (NWCC 2010; Kingsley and Whittam, 2007), at least partly because they are the most abundant species observed at wind energy facilities (NAS, 2007).

Mortalities of migrating landbirds from wind projects within the CEA Study Area are expected to be distributed among a variety of species, most of which were found to be abundant as documented in the NHA/EIS for the Project. As a group, songbirds are considered the most abundant group in the terrestrial ecosystem (NAS, 2007). Migratory passerines that were found to be most common within the Ostrander Park Wind Energy Park site were: Yellow Warbler, Song Sparrow and Brown-headed Cowbird (in spring) and Common Grackle, European Starling (a non-native species) and Blue Jay (in fall). These species are among the most common and widespread species in Ontario and are considered to be able to respond relatively quickly to population fluctuations (Drewitt and Langston, 2008).

Mortality Thresholds

Post construction mortality surveys conducted at wind power projects in Ontario and recent studies undertaken around the world suggest that very low numbers of bird fatalities occur at

wind power projects (MNR, 2010a). Reports from wind energy facilities in Ontario and the United States have shown that approximately two birds per year are killed by individual wind turbines, which is very low compared to other existing sources of human-caused avian mortality (MNR, 2010a).

Based on known bird mortality rates from operational wind projects in North America, MNR has set a threshold for bird mortality and has concluded that mortality levels maintained below the thresholds are unlikely to affect bird populations (MNR, 2010a). Thresholds as set by MNR are:

- 18 birds (including raptors and vultures)/turbine/year at individual turbines or turbine groups;
- 0.2 raptors or vultures/turbine/year across a wind power project; or
- 0.1 raptors of provincial conservation concern/turbine/year across a wind power project; or
- 2 raptors/wind power project (for projects with <10 turbines).

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

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

According to current MNR policy, these thresholds would apply to the proposed Ostrander Point Wind Energy Park, White Pines Wind Project, Ernestown Wind Park and Amherst Island Wind Project.

The Wolfe Island Wind Farm was operational prior to the development and release of thresholds set by MNR. A post-construction follow up plan was developed for the Wolfe Island Wind Project by the proponent in consultation with Natural Resources Canada, MNR and Environment Canada. The plan established thresholds for bird and bat mortality following which adaptive management is required. Note that, according to figures published to-date, observed mortality at the Wolfe Island Wind Farm is lower that the MNR's 2010 thresholds described above.

If mortality were to occur at MNR's threshold levels, the results would be as illustrated in **Table 3.2**. Note that the mortality rate is based on 18 birds per turbine per year comprised of all species and types of birds. Therefore, as described earlier, this analysis will overestimate the level of mortality for migratory landbirds alone.

Table 3.2: Projected Bird Mortality Rates based on MNR Thresholds

Wind Project	Number of Turbines	Percentage of Total Number of Turbines (%)	Mortality Rate[1] (Birds per turbine per year)	Estimated Annual Mortality	Percent Contribution to Total Annual Mortality (%)
Ostrander Point Wind Energy Park	9	5	18	162	5
Amherst Island Wind Project	35	21	18	630	21
White Pines Wind Project	30	18	18	540	18
Wolfe Island Wind Farm	86	52	18	1,548	52
Ernestown Wind Park	6	4	18	108	4
Total	**166**	**100**	**18**	**2,988**	**100**

1- Based on MNR threshold (MNR, 2010a). Note this is the annual mortality rate. Note that the Wolfe Island Wind Project has thresholds that differ from those listed above; however for the sake of simplicity, the MNR's 2010 thresholds have been applied to the Wolfe Island Wind Project.

Based on this evaluation, as shown in the above table, based on the number of turbines the Ostrander Point Wind Energy Park's contribution to overall mortality of all species and types of birds would be approximately 5%.

The results shown in **Table 3.2** compare to **Table 3.1** in that each projects percentage contribution to overall mortality is identical. However the absolute number of birds affected differs due to the change in mortality rate. The observed mortality rate for all birds at the Wolfe Island Wind Farm is lower than the MNR's threshold rate.

