WOLFE ISLAND WIND PLANT
POST-CONSTRUCTION FOLLOW-UP PLAN
BIRD AND BAT RESOURCES

MONITORING REPORT NO. 3
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Executive Summary

This report contains the results of the post-construction monitoring program for bird and bat resources at the Wolfe Island Wind Plant for the period between January 1 and June 30, 2010 (the "Reporting Period"). The Wolfe Island Wind Plant is a 197.8 megawatt ("MW") wind plant on Wolfe Island, Township of Frontenac Islands, Frontenac County, Province of Ontario. Eighty-six 2.3 MW wind turbine generators ("WTGs") and ancillary facilities have been placed over the western portion of Wolfe Island with additional supporting electrical infrastructure on the Kingston mainland.

This report, the third in a series, contains the results of the post-construction monitoring program for the period between January 1 and June 30, 2010. The wind plant achieved commercial operation on June 26, 2009, and all 86 WTGs had completed their commissioning works by June 29. With intermittent and periodic turbine shutdown to allow for 'fine-tuning' maintenance work, the first full week of operation of all 86 WTGs was the week of July 6, 2009.

Consistent with the schedule for post-construction monitoring outlined in Section 5.1 of the Post-Construction Follow-Up Plan for Bird and Bat Resources for the Wolfe Island Wind Plant (revised February 2010) (the "Follow-up Plan"), field surveys conducted during the Reporting Period included:

- bird and bat mortality monitoring
- disturbance effects monitoring – wintering raptors
- disturbance effects monitoring – staging and foraging migratory waterfowl
- disturbance effects monitoring – breeding waterfowl
- disturbance effects monitoring – breeding grassland, woodland and marsh birds

Mortality monitoring was carried out by employees of Wolfe Island Wind Monitoring, an independent consulting firm, according to a schedule and methods prepared by Stantec that were based on the Follow-up Plan. In addition to carcass searches, trials to determine various corrective factors for searcher efficiency and scavenging rates were conducted during the Reporting Period.

A total of 66 carcasses of 28 bird species were collected during the Reporting Period. During the reporting period all species had provincial S-Ranks of S5 (i.e., Secure – common, widespread and abundant in Ontario) or S4 (i.e., Apparently Secure – uncommon but not rare). Bird fatalities were distributed quite uniformly through the spring period (April, May and early

June). Fewer fatalities were recorded in February and March, and no fatalities were noted in January.

One Chimney Swift fatality was recorded at T04 on May 11. This species is listed as Threatened on Schedule 1 of the federal *Species at Risk Act* and on the Species at Risk in Ontario list of the provincial *Endangered Species Act (2007)*. One Bobolink fatality was recorded at T68 on June 10. Although not listed under the *Species at Risk Act* or *Endangered Species Act* at the time, it was identified as threatened by Committee of the Status of Endangered Wildlife in Canada (COSEWIC) in April of 2010 and by the Committee on the Status of Species at Risk in Ontario (COSSARO) in June of 2010. Five of the species have been identified as species of conservation priority by Ontario Partners in Flight (2006). Based on the observation dates, two were likely breeding within or near the wind plant: Wood Thrush (one on June 23), and Bobolink (one on June 8). The other three species, Savannah Sparrow (one on May 6), Chimney Swift and Baltimore Oriole (one on May 17), were likely struck during migration. There is no evidence to suggest Chimney Swifts breed or congregate in the vicinity of the site, and no basis to identify a future threat to other individuals of this species.

Nine raptor and one vulture fatalities were recorded over the course of this Reporting Period: seven Red-tailed Hawks, one Osprey, one Northern Harrier, and one Turkey Vulture. Based on the dates of recovery, five of the fatalities were likely of individuals breeding within or in the vicinity of the wind plant (one Osprey on May 3, one Northern Harrier on May 13, one Turkey Vulture on June 1 and one Red-tailed Hawk on each of May 17 and June10). One Red-tailed Hawk, recovered on February 8, was presumed to be a wintering bird. The remaining Red-tailed Hawks, recovered in April, were presumed to be staging in or moving through the wind plant during spring migration.

The nine raptor and one vulture carcasses recovered, when corrected for scavenger removal, represent an estimated total raptor mortality rate of 0.12 raptors/turbine (0.05 raptors/MW) for the Reporting Period. The estimated mortality rate for all birds is 6.39 birds/turbine (2.78 birds/MW) for the Reporting Period. When combined with the results of the June – December 2009 period, the annual mortality rate can be estimated, and has been calculated to be 13.4 birds/turbine (5.82 birds/MW). This annual mortality rate is well below the adaptive management threshold of 11.7 birds/MW identified in the Follow-up Plan. The Wolfe Island bird mortality rate is strongly influenced by the mortality of swallows and martins, primarily in July and August. Large numbers of Tree Swallows congregate on Wolfe Island during the summer, prior to fall migration.

The annual bird mortality rate of 5.82 birds/MW is very similar to that observed at the Maple Ridge, New York facility (5.81 birds/MW) in 2006 (Jain et al., 2007), and higher than the rate observed at Maple Ridge in 2007 (3.82 birds/MW; Jain et al., 2009). The Maple Ridge facility is located approximately 75 km south of the Wolfe Island Wind Plant. The Wolfe Island mortality rates are within the mortality range of 0 birds/MW to approximately 14 birds/MW reported by The National Wind Coordinating Collaborative (“NWCC”, 2010) in their review of fatality rates at

North American wind facilities. When comparing numbers, it is important to note that most, if not all of the studies at Maple Ridge and those summarized in the NWCC report did not include winter mortality monitoring, and therefore any fatalities occurring over the winter months were not included in annual mortality rates. The data for the Wolfe Island Wind Plant includes winter fatalities.

When combined with the results of the June-December 2009 period, the annual mortality rate can be estimated, and has been calculated to be 0.27 raptors per turbine (0.12 raptors/MW). The annual raptor and vulture mortality rate of 0.12 raptors per MW is within the mortality range observed at other facilities in North America outside California (0 – 0.32 raptors/MW; NWCC, 2010). It is approximately half of the rate observed at Maple Ridge in 2007, (0.25 raptors/MW as reported by NWCC, 2010), although higher than the rate observed at Maple Ridge in 2006 (approximately 0.05 raptors/MW, as reported by NWCC, 2010). The majority of the raptor and vulture fatalities appeared to be individuals migrating through the study area.

The raptor and vulture mortality rate is higher than the notification threshold of 0.09 raptors/MW identified in the Follow-up Plan. In accordance with the Follow-up Plan, TransAlta and the MNR have initiated discussions regarding adaptive management. Raptor behavioural studies are underway involving surveys during four peak mortality periods, and will continue across late summer and late fall, 2010 and spring, 2011.

A total of 34 carcasses of three bat species were collected during the Reporting Period. The Silver-haired Bat (28 fatalities) and Eastern Red Bat (2 fatalities), comprising 88% of all bat fatalities during the Reporting Period, are ranked S4 (i.e., Apparently Secure – uncommon, but not rare) and are classified as long-distance migratory tree bats. The Big Brown Bat (4 fatalities), comprising 12% of all bat fatalities, has a provincial S-Rank of S5 (i.e., Secure – common, widespread and abundant in Ontario). The majority of bat mortality occurred in a one week period at the beginning of May. Correcting for searcher efficiency, scavenger and other removal rates, and percent area searched, the 34 recovered carcasses represent an estimated total bat mortality rate for the Reporting Period of 5.23 bats/turbine (2.27 bats/MW).

When combined with results of June – December 2009 report, the annual bat mortality rate of 8.69 bats/MW (19.99 bats/turbine) is at the median of the mortality range observed at other facilities in North America, which ranges from 0 – 39 bats/MW (NWCC, 2010). It is lower the rates observed at Maple Ridge in 2007 (11.23 bats/MW) (Jain et al., 2009). The annual bat mortality rate at Wolfe Island is below the threshold for adaptive management of 12.5 bats/MW as identified in the Follow-up Plan. Thirty-four (15.9%) of the 214 bat fatalities recorded during year-round monitoring at the Wolfe Island wind plant fell within the spring months, with a decided peak in the first week of May. Long-distance migratory tree bats comprised 76% of identified fatalities.

The annual bat mortality rate is below the adaptive management threshold of 12.5 bats/MW as identified in the Follow-Up Plan. Although the bat mortality rate is below the threshold, TransAlta

is committed to complete additional research in 2011 to evaluate practical measures to reduce the effects of operating wind turbines on bats at the wind plant. TransAlta will complete testing of potential mitigation measures during the fall migration period in 2011 to determine the feasibility and effectiveness of implementing such mitigation measures at Wolfe Island.Disturbance effects monitoring was conducted during the monitoring period. Maximum wintering raptor numbers observed during any one of the 2009/2010 winter raptor surveys include 7 Snowy Owls (December 23), 8 Northern Harriers (December 23), 13 Red-tailed Hawks (February 16), 5 American Kestrels (March 17), 15 Short-eared Owls (December 22) and 4 Bald Eagles (January 6). Winter raptor numbers during 2009/2010 post-construction monitoring were generally lower than those during 2006/2007 pre-construction surveys. Overall, the average density during the afternoon surveys of 2006/2007 and 2009/2010 were respectively 0.72 and 0.25 raptors per kilometer. The average density of Short-eared Owls during the early evening surveys for 2006/2007 and 2009/2010 were respectively 0.16 and 0.09 owls per kilometer.

Northern Harrier and Rough-legged Hawk accounted for the majority of the decrease in abundance between 2006/2007 and 2009/2010. Northern Harrier observations decreased from 159 in 2006/2007 to 19 in 2009/2010. Rough-legged Hawk observations decreased from 119 in 2006/2007 to 13 in 2009/2010.

Numbers of wintering raptors and owls are known to vary significantly from year to year, based on prey conditions in their northern breeding and southern wintering areas. Results from across Ontario in 2009/2010, as reported in surveys conducted at other sites (Stantec, unpublished; Environment Canada, pers. comm.) and on the OntBirds listserve, indicate that the number of wintering raptors and owls in the winter of 2009-2010 were lower than average. Overall, the results of the 2009/2010 post-construction winter raptor monitoring indicate that raptors continued to utilize the wind plant study area. Differences in raptor density observed within the study area between 2006/2007 and 2009/2010 are reflective of observations throughout the Kingston area and across southern Ontario. Therefore, differences observed between the pre- and post-construction monitoring are attributed to natural variability and not avoidance of the Project.

In total, seven species of waterfowl were observed foraging inland during the spring 2010 post-construction monitoring; all species were either geese or dabbling ducks. Species composition in 2010, dominated by Canada Goose, was very similar to that observed during the 2007 pre-construction monitoring. Overall, the total number of waterfowl days was lower in 2010, totaling 57,906, compared to 85,219 waterfowl days in the spring of 2007. This decrease in abundance appears to be attributed largely to a decrease in the number of Canada Goose observations.

In the spring of 2010, areas of highest waterfowl concentration occurred in the southern portion of Wolfe Island, south of Reed's Bay Road. The largest flocks usually occurred in close proximity to the bays where they stage overnight. When comparing 2007 and 2010 spring results, the areas of waterfowl concentration were generally similar with some localized shifting

(e.g., using different fields within the same concession). Crop preference in the spring of 2007 and 2010 were similar, with the majority of observations in hay or pasture. Grain fields, such as corn or soy, were generally not as important to foraging waterfowl during the spring season.

Major movement routes were similar in 2007 and 2010. All major routes were associated with the primary offshore staging areas, namely Reed's Bay, Pyke's Bay, Button Bay, Bayfield Bay and the small inlet off Carpenter's Point Rd. Waterfowl did not appear to adjust their flight height in reaction to the WTGs, with the majority of ducks and geese flying at blade sweep height. In many cases, avoidance behavior was observed, as flocks of waterfowl adjusted their flight course as they approached a WTG.

Waterfowl use of offshore staging areas, as measured through aerial surveys, was very similar in the spring of 2008, 2009 and 2010; waterfowl days in the spring of 2010 was 8% larger than that of 2008 and 1% smaller than 2009. A significant increase in waterfowl days in 2010 (118% larger than 2009) was observed along the southern side of the Wolfe Island, including Button Bay. However, a decrease in waterfowl days between 2010 and 2009 was observed in Bayfield Bay. The north and west sides of Wolfe Island experienced less variability in waterfowl days between years. As the overall waterfowl days remained similar between years, the observed fluctuations between sectors is likely due in large part to movement of flocks, and their location at the time of the survey.

For most guilds (i.e. bay ducks, goldeneye and merganser), waterfowl days recorded in the spring of 2010 were consistent with data from 2008 and 2009. Geese, large dabblers and small dabblers were recorded in larger numbers in spring 2010 than in spring 2008 and 2009. The waterfowl days for sea ducks fluctuated notably, with 2010 being an intermediate year. Overall, it is apparent that waterfowl remained abundant in each sector and each of the major staging areas each year, with no apparent avoidance of Project during construction in 2009 or operation in 2010.

Breeding waterfowl surveys found a total of 11 species of waterfowl, 8 of which were expected to be breeding within the five major wetlands in proximity to WTG's. Mallard (19 observed breeding pairs) was the most common species, followed by Canada Goose (9 observed breeding pairs) and Wood Duck (9 observed breeding pairs). Other species were observed in lower numbers; 1 to 3 breeding pairs across the five wetlands. The Bayfield Bay Marsh route had the largest number of breeding pairs observed, 14 in total. Overall, the waterfowl breeding pairs surveys found populations of breeding geese and/or ducks in each of the major wetlands that are in proximity to WTG. The results of the surveys did not provide any indication that waterfowl avoided nesting in proximity to the WTG.

Overall, the grassland surveys indicated that grassland breeding birds remained common throughout the project area. The grassland point counts, repeated during pre and post-construction monitoring, recorded an apparent decrease in breeding density in several grassland species. However, decreases were not observed for the same species in the study

area through paired point count surveys and grassland area searches; one potential explanation for the decrease observed at grassland point counts is roadside avoidance. Results of the grassland area searches, which surveyed large portions of the study area with high grassland bird densities both pre and post-construction, did not demonstrate a decrease in grassland bird density. In addition, a WTG avoidance effect was not observed for most grassland species through paired point count data.

Generally, the abundance of wetland breeding birds, as measured by the point counts and area searches, remained similar between pre and post-construction surveys. Species of note included Red-winged Blackbird, which were recorded at significantly lower densities and Common Yellowthroat, which were recorded in significantly higher densities. Overall, results of the wetland point counts and area searches suggest population of breeding birds in the five major wetlands in proximity to WTGs remained relatively consistent between pre and post-construction surveys.

Relatively high breeding bird species diversity was recorded through area searches in the surveyed woodlands in proximity to WTGs. For most species, point count data suggest there was little change in breeding densities between 2008 pre-construction and 2010 post-construction surveys.

Mortality and disturbance effects monitoring should proceed in 2010 according to the February 2010 Follow-up Plan. For mortality monitoring, it is recommended that additional correction factor trials be conducted for searcher efficiency and scavenger removal to better assess the number of raptor and vulture fatalities.

The Follow-up Plan indicates that searcher efficiency trials will typically be conducted once each year. More frequent searcher efficiency trials (i.e., once each season) are recommended to ensure seasonal correction factors are appropriate to seasonal conditions.

Finally, the Follow-up Plan indicates that if scavenging rates are low, the carcass searches may be scaled back to once per week. Scavenging rates are similar to or higher than those observed at other Ontario sites during spring, summer and fall, but are very low during winter: on average, 89.4% of test carcasses are not scavenged over the average search interval. In consideration of the very low number of fatalities observed during the winter months (six bird fatalities in December, January and February), it is recommended that the winter carcass searches be scaled back to once per week through December, January and February.

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1.0 Introduction

1.1 PROJECT OVERVIEW

TransAlta Corporation, through its wholly owned subsidiary Canadian Renewable Energy Corporation ("CREC"), has developed a 197.8 MW wind plant on Wolfe Island, Township of Frontenac Islands, Frontenac County, Province of Ontario. Eighty-six 2.3 MW WTGs and ancillary facilities have been placed over the western portion of Wolfe Island (**Figure 1, Appendix A**) with additional supporting electrical infrastructure on the Kingston mainland.

BirdLife International, in cooperation with Bird Studies Canada and Nature Canada, has identified Wolfe Island as an Important Bird Area ("IBA") due to the presence of globally and continentally significant numbers of "congregatory" waterfowl species that gather offshore during the spring migration (information is available at www.bsc-eoc.org/iba/site.jsp?siteID=ON037). In addition, Wolfe Island supports notable landbird populations (albeit not in numbers of global or continental importance) including wintering raptors and Tree Swallows.

The high quality grassland habitat that attracts wintering raptors also supports a high abundance and diversity of grassland breeding bird species of conservation priority (Cadman et al., 2007; Ontario Partners in Flight, 2006). As discussed in Section 7.9.1 of the Environmental Review Report ("ERR"), Wolfe Island is a Category 4 Level of Concern Project from the perspective of bird use, based on criteria provided in Environment Canada's *Wind Turbines and Birds: A Guidance Document for Environmental Assessment* (April, 2007a).

Wolfe Island would be a Sensitivity Rating 3 (High) project for bats based on the criteria provided in the Ontario Ministry of Natural Resources *Guideline to Assist in the Review of Wind Power Proposals: Potential Impacts to Bats and Bat Habitats* (August 2007). Potential concerns with bats are generally associated with the Project's proximity to the shoreline of Lake Ontario, which could potentially act as a corridor or channeling feature for migrating bats.

Recognizing the IBA designation related to waterfowl, as documented in the Project's ERR, and the importance of the area to wintering raptors and breeding grassland birds, extensive primary pre-construction data were collected through multiple-year bird and bat baseline studies on Wolfe Island. These data were further augmented with secondary data from published and unpublished sources to generate a robust data set from which to assess the potential effects of the Project during its operation phase.

The potential bird and bat effects and associated mitigation measures, based upon this dataset, ornithological advice, and professional opinion, among other factors, are provided in ERR Section 7.9. Additionally, bird and bat post-construction monitoring commitments are provided in ERR Section 9.4. These commitments provide the first step of confirming the ERR

predictions of potential effects and provide the basis from which the need for mitigative actions, if any, may be determined.

1.2 POST-CONSTRUCTION FOLLOW-UP PLAN

A formal Post-Construction Follow-up Plan for Bird and Bat Resources ("Follow-up Plan") was developed among CREC, Environment Canada / Canadian Wildlife Service, the Ontario Ministry of Natural Resources, Natural Resources Canada, and Ducks Unlimited Canada (collectively the "parties") in consideration of the unique features of Wolfe Island. The final Follow-up Plan was posted to the Wolfe Island Project website in May, 2009 following a period of public comment on a draft Follow-up Plan.

The Follow-up Plan was subsequently revised to reflect site-specific findings available from the 2009 studies on Wolfe Island, and revised guidance materials available from the regulatory agencies. The revised Follow-up Plan (February, 2010) has been posted on TransAlta's Wolfe Island Wind Plant website at www.transalta.com/wolfeisland for stakeholder information. Hard copies were also made available at the Township office on Wolfe Island and at the public library on Wolfe Island. The previous version of the Plan (May, 2009), a summary of stakeholder comments received on the draft Follow-up Plan, and written notification of the revised Follow-up Plan are also available on the Project website, the Township office and the public library on Wolfe Island for stakeholder review.

The objective of the Follow-up Plan was to set out the methods used to assess the direct and indirect effects of the 86 WTGs on the birds and bats of Wolfe Island and, if necessary, to implement appropriate measures to mitigate adverse environmental effects so they do not become significant. The Follow-up Plan was designed by the parties to achieve all of the provincial and federal commitments and requirements.

The Follow-up Plan is to be fully implemented upon commencement of commercial operations. The implementation of the Follow-up Plan will test the predictions of the ERR prepared in accordance with the Ontario *Environmental Assessment Act* and the Canadian *Environmental Assessment Act*. Should any unanticipated adverse environmental effects be identified, it is the goal of the Follow-up Plan to mitigate those effects such that they do not become significant.

1.3 MONITORING REPORT OVERVIEW

The Follow-up Plan specifies bi-annual post-construction monitoring reporting for periods ending June 30 and December 31. This report, the third in a series, contains the results of the post-construction monitoring program for the period between January 1 and June 30, 2010 (the "Reporting Period").

Consistent with the schedule for post-construction monitoring outlined in Section 5.1 of the Follow-up Plan, field surveys conducted during the Reporting Period included:

- bird and bat mortality monitoring
- disturbance effects monitoring – wintering raptors
- disturbance effects monitoring – staging and foraging migratory waterfowl
- disturbance effects monitoring – breeding waterfowl
- disturbance effects monitoring – breeding grassland, woodland and marsh birds

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2.0 Methods

2.1 MORTALITY MONITORING

2.2 FIELD SURVEYS

Mortality monitoring was carried out by employees of Wolfe Island Wind Monitoring, an independent consulting firm. Their activities were carried out according to a schedule and methods prepared by Stantec that were based on the Follow-up Plan.

The Follow-up Plan specifies that carcass searches are to be conducted at half the WTGs twice per week and at the other half once per week; the two groups shall be rotated so that one week the subset of WTGs receives the less intensive treatment, and the next week the more intensive treatment. Prior to the start of carcass searches, a schedule was prepared to ensure all WTGs received the appropriate coverage (**Appendix C**). To reduce some imprecision arising from the alternating carcass search schedule, one recommendation of Monitoring Report No. 2 (Stantec Consulting Ltd., May 2010) was to change to a search schedule in which one half the WTGs are searched twice weekly (3.5 day search interval) and the other half are searched once weekly (7 day search interval). Mortality estimates were calculated separately for each treatment. With agreement from the agencies, the latter approach was adopted starting at the beginning of May 2010.

Carcass searches for birds and bats were conducted at operating WTGs on weekdays during the Reporting Period, consistent with the Follow-Up Plan. Carcass searches were not conducted under hazardous weather conditions (e.g., thunder and lightning), or when maintenance or reclamation activities prevented access or presented a safety concern. A complete summary of survey dates, times, and weather conditions is provided in **Appendix D**.

The carcass searches consisted of one surveyor searching clear or minimally-vegetated portions (as recommended by Environment Canada [2007b]) of a 50 m radius area under each WTG, walking concentric transects spaced at 7 m intervals starting at 2 m from the turbine base. The search area radius and the locations of the transects at each WTG were determined using laser rangefinders with an accuracy of ±1 m.

If a bird or bat carcass was discovered, the following information was recorded:

- date and time it was found
- state of decomposition
- estimated number of days since death
- injury sustained (or best estimate if the carcass was in poor condition)

- species (or best estimate if the carcass was in poor condition)
- distance and direction from the nearest WTG
- substrate in which the carcass was found.

Carcasses were photographed, collected, and transported to an on-site freezer by Wolfe Island Wind Monitoring for confirmation of species by Stantec, if necessary. Those that were found in reasonable condition were kept for later use in searcher efficiency trials.

2.2.1 Correction Factors and Data Analysis

Information to calculate various corrective factors for searcher efficiency and scavenging rates was also collected during the Reporting Period. Correction factors were calculated to account for carcasses that fell in areas that were not searched as a result of dense vegetation, standing water or other obstacles, for carcasses that were overlooked, and for carcasses that were removed by scavengers prior to the search.

There are numerous published and unpublished approaches to incorporating these corrective factors into an overall assessment of total bird and bat mortality. Currently, as documented in the Follow-up Plan, Environment Canada and the Canadian Wildlife Service recommend the following correction formula:

C = c / (Se x Sc x Ps), where

C is the corrected number of bird or bat fatalities

c is the number of carcasses found

Se is the proportion of carcasses expected to be found by searchers (searcher efficiency)

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

Ps is the percent of the area searched.

Correction factors for raptors and vultures are expected to be significantly different than those for small birds and bats, for the following reasons:

- searcher efficiency rates are higher than average for larger birds
- larger and heavier birds are more likely to land closer to the wind turbine generators

- scavenger rates are lower for larger birds as they are harder for scavengers to carry off. There is also some evidence from western North America that scavengers may have an aversion to the carcasses of large hawks (Strickland and Morrison, 2008).

As a result, Se and Ps are estimated to be 1.0 for raptors and vultures. An estimate of Sc for raptors and vultures was determined through a January scavenger trial using 3 raptor and 3 vulture carcasses. Therefore, in calculating the total number of bird fatalities, raptor and vulture fatalities were corrected separately. The corrected number of raptor and vulture fatalities was added to the corrected number of other bird fatalities to obtain the total estimated number of bird fatalities:

$\mathbf{C = (c_1 / (Se_1 \times Sc_1 \times Ps_1)) + (c_2 / (Se_2 \times Sc_2 \times Ps_2))}$, where

C is the corrected number of bird fatalities

$\mathbf{c_1}$ is the number of raptor or vulture carcasses found

$\mathbf{c_2}$ is the number of other carcasses found

Se is the proportion of raptor/vulture carcasses ($\mathbf{Se_1}$) or other carcasses ($\mathbf{Se_2}$) expected to be found by searchers (searcher efficiency)

Sc is the proportion of raptor/vulture carcasses ($\mathbf{Sc_1}$) or other carcasses ($\mathbf{Sc_2}$) not removed by scavengers over the search period

Ps is the percent of the area searched for raptors/vultures ($\mathbf{Ps_1}$) or other carcasses ($\mathbf{Ps_2}$).