3.1.2.2 Avoidance

Birds may move around the wind farm, or gain additional altitude and fly well above turbine height (SNH, 2009). The results of radar work conducted by EchoTrack to study night-time bird and bat activity during the 2004 autumn migration period at six wind facilities in Alberta showed many birds increased their flight height and slowed their flight speed when they approached the wind turbines (EchoTrack Inc., 2005). Since no such behaviour was observed at the control sites, the research suggests that it was the presence of the turbines that led to this behaviour. By increasing altitude and flying well above the turbine blades, birds avoided the wind turbines and effectively reduced the risk of collision (EchoTrack Inc., 2005).

This avoidance response may eventually contribute to an impact (i.e. reduced population size as a result of lower breeding success due to the expenditure of energy during migration than the bird would have otherwise) (Masden et al., 2010). The extent to which an avoidance is considered an impact depends on the species, size of wind project, spatial arrangement of the turbines, type of movements (i.e. local movements or annual migrations) and the incurred energetic cost (Masden et al., 2009). Masden et al. 2010 concluded that the energetic cost

expended to avoid a wind project was undetectable and insignificant compared with other factors such as strong or unfavourable winds.

Reviews of available literature suggest the barrier effect has not been proven to significantly impact on the fitness of bird populations (Drewitt and Langston, 2006) however the effect of wind farms as barriers to migratory bird movement is not yet fully understood and has not been well studied (Telleria, 2009; Masden et al., 2009).

As shown in **Table 3.2** above, based on the number of turbines the Ostrander Point Wind Energy Park's contribution to potential avoidance by birds would be approximately 5%. Furthermore, the distance from the Ostrander Wind Energy Park to the other wind projects within the CEA Study Area is as follows:

- White Pines Wind Project – adjacent
- Amherst Island Wind Project – 27 km
- Ernestown Wind Park – 40 km
- Wolfe Island Wind Farm – 47 km

Within the Prince Edward County itself shoreline turbines are proposed along an approximate 14 km stretch of the approximate 30 km of shoreline contained within the Prince Edward County South Shore IBA. Within this 14 km stretch a number of contiguous blocks of habitat occur which are not proposed for wind energy project development. As evidenced by the distances between the wind projects, shorelines and inshore areas consist of large areas of contiguous blocks of habitat that will not be affected by the construction of the proposed wind projects.

3.1.3 Conclusion

3.1.3.1 Direct Mortality

The analysis above indicates that, for all wind projects within the CEA Study Area, there would be a combined estimated annual mortality rate of approximately 2,224 birds. This includes all species and types of birds, not just migratory landbirds. It is estimated that the Ostrander Point Wind Energy Park would contribute only 5% of the total. For migratory landbirds, the projected number of fatalities from wind projects in the CEA Study Area comprise a small proportion of the birds migrating or staging in the area.

The mortality levels experienced from the cumulative presence of wind projects within the landscape represent a relatively minor component of overall mortality levels (incurred both from other human induced actions [i.e. towers, buildings] and from natural causes [i.e. weather, fitness levels]). Given the projected bird mortality rates presented in **Table 3.1** or **Table 3.2**, and the mitigation measures that are in place to limit mortality levels within Ontario from wind projects (see MNR 2010a), the projects within the CEA Study Area are not expected to have population level effects for individual species.

The impacts to migrating birds would be spread over a larger population base, with the species most impacted expected to be common species with high reproduction rates. If mortality levels are maintained below the threshold, the Project will not have significant impacts to populations of migratory landbirds. As described earlier, the Ostrander Point Wind Energy Park will be subject to the monitoring provisions of the Environmental Effects Monitoring Plan. All of the other wind projects within the CEA Study Area are expected to be subject to similar types of monitoring plans. In the event that the thresholds for bird mortality within these plans is exceeded, the implementation of operational mitigation will reduce bird mortality and help ensure that the impacts are maintained within a level acceptable to the MNR. The cumulative sum of projected fatality rates by species is considered low relative to their overall population sizes. This is not expected to biologically impact migrating landbird populations.