The total number of bird or bat fatalities was divided by the number of turbines (i.e., 86) and the number of MW (i.e., 197.8) to obtain the estimated mortality rates by turbine and by MW for the Reporting Period.

2.2.1.1 Searcher Efficiency

Searcher efficiency trials are designed to correct for carcasses that may be overlooked by searchers during the survey periods. Environment Canada (2007b) provides detailed recommendations on determining searcher efficiency, expressed as a proportion of carcasses expected to be found by individual searchers.

During the Reporting Period, searcher efficiency trials involved a “tester” that placed carcasses under WTGs prior to the standard carcass searches over a period of several weeks between April 22 and July 19, 2010 to test each searcher’s detection rate. The trials involved between 10 and 25 test bird carcasses for each of the three searchers.

Searcher efficiency is expressed as a proportion of unscavenged carcasses found by individual searchers. Searcher efficiency (Se) was calculated for each searcher as follows:

$$Se = \frac{\text{number of test carcasses found}}{\text{number of test carcasses placed} - \text{number of test carcasses removed by scavengers}}$$

Because searchers surveyed varying numbers of turbines over the course of the mortality monitoring, it was necessary to find a weighted average which reflected the proportion of turbines each searcher surveyed. This weighted average, or overall Se, was calculated as follows:

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

where:

Se_o	is the overall searcher efficiency;
$Se_1 – Se_3$	are individual searcher efficiency ratings;
$n_1 – n_3$	is quantity of search days completed by each searcher; and
T	is the total number of search days completed by all searchers.

2.2.1.2 Scavenger Trials

Scavenger trials are designed to correct for carcasses that are removed by scavenging animals before the search period. These trials involve the distribution of carcasses in known locations at each WTG, followed by periodic checking to determine the rate of removal.

During the Reporting Period, three two-week scavenger trials were conducted during the months of January, May and June. Two dead, dark-coloured chicks were placed in two locations within the 50 m search radius around one half of the WTGs. In May and June, trial carcasses were split between turbines that were searched once weekly and turbines that were searched twice weekly. If there was more than one substrate type (e.g., gravel, hay, crop, or ploughed soil), the two chicks were placed on different substrates. UTM coordinates were taken at each chick location and the distance and direction from the WTG were measured.

Chick carcasses were placed on January 3, May 16, and June 13, 2010, with their presence or absence recorded during regularly-scheduled carcass searches over the subsequent two weeks. In May, some regularly-scheduled checks could not be carried out due to WTG maintenance or weather. To ensure an accurate value of Sc, trial carcasses were only included in the calculation if data were available from the first scheduled check. Proportions of carcasses remaining after each search interval were pooled to calculate the overall scavenger correction (Sc) factors as follows:

$$Sc = \frac{n_{visit1} + n_{visit2} + n_{visit3} + \ldots}{n_{visit0} + n_{visit1} + n_{visit2} + \ldots} \quad \text{where}$$

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

$\mathbf{n_{visit0}}$ is the total number of carcasses placed

$\mathbf{n_{visit1} - n_{visit3}}$ are the numbers of carcasses remaining on visits 1 through 3

Sc is expected to vary with the length of the search interval, i.e., the proportion of carcasses not removed by scavengers over the search period is expected to be higher for shorter search intervals and lower for longer search intervals. In May and June, Sc was calculated separately for the two WTG treatments (searched once weekly [7 day search interval] and searched twice weekly [3.5 day search interval]).

An additional scavenger trial was conducted using three raptor carcasses, placed at three different WTGs on January 3, and three vulture carcasses, placed at three different WTGs on January 11. Their presence or absence was recorded during regularly-scheduled carcass searches over the subsequent two weeks, and Sc for raptors and vultures was calculated in the manner as described above.

2.2.1.3 Percent Area Searched

Environment Canada has indicated that 85% to 88% of carcasses fall within 50 m of a WTG base (C. Francis, pers. comm., January 2008). Environment Canada (2007b) also specifies that for a WTG of the size as those on Wolfe Island, most bat carcasses fall within 50 m. Furthermore, it is generally agreed in the literature that the density of carcasses decreases with distance from the WTG base (e.g., Jain et al., 2007; Kerns et al., 2005 [as cited in Arnett et al., 2008]). Accordingly, and to be comparable to the results of post-construction monitoring reported for other Ontario wind power facilities, and in accordance with the Follow-Up Plan, the percent area searched was calculated based on a 50 m radius circle.

Ps was 100% during January and February, when the entire search areas were snow-covered and could be readily accessed. Ps was calculated for the remainder of the Reporting Period

based on data collected during regularly-scheduled surveys at between March 29 and April 2, May 24 to May 28, and June 28 to July 2. In each season, searchers filled out a 50 m radius circle diagram with 5 m x 5 m grid cells for each WTG, sketching areas searched and identifying areas that could not be searched due to vegetation cover or other factors. The area searched was determined for each WTG or MET tower by counting the number of searched grid cells within 50 m, and dividing the summed area of those cells 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 or the MET tower).

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

The overall Ps for the facility during the search period was calculated as the average of Ps_1 through Ps_{86}, with Ps for MET towers calculated separately:

$$Ps = \frac{Ps_1 + Ps_2 + Ps_3 + \ldots. + Ps_{86}}{86}$$

In May and June, Ps was calculated separately for the two WTG treatments (searched once weekly [7 day search interval] and searched twice weekly [3.5 day search interval]).

2.3 AGENCY SITE VISITS

NRCan has prepared a “Report on Ensuring Implementation of the Wolfe Island EcoPower Centre’s Post-Construction Follow-up Plan for Bird and Bat Resources (PCFP)” based on the results of site visit audits by MNR and EC in winter, spring and early summer. The report concluded that MNR and EC have indicated that the PCFP is being implemented as expected, and provided some recommendations for future surveys (Appendix E).

2.4 DISTURBANCE EFFECTS

Disturbance studies completed during the Reporting Period include winter raptor surveys, spring waterfowl migrant studies (i.e. field foraging surveys, overland movement surveys and aerial surveys of bays, wetlands and rivers), waterfowl breeding pairs surveys and breeding bird surveys. Breeding bird surveys included point counts and area searches of grassland, wetland and woodland habitat. In total, forty-two point counts (27 in grassland, 8 in wetland and 7 in woodland habitat) were conducted in the same locations as the pre-construction surveys, using the same, standard point count protocols as the pre-construction surveys. In addition to the standard point counts, paired point counts were conducted at turbine locations in grassland habitat and playback surveys were conducted at wetland point count stations.

Survey dates, times and weather conditions for all disturbance effects monitoring surveys are provided in **Appendix D**.

2.4.1 Winter Raptor Surveys

Pre-construction baseline winter raptor surveys were conducted to establish areas of raptor use and general behaviour in the study area. The purpose of the post-construction winter raptor use surveys is to assess potential displacement or disturbance effects (i.e., distribution and abundance) to these species compared to pre-construction conditions.

The post-construction winter raptor surveys were carried out using the same survey protocols as the pre-construction baseline surveys conducted in 2006-2007. On each date, a late afternoon survey was conducted for raptors and an early evening survey (from sunset to dusk) was conducted for Short-eared Owls. Two vehicles were used on each survey, with an experienced surveyor and a driver in each vehicle. The use of two vehicles allowed the study area to be more thoroughly covered during the early evening period.

All north-south roads and most of the east-west roads in the study area were driven at slow speeds (i.e., 30-40 km/h). The fields and woodlots were scanned using binoculars to detect any raptors, and a spotting scope was used for closer inspection of stationary birds. All raptors and owls were recorded and their locations mapped.

On each visit, weather conditions, the route taken and the number of kilometers driven were recorded. Density estimates were calculated as the number of raptors or owls per km travelled. Visibility during each of the surveys was good or excellent.

Winter raptor surveys were completed once every two weeks in November, 2009 through March, 2010. Monitoring Report No. 2 - July to December 2009, presented the findings of the November and December 2009 winter raptor surveys. This report will address the entire winter raptor season (i.e. November 2009 to March 2010) which will allow for a full comparison to 2006-2007 results.

2.4.2 Foraging Waterfowl Surveys

In spring and fall, geese and dabbling ducks that stage in the bays surrounding Wolfe Island move inland to forage in agricultural fields. Studies were completed during the Reporting Period to examine any changes in patterns of spring foraging across the study area compared to pre-construction conditions.

The post-construction spring foraging waterfowl surveys were conducted using the same protocols as the pre-construction baseline surveys carried out in the spring of 2007. Weekly daytime surveys were conducted for 8 consecutive weeks during peak waterfowl migration and staging, between March 24 and May 13, 2010.

These daytime surveys consisted of two experienced surveyors driving all north-south roads and the majority of the east-west roads in the study area at slow speeds (i.e., 30-40 km/h), using binoculars to scan fields and open areas. Information on species, numbers, location, and activity for all waterfowl observed inland was recorded and mapped.

Data on waterfowl use of fields was calculated in the form of "waterfowl days", as described in Dennis and Chandler (1974) as cited by Ross (1989). This analysis involves averaging results for each successive pair of surveys, multiplying the results by the number of days separating each pair, and summing over the migration period.

2.4.3 Overland Waterfowl Movement Surveys

The purpose of the overland movement surveys was to record movement of waterfowl across the study area at dawn and dusk, when waterfowl are most active. Although some movement of waterfowl may occur throughout the day, the largest movements occur at dawn, with waterfowl moving from the bays into the fields to forage, and at dusk, with waterfowl returning from the fields into the bays to roost for the night. The post-construction waterfowl movement surveys were carried out using the same protocols established during the pre-construction baseline surveys conducted in the fall of 2007.

The surveys were conducted weekly for 8 consecutive weeks from late March to mid-May. During each survey, two observers were stationed at separate points (**Figure 12, Appendix A**) placed at locations with locally high elevation and good visibility towards the bays. One observer was situated on the western side of the study area, with views towards Pyke's Bay, Big Sandy Bay Wetland and Reeds Bay Wetland. The other observer was situated on the eastern side of the study area with views towards Bayfield Bay Marsh and Button Bay Wetland.

The same two locations were used for each survey in both the 2007 and 2010 waterfowl studies. Movement of waterfowl flocks was mapped and the height, direction, and flight path were recorded along with the size of the flock and species, where possible.

2.4.4 Aerial Waterfowl Surveys

The purpose of the aerial waterfowl surveys was to record the abundance of staging waterfowl in the bays, shorelines and coastal marshes around Wolfe Island. The surveys focused on both the western and eastern portions of the island.

Aerial surveys were conducted in association with Canadian Wildlife Service ("CWS"), following the methods used by CWS as outlined in Ross (1989). The same methods were used for CWS's 1999 waterfowl surveys, the 2008 pre-construction monitoring, and the 2009 and 2010 post-construction monitoring.

Pre-construction surveys were undertaken by Stantec and CWS in the spring of 2008. In the spring of 2009, construction of the facility was occurring with turbines erected and a few beginning to come on-line during the waterfowl staging season (i.e. late March to early May). During the construction of spring 2009, CWS conducted aerial waterfowl surveys of Wolfe Island as part of their eastern Lake Ontario studies and provided the results to Stantec. In the spring of 2010, when the project was fully operational, Stantec undertook post-construction surveys of staging waterfowl.

In the spring of each year (i.e. 2008 to 2010), surveys were conducted over an 8 week period from late-March/early April to early May. Surveys were conducted from a four-seater fixed-wing aircraft by two qualified surveyors accompanied by one pilot. One surveyor was situated in the front passenger (shore) side of the plane, while the other was situated in the back left, behind the pilot (offshore side). The plane departed from the Kingston airport and completed a standardized route following a line roughly 200 metres off the shoreline. Waterfowl numbers were assessed, and individuals were identified to species where possible, and to larger species grouping (guild) when segregation to species was not possible. Observations were recorded on digital recorder and later transcribed onto paper data forms.

Data were recorded according to a sector system as established by CWS (see **Figure 2.0, Appendix A** and **Table 2.1, Appendix B**). Data for each of the major staging areas (i.e., Bayfield Bay, Button Bay, Pyke's Bay and Reed's Bay) were collected separately so specific results could be discerned from the sectors. Species were grouped into one of eight guilds (**Table 2.2**, **Appendix B**). Data on waterfowl use of bays are presented in the form of "waterfowl days", as calculated in Dennis and Chandler (1974) and cited by Ross (1989).

2.4.5 Waterfowl Breeding Pairs Surveys

The purpose of the waterfowl breeding pairs survey was to record the density of breeding waterfowl in wetlands adjacent to the Project. Daytime surveys for breeding waterfowl were conducted twice in early May, 2010 within major wetlands in the vicinity to the Project. Button Bay Marsh and Big Sandy Bay Wetland were traversed on foot from the edge and trails. Bayfield Bay Marsh, Reed's Bay Wetland and Sandy Bay Wetland were less accessible and therefore traversed by canoe. The routes traveled in each wetland are shown in **Figure 3.0, Appendix B**.

The location and species of all waterfowl were recorded. For species with sexual dimorphism, the number of males and females in each grouping were noted. Waterfowl sightings were assessed record by record and considered to be breeding (versus migrating) based on the species' breeding range, late migration date, early nesting date, and habitat requirements during breeding and migration. The Canadian Wildlife Service's table "Calculation of Indicated Pairs" was used to determine the number of breeding pairs.

2.4.6 Grassland Breeding Bird Point Counts, Paired Point Counts and Area Searches

The post-construction grassland breeding bird surveys gathered extensive data on species presence and breeding density, to be compared to pre-construction conditions. Two types of point count surveys were conducted: pre/post construction point counts and paired point counts.

Each of the 27 point counts in grassland habitat established during pre-construction surveys was resurveyed in 2010, using the same protocols. Due to changes in crop types, some point count locations were adjusted to ensure all 27 were in suitable grassland habitat. Point count locations are shown in **Figure 4.0, Appendix A**.

Paired point counts were conducted at 20 WTGs that were in prime grassland habitat (**Figure 4.0, Appendix A**). Paired point counts consisted of two 10-minute point counts; one half circle, 100m-radius point count at the WTG base and one full circle, 100m-radius point count 200m from the base of the WTG. During both point counts, birds were recorded at 100m intervals allowing bird occurrences to be mapped in 100m bands from 0-300 m from the WTG' s base.

All point counts were conducted twice in June, once during an early June visit and once during a late June visit. Point counts were conducted in the mornings between dawn and 10:00. For each point count, a record was made of the start time and a hand-held GPS unit was used to georeference its location. A brief description of the habitat was recorded for each point count. Each standard point count was conducted for 10 minutes, during which time all breeding pairs were recorded within 100m of the observer.

In addition to the point counts, area searches were repeated using the same areas and protocols as the pre-construction baseline surveys in 2007 (**Figure 5.0, Appendix B**). Each area search covered two large tracts of high quality grassland habitat with relatively high WTG density, one in the northwestern portion of the study area (199ha) and the other in the southeastern portion (195ha). Both area searches were conducted twice in June, 2010.

The "Southeast Area" was located between Concession 9 and Concession 8, and between Reeds Bay Road and Bennett Road. Landowner permission determined which fields were surveyed. The area was broken into twelve sub-areas, or "sectors", based on land use. Separate lists of breeding birds were recorded for each sector. The Southeast Area contained several open country habitats including 57.9 ha of hay, 107.1 ha of pasture and 30.5 ha of wheat. There was more suitable habitat for grassland birds in the Southeast Area during the post-construction survey, as some cropland had been converted to hay since 2007. Total grassland habitat (i.e. hay and pasture) in the Southeast Area encompassed 141.1ha in 2007 and 164.9 ha in 2010, a 17% increase.

The "Northwest Area" was located between Concession 2 and Concession 3 for approximately 500 m north of and 1200 m south of Baseline Road. This area was broken into six sub-areas, or "sectors" based on land use. Separate lists of breeding birds were recorded for each sector.

The Northwest Area encompassed 146.5ha of hay fields, 24.4ha of plowed field and 28.7ha of fallow field. The fallow field had been recently fallowed, containing early successional species such as horseweed, chickweed and wild mustards, but little grass cover; it was not considered grassland habitat, as it did not support species such as Bobolink. As some fields supporting hay in 2007 were plowed in 2010, less grassland habitat was present during the post-construction survey. Total grassland habitat (i.e. hay) encompassed 199.6 ha in 2007 and 146.5 ha in 2010, a 27% decrease.

Each area search consisted of walking predetermined transects through the designated area. Transects ran parallel through each area at 200 m intervals. While in the field, aerial photography was used to navigate along the routes, while a GPS unit assisted in spacing the transects. Tallies of all breeding pairs of each species were recorded. For grassland birds, separate tallies were made for each parcel.

A conservative approach to breeding status was taken. The presence of a male bird (singing, displaying, perched or flying) in appropriate breeding habitat was considered to represent a breeding pair. Of the grassland species present, Bobolink required additional consideration to record accurate numbers of breeding pairs, due to their colonial nesting habits. Therefore, Bobolinks were counted on a landscape scale, recording the number of flying and/or displaying males in each colony as they were encountered.

Some species, such as the Northern Harrier or Upland Sandpiper, frequently travel some distance while hunting or displaying. A single individual of these species could likely be encountered on two or more of the transects. In the case of Northern Harrier, a single individual could be encountered throughout an area search. However, the relatively large size and conspicuous flight of these species made it relatively easy to track individuals and avoid double counting.

To standardize the data, all breeding bird point count and area search results were expressed in pair densities per 10 ha. To address changes in the amount of grassland habitat (i.e. hay and pasture) within the area searches between pre and post construction, the density was also calculated within just the grassland sectors. For paired point counts, an Analysis of Variation (ANOVA) was performed to determine whether the differences in the most commonly observed species' densities were significant among of the distance regimes.

2.4.7 Wetland Breeding Bird Point Counts and Area Searches

The wetland breeding bird surveys recorded species presence and density of breeding birds in major wetlands adjacent to the Project. The purpose of the surveys was to establish post-construction data to examine any disturbance/displacement effects on breeding wetland birds compared to pre-construction surveys.

Wetland point counts and area searches were conducted twice in June 2010 using the same locations and protocols as the pre-construction surveys. Point counts were conducted twice in June, once during an early June visit and once during a late June visit. Point counts were conducted in the mornings between dawn and 10:00. For each point count, a record was made of the start time and a hand-held GPS unit was used to georeference its location. A brief description of the habitat was recorded for each point count. Each standard point count was conducted for 10 minutes, during which time all breeding pairs were recorded within 100m of the observer. The area search routes typically followed open channels and focused on portions of the wetlands in the vicinity of WTG's. Button Bay Marsh and Big Sandy Bay Wetland were traversed on foot and Bayfield Bay Marsh, Reed's Bay Wetland and Sandy Bay Wetland were traversed by canoe. Survey routes (same as those used during pre-construction surveys and post-construction waterfowl breeding pairs surveys) are shown in **Figure 3.0, Appendix A**. The species and number of all breeding pairs heard or seen during the area search were recorded. Observations were recorded at unlimited distance, but restricted to the marsh community.

All eight wetland point counts established during pre-construction surveys were resurveyed in June 2010 (**Figure 4.0, Appendix A**). Each point count consisted of a standard ten minute, 100m radius point count followed by an additional ten minute playback survey. Playback surveys were used to aid in detection of more secretive marsh bird species, specifically Virginia Rail, Sora, Least Bittern and King Rail, and were conducted in accordance with Bird Studies Canada's Marsh Monitoring Program ("MMP") protocols. The playback surveys involved broadcasting taped breeding calls of each species listed above, to induce a vocal or approach response. The call of each species was repeated for a duration of approximately one minute, followed by a one minute pause to listen for a response. The response of marsh birds during the playback survey were recorded at an unlimited radius.

2.4.8 Woodland Breeding Bird Point Counts and Area Searches in Woodlots Larger than 10ha

The woodland breeding bird surveys collected species presence and density of birds in woodlots larger than 10ha in size that are located in proximity to WTG's. Two forested areas were surveyed, including the woodlot immediately south of the Sand Bay Wetland (16.4 ha) and the wooded area associated with the Big Sandy Bay ANSI (101 ha).

In total, seven standard point counts were conducted in the same location as pre-construction surveys in June 2008, one in the forested area south of the Sand Bay Wetland and six points in the Big Sandy Bay woodlot. Point counts were conducted twice in June, once during an early June visit and once during a late June visit. Point counts were conducted in the mornings between dawn and 10:00. For each point count, a record was made of the start time and a hand-held GPS unit was used to georeference its location. A brief description of the habitat was recorded for each point count. Each standard point count was conducted for 10 minutes, during which time all breeding pairs were recorded within 100m of the observer. Area searches were

conducted in both woodlots consisting of traversing the woodlot on foot, along the routes used in pre-construction surveys, and recording all species observed.

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3.0 Results

3.1 MORTALITY MONITORING

3.1.1 Correction Factors

3.1.1.1 Searcher Efficiency

Individual searcher efficiency during the Reporting Period ranged from 10% to 65% (**Table 3.1, Appendix B**). The overall searcher efficiency was subsequently calculated by weighting the individual searcher efficiencies, according to the proportion of search days surveyed in each month over the Reporting Period. The weighted searcher efficiency values for each month are shown in **Table 3.2, Appendix B** and ranged from 0.359 to 0.412. These values were applied to assess bat and small bird mortality rates.

Searcher efficiency for raptors and vultures was assumed to be 100% due to the size of these birds. Vegetation cover was non-existent or low over the majority of the Reporting Period, and was not expected to be a significant factor affecting searcher efficiency in the periods of concern (winter and spring migration).

3.1.1.2 Scavenger Removal

Analysis of the scavenger trial indicates that in the winter, on average, 89.4% of trial carcasses were not removed by scavengers over the average search interval (**Table 3.3, Appendix B**). The winter results were applied in January, February and March. In spring, the May scavenger trial indicated that, on average, 54.4% of carcasses were not removed by scavengers over the 3.5 day search interval, and 36.2% were not removed by scavengers over the 7 day search interval (**Table 3.3, Appendix B**). The value for April scavenger removal was calculated as the combined May 3.5 and 7 day search interval results. In June, the scavenger trial indicated that, on average, 60% of carcasses were not removed by scavengers over the 3.5 day search interval, and 29.1% were not removed by scavengers over the 7 day search interval (**Table 3.3, Appendix B**).These values were applied to assess bat and small bird mortality rates.

The scavenger removal rate of raptor and vulture carcasses is expected to be less than for that of bats and smaller birds for the reasons discussed in Section 2.1.2. Based on the early January scavenger trial using Red-tailed Hawk and Turkey Vulture carcasses, approximately 94.1% of raptor and vulture carcasses were not removed by scavengers over the average search interval (n=17). Although just one Red-tailed Hawk carcass was moved by scavengers during the trial, it was refound within the search radius on February 16, 2010.

3.1.1.3 Percent Area Searched

Ps was 100% during January and February, when the entire search areas were snow-covered and could be readily accessed. The average proportion of the 50 m radius search area that was physically searched during the March/April period was 84.5%. In May, Ps was 0.521 for the WTGs with 3.5 day search interval and 0.531 at WTGs with 7 day search interval. In June, there was considerably more vegetation; Ps was 0.252 for the WTGs with 3.5 day search interval and 0.272 at WTGs with 7 day search interval. These values were applied to assess bat and small bird mortality rates.

Ps for raptors and vultures was assumed to be 100%. Vegetation cover was non-existent or low over the majority of the Reporting Period, and was not expected to be a significant factor affecting searcher efficiency in the periods of concern (winter and spring migration). The large size of raptors and vultures meant that carcasses were visible in vegetation that would obscure smaller birds or bats, and the longer persistence times of the large carcasses meant that carcasses would be present over several weeks, through changing vegetation or standing water conditions, greatly increasing the likelihood of detection.

3.1.2 Direct Effects - Birds

Raw mortality data for the Reporting Period is provided in **Appendix E**.

An Avian and Bat Observation Form is available on the Project website to receive comments from the public regarding bird and bat observations related to wind plant operations. No comments were received from the public during the Reporting Period.

A total of 65 carcasses of 28 bird species were collected during mortality monitoring during the Reporting Period. A summary is presented in **Table 3.4 (Appendix B)**. In addition, one Turkey Vulture carcass was recovered by a landowner outside of regularly-scheduled searches, for a total of 66 carcasses. All native species have provincial S-Ranks of S5 (i.e., Secure – common, widespread and abundant in Ontario) or S4 (i.e., Apparently Secure – uncommon but not rare). Two species, Ring-necked Pheasant and European Starling, are not native to Ontario and have provincial S-Ranks of SNA (i.e., Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities). Seven bird carcasses were not identifiable to genus or species, as a result of prior activity by scavenging animals or an advanced state of decomposition.