3.1.3.2 Avoidance

As described in **Section 3.1.2.2** above, the extent to which avoidance is considered an impact depends on a number of variables and the real effect of any such avoidance has not been measureable. More research is required to further understand the relationship of wind turbines, bird behaviour and population dynamics. Some of this information would be gained through the implementation of the *Environmental Effects Monitoring Plan* for the Ostrander Point Wind Energy Park, as well as other wind projects.

Based on the results of the discussion above, the Ostrander Point Wind Energy Park constitutes 5% of all wind turbines either operating or proposed within the CEA Study Area. The Projects potential contribution to overall disturbance effects, if any, would be correspondingly small.

Given the large distances between the wind projects within the CEA Study Area, their relative number of turbines, and the availability of other suitable habitat in the region, it is not expected that the behavior of migratory landbirds will be adversely affected in a cumulative manner.

3.2 SHRUB-SUCCESSIONAL BREEDING BIRDS

3.2.1 Environmental Setting

The southern third of Prince Edward County contains limestone bedrock which is covered by a shallow layer of soil. The southern location, soil textures, drainage patterns, microclimate and proximity to Lake Ontario have resulted in the development of alvar-like conditions throughout much of this area (Wilson and Cheskey, 2001). Due to the restricted growing conditions and the shallow soils within south Prince Edward County, shrubland/early successional habitat is common throughout this landscape, which includes portions of the Ostrander Point Wind Energy Park and adjacent White Pines Wind Project.

The Project site supports approximately 208 ha of shrubland. Areas of the Ostrander Crown Land Block were mowed in 1997 as part of a habitat management plan to reduce shrub density and promote grassland (MNR, 2007). Project site-specific field studies (documented in the

Project NHA/EIS report) determined that the most abundant breeding bird species located within the Project site were: Song Sparrow (7.71 pairs/10ha), Yellow Warbler (5.36 pairs/10ha), Field Sparrow (3.52 pairs/10ha), Clay-coloured Sparrow (2.68 pairs/10ha) and Brown Thrasher (2.51 pairs/10ha). The Project site supports a healthy population of shrub/successional species and, as such, is considered important habitat for the aforementioned species .

At present, project site-specific information is limited to the Ostrander Point Wind Energy Park and Wolfe Island Wind Farm. A similar level of information is not currently available for the other wind projects (Amherst Island Wind Project and Ernestown Wind Park) within the CEA Study Area. Based on the information available to-date, the wind projects located outside of Prince Edward County do not support a large amount of shrub-successional habitat.

The most common shrub-successional breeding birds that occur on or around the Project site have home ranges that occupy up to approximately 1 ha. When foraging they generally remain within these territories, staying within approximately 500 metres of the nest.

Given the confined location of shrub-successional habitat, potential cumulative interactions can be expected to be limited to those between the Ostrander Point Wind Energy Park and the White Pines Wind Project. Given their relatively small size, the home ranges of shrub-successional breeding birds may overlap the Ostrander Point Wind Park and the White Pines Wind Project turbine location in only a few locations. Generally, a home range could overlap turbines of both projects at the western edge of the Ostrander Point Wind Energy Park site. As such, the remainder of this analysis focuses on potential cumulative effects between these two projects.

3.2.2 Effects

Examples of ways in which the Project, together with one or more other reasonably foreseeable or certain activities, may act cumulatively on shrub-successional breeding birds is as follows:

- Direct Mortality - Birds have a higher probability of mortality as a result of passing through multiple projects; and
- Avoidance - The addition of multiple projects increases a disturbance effect, thereby displacing birds to lower quality habitat or reducing fitness levels.

3.2.2.1 Direct Mortality

Projected mortality rates for all birds for reasonably foreseeable and certain projects within the CEA Study Area are provided in **Table 3.1**. The majority of fatalities observed at the Wolfe Island Wind Farm are of migrating birds (Stantec, 2011); only a small proportion of the total projected mortality for wind turbines in the CEA Study Area are expected to be breeding birds, with even fewer being shrub-successional species.

In general, resident breeding birds tend to have lower collision rates than non-residents, at least partly because they become familiar with the turbines and avoid them (Kingsley and Whittam, 2007).

Given the home range for these types of birds observed on the Project site is up to about 1 ha, limited overlap of home ranges with turbines of both the Ostrander Point Wind Energy Park and White Pines Wind Project is expected. As such, the potential for cumulative effects between the two projects is considered to be low.

As discussed in **Section 3.0**, projected mortality rates are not expected to be significant at a population level.

3.2.2.2 Avoidance

No disturbance information related to the effects of wind projects currently exists for shrubland birds. Studies of bird densities in grassland habitats have documented localized avoidance behavior in some species (Leddy et al., 1999; Johnson et al., 2000; Erickson et al., 2004). Avoidance behavior was documented from 50 m to 180 m from turbine bases. Between the Ostrander Point Wind Energy Park and the other projects within the CEA Study Area, no turbines are located within 180 m of one another.

Other studies have shown no avoidance of wind turbines (Shaffer and Johnson, 2008; James 2008) while others show species nesting in higher abundances near turbines (de Lucas et al., 2004). Post-construction studies monitoring woodland, wetland and grassland breeding birds at the Wolfe Island Wind Project have not shown that these groups of birds are displaced by the wind turbines; species types and numbers are comparable to pre-construction conditions (Stantec, 2011).

Section 3.1.2.2 addressed the general avoidance of wind turbines by birds.

For shrub-successional breeding birds, the only potential cumulative interaction between the Ostrander Point Wind Energy Park and another project within the CEA Study Area is with the White Pines Wind Project. This potential interaction of both projects upon this VEC is expected to be limited to the western portion of the Ostrander Point Wind Energy Park site where its turbines are closest to the adjacent White Pine Wind Project turbines. At this location, three turbines from the Ostrander Point Wind Energy Park are within approximately 500 m of one turbine from the White Pines Wind Project. All other turbines are at much greater distances between the two projects.

Based on avoidance behavior discussed above (i.e., within 180 m of turbines), with a bird's home range centered around these project turbines, or even with immediately adjacent home ranges to those turbines, a separation of home ranges would still exist, potentially in the order of hundreds of metres.

3.2.3 Conclusion

Shrub-successional breeding birds have small home ranges and foraging distances, relative to migratory birds. Given the relatively large distances between the wind projects within the CEA Study Area (including the distances between turbines of the adjacent White Pines Wind Project), the projects are not likely to interact in a cumulative manner.

3.3 BATS

3.3.1 Environmental Setting

Bats are present within the CEA Study Area and use it for feeding and foraging. However, hibernacula or significant natural maternity colonies are not known to occur within the CEA Study Area (MNR 2010b).

No bat hibernacula features (i.e. karst topography, abandoned mines, forested ridges) were identified through the site investigations completed for the Ostrander Point Wind Energy Park. Additionally, no known maternity roosts were identified through the records review. The results of these studies are presented in the NHA/EIS completed for the Project.

Depending on the species, maternity roosts for bats can include tree foliage, tree cavities and crevices under loose bark, under shutters or shingles, in buildings or between rocks. As described in the NHA/EIS, no maternity roosts were identified during site investigations for the Project.

Site-specific information for other project locations is not available.

3.3.2 Effects

Mortality caused by collision with wind turbines appears to be a more serious problem for bats than for most birds (NWCC, 2010; Arnett et al., 2007; Kunz et al., 2007). Current literature on bat populations, migratory routes, and interaction with wind power developments is limited. However, trends from bat mortality studies at operating wind power projects indicate that bat mortality generally occurs during late summer and fall, and disproportionately affects migratory species such as the hoary bat, red bat, silver-haired bat, and eastern pipistrelles.