One Chimney Swift fatality was recorded at T04 on May 11. This species is listed as Threatened on Schedule 1 of the federal *Species at Risk Act* and on the Species at Risk in Ontario list of the provincial *Endangered Species Act (2007)*. This individual was likely a migrant; Cink and Collins (2002) indicate that this species arrives in Ontario in late April or early May, and begins nest building in late May or early June in nearby New York.

Five of the species have been identified as species of conservation priority by Ontario Partners in Flight (2006). Based on the observation dates, two were likely breeding within or near the wind plant: Wood Thrush (one on June 23), and Bobolink (one on June 8). Although not listed under the *Species at Risk Act* or *Endangered Species Act* at the time, the Bobolink was identified as threatened by Committee of the Status of Endangered Wildlife in Canada (COSEWIC) in April of 2010 and by the Committee on the Status of Species at Risk in Ontario (COSSARO) in June of 2010. The other three species, Savannah Sparrow (one on May 6), Chimney Swift and Baltimore Oriole (one on May 17), were likely struck during migration.

The most commonly encountered bird species were Ring-billed Gull (seven fatalities, with three fatalities between April 26 and May 4 and four fatalities between May 31 and June 11), Wilson's Snipe (seven fatalities; six were detected between April 13 and April 26, with the seventh occurrence on June 25), and Red-tailed Hawk (seven fatalities, discussed below).

Nine raptor and one vulture fatalities were recorded over the course of this Reporting Period: seven Red-tailed Hawks, one Osprey, one Northern Harrier and one Turkey Vulture. Based on the dates of recovery, five of the fatalities were likely of individuals breeding within or in the vicinity of the wind plant (one Osprey on May 3, one Northern Harrier on May 13, one Turkey Vulture on June 1 and one Red-tailed Hawk on each of May 17 and June 10). One Red-tailed Hawk, recovered on February 8, was presumed to be a wintering bird. The remaining Red-tailed Hawks, recovered in April, were presumed to be staging in or moving through the wind plant during spring migration.

Bird fatalities were distributed quite uniformly through the spring period (April, May and early June). Fewer fatalities were recorded in February and March, and no fatalities were noted in January (**Figure 7, Appendix A**). The highest number of bird fatalities over the course of the Reporting Period occurred at T46 and T76 (four fatalities at each), which are located in the eastern and western portion of the wind plant (**Figure 8, Appendix A**).

The ten raptor and vulture carcasses recovered, when corrected for scavenger removal, represent an estimated total raptor mortality rate of 0.12 raptors/turbine (0.05 raptors/MW) for the Reporting Period (**Table 3.5, Appendix B**). Correcting seasonally for searcher efficiency, scavenger and other removal rates, and the percent area searched, the 56 other bird carcasses recovered represent an estimated bird mortality rate (excluding raptors) for the Reporting Period of 6.27 birds/turbine (2.73 birds/MW) (**Table 3.6, Appendix B**). Combined, the estimated bird mortality rate is 6.39 birds/turbine (2.78 birds/MW) for the reporting period.

3.1.3 Direct Effects - Bats

Raw mortality data for the Reporting Period is provided in **Appendix E**. An Incidental Avian and Bat Observation Form is available on the Project website to receive comments from the public regarding bird and bat observations related to wind plant operations. No comments were received from the public during the Reporting Period.

A total of 34 carcasses of three bat species were collected during the Reporting Period. A summary is provided in **Table 3.7 (Appendix B)**. The Silver-haired Bat (28 fatalities) and Eastern Red Bat (2 fatalities), comprising 88% of all bat fatalities during the Reporting Period, are ranked S4 (i.e., Apparently Secure – uncommon, but not rare) and are classified as long-distance migratory tree bats. The Big Brown Bat (4 fatalities), comprising 12% of all bat fatalities, has a provincial S-Rank of S5 (i.e., Secure – common, widespread and abundant in Ontario).

The majority of bat mortality occurred in a one week period at the beginning of May (**Figure 7, Appendix A**). The highest number of bat fatalities over the course of the Reporting Period occurred at T58 (three fatalities) (**Figure 8, Appendix A**), located in the eastern portion of the wind plant.

Correcting for searcher efficiency, scavenger and other removal rates, and percent area searched, the 34 recovered carcasses represent an estimated total bat mortality rate for the Reporting Period of 5.23 bats/turbine (2.27 bats/MW) (**Table 3.8, Appendix B**).

In an effort to correlate bat mortality to wind speed, wind speed data for the Reporting Period was downloaded from the MET tower in the northwest portion of the wind plant. Wind speed is recorded at 10 minute intervals and these data were summarized to obtain a mean wind speed for each ten hour period from 20:00 to 06:00. Wind speeds recorded at a height of 78 m were used to correspond to wind speeds in the blade sweep area. Mean wind speed was calculated over the ten hour period from 20:00 the night before until 06:00 the day of each carcass search. For example, mean wind speed for April 18 was calculated from 20:00 April 17 to 06:00 April 18. **Figure 9, Appendix A** compares bat mortality to mean wind speed. When considering the results depicted in **Figure 9**, it is important to consider the lag period over the search interval. If, for example, higher mortality occurred across the wind plant on a single low wind night, detection of the carcasses would be spread out over the search interval (three to seven days). It appears that the peak of bat mortality observed during the first week of May corresponded to a period of relatively low wind speeds.

3.2 DISTURBANCE EFFECTS MONITORING

3.2.1 Winter Raptor Surveys

A complete summary of raptors and owls recorded during each survey throughout the winter season (November 2009 to March 2010) is provided in **Table 3.9 (Appendix B).** Although not within the Reporting Period, November and December 2009 were included to provide a full season of results, allowing for a complete comparison to pre-construction surveys.

Within the 2009/2010 season, Red-tailed Hawk (60 observations) was the most common raptor observed during the afternoon surveys. Snowy Owl (34 observations) was the second most common raptor with observations peaking in December and January. Other relatively common

species included American Kestrel (30 observations) and Northern Harrier (19 observations). Although Northern Harrier was the most common species observed in November and December 2009, no harriers were observed from January to March, 2010. Maximum numbers of observations during any one survey include 7 Snowy Owls (December 23), 8 Northern Harriers (December 23), 13 Red-tailed Hawks (February 16) and 5 American Kestrels (March 17).

During the evening surveys, Short-eared Owls were relatively common with a total of 52 observations throughout the season. The maximum number of Short-eared Owls observed in a single survey was 15 on December 22, 2009.

Average raptor density, calculated as the number of raptors per kilometer, was highest on January 6, 2010 (0.5 raptors per kilometer); this included 11 Short-eared Owl during the afternoon survey, as well as 9 Red-tailed Hawks and 6 Snowy Owls. The largest number of Bald Eagles (4 observations) was also observed on this date.

Table 3.10 (Appendix B), provides a comparison of 2006/2007 pre-construction and 2009/2010 post-construction survey results by species. Overall, significantly fewer raptors were observed during the 2009/2010 season with an approximate 65% decrease in abundance during the afternoon surveys. The difference in abundance between the two years can almost entirely be attributed to two species, Northern Harrier and Rough-legged Hawk. Northern Harrier observations decreased from 159 in 2006/2007 to 19 in 2009/2010. Rough-legged Hawk observations decreased from 119 in 2006/2007 to 13 in 2009/2010. Results of the evening surveys suggest that abundance of Short-eared Owls in the winter of 2009/2010 was approximately half that of the 2006/2007 season. Species that appeared to be more abundant in 2009/2010, compared to 2006/2007 include Snowy Owl (34 and 14 observations respectively), Bald Eagle (11 and 6 observations respectively) and Merlin (4 and 2 observations respectively).

Numbers of wintering raptors and owls are known to vary significantly from year to year, based on prey conditions in their northern breeding and southern wintering areas. **Table 3.11, Appendix B** summarizes the results of the Kingston Christmas Bird Count (“CBC”) from 2000 to 2009, and demonstrates annual fluctuations in wintering raptor numbers in the Kingston area. The results are presented as number of birds observed per party hour. The CBC data suggests that 2006 was peak year for many raptor species with high numbers of Northern Harriers, Red-tailed Hawks, Short-eared Owls and Rough-legged Hawks.

As with the results of the pre-construction raptor surveys, areas of particularly high raptor and Short-eared Owl density (defined as more than 5 raptors per kilometer or more than 3 owls per kilometer) were mapped. Areas of high raptor and high owl density, as defined above, are shown in **Figure 10.0** and **Figure 11.0, Appendix A**, respectively. Most areas of raptor concentration in 2009/2010 occurred in the western portion of the study area, between Highway

95 and Concession 4, with a single area of high concentration in the northeastern corner of the study area. Concentrations of Short-eared Owl activity were most commonly observed centrally within the study area, between Concession 7 Rd, Ridge Rd, Concession 5 Rd and Baseline Rd, and near the south end of Concession 9 Rd. During the 2006/2007 preconstruction surveys, several more areas of high raptor and owl concentration occurred, most of which were located in the northwestern end of Wolfe Island (west of Conc 4. Rd), and the southern part of the Wolfe Island study area (south of Reeds Bay Road).

3.2.2 Foraging Waterfowl Surveys

In total, seven species of waterfowl were observed foraging inland during the spring 2010 post-construction monitoring; all species were either geese or dabbling ducks. Canada Goose was the most abundant species, representing approximately 99% of all observations. Mallard represented approximately 1% of observations, with only a small number of the remaining five species (American Black Duck, Gadwall, Northern Shoveler, Northern Pintail and Green-winged Teal). The species composition was very similar to that observed during the 2007 pre-construction monitoring (**Table 3.12, Appendix B**).

Overall, the number of waterfowl observed during 2007 pre-construction surveys and 2010 post construction surveys were respectively 10,295 and 9031, a 12% reduction. When the results are expressed as waterfowl days, the difference between 2007 and 2010 is 32%, with 85,219 and 57,906 waterfowl days, respectively. The number of waterfowl days at inland foraging areas in spring 2007 and spring 2010 are shown in **Figure 12.0, Appendix A**.

In the spring of 2010, areas of highest waterfowl concentration occurred in the southern portion of Wolfe Island, south of Reed's Bay Road. The largest flocks usually occurred in close proximity to the bays where they stage overnight. When comparing 2007 and 2010 spring results, the areas of waterfowl concentration were generally similar with some localized shifting (e.g., using different fields within the same concession).

Crop preference in the spring of 2007 and 2010 were similar, with the majority of observations in hay or pasture. During the spring migration period, young grass shoots appear to be the diet of choice for the Canada Goose. Grain fields, such as corn or soy, were generally not as important to foraging waterfowl during the spring season (**Table 3.13, Appendix B**). Fields used as the primary inland foraging areas were often different between weekly visits. It is presumed that waterfowl foraging inland moved about in response to changing foraging opportunities and field management, for example, moving away from a previously productive foraging site as the food was depleted by the flock, or after the field was tilled.

3.2.3 Overland Waterfowl Movement Surveys

Summaries of the spring 2010 morning and evening waterfowl movement surveys are provided in **Tables 3.14** and **3.15 (Appendix B)**, respectively. **Figures 13.0 and 14.0 (Appendix A)**

compare the major routes used by waterfowl in spring during the 2007 pre-construction and 2010 post-construction monitoring. Generally, major movement routes were similar in 2007 and 2010. All major routes were associated with the primary offshore staging areas, namely Reed's Bay, Pyke's Bay, Button Bay, Bayfield Bay and the small inlet off Carpenter's Point Rd. Routes used by waterfowl were typically similar during morning and evening movement, with the directions reversed. Morning movement of diving ducks from Button Bay to Bayfield Bay, in a route over the St. Lawrence River then crossing Carpenter's Point was observed in 2010, a route also observed during fall waterfowl studies.

Waterfowl observed during the spring 2010 post-construction monitoring flew between WTGs. In many instances, flocks of Canada Geese appeared to alter their course to avoid WTGs. In most cases, these were minor adjustments to avoid individual WTGs. As in the fall 2009 post-construction monitoring, flocks of Canada Geese moving into Bayfield Bay often altered their route up to 500m to avoid a cluster of WTG's, choosing to follow the shoreline into the bay (Route 11, **Figure 14.0, Appendix A**).

Canada Geese represented the majority of movement observations in both 2007 and 2010, representing 95% and 99% of observations respectively. Dabbling ducks represented 5% of the observations in 2007 but less than 1% in 2010.

The results of the 2010 spring waterfowl movement monitoring indicate that the majority of waterfowl moving between bays and inland foraging areas flew at WTG blade sweep height. Of the 15,791 observations during morning and evening movement monitoring, 12,851 (81%) were observed at blade sweep height for at least a portion of their flight. Wind speed appeared to be a significant factor influencing flight height, with flights below blade sweep height often occurring during high wind conditions.

3.2.4 Aerial Waterfowl Surveys

Waterfowl data collected during spring of 1999, 2008, 2009 and 2010 aerial surveys were grouped into guilds and waterfowl days were calculated for each sector. **Appendix F** presents the waterfowl days in each guild by sector for each year. The waterfowl days by guild for each major staging area (i.e., Bayfield Bay, Button Bay, Pyke's Bay and Reed's Bay) for spring 2008, 2009 and 2010 are also provided in **Appendix F**; data specific to each major staging area were not collected by CWS in 1999.

Table 3.16, Appendix B, compares the number of waterfowl days in each sector in the springs of 1999, 2008, 2009 and 2010, inclusive of major staging areas. Overall, 1999 had the largest number of waterfowl days (474,079); approximately 24% higher than the average of the three recent surveys. When comparing the three recent years, the total number of waterfowl days observed was very similar, with the waterfowl days in the spring of 2010 being 8% larger than that of 2008 and 1% smaller than 2009. No significant differences in waterfowl days in Sectors C7, C8 and C11 were observed between the three recent years of data. Sector C10

experienced a significant increase in waterfowl days in 2010, supporting 118% more waterfowl than observed in 2009. Within Sector C9, the waterfowl days in spring 2010 were down 31% from 2009. However, there was only a 2% difference in waterfowl days in Sector 9 between 2010 and 2008.

Table 3.17, Appendix B, compares the waterfowl days in each of the major staging areas in the springs of 2008, 2009 and 2010. Overall, the total number of waterfowl days within the major staging areas was highest in 2009, and was 28% higher in 2009 than in the spring of 2010. The large number of total waterfowl days in 2009 can largely be attributed to Bayfield Bay. Waterfowl days in Bayfield Bay were 66% larger in the spring of 2009 compared to 2010, although only a 16% difference was observed in the number of waterfowl days between 2008 and 2010. The 2010 surveys observed an increase in waterfowl days in Button Bay; up 482% from 2009. It is worth noting that post-construction surveys in the fall of 2009 observed a 61% decrease in Button Bay's waterfowl days from the pre-construction surveys in the fall of 2008. Waterfowl days in Pyke's Bay and Reed's Bay were relatively similar in 2009 and 2010, but were lower compared to 2008. A respective 53% and 66% decrease in waterfowl days was observed between 2008 and 2010 in Pyke's Bay and Reed's Bay.

Table 3.18, Appendix B, compares the waterfowl days for each guild in the springs of 1999, 2008, 2009 and 2010. Generally, the numbers of waterfowl days for each guild were relatively variable between the four years of spring surveys, without distinctive trends. Waterfowl days for geese were similar in 2010 and 2009, but were significantly lower in 2008. Among the three recent years, 2010 had high waterfowl days for large and small dabblers, although large dabblers were much higher in 1999. Similarly, in 2010 waterfowl days for bay ducks were higher than 2008 or 2009, although much lower than 1999. The waterfowl days for the goldeneye guild were quite variable over the years, but 2010 appeared to have relatively average abundance. Waterfowl days for mergansers in 2010 were lower compared to 2009, but higher than that observed in 2008 or 1999. Sea duck observations in 2010 were significantly higher than 2008 (870% increase in waterfowl days), but significantly lower when compared to the spring of 2009 (75% decrease in waterfowl days)

3.2.5 Waterfowl Breeding Pairs Surveys

Appendix G provides the results in each wetland on each of the waterfowl breeding pairs surveys. **Table 3.19, Appendix B** provides a summary of the maximum breeding pairs in each wetland, based on the calculation of indicated pairs.

In total, 11 species of waterfowl were observed during the breeding pairs surveys, 8 of which are expected to be breeding on Wolfe Island. Observations of Bufflehead, American Wigeon and Pied-billed Grebe were not considered breeding individuals based on the calculation of indicated pairs. Mallard was the most common species with 19 breeding pairs observed across the 5 wetlands. Canada Goose and Wood Duck were also relatively common with 9 breeding

pairs each across the 5 wetlands. Other species were observed in fewer numbers, with 1 to 3 breeding pairs across the 5 wetlands. The Bayfield Bay Marsh route had the largest number of breeding pairs observed: 14 in total, 8 of which were Mallard.

Button Bay Wetland route had the lowest number of breeding pairs observed, 5 in total. However, as Button Bay was the shortest route, fewer observations would be anticipated. Big Sandy Bay Wetland route had 9 breeding pairs of 3 species. Reed's Bay had the lowest species diversity, including only Canada Goose and Mallard, 3 breeding pairs of each. Sandy Bay Wetland had the second highest number of breeding pairs, 11 in total, and the highest species diversity with six species, including a possible Red-breasted Merganser breeding pair.

3.2.6 Grassland Breeding Bird Point Counts, Paired Point Counts and Area Searches

Point Counts

Table 3.20, Appendix B compares grassland breeding bird densities, as measured through the 2006 and 2007 pre-construction and 2010 post-construction grassland breeding bird point counts.

Bobolink and Savannah Sparrow are two grassland breeding birds that show little change in recorded breeding densities between the two pre-construction and post-construction surveys. Densities of Eastern Kingbird and Song Sparrow also remained stable. Observed densities of most other grassland species were lower during the post-construction 2010 surveys. Specifically, Upland Sandpiper, Killdeer, Barn Swallow, Horned Lark and Eastern Meadowlark were recorded at lower densities in 2010 than during pre-construction surveys. In addition, a number of species that are not considered "grassland birds" appeared to experience a decrease in abundance between pre and post-construction grassland point counts; specifically Mourning Dove, American Robin, European Starling, Yellow Warbler, Red-winged Blackbird and Common Grackle were all recorded in lower numbers during 2010 post-construction grassland point counts.

The density of all breeding birds, as measured through the grassland point counts, was lower during the post-construction surveys. However, a similar decrease in abundance was not observed between the pre and post-construction grassland area searches (results presented below). Further discussion is provided in Section 4.2.6.

Paired Point Counts

Table 3.21, Appendix B provides the results of the grassland paired point count surveys, comparing average breeding bird densities (pairs/10ha) at three distance regimes; within 100m of the WTG bases, 100-200m and 200-300m from the bases. Bobolink, Savannah Sparrow and

Red-winged Blackbird were the most commonly encountered species, which is consistent with the grassland point counts.

There was no apparent trend in breeding densities between the three distance regimes (i.e., species densities did not clearly increase or decrease in relation to distance from the turbine). Summary statistics are provided in **Appendix I**. The single factor ANOVA analysis of the results indicated that the difference in densities of all species combined was significantly lower between 100-200 m from the WTG base compared to 0-100 m and 200-300 m from the WTG base ($p<0.05$). The combined species densities appeared to be influenced by flocks of European Starlings that were observed in the 0-100 m and 200-300 m distance categories, however, when European Starlings were removed from the analysis, the same significant difference was observed, albeit less pronounced (**Appendix I**).

Species densities for the 6 most common grassland species combined (i.e., Upland Sandpiper, Eastern Kingbird, Savannah Sparrow, Grasshopper Sparrow, Bobolink and Eastern Meadowlark) were not statistically significantly different among the three distance categories ($p<0.05$).

A single factor ANOVA analysis was also conducted for each of the most common species observed that have a strong affinity for grassland habitat (Eastern Kingbird, Savannah Sparrow, Grasshopper Sparrow, Bobolink and Eastern Meadowlark), with no statistically significant difference in breeding densities observed among the three distance categories for four of the five species ($p<0.05$, **Appendix I**). The density of Eastern Meadowlarks was significantly lower within 200 m of the WTG base compared to densities more than 200 m of the WTG base ($p<0.05$, **Appendix I**). Upland Sandpipers were observed in too few numbers to allow for a statistical analysis.

Southeast Area Search

In total, 28 species were observed breeding within the Southeast Area. Detailed observations are provided in **Appendix I**. Savannah Sparrow was the most abundant species (9.7 pairs/10ha), followed by Bobolink (9.4 pairs/10ha) and Red-winged Blackbird (6.8 pairs/10ha). Eastern Meadowlarks were also relatively abundant with a maximum of 24 males observed during the June 14, 2010 survey, which results in 1.2 pairs/10ha. A pair of Northern Harriers was observed and likely bred within the Southeast Area during both pre and post-construction surveys.

Table 3.22, Appendix B compares the densities of grassland breeding birds between 2007 pre-construction and 2010 post-construction surveys. **Table 3.23, Appendix B** compare the densities within grassland sectors alone, to account for change in the amount of hay and pasture between years.

For the majority of grassland species, densities were very similar between pre and post-construction surveys. Savannah Sparrow was the most abundant species in both 2007 and 2010, with the same density of breeding pairs in grassland habitat.

Bobolink appeared to experience the largest change in density, with a significant increase in abundance between 2007 and 2010. Densities of Eastern Kingbird and Grasshopper Sparrow had observed decreases between pre and post-construction surveys. However, these differences are attributed to a relatively small change in the number of breeding pairs; 6 and 3 fewer breeding pairs respectively for Eastern Kingbird and Grasshopper Sparrow. Overall, observed decreases are likely attributed to yearly fluctuation.

Northwest Area Search

In total, 27 species were observed breeding within the Northwest Area. Detailed observations are provided in **Appendix I**. Bobolink had the highest observed density (16.6 pairs/10ha), followed by Savannah Sparrow (15.1 pairs/10ha) and Red-winged Blackbird (7.7. pairs/10ha). A pair of Northern Harriers was observed during both pre and post-construction surveys and were likely breeding within the Northwest Area.

Table 3.22, Appendix B compares the densities of grassland breeding birds between 2007 pre-construction and 2010 post-construction surveys. **Table 3.23, Appendix B** compare the densities within grassland sectors alone, to account for change in the amount of hay and pasture between years.

The overall density of Bobolinks within the Northwest Area was lower during the post-construction surveys. However, this can be attributed to the amount of grassland habitat; within grassland habitat alone, the density of Bobolinks was very similar pre and post-construction. Typically, the grassland habitat in close proximity to WTG had been disturbed for the gravel pads used in tower erections. During the June 2010 surveys, the gravel pads used for construction had been removed and these disturbed areas were in a state of regeneration. Bobolinks typically avoided these regenerating areas. However, where suitable grassy ground cover occurred, Bobolinks were occasionally observed within 50m of the base of WTG.

As observed during pre-construction surveys, Upland Sandpipers remain a common species within the Northwest Area during the post-construction monitoring. An Upland Sandpiper was flushed from a nest approximately 35m from the base of T15. This individual was taking advantage of the regenerating disturbed area, nesting on the bare ground under a clump of weeds.

An observed decline in Grasshopper Sparrows was recorded between pre and post-construction survey. During the 2007 pre-construction surveys, a particular concentration of Grasshopper Sparrows had been observed within a swale in Sector 8. Although Grasshopper

Sparrows were still present in this location, approximately 500m from the closest WTG, they were in lower numbers in 2010.

3.2.7 Wetland Breeding Bird Point Counts and Area Searches

Table 3.24, Appendix B compares the breeding densities of wetland birds, as measured through the 2007 pre-construction and 2010 post-construction wetland breeding bird point counts. Red-winged Blackbird, Swamp Sparrow, Marsh Wren, Yellow Warbler and Common Yellowthroat were the most common species during both pre and post-construction surveys. For most species, abundance was very similar, with differences in breeding density resulting from a small change in the number of breeding pairs observed. However, the point count data suggests the Red-winged Blackbird experienced a decrease in abundance. Red-winged Blackbird abundance in 2010, as measured by the point count survey, was approximately half that recorded in 2007. However, given the relatively small number of point counts conducted in wetland habitat, the data is heavily influenced by outlier points. A gregarious species such as the Red-winged Blackbird would be particularly prone to such influence, as a breeding colony could be located just within, or just outside of, the 100m point count station. In such cases, the area search data provides a more accurate comparison of breeding bird abundance. Red-winged Blackbird numbers, as recorded during the area searches (**Table 3.25, Appendix B**) indicates relatively consistent abundance within all 5 wetlands surveyed.