In Ontario, bat mortality rates as a result of wind facilities vary from 4 to 14 bats/turbine/year (MNR, 2010). In the United States, estimates vary from between less than 1 to more than 50 bat fatalities/turbine/year (MNR 2010c).

The annual mortality rate (July 2009 through June 2010) at the Wolfe Island Wind Project has been estimated at 20 bats per turbine (Stantec, 2011). The Wolfe Island Wind Farm mortality rate was applied to all projects within the CEA Study Area to indicate a projected mortality rate for all wind projects in the CEA Study Area. Results of this evaluation are provided in **Table 3.3**.

Table 3.3: Bat Mortality Rates base on Observed Mortality at Wolfe Island

Wind Project	Number of Turbines	Percentage of Total Number of Turbines (%)	Mortality Rate[1] (Bats per turbine per year)	Estimated Annual Mortality	Percent Contribution to Total Annual Mortality (%)
Ostrander Point Wind Energy Park	9	5	20	180	5
Amherst Island Wind Project	35	21	20	700	21
White Pines Wind Project	30	18	20	600	18
Wolfe Island Wind Farm	86	52	20	1,720	52
Ernestown Wind Park	6	4	20	120	4
Total	**166**	**100**	**20**	**3,320**	**100**

1- Based on Wolfe Island mortality rate (Stantec, 2011).

For bats, the estimated total annual mortality from all wind projects within the CEA Study Area is approximately 3,320. The Project contribution to this overall effect is approximately 5% (or 180 bats). This represents only a small contribution to the overall cumulative effect of all projects.

Mortality Thresholds

In Ontario a threshold approach is now being used (as also implemented for birds as discussed in Section 3.1) to identify and mitigate for bat mortality (MNR, 2010c). Bat mortality is considered by the MNR to be significant when mortality levels exceed 10 bats per turbine per year (MNR, 2010c). Exceedence of this threshold requires mandatory operational mitigation.

The approved mortality rate threshold for bats for the Wolfe Island Wind Farm differs from the MNR threshold for new projects. The analysis completed here uses the actual observed mortality level for the Wolfe Island Wind Farm only; the remaining projects were calculated on a conservative basis using the MNR's threshold (10 bats/turbine/year). For the Wolfe Island Wind Farm, it should be noted that its observed mortality does not account for the implementation of mitigation measures that would potentially reduce actual bat mortality at the Wolfe Island Wind Farm. The project owner has committed to testing potential mitigation measures during the fall migration period in 2011 to determine the feasibility and effectiveness of implementing such mitigation measures for the Wolfe Island Wind Farm(Stantec, 2011).

Estimated bat mortality as a result of projects located within the CEA Study Area is provided in **Table 3.4**.

Table 3.4: Bat Mortality Rates Based on MNR Mortality Thresholds

Wind Project	Number of Turbines	Percentage of Total Number of Turbines (%)	Mortality Rate (Bats per turbine per year)	Estimated Annual Mortality	Percent Contribution to Total Annual Mortality (%)
Ostrander Point Wind Energy Park	9	5	10	90	4
Amherst Island Wind Project	35	21	10	350	14
White Pines Wind Project	30	18	10	300	12
Wolfe Island Wind Farm	86	52	20[1]	1,720	68
Ernestown Wind Park	6	4	10	60	2
Total	**166**	**100**	**12**	**2,520**	**100**

1- Based on observed mortality rates at the Wolfe Island Wind Farm. This rate does not account for the implementation of mitigation measures that would potentially reduce bat mortality at the Wolfe Island Wind Farm. The project owner has committed to testing potential mitigation measures during the fall migration period in 2011 to determine the feasibility and effectiveness of implementing such mitigation measures at Wolfe Island (Stantec, 2011).

As shown in **Table 4.4** above, the Ostrander Point Wind Energy Park's contribution to overall mortality of all species and types of bats would be approximately 4%.