Another species, the Common Yellowthroat, also appeared to have a change in abundance between the pre and post-construction surveys. Both the point count data and the area searches recorded an increase in Common Yellowthroats, suggesting this species was in fact more abundant during the 2010 surveys. For most other species, the area searches (**Table 3.25, Appendix B**) recorded similar abundance during pre and post-construction surveys. Changes were recorded for the Wood Duck (increase from 8 to 15 pairs), Mallard (decrease from 17 to 7 pairs) and the Willow Flycatcher (increase from 6 to 13 pairs).

Species diversity between the 2007 and 2010 surveys was very similar. In 2007, 43 species were observed during the wetland area searches, 40 of which were likely breeding in the wetlands; 3 were visiting to forage (Double-crested Cormorant, Great Blue Heron and Osprey). In 2010, 50 species were observed, 41 of which were likely breeding within the wetlands; 8 were visiting to forage (Double-crested Cormorant, Great Blue Heron, Bald Eagle, Osprey, Herring Gull, Ring-billed Gull, Caspian Tern and Barn Swallow) and 1 was a late migrant (Least Sandpiper).

One threatened species, the Least Bittern, was observed during the wetland post-construction monitoring. A single male was heard calling in the Big Sandy Bay Wetland on June 15, 2010; recorded during both the area search and on a point count. This species was not detected during pre-construction surveys, but had been historically recorded breeding on the island.

3.2.8 Woodland Breeding Bird Point Counts and Area Searches in Woodlots Larger than 10ha

Point counts and area searches were conducted in two of the large woodland areas that were in close proximity to WTGs, the woodlands connected to Big Sandy Bay Wetland and woodlands associated with the Sandy Bay Wetland. The Big Sandy Bay woodland habitat consisted mostly of swamp, ranging from mature closed canopy silver maple swamp to more open canopy ash-maple swamp with a dense understorey. The Sandy Bay woodland consisted of a deciduous forest community dominated by ironwood, sugar maple and white ash with hawthorn in the understorey.

Respective totals of 45 and 51 species were recorded during the 2008 pre-construction and 2010 post-construction area search surveys (**Appendix J**). Due to the wet nature of the Big Sandy Bay woodlands, some species typical of thicket swamps were recorded, such as Swamp Sparrow and Common Yellowthroat. Waterfowl, including Canada Goose, Mallard and Wood Duck were observed in the swamp communities; they were considered potential breeders as suitable habitat was present. The woodlands also supported many forest breeding species such as Wood Thrush, Eastern Wood-Pewee, Great Crested Flycatcher, Red-eyed Vireo and Rose-breasted Grosbeak. Several area-sensitive forest nesting species were recorded within the two woodlands including Pileated Woodpecker (recorded during the 2008 surveys), Blue-gray Gnatcatcher, American Redstart, Northern Waterthrush and Mourning Warbler (recorded during the 2010 surveys) and Veery (recorded in both years).

Woodland point count results are provided in **Table 3.26, Appendix B**. The most abundant species were generally similar during both pre and post-construction surveys including Yellow Warbler, American Robin, Song Sparrow and Swamp Sparrow; these are species that are generally characteristic of the more open canopy nature of most of the woodlots. Species characteristic of more mature forests, such as Wood Thrush or Rose-breasted Grosbeak, were typically less common. For most species, the point counts recorded very similar densities between pre and post-construction surveys, with differences resulting from a small change in the number of breeding pairs observed.

3.3 NOTIFICATIONS

Section 3.2 of the Follow-up Plan outlines mortality and disturbance thresholds which trigger contact with Environment Canada / Canadian Wildlife Service, the Ontario Ministry of Natural Resources, and Natural Resources Canada. There were seven notifications filed during the Reporting Period (**Table 3.27 Appendix B**), related to mortality of raptors and vultures, bats, species at risk and disturbance to staging waterfowl.

Notifications and the agency responses are provided in **Appendix K**.

3.3.1 High Annual Mortality Rates – Raptors and Vultures

The threshold for high annual mortality rates – raptors as outlined in the Follow-up Plan is two raptor or vulture fatalities over a six-week period. Four of the seven notifications were related to raptor and vulture fatalities, and were submitted on April 15, May 6, May 18, and June 11, 2010 (**Table 3.27, Appendix B**). Each notification involved two or three raptor or vulture fatalities over periods of varying length, but less than six weeks (**Table 3.27 Appendix B**).

3.3.2 High Annual Mortality Rates – Bats

The threshold for high annual mortality rates – bats as outlined in the Follow-up Plan is 144 bat fatalities over a consecutive three-week period. This threshold value is intended to represent the estimated actual number of fatalities corrected for projected scavenger removal and searcher efficiency. One of the notifications was related to bat fatalities, and was submitted on May 26 (25 bat fatalities) (**Table 3.27, Appendix B**).

3.3.3 Mortality of Species at Risk

The Follow-up Plan requires that any mortality of species at risk must be immediately reported to NRCan, MNR and EC. On May 11, 2010 a single Chimney Swift fatality was recorded at T04. This species is listed as Threatened on Schedule 1 of the federal *Species at Risk Act* and on the Species at Risk in Ontario list of the provincial *Endangered Species Act (2007)*. This individual was likely a migrant; Cink and Collins (2002) indicate that this species arrives in Ontario in late April or early May, and begins nest building in late May or early June in nearby New York.

3.3.4 Disturbance of Staging Waterfowl

The threshold for disturbance to staging waterfowl as outlined in the Follow-up Plan is a 30% decline in the staging numbers of any of the listed waterfowl guilds over a period of more than one month. The measure of abundance is “waterfowl days” per guild, compared between the average of 2008/2009 pre-construction surveys and the 2010 post-construction surveys.

Over the period March 24-May 5, 2010, waterfowl days for the sea duck guild (which includes Long-tailed Duck, scoters and eiders) were 1,050, which represents a 50.3% decline over the pre-construction 2008/2009 average of 2,113. The notification (**Appendix K**) cautioned that these numbers are small, and a relatively small deviation of hundreds of waterfowl days (arising from a difference of a few dozen individuals over several weeks) results in a large percentage change. Additionally, the small number is sensitive to inter-year variation; the 2010 value of 1,050 waterfowl days is an order of magnitude greater than the 2008 pre-construction value (108) although it is considerably less than the 2009 construction season value (4,118) (**Table 3.18, Appendix B**).

Four surveys were conducted between March 24 and May 5. Following the first two surveys, sea duck waterfowl days in 2010 were nearly double the average number of sea duck waterfowl days observed under pre-construction conditions. Following the third survey, sea duck waterfowl days were approximately equivalent under pre- and post-construction conditions. The decline in numbers observed following the fourth survey strongly suggests that the sea ducks arrived and departed the area earlier than in previous years, probably as a result of weather or other factors unrelated to the wind plant. Overall, the data suggest that similar numbers of sea ducks were present in 2010 but that they were present over a shorter period of the survey, which was reflected in reduced waterfowl days.

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4.0 Discussion and Recommendations

4.1 DIRECT EFFECTS – MORTALITY

The actual number of bird and bat carcasses found during the carcass searches for the period from July 2009 to June 2010 is as follows:

	Jul –Dec 2009 (Actual Carcasses Found)	Jan – Jun 2010 (Actual Carcasses Found)	**July 2009- June 2010 (Total Number of Carcasses Found)**
Birds	100	66	**166**
Raptors and Vultures	12	10	**22**
Bats	180	34	**214**

The mortality rates from Monitoring Report No. 2 (Stantec, 2010) and this Reporting Period can be combined to produce mortality estimates for one full year at the Wolfe Island Wind Plant, July 2009-June 2010:

	Jul –Dec 2009 (Estimated Fatalities / turbine)	Jan – Jun 2010 (Estimated Fatalities / turbine)	**July 2009- June 2010 (Estimated Fatalities / turbine / year)**
Birds	6.99	6.39	**13.38**
Raptors and Vultures	0.15	0.12	**0.27**
Bats	14.77	5.23	**20.00**

	Jul –Dec 2009 (Estimated Fatalities / MW)	Jan – Jun 2010 (Estimated Fatalities / MW)	**July 2009- June 2010 (Estimated Fatalities / MW / year)**
Birds	3.04	2.78	**5.82**
Raptors and Vultures	0.07	0.05	**0.12**
Bats	6.42	2.27	**8.69**

The annual mortality estimates can be compared to levels reported at other wind power plants in North America. A recent summary of available mortality rates for birds, raptors and bats has been prepared by the National Wind Coordinating Committee (“NWCC”) (2010). The following discussions relate to mortality observed over the one-year period (July 2009 – June 2010).

4.1.1 Birds

The estimated annual bird mortality rate of 5.82 birds/MW (13.39 birds/turbine) is very similar to that observed at the Maple Ridge facility (5.81 birds/MW) in 2006 (Jain et al., 2007), although it is higher than the rate observed at Maple Ridge in 2007 (3.82 birds/MW; Jain et al., 2009). Jain et al. (2007) concluded that such a rate, provided that it did not involve endangered or threatened species at risk, was not likely to lead to significant adverse effects on a population level, "even with respect to cumulative impacts of fatalities from many wind plants." Arnett et al (2007) similarly concluded that the fatality of passerines, which comprise the majority of collision victims at wind facilities, has been so low that it "is not significant at the population level."

The annual mortality rate at the Wolfe Island Wind Plant is within the mortality range of 0 to 14 birds/MW as reported by NWCC (2010). The estimated annual fatality rate for birds at the wind plant is well below the threshold of 11.7 birds/MW, as identified in the Follow-up Plan. When comparing mortality rates, it is important to note that most, if not all of the studies at Maple Ridge and those included in the NWCC summary did not involve mortality monitoring during the winter months. Fourteen (8.5%) of the 165 bird fatalities found at Wolfe Island were found between mid-November and the end of March.

The Wolfe Island mortality rate is strongly influenced by the mortality of swallows and martins, primarily in July and August. Large numbers of Tree Swallows congregate on Wolfe Island during the summer, prior to fall migration. Swallows and martins comprised 41 (24.5%) of the 165 observed bird fatalities, however, this number is small relative to the estimated 10,000 Tree Swallows reported to use the site in the IBA Site Summary for Wolfe Island (IBA Canada, undated) and the estimated Ontario population of 400,000 (Cadman et al., 2007). Although Tree Swallows and Barn Swallows were identified as having an elevated risk of collision in the ERR based on their observed flight heights, they were not identified as one of the main species at risk of collision overall.

and

As identified in the ERR, grassland species that conduct aerial mating displays may be at higher risk to collisions with turbines. In particular, Wilson's Snipe was a species that was identified as having an elevated risk as male perform aerial territorial displays at the height of turbine blade sweep and as suitable breeding habitat is common throughout the project area. Seven Wilson's Snipe fatalities were recorded during the spring period in which they conduct their aerial displays. This is small relative to the common and secure Ontario population, which is estimated at 500,000 individuals (Cadman et al., 2007). Wilson's Snipe is a managed game bird in Ontario, with a daily bag limit of 10 individuals which is considered an acceptable take in managing the population. Overall, the annual mortality rate of Wilson's Snipe, which is far below limits set for hunting, is anticipated to have a negligible impact on the local population.

Nine other species of conservation priority were on the list of fatalities over the one-year period July 2009-June 2010 (American Kestrel, Baltimore Oriole, Bank Swallow, Black-billed Cuckoo, Chimney Swift, Eastern Kingbird, Savannah Sparrow, Wood Thrush), however, only one or two fatalities of each were recorded. This level of mortality is not considered to be a concern at the population level for these nine species.

Bobolinks have been identified as a species of conservation priority by Ontario Partners in Flight (2006). This species was identified as threatened by Committee of the Status of Endangered Wildlife in Canada (COSEWIC) in April of 2010 and by the Committee on the Status of Species at Risk in Ontario (COSSARO) in June of 2010, but was not listed or protected under the federal *Species at Risk Act* or provincial *Endangered Species Act* during the reporting period. Nine Bobolink fatalities were recorded from July 2009 to June 2010. The majority of Bobolink fatalities occurred in late July or August, a time when juveniles are leaving the nests, suggesting many of the fatalities may have been recently fledged young. Positive confirmation of which specimens were juvenile was not always possible, due to the condition of some specimens and similarities between juvenile and non-breeding adult Bobolinks. However, at least three of the fatalities could be identified as juveniles. Applying the correction factors to a single species can provide a rough estimate of the actual mortality rate, although this relies on a potentially erroneous assumption that the species composition of recovered fatalities is equivalent to the species composition of all fatalities. If the correction factors were applied to the nine Bobolink fatalities, the estimated annual mortality rate would be 73 birds. This estimated annual mortality rate is small relative to the estimated regional and Ontario population. Pre-construction surveys estimated the population in June within the Study Area to be 1,000-1,500 (approximately 1,050 counted during area searches, plus others observed during point counts; Stantec, 2008a). The estimated population in Ontario during the June breeding season is 800,000 Bobolinks (Cadman et al., 2007). It is noted that population sizes would be significantly larger after July 1, when the majority of fatalities were observed, with the addition of juvenile birds.

Chimney Swift has been identified as both provincially and federally Threatened. The individual found in May was a spring migrant. There is no evidence to suggest Chimney Swifts breed or congregate in the vicinity of the site, and no basis to identify a future threat to other individuals of this species.

The annual raptor and vulture mortality rate of 0.12 raptors per MW (0.27 raptors/turbine) is in the middle of the mortality range observed at other facilities in North America outside California (0 – 0.32 raptors/MW; NWCC, 2010). It is lower the rates observed at Maple Ridge in 2007 (0.25 raptors/MW as reported by NWCC, 2010), although higher than the rate observed at Maple Ridge in 2006 (approximately 0.05 raptors/MW, as reported by NWCC, 2010). The majority of the raptor and vulture fatalities appeared to be individuals migrating through the study area. Corrected for scavenger removal, the 22 observed raptor and vulture fatalities of six species (ten Red-tailed Hawks, seven Turkey Vultures, two American Kestrels and one each of

Merlin, Osprey and Northern Harrier) represent 23 raptor and vulture fatalities over the period July 2009 – June 2010.

The raptor and vulture mortality rate is higher than the notification threshold of 0.09 raptors/MW identified in the Follow-up Plan. At the time of Plan preparation, 0.09 raptors/MW was the highest rate of raptor mortality recorded in North America, outside California, although since that time, studies at ten additional facilities in New York, Oregon, Washington, Texas and Alberta have reported higher rates of raptor mortality (NWCC, 2010). Nonetheless, in accordance with the Follow-up Plan, TransAlta and the MNR have initiated discussions regarding adaptive management. Raptor behavioural studies are underway involving surveys at during four peak mortality periods, and will continue across late summer and late fall, 2010 and spring, 2011.

4.1.2 Bats

The annual bat mortality rate of 8.69 bats/MW (19.99 bats/turbine) is at the median of the mortality range observed at other facilities in North America, which ranges from 0 – 39 bats/MW (NWCC, 2010). It is lower the rates observed at Maple Ridge (11.23 bats/MW) in 2007 (Jain et al., 2009). The annual bat mortality rate at Wolfe Island is below the threshold for adaptive management of 12.5 bats/MW as identified in the Follow-up Plan.

Johnson (2004, as cited by Ontario Ministry of Natural Resources, 2006) indicated that over 90% of bat fatalities at wind plants occur between mid-July and the end of September. In the period July 2009 – June 2010, the peak of bat mortality occurred at the wind plant in late August. However, 34 (15.9%) of the 214 bat fatalities recorded during year-round monitoring at the Wolfe Island Wind Plant fell within the spring months, with a decided peak in the first week of May. Long-distance migratory tree bats comprised 76% of identified fatalities during the first full year of monitoring.

The annual bat mortality rate is below the adaptive management threshold of 12.5 bats/MW as identified in the Follow-Up Plan. Although the bat mortality rate is below the threshold, TransAlta is committed to complete additional research in 2011 to evaluate practical measures to reduce the effects of operating wind turbines on bats at the wind plant. TransAlta will complete testing of potential mitigation measures during the fall migration period in 2011 to determine the feasibility and effectiveness of implementing such mitigation measures at Wolfe Island.

4.2 INDIRECT EFFECTS – DISTURBANCE

4.2.1 Wintering Raptors

Wolfe Island has been identified as a significant wintering area for a variety of species of raptors and owls. Results of the pre-construction winter raptor monitoring, which was conducted from November 2006 to March 2007, confirmed that some species can become abundant during winter months, including one species at risk, the Short-eared Owl.

Overall, the 2009/2010 post-construction monitoring found that, although raptors were still relatively common, the overall density was well below that observed in 2006/2007. The average density in 2009/2010 was 0.25 raptors/kilometer compared with 0.72 raptors/kilometer in 2006/2007, a 65% decrease. Annual numbers of most overwintering raptors are dependent upon the number of meadow voles, the populations of which vary in a cyclical fashion. As such, the low density of raptors on Wolfe Island in the winter of 2009/2010 is likely a direct result of low prey abundance. Most of southern Ontario likely experienced low prey abundance during the winter of 2009/2010, as surveys conducted at other sites (Stantec, unpublished; Environment Canada, pers. comm.) and reported on the OntBirds listserve, indicate that the number of wintering raptors and owls were generally lower than average across southern Ontario.

Christmas Bird Count ("CBC") results, which include observations throughout the Kingston count circle, generally correlate with the differences observed between the 2006/2007 pre-construction and 2009/2010 post-construction monitoring on Wolfe Island. Both the CBC and the post-construction monitoring found Rough-legged Hawks and Northern Harriers experienced the largest changes in abundance, with less significant changes in the abundance of Short-eared Owls. It is noted that, whereas in 2006-2007 Northern Harriers were generally abundant throughout the winter months, during post-construction surveys they were observed in November and December only, suggesting they moved further south mid-winter in search of areas with higher prey density. Overall, it is evident that low raptor abundance observed on Wolfe Island in the winter of 2009/2010 was observed throughout the Kingston area and across southern Ontario, and was likely attributed to low prey abundance. As such, low raptor density was not attributed to avoidance of potential project disturbances, such as WTGs.

Bald Eagle was a species that appeared to experience a significant increase in abundance between 2006/2007 and 2009/2010, as observed through both the post-construction monitoring and the CBC. The increase in Bald Eagle observations is likely attributed to the general increase in abundance of this species throughout Ontario, as it continues to recover from population crashes experienced mid-century (Cadman et al., 2007).

Fewer areas of raptor and owl concentration, as shown on **Figures 10.0** and **11.0**, **Appendix A**, were identified during the post-construction survey. The overall low raptor density in 2009/2010 was likely the major contributing factor to the lack of raptor and owl concentration areas. As such, trends in the distribution of raptor and owl concentration areas in the 2009/2010 season are not evident. However, it is noted that no raptor or owl concentration areas were recorded in the northwest end of Wolfe Island, an area of high WTG concentration. Although not occurring in concentrations of 5 or more raptors within 1 kilometer, raptors were regularly recorded in this area. Throughout the season, 11% of raptor observations were made in the northwest end of Wolfe Island, an area which encompasses approximately 15% of the survey route traveled.

Concentrations of both raptors and owls were observed in close proximity to single WTGs, suggesting raptors and owls do not avoid utilizing habitat adjacent to WTGs. Further disturbance studies, in years with higher raptor densities, will be capable of providing further insight into the potential impacts on raptor abundance in areas with high WTG densities.

4.2.2 Foraging Waterfowl Surveys

The results of the spring inland foraging surveys indicated a general decrease in waterfowl abundance between 2007 and 2010. In both 2007 and 2010, Canada Goose was by far the most common species observed. As such, the change in waterfowl days can almost entirely be attributed to the Canada Goose. Lower goose observations were relatively consistent throughout the spring 2010 season, with lower numbers observed on most surveys when compared to the same week in 2007. Conversely, the post-construction monitoring conducted in the fall of 2009 found consistently higher Canada Goose abundance over the pre-construction surveys in the fall of 2007. Possible explanations for the fluctuation in the abundance of Canada Geese observed during the post-construction monitoring include natural variability, crop rotation or presence of the turbines. Regardless, it is clear from the spring 2010 post-construction surveys that Canada Geese remained an abundant species on Wolfe Island through the spring migratory season.

Fewer Mallard observations were recorded in 2010, a 54% decrease from 2007. However, given the low numbers of Mallard recorded in both years, outlier observations, such as the 125 Mallards observed on April 4, 2007, have a significant influence on the perceived overall abundance. As the difference in Mallards recorded between 2007 and 2010 resulted from a small number of flock observations, it may not be a reliable indication of lower Mallard abundance. During the aerial waterfowl surveys, a method which samples much higher numbers of waterfowl, large dabblers, including Mallards, were significantly higher in the spring of 2010 over the 2008 pre-construction data.

The distribution of flocks in 2007 and 2010 was similar with flocks often choosing to forage in the same general locations. It was also noted that flocks were occasionally observed foraging in proximity (i.e. within 300 m) to a WTG. Overall, the results suggest that proximity to wind turbines is not an important factor to the foraging field selection of waterfowl. Factors that are likely to have more significant influences on foraging field selection would include foraging opportunities and field management.

4.2.3 Overland Waterfowl Movement Surveys

Routes selected during the waterfowl morning and evening movement were very similar during the spring 2007 and spring 2009 surveys. The major movement routes occurred in and out of the primary off-shore staging areas for geese and dabblers, including Reed's Bay, Pyke's Bay, Button Bay, Bayfield Bay and the small inlet off Carpenter's Point Rd. Waterfowl did not appear to adjust their flight height in reaction to the WTGs, with the majority of ducks and geese flying

at blade sweep height. Flight height did, however appear to be affected by wind conditions, with lower flight heights being more prevalent during periods of stronger winds.

Waterfowl appeared to adjust their flight route to avoid flying in close proximity to WTG. In many cases, obvious avoidance behavior was observed, as flocks of waterfowl adjusted their flight course as they approached a WTG. As a result, more routes were recorded during the post-construction monitoring, as flocks chose difference paths around WTGs to reach their destination. Overall, overland movement routes were very similar during pre and post-construction surveys, with slight changes likely attributable to changes in foraging fields and adjustments around WTGs.

4.2.4 Aerial Waterfowl Surveys

The total number of waterfowl days were very similar in 2008, 2009 and 2010, although down from 1999. When comparing the recent years of data including 2008 pre-construction, 2009 during construction and 2010 post-construction, there was no apparent change in overall waterfowl abundance throughout the Wolfe Island study area.

Through analysis of the spring data, it is not apparent if the reduction in the number of waterfowl days from 1999 to 2008-2010 is attributable to natural variation, a decreasing trend in waterfowl abundance over the past decade, or perhaps in part, an artefact of variability related to sampling on a large scale. However, for comparison, an examination of the aerial waterfowl data from the fall of 1999 and 2009 suggests waterfowl abundance has remained relatively stable. Overall, differences in spring 1999 and 2010 waterfowl days can likely be attributed to natural variation.

Despite the consistency in overall waterfowl days from 2008 to 2010, the distribution of waterfowl between the five Wolfe Island sectors experienced considerable fluctuations. Specifically, the 2010 post-construction surveys revealed a reduction of waterfowl days in Sector 9 (including Bayfield Bay) compared with 2009 data, although 2010 was similar to 2008 data. In Sector 10 (including Button Bay), waterfowl days were similar during the spring surveys of 2008 and 2009, but experienced an increase in 2010. Waterfowl days in Sector 11 (including Reed's Bay) had a general decreasing trend from 2008 through 2009 and 2010. Evidence from morning movement surveys (both pre- and post-construction) suggest that large flocks of bay ducks make daily movements between bays, specifically Button Bay and Bayfield Bay. As the overall waterfowl days remained similar between years, the observed fluctuations between sectors is likely due in large part to movement of flocks, and their location at the time of the survey. Regardless, it is apparent that waterfowl remained abundant in each sector and each of the major staging areas each year, with no apparent avoidance of project construction in 2009 or operation in 2010.

For most guilds (i.e. bay ducks, goldeneye and merganser), waterfowl days recorded in the spring of 2010 were consistent with the other three years of pre-construction data. Geese, large dabblers and small dabblers were recorded in larger numbers in the spring 2010 than the other

spring surveys in 2008 and 2009. The waterfowl days for sea ducks experienced significant fluctuations, within 2010 being a year of intermediate abundance. However, the waterfowl days for sea ducks should be viewed with some caution, as they are small and a relatively small deviation of hundreds of waterfowl days results in a large percent change. Four surveys were conducted between March 24 and May 5, 2010. Following the first two surveys, sea duck waterfowl days in 2010 were nearly double the number of sea duck waterfowl days observed under pre-construction conditions. Following the third survey, sea duck waterfowl days were approximately equivalent under pre- and post-construction conditions. The decline in numbers observed following the fourth survey strongly suggests that the sea ducks arrived and departed the area earlier than in previous years, probably as a result of weather or other factors unrelated to the wind plant. Overall, the data suggest that similar numbers of sea ducks were present in 2010 but that they were present over a shorter period of time, which was reflected in reduced waterfowl days. Overall, the fluctuation of waterfowl days within the guilds can be attributed to natural fluctuation and variability related to sampling on a large scale.