It should be noted that, if a project exceeds the MNR threshold of 10 bats/turbine/year, mortality rates for the remainder of the operation life cycle of the project will be limited through the implementation of operational mitigation. Operational mitigation has been shown to reduce fatalities by up to 70 % (MNR, 2010c) or from 44-93% (Arnett et al., 2010). Potential reductions in mortality rates as a result of operational mitigation have not been factored into this assessment.

3.3.3 Conclusion

There is insufficient information regarding regional population levels of bats to determine the relative importance of the CEA Study Area predictions to mortality and therefore to long-term population viability. The analysis completed for this CEA, using MNR's mortality thresholds for new projects and observations made for the Wolfe Island Wind Farm found that the Ostrander Point Wind Energy Park would contribute approximately 4% to the overall mortality level calculated for all wind projects within the CEA Study Area. Given the development of mitigation measures that enable mortality to be reduced by up to 70% (MNR, 2010c) and the regulatory requirement in Ontario for these measures to be implemented upon threshold exceedence, the potential is low for cumulative effects to bat populations incurred from wind projects within the CEA Study Area.

4.0 Conclusion

This CEA presents a summary of potential cumulative effects by the proposed Ostrander Project Wind Energy Park project and four other reasonably foreseeable or certain wind projects. The Project's size (nine turbines) is a relatively small fraction (5%) of the total number of turbines (166) of all these projects.

In consideration of the VECs that were assessed under the REA process, the decision-making process described above, and public interest, three VECs were assessed in this CEA:

- Migratory landbirds
- Shrubland-successional breeding birds
- Bats

For migratory landbirds, the projected number of fatalities from wind projects in the CEA Study Area comprise a very small proportion of the birds migrating or staging in the area, with a projected annual mortality rate of approximately 2,224 birds, based on mortality observations at the Wolfe Island Wind Farm. This includes all species and types of birds, not just migratory landbirds. It is estimated that only approximately 5% of this (or approximately 121 birds) will be contributed to by the Ostrander Point Wind Energy Park. The cumulative sum of projected fatality rates by species is considered low relative to their overall population sizes. This is not expected to biologically impact migrating landbird populations. Likewise, it is not expected that the behavior of migratory landbirds will be affected in a cumulative manner by the wind projects located within the CEA Study Area.

Shrub-succesional breeding birds have small home ranges and foraging distances, relative to migratory birds. Given the relatively large distances between the wind projects within the CEA Study Area (including the distances between most turbines of Ostrander Point Wind Energy Park and those of the White Pines Wind Project), the projects are not likely to interact in a cumulative manner. The only potential cumulative interaction between the Ostrander Point Wind Energy Park and another project within the CEA Study Area is with the White Pines Wind Energy Park. This potential interaction of both projects upon this VEC is expected to be limited to the western portion of the Ostrander Point Wind Energy Park site where its turbines are closest to the adjacent White Pine Wind Project turbines. As such, the potential for significant cumulative effects to shrub-successional breeding bird populations incurred from wind projects within the CEA Study Area is considered limited.

For bats, the analysis completed for this CEA found that the Ostrander Point Wind Energy Park would contribute approximately 4% to the overall mortality level calculated for all wind projects within the CEA Study Area. Given the mandated implementation of operational mitigation

measures focussed on mortality reduction, the potential for significant cumulative effects to bat populations incurred from wind projects within the CEA Study Area is considered limited.

In conclusion, there will likely be no measureable cumulative environmental effects on the assessed VECs.