4.2.5 Waterfowl Breeding Pairs Surveys

Overall, all five wetlands surveyed for breeding pairs of waterfowl supported breeding populations of geese and/or ducks. Although the surveys routes did not cover the entire wetlands, and therefore did not attempt to identify every breeding pair within each wetland, the surveys provide an indication of waterfowl breeding in portions of the wetlands close to WTGs. The largest number of breeding pairs was observed in the Bayfield Bay Marsh. The predominant species observed were Mallard and Wood Duck. Extensive suitable breeding habitat was present, including cattail marsh with small ponds and channels, including channels that were created as part of a Ducks Unlimited Canada's habitat project. Woodlands, providing potential nesting cavities, occurred along the shoreline, adjacent to the marsh. Two WTGs occur approximately 350 m south of the wetland edge.

Button Bay Wetland had the fewest numbers of breeding pairs, although it is smaller in size than the other wetlands, and the overall breeding density would be similar or higher than other wetlands. Habitat was limited to the open bay with marginal cattail habitat, surrounded by agricultural fields. A fallow area with patches of trees occurred to the north of the wetland. The treed area potentially provided suitable nesting cavities for the Wood Ducks and Common Mergansers observed, although more mature forest cover occurs at the east end of Button Bay. Two WTGs occur in the field to the west, approximately 200 m from the wetland edge.

Big Sandy Bay Wetland encompasses extensive swamp habitat. Due to limited accessibility, only a portion of the wetland was surveyed along the existing trail system. Habitat along the survey route included dense thicket swamp, mature deciduous swamp and a dug open channel. Four species of waterfowl were observed, the most common being Mallard. A string of WTGs occur to the east of the wetland, approximately 150 m from the wetland edge.

Two species of waterfowl were observed breeding in Reed's Bay Wetland, Mallard and Canada Goose. Habitat was limited to cattail marsh surrounding the open bay. The wetland was surrounded by agricultural fields with tree cover limited to patches along the lakeshore. No WTGs are present in the immediate vicinity to the wetland, with individual WTGs occurring more than 500 m away to the north, east and south.

Sandy Bay Wetland had the highest diversity of waterfowl with six species recorded. Habitat consisted of cattail marsh surrounding the open bay, with mature willow trees along the lakeshore. A group of Red-breasted Mergansers was observed during the May 13, 2010 survey, and included 3 females and a male, indicating a potential breeding pair. WTGs are present within 150 m, to the north and south of the wetland. Waterfowl observations were made in portions of the wetland closest to WTG, suggesting that presence of the WTG did not deter breeding.

Overall, the waterfowl breeding pairs surveys found populations of breeding geese and/or ducks in each of the major wetlands that are in proximity to WTGs. The results of the surveys did not provide any indication that waterfowl avoided nesting in proximity to the WTGs.

4.2.6 Grassland Breeding Bird Point Counts, Paired Point Counts and Area Searches

Overall, the grassland surveys indicated that grassland breeding birds remained common throughout the project area. It was noted that, due to crop rotation, in some fields grassland habitat (i.e., hay and pasture) was lost, while in other fields grassland habitat was gained. By shifting three of the pre-construction grassland point count locations to adjacent fields, to account for crop rotation, and by correcting the grassland area searches for changes in percent grassland habitat, the composition of grassland habitat surveyed during pre and post-construction were generally consistent.

The grassland point counts, repeated during pre and post-construction monitoring, recorded an apparent decrease in breeding density in several grassland species. It is possible that the observed decrease in grassland species could, in part, be attributed to the general declining population trend in grassland birds, which has been reported throughout Ontario (McCracken, 2009). However, given the relatively short timeframe between pre and post-construction surveys, and because decreases were not observed for the same species in the study area through paired point count surveys and grassland area searches, it is likely that some other factors, unrelated to the operation of the wind plant, have contributed to the decrease. Additionally, many species of common and widespread non-grassland birds, such as American Robin, Mourning Dove and Yellow Warbler, were also observed to decrease between pre and post-construction conditions, further suggests that the observed decreases are not related to greater population trends. Results of the grassland area searches, which surveyed large portions of the study area with high grassland bird densities both pre and post-construction, did not demonstrate the same decrease in grassland bird density.

One potential explanation for the decrease observed at grassland point counts is roadside avoidance. Twenty-three of the 27 grassland point counts were conducted from roadsides. Road improvement work along Township roads, following the construction of the Wind Plant, resulted in wider road corridors along most roads as roadside ditches were graded and vegetation was disturbed. It is possible this disturbance resulted in decreased nesting densities along the roadsides. Species that are likely to breed in roadside ditches and shrubs (e.g., Eastern Meadowlark, Red-winged Blackbird, Yellow Warbler, American Robin) were also observed in lower densities, whereas species that are more likely to nest in fields (i.e., Bobolink), but perch on roadside fences (and thus be detected during point counts), were recorded at similar densities pre and post road improvement.

A second possible explanation for reduced roadside breeding bird density is traffic disturbance. Ordinarily, the relatively low level of traffic on most Wolfe Island roads would result in little disturbance to birds nesting in roadside ditches and hedgerows. However, the increased level of traffic in the summers of 2008 and 2009, during project construction, commissioning and land reclamation, may have resulted in avoidance of roadside nesting. It is generally thought that, following a disturbance at a nest site, avoidance of that nest site may carry through to the next breeding season. As such, reduced breeding bird density in 2009, as measured by the largely roadside grassland point counts, could possibly be attributed to residual avoidance behavior from increased traffic during construction. If this is the case, such impacts would be short term, as breeding densities in roadside ditches and hedgerows should begin to return to normal levels as road traffic has returned to pre-construction levels. Additional seasons of post-construction data will provide an indication if breeding densities in the vicinity of Township roads rebound.

A WTG avoidance effect was not observed for most grassland species through paired point count data. Eastern Meadowlarks were present in small numbers and bred in significantly lower densities within approximately 200 m of WTG bases. As well, although not statistically significant, Bobolinks were observed in slight lower numbers within 0-100m of the WTG base. At some turbines, portions of the 0-100m sector consisted of disturbed areas in a state of early succession, where the gravel pads used during construction had been removed. These early successional areas, which were not suitable for nesting Bobolink, made up a relatively small proportion of the 0-100m sectors. However, the small reduction in suitable habitat may account for the slight deduction in Bobolink density. Species that are more likely to nest within the early successional areas, such as Savannah Sparrow or Upland Sandpiper, did not show any reduction in density within the 0-100m sectors. Incidentally, an Upland Sandpiper nest was observed during grassland area searches approximately 35m from the base of a WTG, within an early successional area. Overall, the results of the paired point counts did not provide any evidence to suggest avoidance of the most common grassland breeding birds around WTG's.

For most species, the results of the grassland area searches showed little change in breeding density between pre and post-construction surveys. Bobolinks were more abundant in the Southeast Area search during the 2010 post-construction monitoring. The reason for this

observed increase in Bobolink density is not apparent. The highest densities of Bobolinks occurred in Sectors 5 and 6, new hayfields that were not present in 2007. However, pasture habitat, such as that found in Sector 4, appeared to remain unchanged between 2007 and 2010 but also supported an increased number of Bobolinks. A potential hypothesis for the changes in Bobolink density within pasture could be changes in density of cattle or grazing pressure, however, such habitat information was not recorded pre and post-construction to allow for a comparison. Given the study design, the reasons for the changes in Bobolink density between pre and post-construction surveys cannot be determined, however, it is likely attributed in changes in habitat structure or local population variability.

Eastern Meadowlark was also recorded in higher densities in the Southeast Area search during the 2010 surveys, when compared to pre-construction surveys. The differences in densities relates to 24 individuals observed in 2010, compared to only 7 observations in 2007. As with the Bobolink, this change can likely be attributed to changes in habitat structure or local population variability.

Although Grasshopper Sparrows were still present in the Northwest Area search during the 2010 surveys, they were observed in lower numbers than during the pre-construction survey. In both years, they were observed in a similar location, approximately 500m from the closest WTG. The rational for this observed decrease is not apparent, but due to the distance from the closest WTG, is likely not attributable to avoidance.

Overall, the results of the grassland breeding bird surveys suggest populations of grassland species remain common within the study area with no evidence of avoiding WTG's.

4.2.7 Wetland Breeding Bird Point Counts and Area Searches

Generally, the abundance of wetland breeding birds, as measure by the point counts and area searches, remained similar between pre and post-construction surveys. The point count data recorded an apparent decrease in the abundance of Red-winged Blackbirds. However, given the small number of wetland point counts, the calculated density was heavily influenced by a relatively minor difference in observed numbers of Red-winged Blackbirds. Results of the wetland area search are considered to provide a more accurate estimate of abundance pre and post-construction, which showed little change in Red-winged Blackbird abundance.

Common Yellowthroat appeared to be particularly more abundant during the post-construction surveys. A reason for this increase was not obvious. Although detailed records of habitat characteristics within each wetland were not kept during pre and post-construction years, the surveyor's generally impression was that habitat remained relatively unchanged, without a significant increase in suitable Common Yellowthroat nesting habitat (i.e. dense low vegetation). As such, the increase in Common Yellowthroat could likely be attributed to natural variation or surveyor differences.

A change in the abundance of Mallards and Wood Ducks was recorded through the wetland area searches. However, as these species typically breed earlier in the year, the June wetland surveys are not considered an accurate indicator of breeding abundance.

Overall, results of the wetland point counts and area searches suggest population of breeding birds in the five major wetlands in proximity to WTGs remained relatively consistent between pre and post-construction surveys.

A single male Least Bittern was detected within the Big Sandy Bay Wetland during the 2010 post-construction surveys. The habitat in the vicinity of the observation appeared to be ideal for the Least Bittern: cattail marsh interspersed with open water and shrubby vegetation. This species was not recorded during the pre-construction surveys.

4.2.8 Woodland Breeding Bird Point Counts and Area Searches in Woodlots Larger than 10ha

Relatively high breeding bird species diversity was recorded through area searches in the surveyed woodlands in proximity to WTGs. For most species, point count data suggest there was little change in breeding densities between 2008 pre-construction and 2010 post-construction surveys. American Robin and Common Yellowthroat had the highest observed increases in density, relating to an average increase of 1 breeding pair per point count. As discussed with the wetland area search and point count data, Common Yellowthroat appeared to be particularly abundant on Wolfe Island during the 2010 breeding season. The largest decreases in abundance were observed in House Wren and Mourning Dove, relating to an average decrease of less than 1 breeding pair per point count. It is likely such fluctuations in observed breeding density are a result of natural variability and variability resulting from the relatively small sample size of point counts.

During the 2008 surveys, Wood Thrush were observed at 5 of the 7 woodland point count stations, with observations in both the Big Sandy Bay woodland and Sandy Bay woodland. However, during the 2010 surveys, Wood Thrush was observed at only a single point count station, in the Big Sandy Bay woodland. Anecdotal reports (L. Friesen per. comm) suggest Wood Thrush has experienced significant declines in numbers over its southern Ontario breeding range over the past two breeding seasons. Although the reason for the Wood Thrush's decline has yet to be confirmed, the most likely cause is the loss the suitable mature forest habitat in its overwintering range in Central America.

4.3 RECOMMENDATIONS

Mortality and disturbance effects monitoring should proceed in 2010 according to the February 2010 Follow-up Plan. For mortality monitoring, it is recommended that additional correction factor trials be conducted to better assess the number of raptor and vulture fatalities:

- The Follow-up Plan specified that one scavenger trial be conducted using raptor and vulture carcasses, in early winter. However, most of the raptor and vulture mortality was observed outside the winter period, and scavenger removal of small birds was lowest during winter compared to spring, summer and fall. A scavenger trial should be conducted using raptor and vulture carcasses in fall, 2010, although this will depend on the availability of a sufficient number of carcasses.

- Searcher efficiency has been assumed to be 100% for raptor and vulture carcasses, but this should be confirmed through searcher efficiency trials using raptor and vulture carcasses (if available; priority will be given to scavenger trials).

The Follow-up Plan indicates that searcher efficiency trials will typically be conducted once each year. More frequent searcher efficiency trials (i.e., once each season) are recommended to ensure seasonal correction factors are appropriate to seasonal conditions.

Finally, the Follow-up Plan indicates that if scavenging rates are low, the carcass searches may be scaled back to once per week. Scavenging rates are similar to or higher than those observed at other Ontario sites during spring, summer and fall, but are very low during winter: on average, 89.4% of test carcasses are not scavenged over the average search interval. In consideration of the very low number of fatalities observed during the winter months (six bird fatalities in December, January and February), it is recommended that the winter carcass searches be scaled back to once per week through December, January and February.

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Appendix A

Figures

TransAlta™

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Legend

- Study Area
- Gardiners Transformer Station
- Turbine Layout
- 230 kV Submarine Cable
- 230 kV Transmission Line - Underground
- Access Roads
- 34.5 kV Collector Lines
- 230 kV Substation / Operation & Maintenance Building
- Temporary Road
- Crane Walk Path

Area of Natural or Scientific Interest (ANSI)

- Earth
- Life

Wetlands

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland

Other Natural Areas

- Earth Science Site
- International Biological Program Site
- Life Science Site
- Vegetation Communities
- Warm Water Streams
- Cataraqui Region Conservation Authority Lands
- Rare Species Occurence
- Woodlot

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009.
3. Image Sources: © LIDAR (study area coverage), January 2006; © LANDSAT7 (U.S. coverage), 1999; © City of Kingston (city coverage), 2005.

Natural environmental features and hydrological data is from the Ministry of Natural Resources Peterborough District NRVIS 2006 and the Cataraqui Region Conservation Authority, 2006.

March 22, 2010
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Client/Project

WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 3

Figure No.

1.0

Title

Wolfe Island Project Layout

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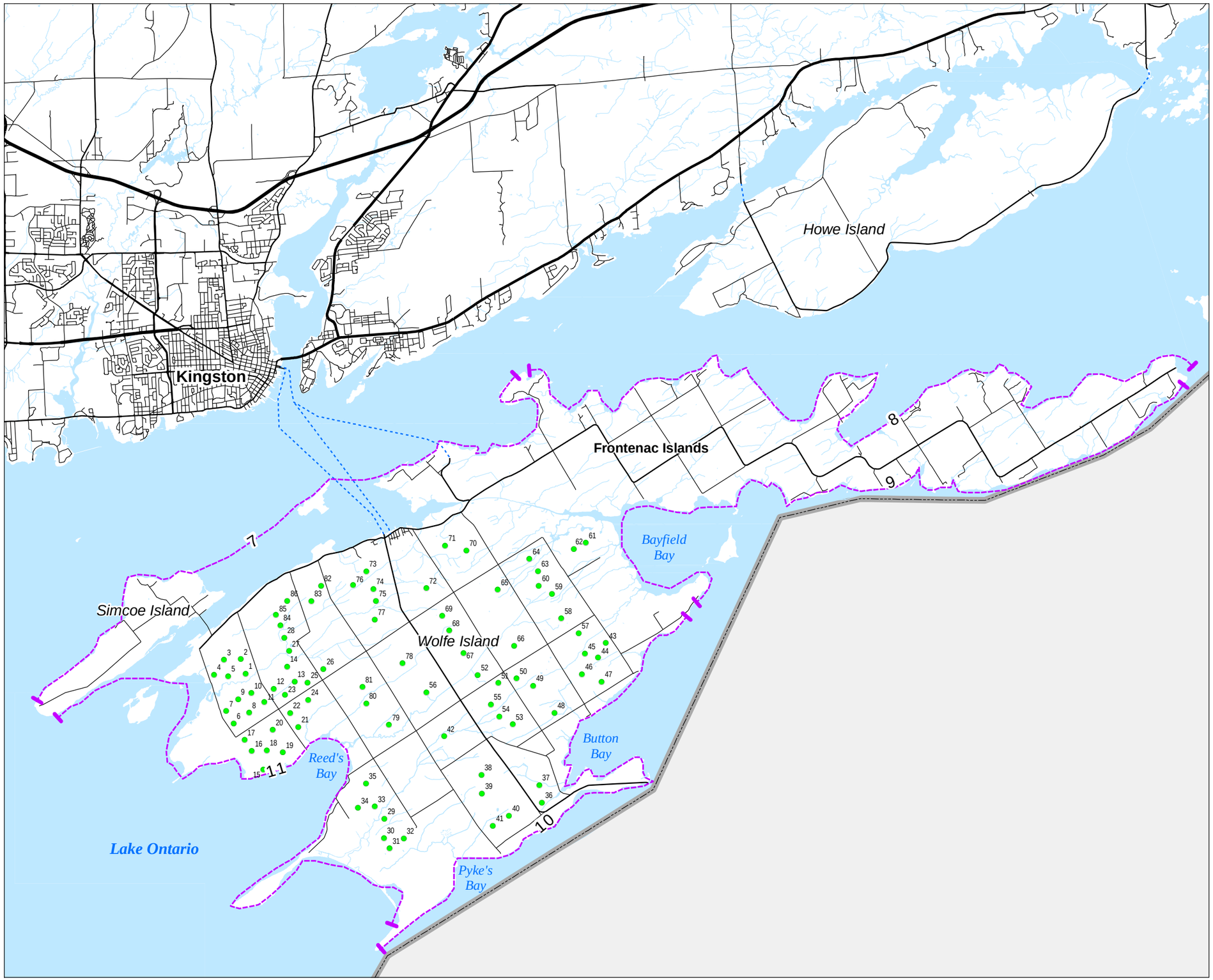

TransAlta

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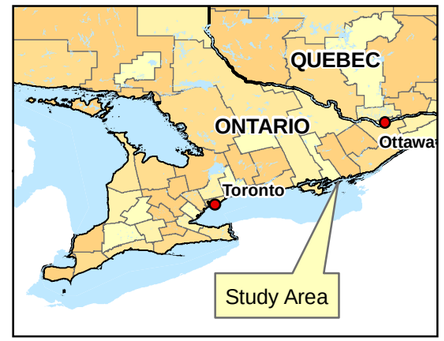
Legend

- Turbine Layout
- Expressway / Highway
- Primary Road
- Secondary Road
- Ferry
- International Boundary
- Watercourse
- Waterbody



Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
2. Data Sources: Ontario Ministry of Natural Resources
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WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 3

Figure No.

2.0

Title

Wolfe Island Waterfowl Survey Sectors

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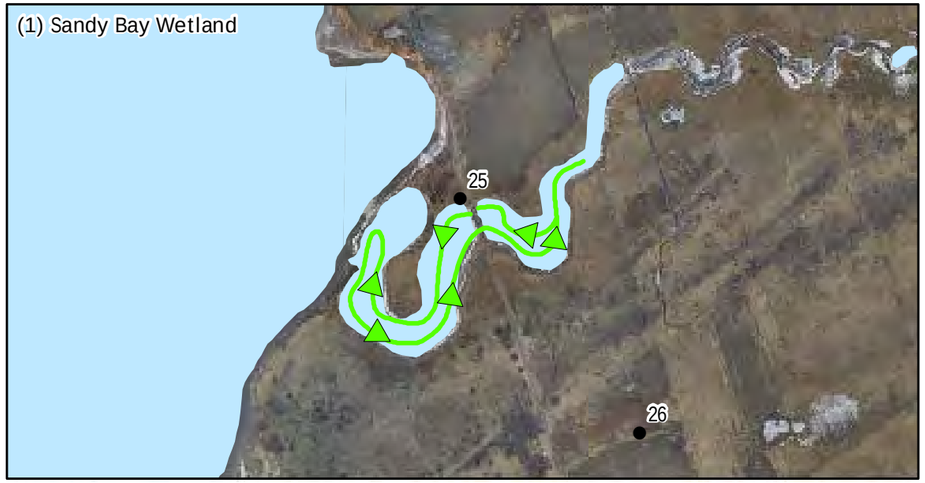

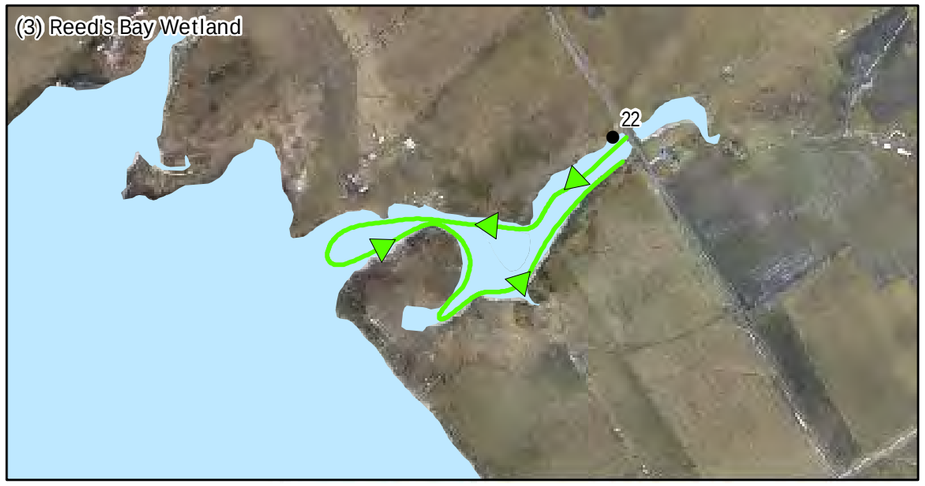

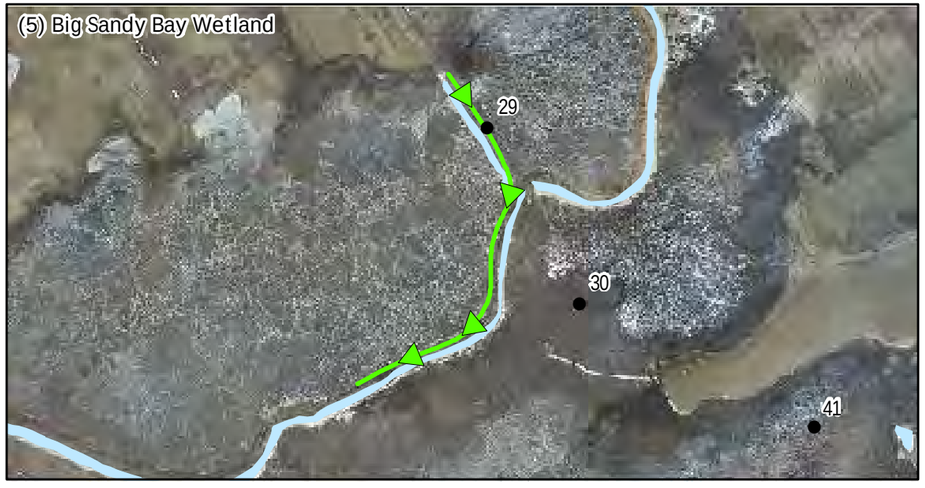

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Legend

- Search Routes
- Location of Breeding Bird Point Count

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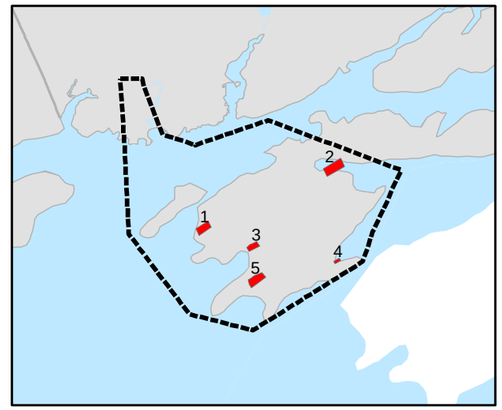
Key Map



Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
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3. Image Sources: © LIDAR (study area coverage), January 2006; © LANDSAT7 (U.S. coverage), 1999; © City of Kingston (city coverage), 2005.

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160960494

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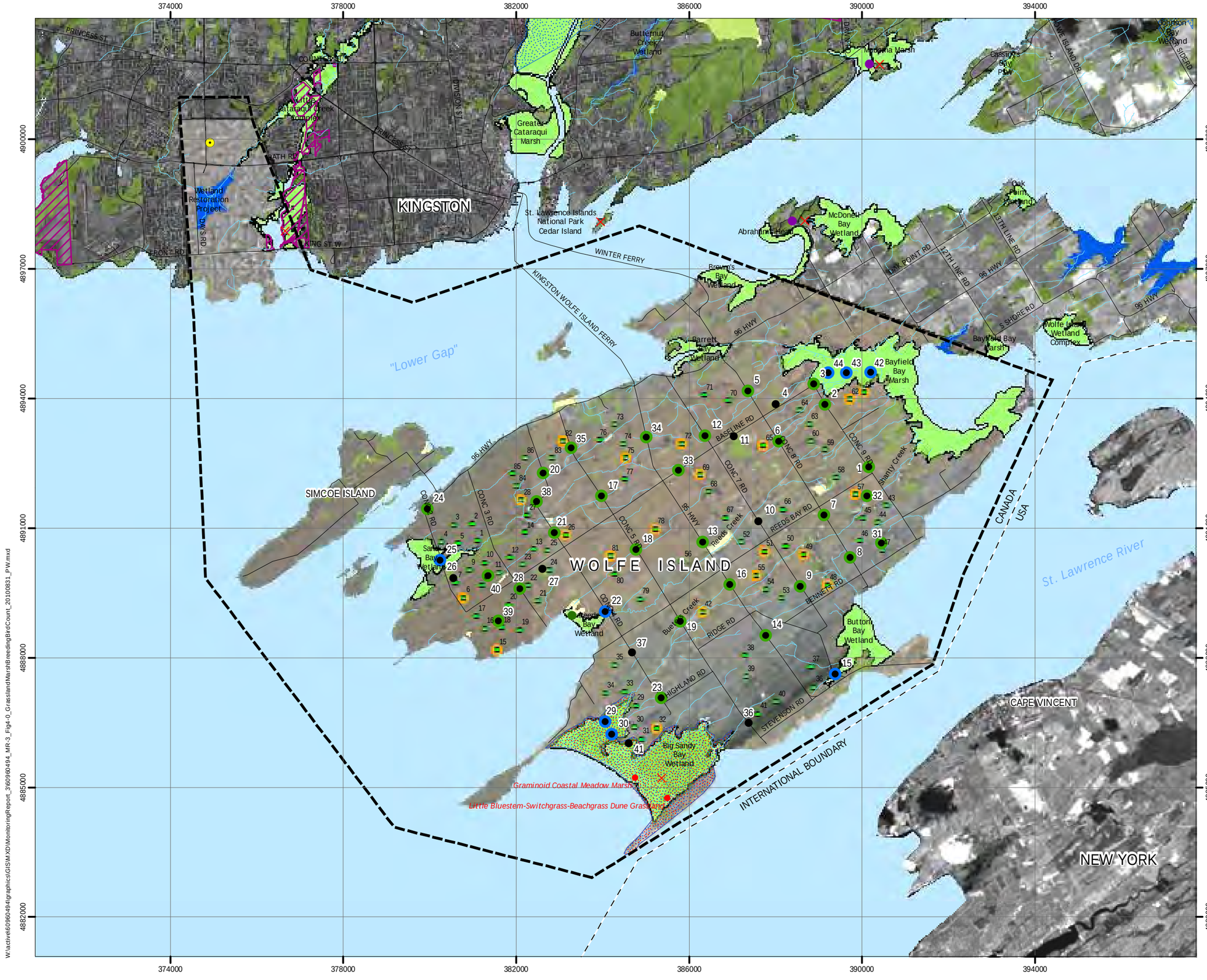
MONITORING REPORT NO. 3

Figure No.
3.0

Title
Marsh and Breeding Waterfowl Area Search Route

W:\active\60960494\graphics\GIS\MXD\MonitoringReport_360960494_MR3_Fig3-0_MarshBreedingWaterfowl_20100831_PW.mxd



0 1 2 Kilometers

N W E S

Legend

- Study Area
- Turbine Layout
- Gardiners Transformer Station
- Location of Preconstruction Breeding Bird Point Count
- Paired Point Count Location
- Grassland Point Count Resurveyed Post-Construction
- Wetland Point Count Resurveyed Post-Construction
- roads

Area of Natural or Scientific Interest (ANSI)
- Earth
- Life

Wetlands
- Provincially significant wetland
- Non-provincially significant wetland
- Unevaluated wetland

Other Natural Areas
- Earth Science Site
- International Biological Program Site
- Life Science Site
- Vegetation Communities
- Woodlot
- Cataraqui Region Conservation Authority Lands

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009.
3. Image Sources: © LIDAR (study area coverage), January 2006; © LANDSAT7 (U.S. coverage), 1999; © City of Kingston (city coverage), 2005.
4. Natural environmental features and hydrological data is from the Ministry of Natural Resources Peterborough District NRVIS 2006, the Cataraqui Region Conservation Authority, 2006, and Ducks Unlimited Canada, April 2006.

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Client/Project
WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 3

Figure No.
4.0

Title
Location of Grassland and Marsh Breeding Bird Point Counts

W:\active\160960494\graphics\GIS\MXD\MonitoringReport_3\160960494_MR-3_Fig4-0_GrasslandMarshBreedingBrdCount_20100831_PW.mxd

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0 1 2 Kilometers

N W E S

Legend

- Study Area
- Turbine Layout
- (1) Sector Number

Notes

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3. Image Sources: © LIDAR (study area coverage), January 2006; © LANDSAT7 (U.S. coverage), 1999; © City of Kingston (city coverage), 2005.

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WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 3

Figure No.
5.0

Title
Post-Consturction Breeding Bird Area Search Locations

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TransAlta

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0 1 2 Kilometers

N W E S

Legend

- Study Area
- 230 kV Transmission Line - Underground
- Access Roads
- 34.5 kV Collector Lines
- 230 kV Submarine Cable
- 230 kV Substation
- 230 kV Substation / Operation & Maintenance Building
- Crane Walk Path
- Temporary Road
- Gardiners Transformer Station
- Turbine Layout

Area of Natural or Scientific Interest (ANSI)
- Earth
- Life

Wetlands
- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland
- Woodlot

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
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WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 3

Figure No.
6.0

Title
Woodlot Point Count and Area Search Locations

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Figure 7: Fatalities by Date

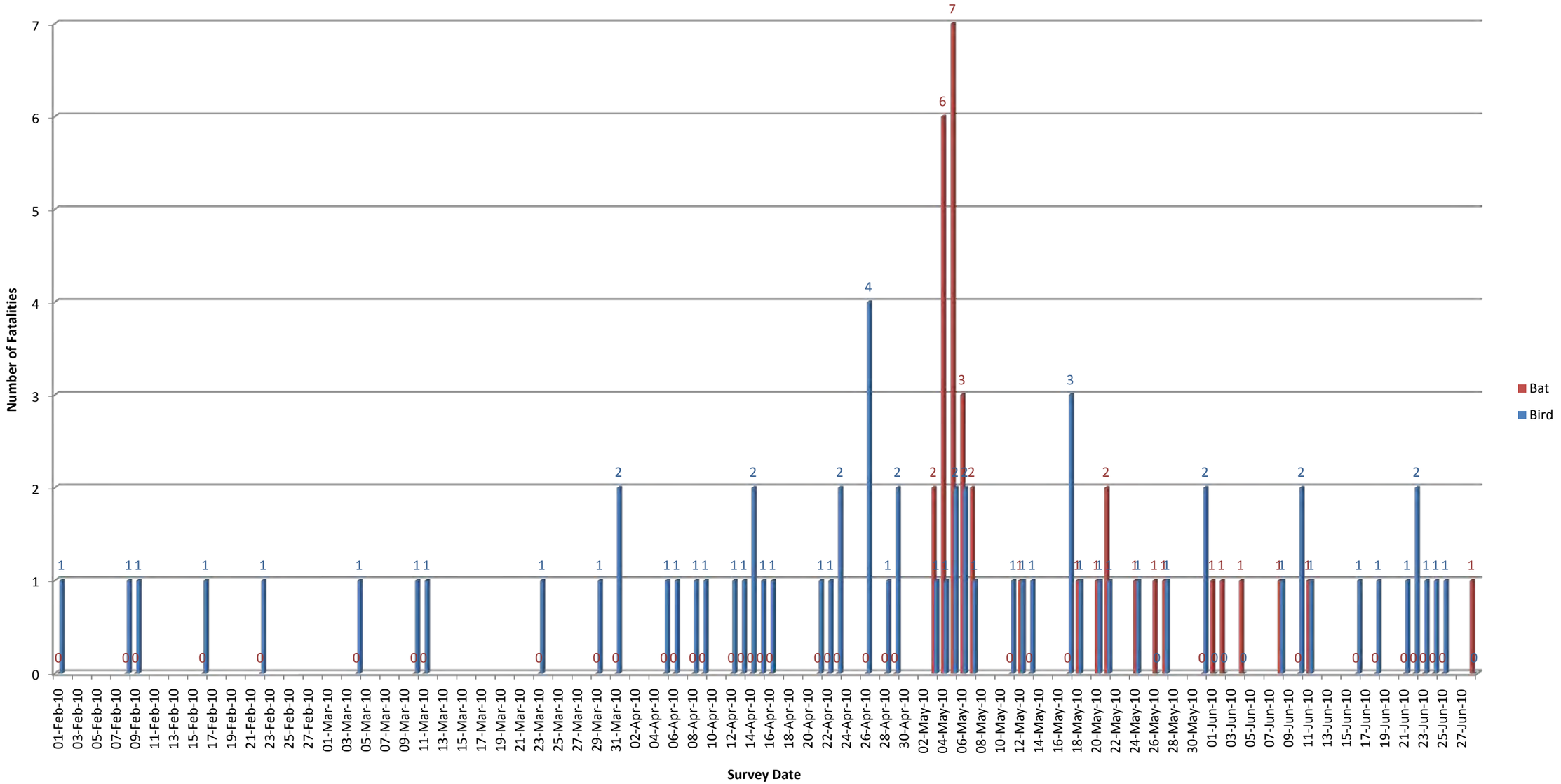


Figure 8: Fatalities at Each Turbine

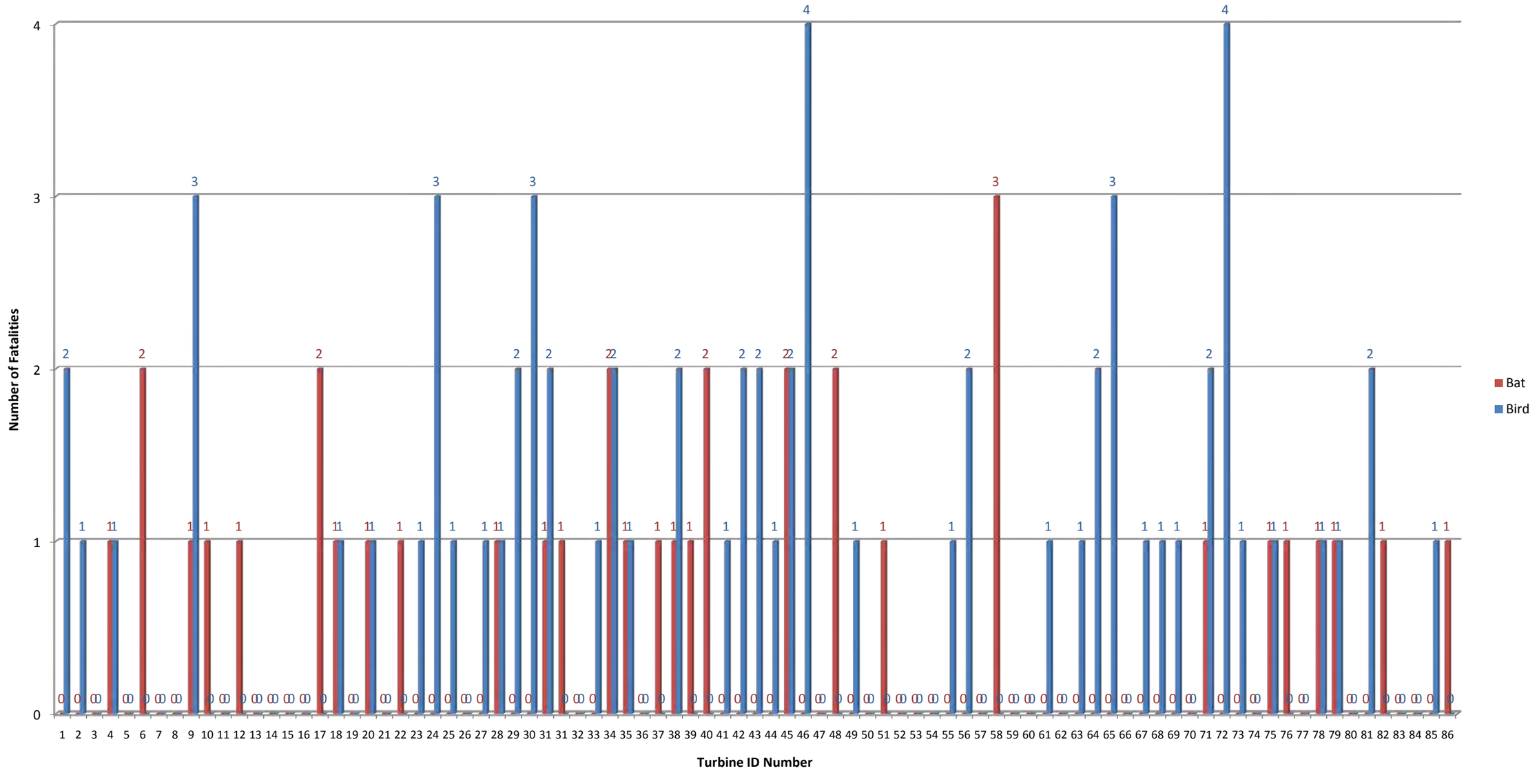
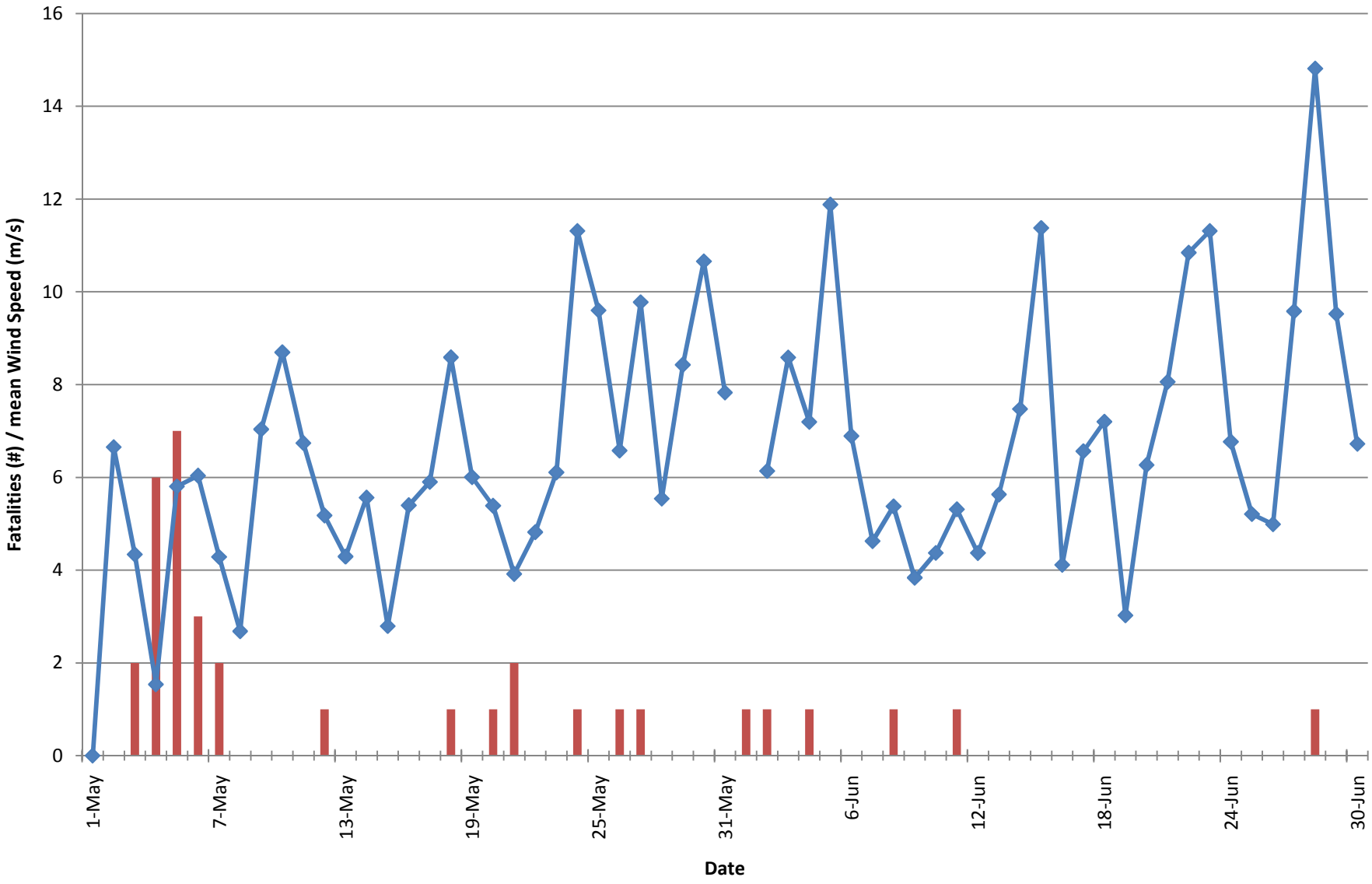
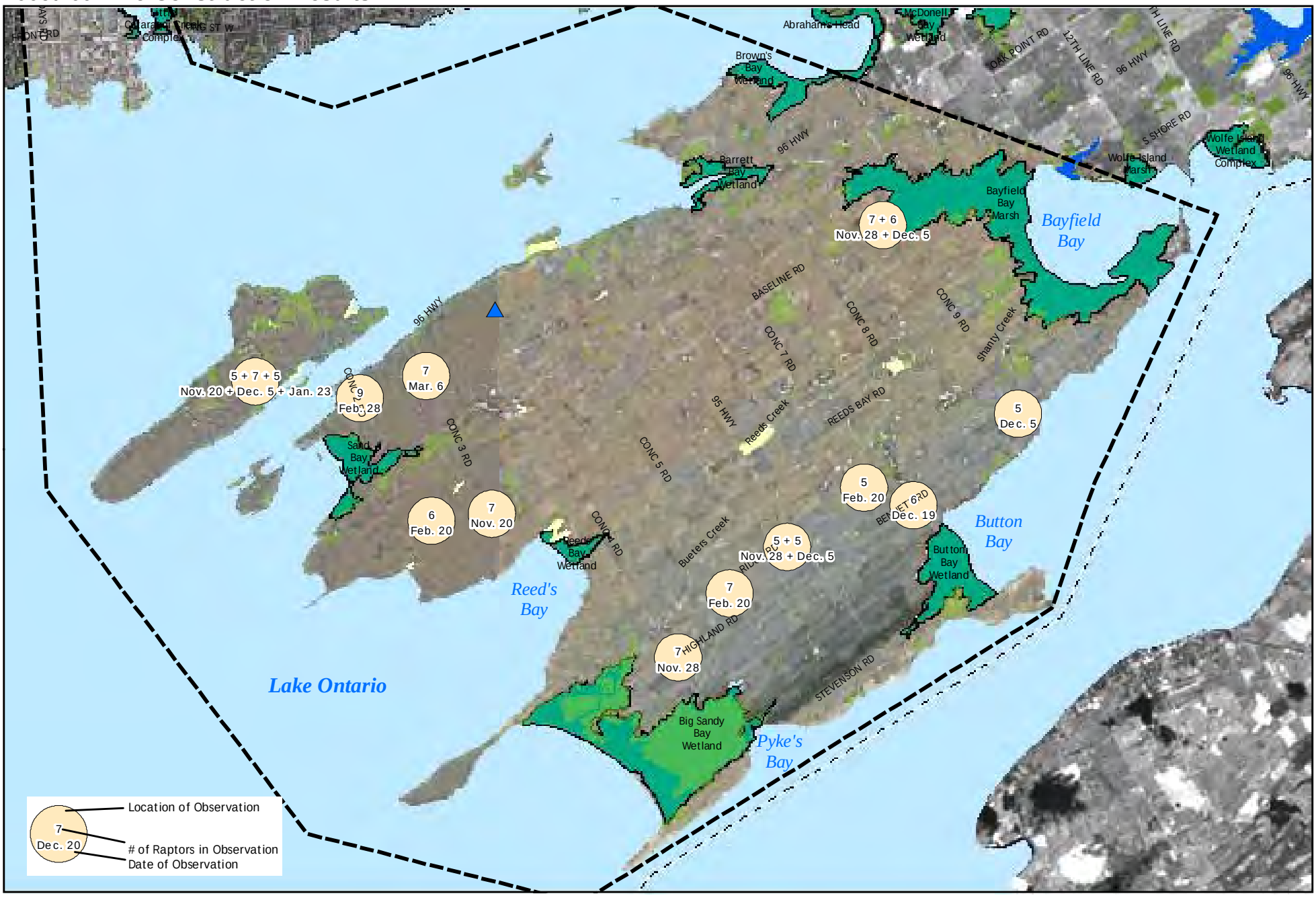


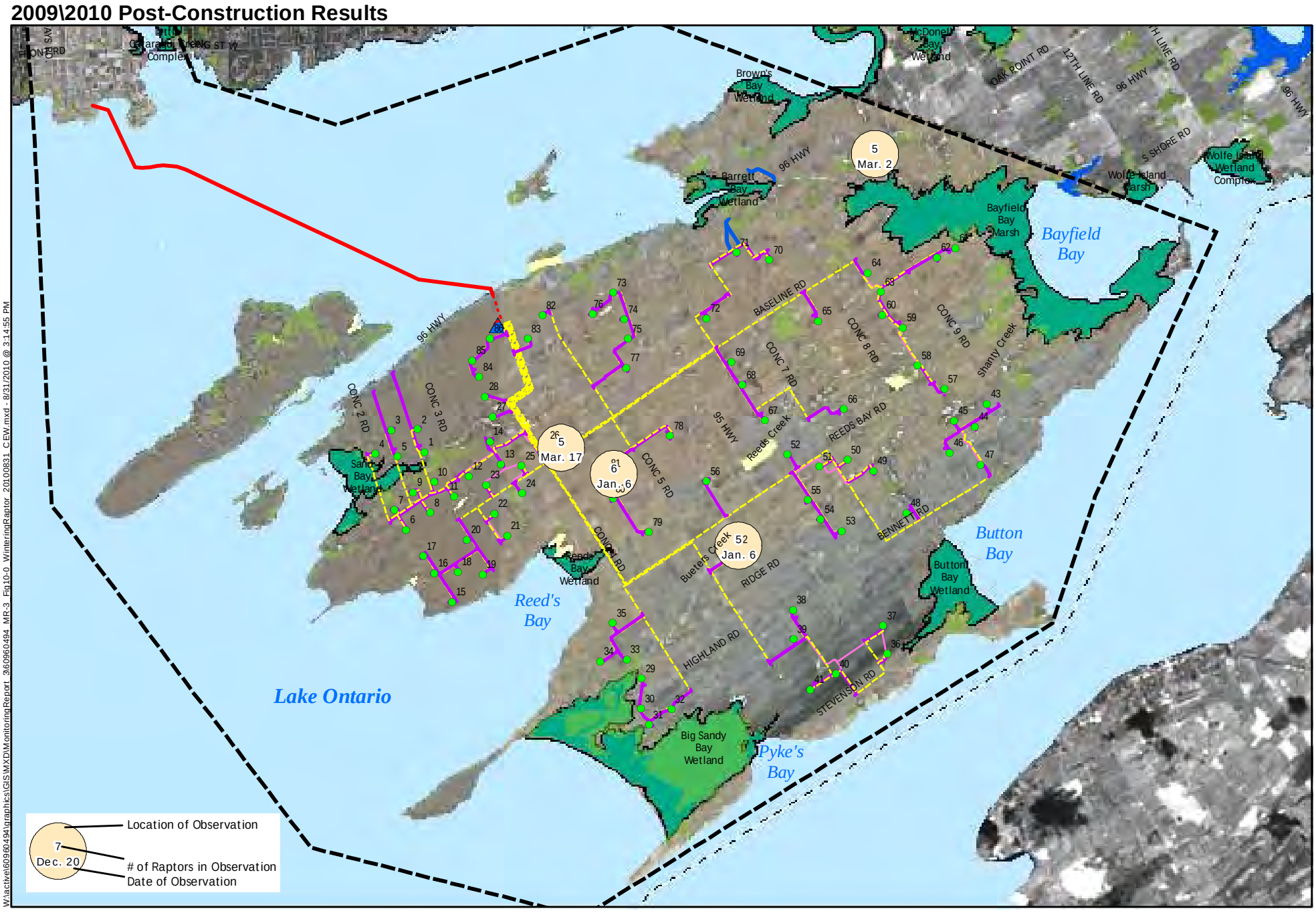
Figure 9: Comparison of bat fatalities (bars) vs. mean overnight wind speed (line)



2006\2007 Pre-Construction Results



2009\2010 Post-Construction Results



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Legend

- Study Area
- Gardiners Transformer Station
- Turbine Layout
- 230 kV Submarine Cable
- 230 kV Transmission Line - Underground
- Access Roads
- 34.5 kV Collector Lines
- 230 kV Substation / Operation & Maintenance Building
- Temporary Road
- Crane Walk Path
- Woodlot

Wetlands

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland

0 1 2 Kilometers

1:85,000

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
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WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 3

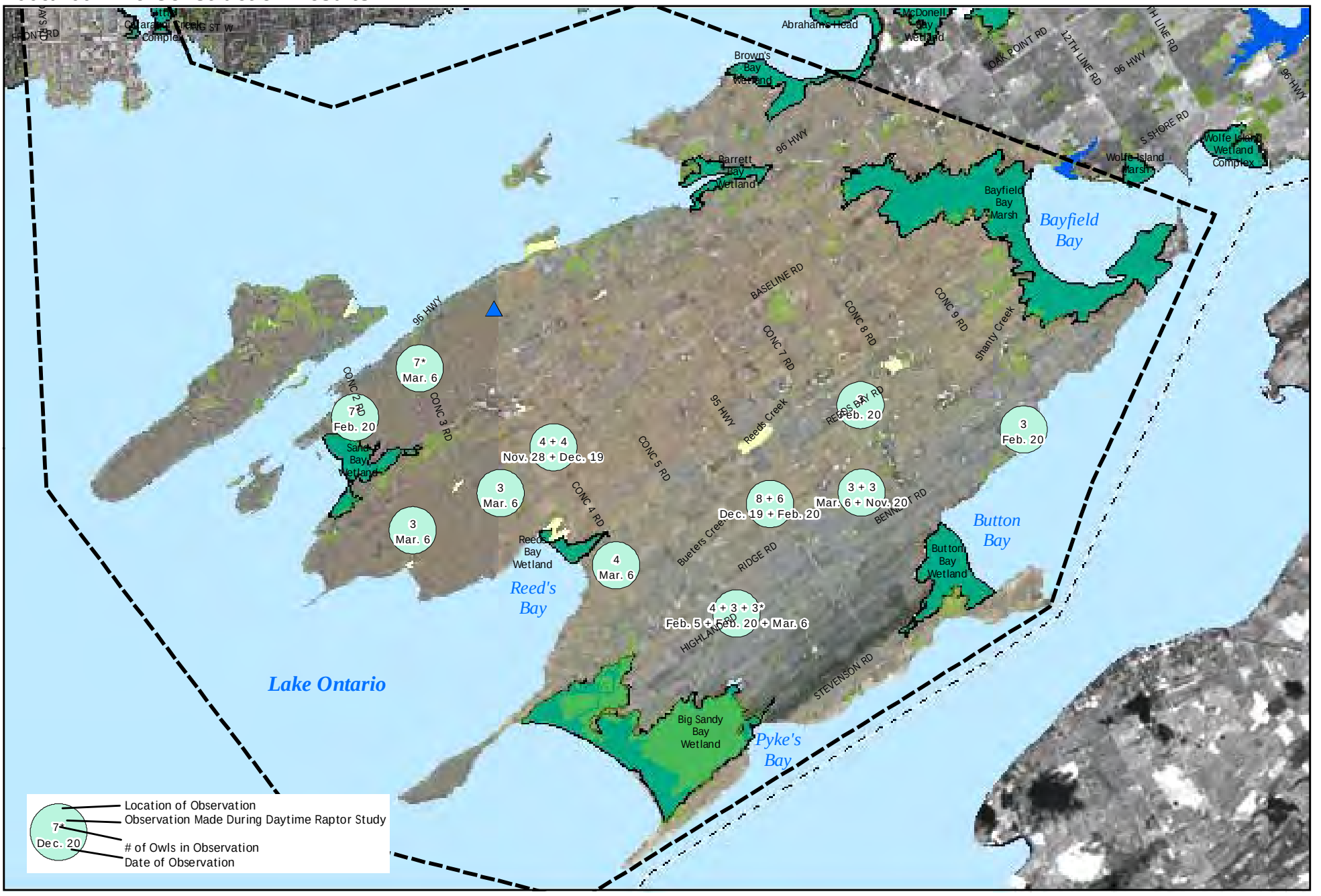
Figure No.