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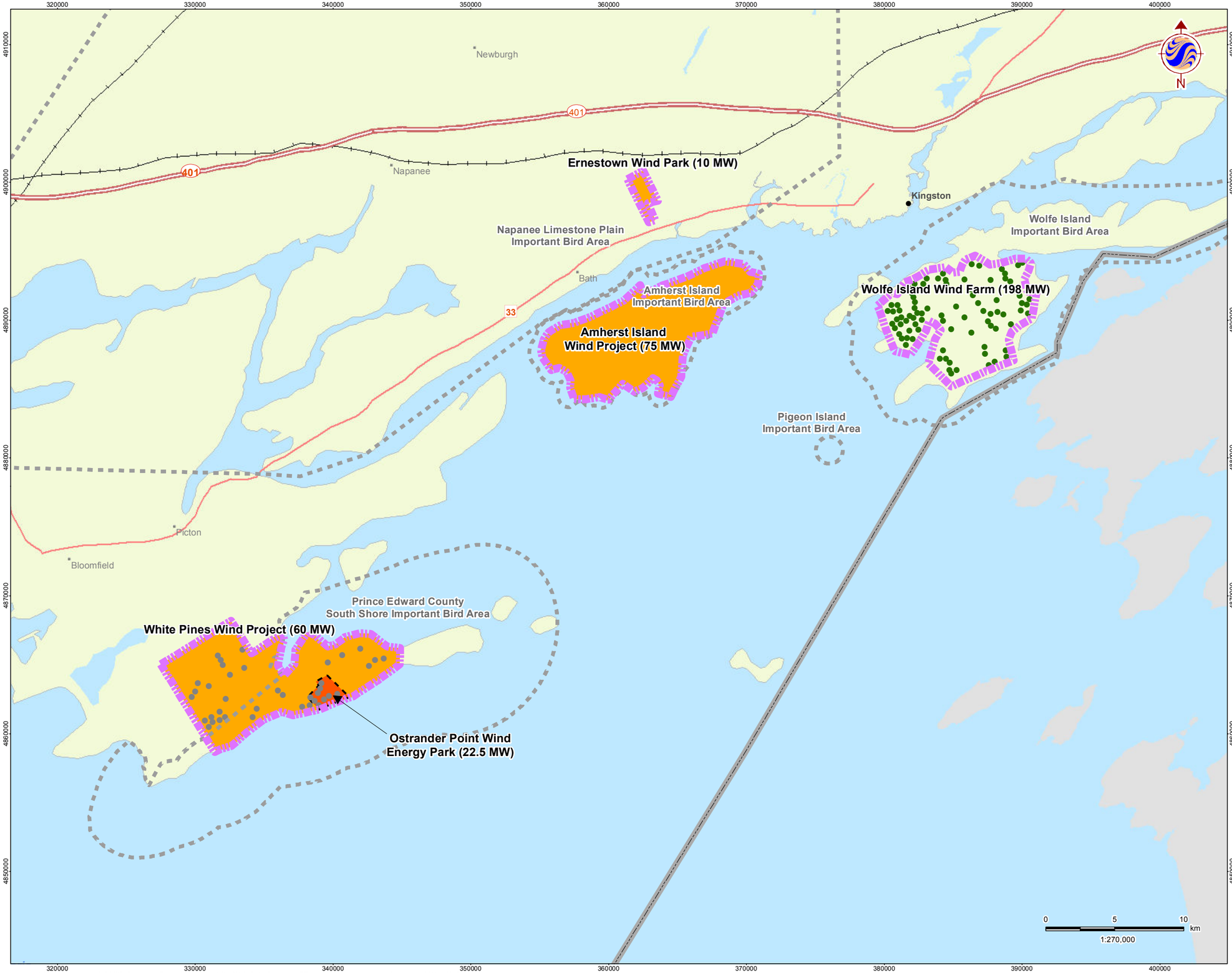
Attachment A

Figures



Legend

- Ostrander Point Wind Energy Park Project Site
- Cumulative Effects Study Area
- International Boundary
- Proposed Turbine Location
- Existing Turbine Location
- Important Bird Area Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011; © ESRI, 2011, © Bird Studies Canada and the Canadian Nature Federation, 2004.

Stantec

May 2011
160960369

Client/Project
GILEAD POWER
OSTRANDER POINT WIND ENERGY PARK

Figure No.
1.0

Title
CUMULATIVE EFFECTS ASSESSMENT STUDY AREA

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Revised: 2011-05-11 By: dharvey