10.0

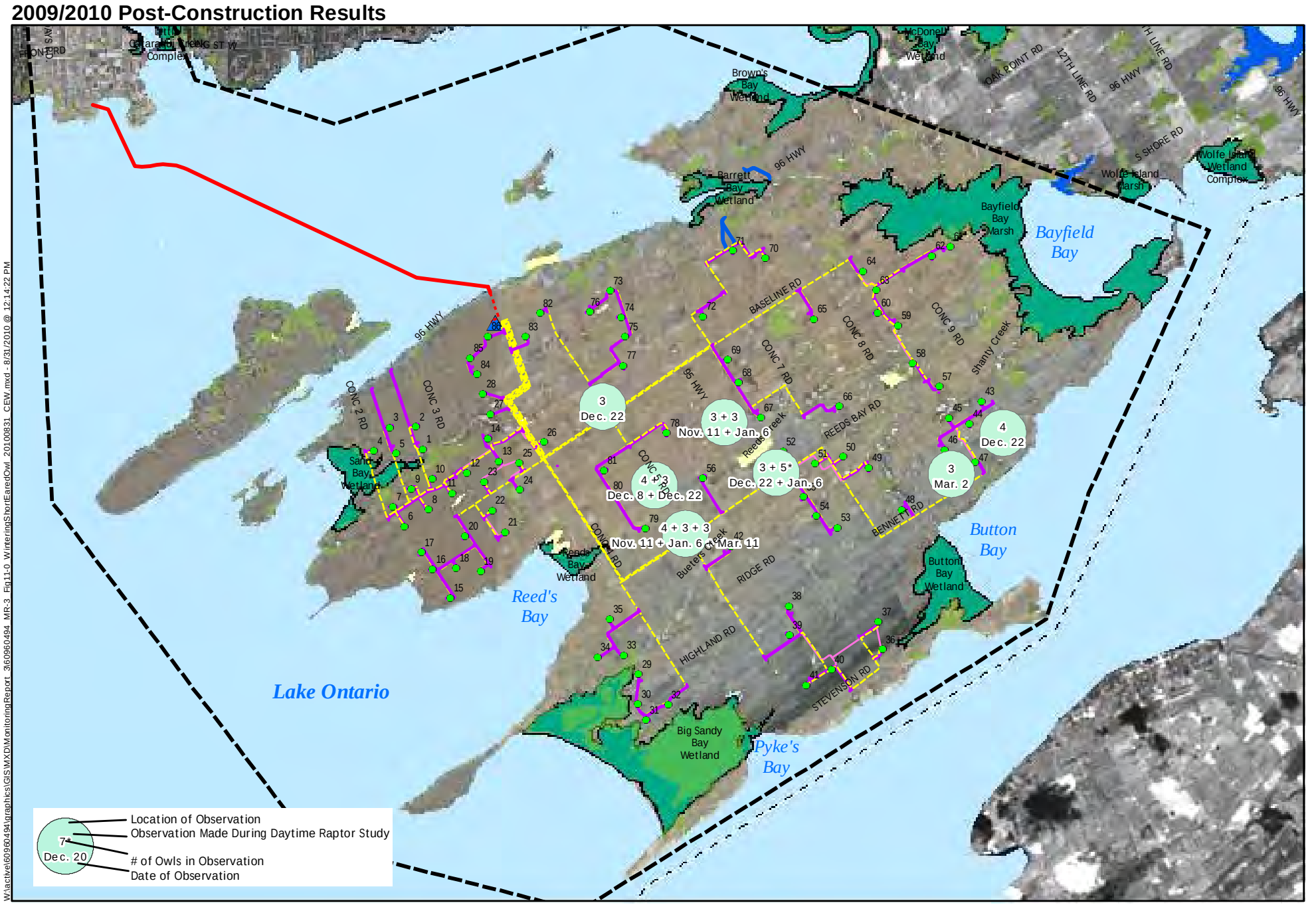
Title

Comparison of Wintering Raptor Concentrations 2006/2007 AND 2009/2010

2006/2007 Pre-Construction Results



2009/2010 Post-Construction Results



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Legend

- Study Area
- Gardiners Transformer Station
- Turbine Layout
- 230 kV Submarine Cable
- 230 kV Transmission Line - Underground
- Access Roads
- 34.5 kV Collector Lines
- 230 kV Substation / Operation & Maintenance Building
- Temporary Road
- Crane Walk Path
- Woodlot

Wetlands

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland

0 1 2 Kilometers

1:85,299

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
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WOLFE ISLAND ECOPOWER CENTRE MONITORING REPORT NO. 3

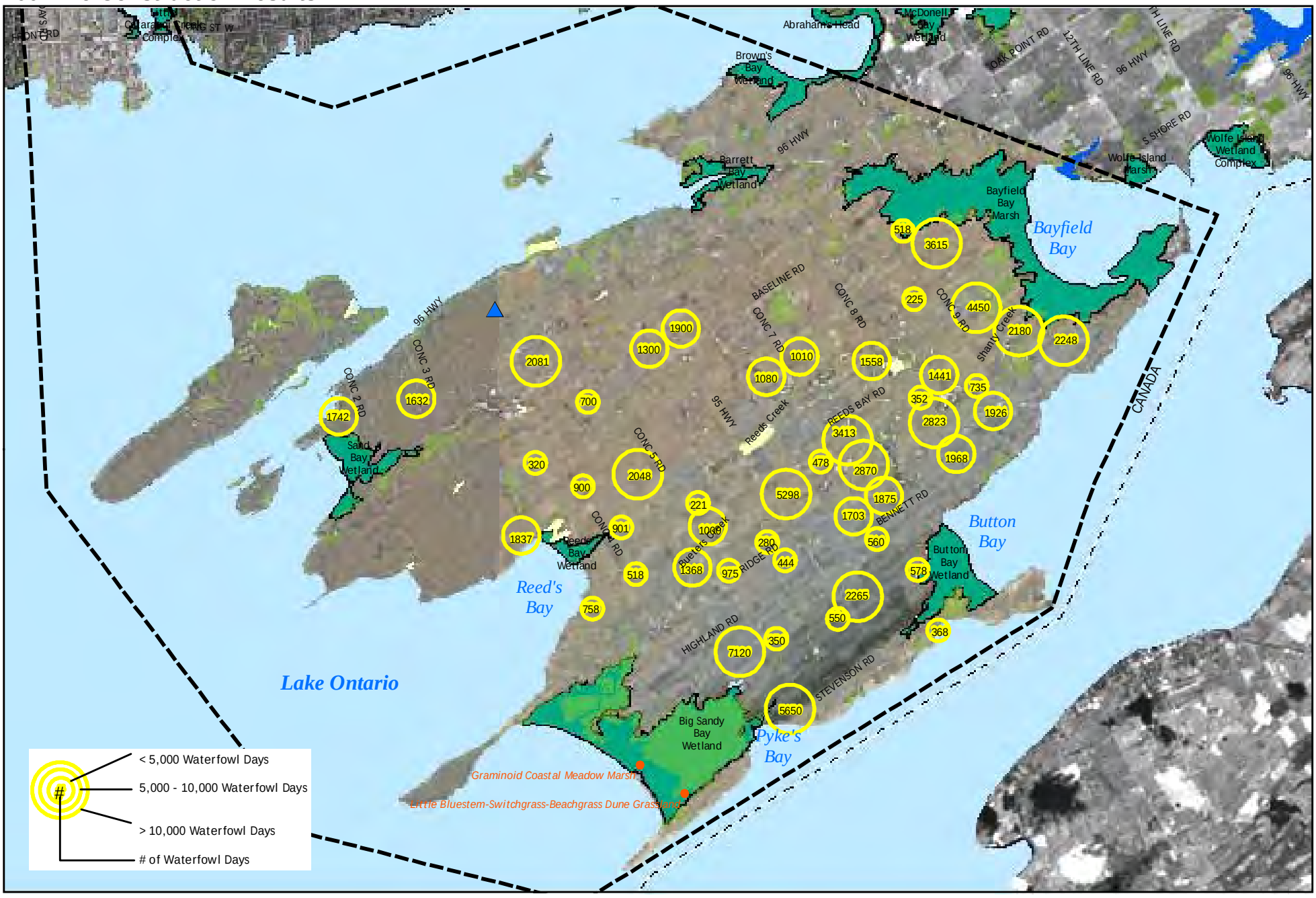
Figure No.

11.0

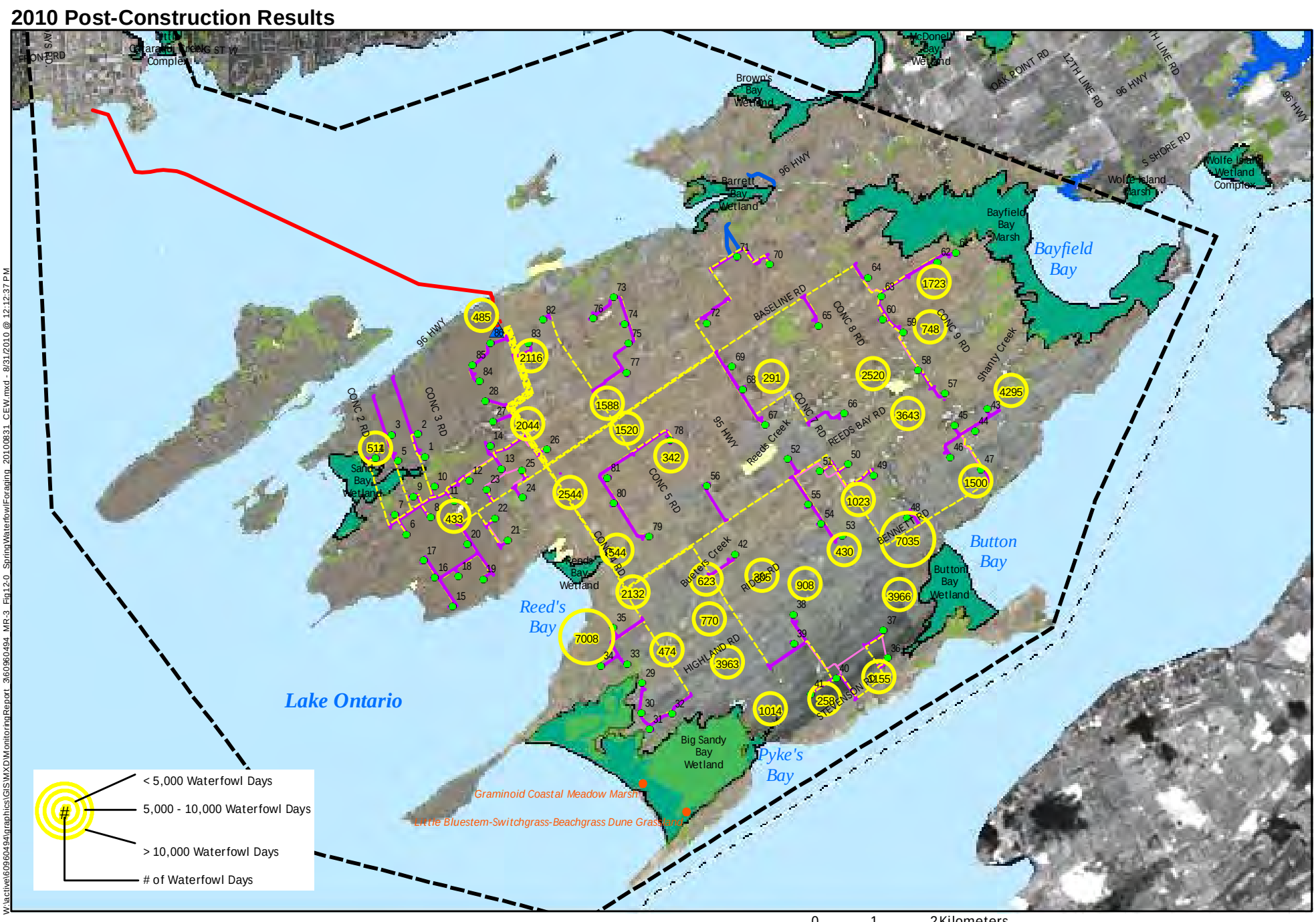
Title

Comparison of Wintering Short-eared Owl Concentrations 2006/2007 AND 2009/2010

2007 Pre-Construction Results



2010 Post-Construction Results



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Legend

- Study Area
- Gardiners Transformer Station
- Turbine Layout
- 230 kV Submarine Cable
- 230 kV Transmission Line - Underground
- Access Roads
- 34.5 kV Collector Lines
- 230 kV Substation / Operation & Maintenance Building
- Temporary Road
- Crane Walk Path
- Woodlot

Wetlands

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland

0 1 2 Kilometers

1:85,000

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
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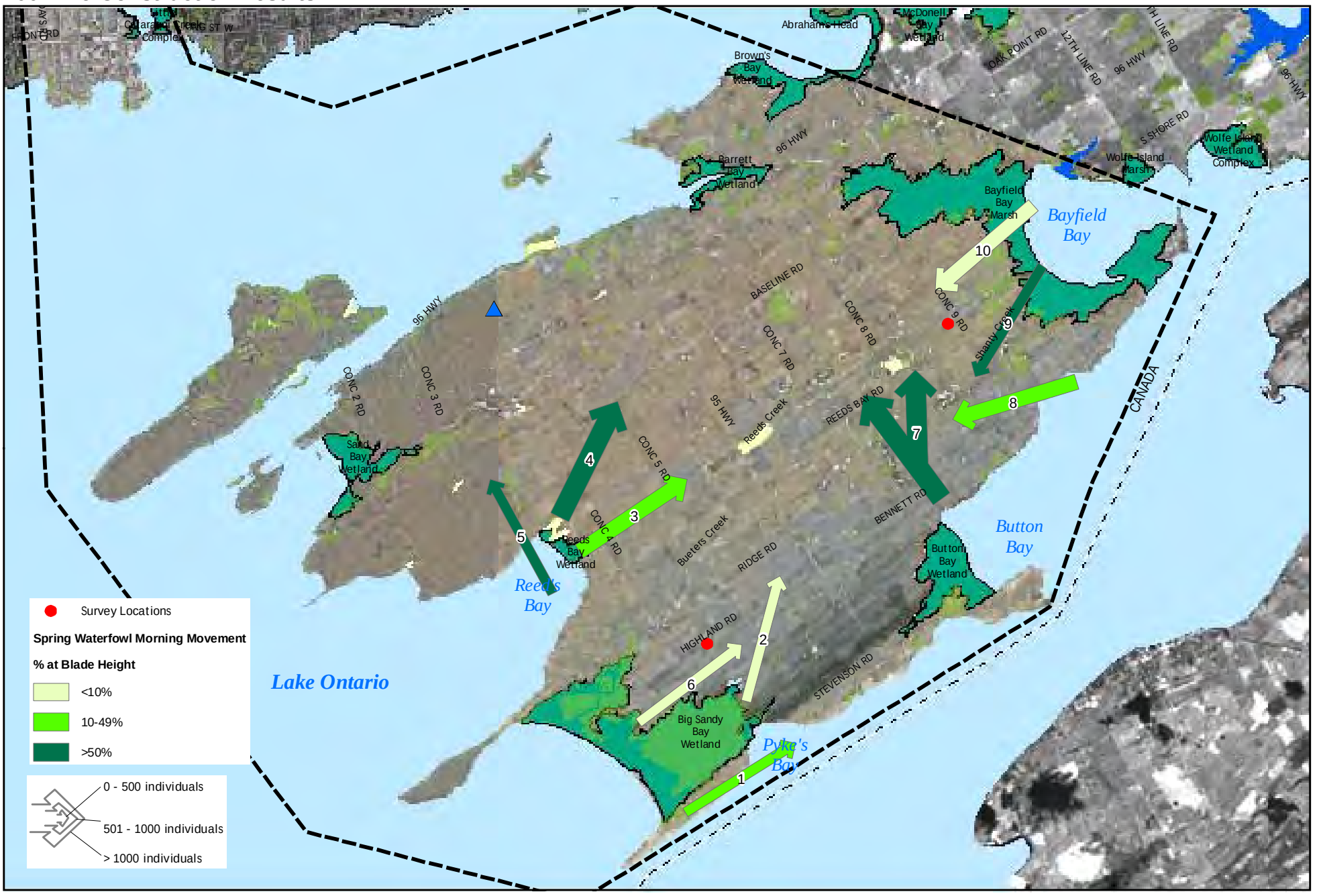
Figure No.

12.0

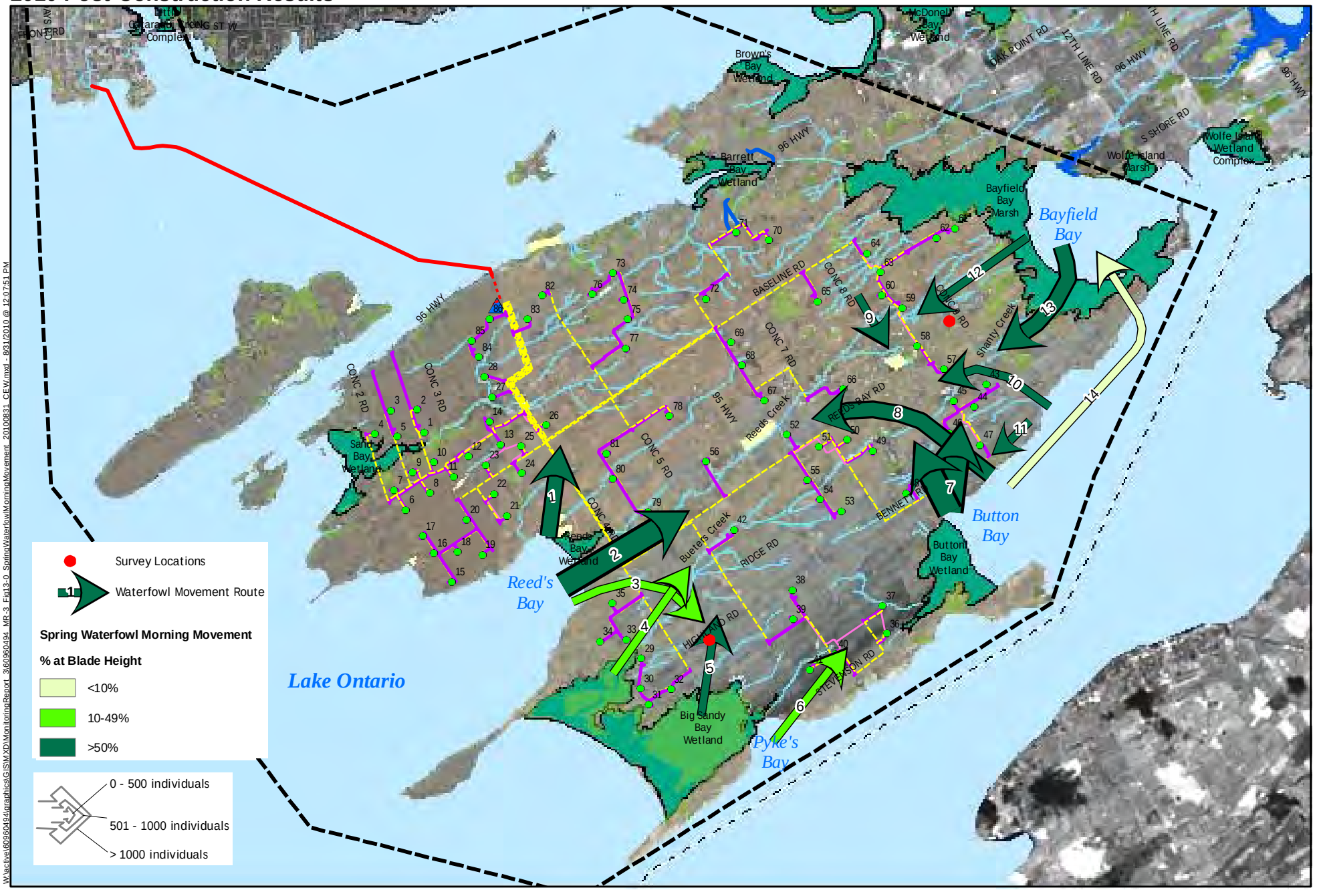
Title

Comparison of Spring Waterfowl Foraging in 2007 and 2010

2007 Pre-Construction Results



2010 Post-Construction Results



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Legend

- Study Area
- Gardiners Transformer Station
- Turbine Layout
- 230 kV Submarine Cable
- 230 kV Transmission Line - Underground
- Access Roads
- 34.5 kV Collector Lines
- 230 kV Substation / Operation & Maintenance Building
- Temporary Road
- Crane Walk Path
- Woodlot

Wetlands

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland

0 1 2 Kilometers

1:85,000

Notes

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MONITORING REPORT NO. 3

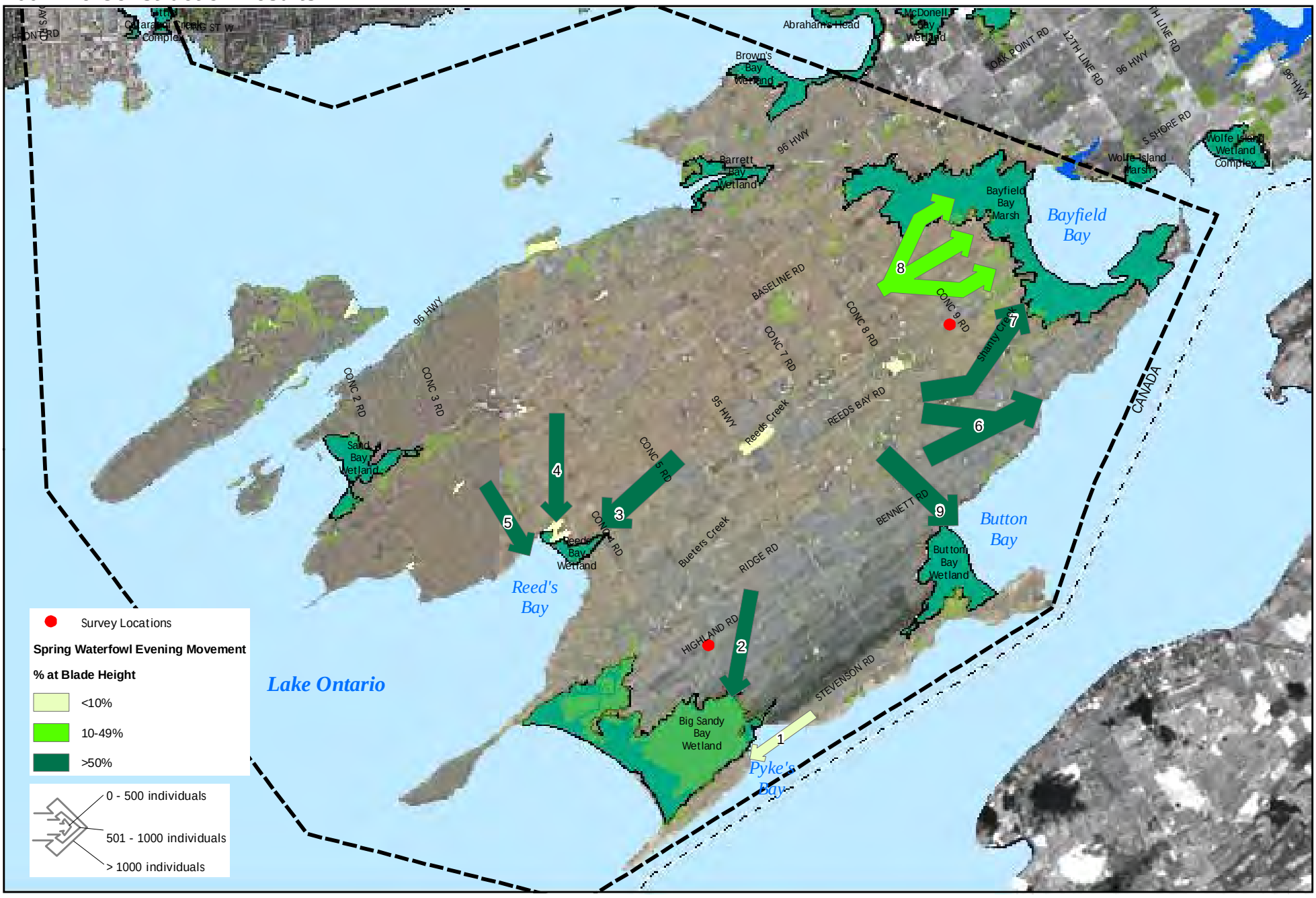
Figure No.

13.0

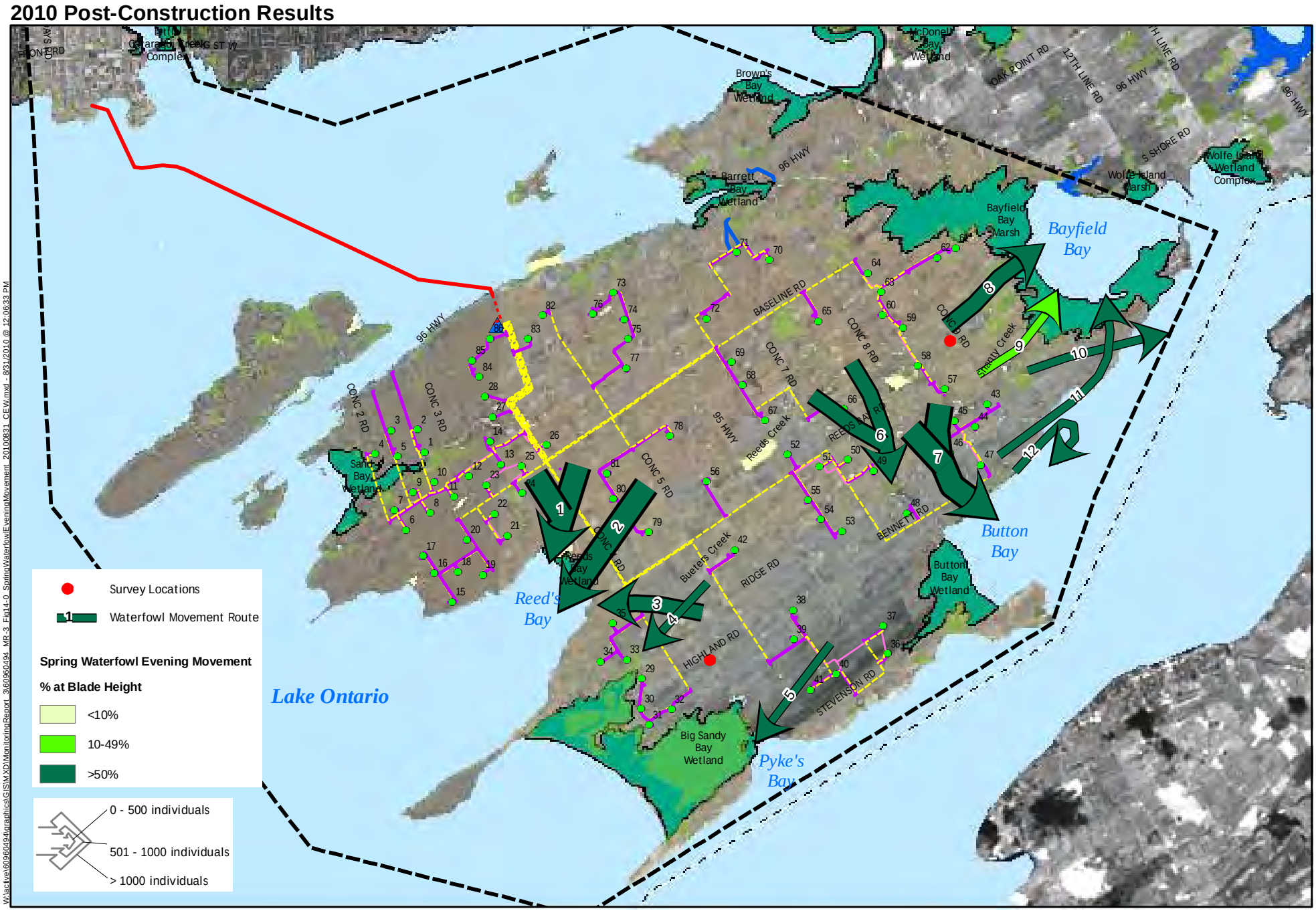
Title

Comparison of Spring Waterfowl Morning Movement 2007 and 2010

2007 Pre-Construction Results



2010 Post-Construction Results



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Legend

- Study Area
- Gardiners Transformer Station
- Turbine Layout
- 230 kV Submarine Cable
- 230 kV Transmission Line - Underground
- Access Roads
- 34.5 kV Collector Lines
- 230 kV Substation / Operation & Maintenance Building
- Temporary Road
- Crane Walk Path
- Woodlot

Wetlands

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland

0 1 2 Kilometers

1:85,000

August, 2010
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WOLFE ISLAND ECOPOWER CENTRE MONITORING REPORT NO. 3

Figure No.

14.0

Title

Comparison of Spring Waterfowl Evening Movement 2007 and 2010

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
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Appendix B

Tables

Table 2.1: Aerial Waterfowl Survey Sectors

Sector	Description
C7	Nine Mile Point to 10th Line near Brophy Point
C8	10th Line near Brophy Point to the tip of the island north of Port Metcalf
C9	Tip of the island north of Port Metcalf to Carpenter Point including Bayfield Bay
C10	Carpenter Point to Bear Point
C11	Bear Point to Nine Mile Point

Table 2.2: Species Composition of Waterfowl Guilds

Guild	Species
Swans	Tundra Swan (*Cygnus columbianus*), Trumpeter Swan (*Cygnus buccinator*), Mute Swan (*Cygnus olor*).
Geese	Snow Goose (*Anser caerulescens*), Brant (*Branta bernicula*), Canada Goose (*Branta Canadensis*)
Large Dabblers	American Black Duck (*Anas rubripes*), Mallard *(Anas platyrhynchos*), Northern Pintail (*Anas acuta*), Gadwall (*Anas strepera*)
Small Dabblers	Wood Duck (*Aix sponsa*), Green-winged Teal (*Anas crecca*), Blue-winged Teal (*Anas discors*), American Wigeon (*Anas Americana*), Northern Shoveler (*Anas clypeata*)
Bay Ducks	Canvasback (*Aythya valisineria*), Redhead (*Aythya americana*), Ring-necked Duck (*Aythya collaris*), Greater Scaup (*Aythya marila*), Lesser Scaup (*Aythya affinis*), Ruddy Duck (*Oxyura jamaicensis*)
Sea Ducks	Long-tailed Duck (*Clangula hyemalis*), Black Scoter (*Melanitta nigra*), Surf Scoter (*Melanitta perspicillata*), White-winged Scoter (*Melanitta fusca*), Common Eider (*Somateria mollissi*), King Eider (*Somateria spectabilis*)
Goldeneye	Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*)
Merganser	Hooded Merganser (*Lophodytes cucullatus*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*)

Table 3.1 Results of Searcher Efficiency Trials April – July 2010

Surveyor	number of carcasses placed	number of carcasses scavenged	number of carcasses found	Individual Se
1	25	5	13	0.650
2	22	4	8	0.444
3	10	0	1	0.100

Table 3.2: Weighted Searcher Efficiency by Month

Surveyor	Individual Se	January: Proportion of Searching (Weighted Se)	February: Proportion of Searching (Weighted Se)	March: Proportion of Searching (Weighted Se)	April: Proportion of Searching (Weighted Se)	May: Proportion of Searching (Weighted Se)	June: Proportion of Searching (Weighted Se)
1	0.650	23% (0.150)	24% (0.156)	24% (0.153)	23% (0.152)	28% (0.184)	26% (0.172)
2	0.444	38.5% (0.171)	40% (0.178)	45% (0.200)	47% (0.208)	46% (0.203)	45% (0.199)
3	0.100	38.5% (0.038)	36% (0.036)	31% (0.031)	30% (0.030)	26% (0.026)	29% (0.029)
		100% (0.359)	**100% (0.370)**	**100% (0.385)**	**100% (0.390)**	**100% (0.412)**	**100% (0.400)**

Table 3.3: Results of Scavenger Trials by Month

	Number of Test Carcasses Placed	Number Remaining - Visit 1	Number Remaining - Visit 2	Number Remaining - Visit 3	Number Remaining - Visit 4	Sc
January (raptors)	6	6	5	5	-	0.941
January (small birds)	83	80	72	58	-	0.894
May (3.5 Day Search Interval)	38	27	10	4	2	0.544
May (7 Day Search Interval)	34	13	4	-	-	0.362
June (3.5 Day Search Interval)	44	33	16	12	2	0.600
June (7 Day Search Interval)	42	13	3	-	-	0.291

Table 3.4: Summary of Bird Fatalities, Reporting Period

Species	Number of Fatalities	Turbine Number
Baltimore Oriole	1	85
Bird Sp.	6	30, 46, 55, 65, 69, 73
Black-and-white Warbler	1	34
Blue Jay	1	29
Bobolink	1	68
Chimney Swift	1	4
Common Grackle	2	9, 18
Double-crested Cormorant	1	2
European Starling	4	1, 41, 61, 72
Horned Lark	3	23, 38, 72
Killdeer	3	20, 30, 43
Magnolia Warbler	1	33
Mallard	3	1, 31, 56
Mourning Dove	2	46, 67
Nashville Warbler	1	71
Northern Harrier	1	46
Osprey	1	43
Philadelphia Vireo	1	25
Red-tailed Hawk	7	27, 29, 64, 75, 78, 81, 81
Red-winged Blackbird	1	64
Ring-billed Gull	7	24, 24, 24, 35, 38, 65, 71
Ring-necked Pheasant	1	56
Savannah Sparrow	1	34
Tree Swallow	3	42, 46, 63
Turkey Vulture	1	83
Upland Sandpiper	2	65, 72
Wilson's Snipe	7	9, 9, 28, 30, 42, 49, 79
Wood Thrush	1	31
Yellow Warbler	1	72

Table 3.5: Calculation of Bird (Raptor) Mortality Rates, January – June 2010

	c (raptors)	Ps	Sc	Se	C (raptors)
January	0	1.000	0.941	1.000	0.00
February	1	1.000	0.941	1.000	1.06
March	0	1.000	0.941	1.000	0.00
April	4	1.000	0.941	1.000	4.25
May - 2x weekly	2	1.000	0.941	1.000	2.13
May - 1x weekly	1	1.000	0.941	1.000	1.06
June - 2x weekly	0	1.000	0.941	1.000	0.00
June - 1x weekly	2	1.000	0.941	1.000	2.13
total	**10**				**10.63**
per turbine					**0.12**
per MW					**0.05**

Sc: Scavenger Impact Trial Results

Se: Searcher Efficiency Trial Results

Ps: Percent Area Searched

C: Corrected Number of Fatalities

Per Turbine: C Divided by Total Number of Turbines

Per MW: C Divided by Total Number of MW

Table 3.6: Calculation of Bird Mortality Rates (Excluding Raptors), January – June 2010

	c (birds)	Ps	Sc	Se	C (birds)
January	0	1.000	0.894	0.359	0.00
February	4	1.000	0.894	0.370	12.09
March	7	0.845	0.894	0.385	24.07
April	18	0.845	0.462	0.390	118.22
May - 2x weekly	14	0.521	0.544	0.412	119.89
May - 1x weekly	3	0.531	0.362	0.412	37.88
June - 2x weekly	8	0.252	0.600	0.400	132.28
June - 1x weekly	3	0.272	0.291	0.400	94.75
total	**57**				**539.19**
per turbine					**6.27**
per MW					**2.73**

Sc Scavenger Impact Trial Results

Se Searcher Efficiency Trial Results

Ps Percent Area Searched

C Corrected Number of Fatalities

Per Turbine C Divided by Total Number of Turbines

Per MW C Divided by Total Number of MW

Table 3.7: Summary of Bat Fatalities, Reporting Period

Species	Number of Fatalities	Turbine Number
Big Brown Bat	4	58, 75, 78, 82
Red Bat	2	9, 48
Silver-haired Bat	28	4, 6, 6, 10, 12, 17, 17, 18, 20, 22, 28, 31, 34, 34, 35, 37, 38, 39, 40, 40, 48 51, 58, 58, 71, 76, 79, 86

Table 3.8: Calculation of Bat Mortality Rates, January – June 2010

	c (bats)	Ps	Sc	Se	C - bats
January	0	1.000	0.894	0.359	0.00
February	0	1.000	0.894	0.370	0.00
March	0	0.845	0.894	0.385	0.00
April	0	0.845	0.462	0.390	0.00
May - 2x weekly	12	0.521	0.544	0.412	102.77
May - 1x weekly	16	0.531	0.362	0.412	202.03
June - 2x weekly	3	0.252	0.600	0.400	49.60
June - 1x weekly	3	0.272	0.291	0.400	94.75
total	**34**				**449.15**
per turbine					**5.22**
per MW					**2.27**

Sc Scavenger Impact Trial Results

Se Searcher Efficiency Trial Results

Ps Percent Area Searched

C Corrected Number of Fatalities

Per Turbine C Divided by Total Number of Turbines

Per MW C Divided by Total Number of MW

Table 3.9: Winter Raptor Survey Results, November 2009 to March 2010

Species	Survey Date										Total
	Nov-11-2009	Nov-25-2009	Dec-08-2009	Dec-23-2009	6-Jan-2010	21-Jan-2010	4-Feb-2010	16-Feb-2010	2-Mar-2010	17-Mar-2010	
Afternoon Survey											
Great Horned Owl							1				**1**
Snowy Owl			5	7	6	5	3	4	3	1	**34**
Short-eared Owl					11		1				**12**
Bald Eagle				1	4	3	2		1		**11**
Northern Harrier	4	3	4	8							**19**
Cooper's Hawk							1				**1**
Red-tailed Hawk	1		5	4	9	5	6	13	11	6	**60**
Rough-legged Hawk	1		2	2	1			1	5	1	**13**
American Kestrel	3	4	3	3	2	4		2	4	5	**30**
Merlin	1	2							1		**4**
Unidentified										2	**2**
Total	**10**	**9**	**19**	**25**	**33**	**17**	**14**	**20**	**25**	**15**	**187**
Total Kilometers	**75**	**70**	**65.8**	**70.6**	**71.5**	**74.2**	**76**	**81.1**	**75.5**	**74.5**	**734.2**
Density / kilometer	**0.1**	**0.1**	**0.3**	**0.4**	**0.5**	**0.2**	**0.2**	**0.2**	**0.3**	**0.2**	**0.3**

Table 3.9: Winter Raptor Survey Results, November 2009 to March 2010

Species	Survey Date										Total
	Nov-11-2009	Nov-25-2009	Dec-08-2009	Dec-23-2009	6-Jan-2010	21-Jan-2010	4-Feb-2010	16-Feb-2010	2-Mar-2010	17-Mar-2010	
Evening Survey											
Short-eared Owl	7	0	4	15	8	6	0	4	8	0	**52**
Total Kilometers	36.2	53.9	47.4	50.7	65.3	74	72	66	71	66.5	**603**
Density / kilometer	**0.2**	**0.0**	**0.1**	**0.3**	**0.1**	**0.1**	**0.0**	**0.1**	**0.1**	**0.0**	**0.1**

Table 3.10: Comparison of total winter raptor observations, November to March 2006/2007 and 2009/2010.

	Total Observations November - March	
	2006/2007	**2009/2010**
Afternoon Survey		
Great Horned Owl	0	1
Snowy Owl	14	34
Short-eared Owl	39	12
Bald Eagle	6	11
Northern Harrier	159	19
Sharp-shinned Hawk	1	0
Cooper's Hawk	0	1
Red-tailed Hawk	85	60
Rough-legged Hawk	119	13
American Kestrel	30	30
Merlin	2	4
Unidentified	0	2
Total	**455**	**187**
Total Kilometers	**634**	**734**
Density / kilometer	**0.72**	**0.25**
Evening Survey		
Short-eared Owl	83	52
Total Kilometers	**519**	**603**
Density / kilometer	**0.16**	**0.09**

Table 3.11: Summary of Kingston Area Christmas Bird Count results from 2000-2009

	Number of Raptors per Party Hour									
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Great Horned Owl	0.04	0.14	0.09	0.06	0.14	0.06	**0.08**	N/A	0.04	**0.06**
Snowy Owl	0.09	0.07	0.06	0.01	0.03	0.03	**0.06**	N/A	0.09	**0.07**
Short-eared Owl	0.03	0.00	0.03	0.03	0.03	0.00	**0.04**	N/A	0.01	**0.00**
Bald Eagle	0.20	0.10	0.04	0.08	0.08	0.13	**0.02**	N/A	0.29	**0.70**
Northern Harrier	0.01	0.13	0.04	0.29	0.18	0.02	**0.60**	N/A	0.18	**0.18**
Sharp-shinned Hawk	0.03	0.03	0.03	0.01	0.03	0.05	**0.04**	N/A	0.03	**0.05**
Cooper's Hawk	0.05	0.04	0.03	0.02	0.01	0.06	**0.02**	N/A	0.03	**0.02**
Red-tailed Hawk	0.40	0.40	0.42	0.27	0.27	0.23	**0.51**	N/A	0.49	**0.22**
Rough-legged Hawk	0.11	0.14	0.02	0.43	0.08	0.06	**0.18**	N/A	0.18	**0.08**
American Kestrel	0.15	0.16	0.11	0.01	0.03	0.08	**0.10**	N/A	0.13	**0.05**
Merlin	0.04	0.02	0.01	0.00	0.01	0.03	**0.02**	N/A	0.02	**0.02**

N/A – data not available.

Bolded numbers highlight 2006, year of pre-construction monitoring and 2009, year of post-construction monitoring.

Table 3.12: Comparison of Species Composition of Field Foraging Waterfowl: March-May 2007 and March-May 2010

	2007	**2010**
Canada Goose	10052	8903
Mallard	203	92
American Black Duck		4
Gadwall		6
Northern Shoveler	7	
Northern Pintail		5
Green-winged Teal	3	21
Teal sp.	30	
Total	**10295**	**9031**

Table 3.13: Comparison of Foraging Field Selection by Waterfowl: March-May 2007 and March-May 2010

	2007	2010
Corn	3%	1%
Fallow Field	5%	1%
Golf Course		<1%
Hayfield	73%	31%
Pasture	15%	43%
Plowed Field	1%	2%
Soy	2%	9%
Wheat		6%
Creek/Flooded	1%	5%
Unknown		2%

Table 3.14: Spring 2010 Waterfowl Morning Movement

Date	Route*															
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14****	**Other*****	**Grand Total**
24-Mar-10	40	148		68	33					18		60	78		67	512
31-Mar-10	94	189	18		20	13	465		20	20		20	70	150		1079
9-Apr-10		13				4	228			65			105		15	430
14-Apr-10	513	277			6	99	550	155	38			5	120		28	1791
22-Apr-10		254	15	35	135		460	185	20	390			175		6	1675
30-Apr-10	20	470	2	155		13	48	233			60		318		6	1325
5-May-10		343		4	17	15	50	15			138		60		2	644
14-May-10		5														5
Grand Total	**667**	**1699**	**35**	**262**	**211**	**144**	**1801**	**588**	**78**	**493**	**198**	**85**	**926**	**150**	**124**	**7461**
% at Blade Height	**85%**	**64%**	**34%**	**27%**	**69%**	**10%**	**97%**	**80%**	**59%**	**95%**	**69%**	**100 %**	**64%**	**0%**	**79%**	**74%**

Notes: Cells represent number of individuals.

*Routes depicted on Figure 13.0

**All individuals on this route are diving ducks not moving over land.

***Represents the sum of smaller flocks not following a major flight route

Table 3.15: Spring 2010 Waterfowl Evening Movement

	Route*													
Date	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Other****	**Grand Total**
23-Mar-10				14		110		12		53			8	197
30-Mar-10	280	175		50		20			30				41	596
8-Apr-10	250	140	3	52	250	230	3		6	15	290			1239
13-Apr-10	1791	550	298			380			2	98			12	3131
21-Apr-10	72	400	175				140	40		253				1080
29-Apr-10	37	383					90		8	565	312		3	1398
4-May-10	2	188	129							108		230	4	661
13-May-10			6							22				28
Grand Total	**2432**	**1836**	**611**	**116**	**250**	**740**	**233**	**52**	**46**	**1114**	**602**	**230**	**68**	**8330**
% at Blade Height	**99%**	**94%**	**62%**	**98%**	**100%**	**97%**	**100%**	**100%**	**22%**	**65%**	**73%**	**100%**	**54%**	**88%**

Notes: Cells represent number of individuals.

*Routes depicted on Figure 14.0

**Represents the sum of smaller flocks not following a major flight route

Table 3.16: Comparison of Waterfowl Use by Sector

	1999	2008	2009	2010
C7	36,316	33,363	35,696	47,060
C8	121,622	33,846	31,110	39,092
C9	266,231	148,667	212,323	145,796
C10	23,054	54,425	46,492	101,349
C11	26,857	69,806	45,658	35,422
Total	**474,079**	**340,105**	**371,278**	**368,718**

Notes: Cells represent waterfowl days.

Table 3.17: Comparison of Waterfowl Use by Staging Area

	2008	2009	2010
Bayfield	62,794	158,209	52,939
Button	18,242	11,529	67,126
Pyke's	13,183	5,359	6,143
Reed's	19,905	8,593	6,705
Total	**114,124**	**183,689**	**132,913**

Notes: Cells represent waterfowl days.

Table 3.18: Comparison of Waterfowl Use by Guild

	1999	2008	2009	2010
Swans	218	35	214	582
Geese	17,867	7,251	23,779	26,152
Large dabblers	23,360	1,214	8,321	16,282
Small dabblers	663	62	78	1,185
Bay ducks	381,605	186,325	179,704	205,895
Sea ducks	89	108	4,118	1,050
Goldeneye	30,628	125,058	54,093	83,109
Mergansers	19,651	17,247	55,737	29,777
Unknown		2,809	45,236	4,688
Total	**474,079**	**340,105**	**371,278**	**368,718**

Notes: Cells represent waterfowl days.

Table 3.19: Number of waterfowl breeding pairs observed in each wetland in May 2010

	Number of breeding pairs				
	Bayfield Bay Marsh	**Button Bay Wetland**	**Big Sandy Bay Wetland**	**Reed's Bay Wetland**	**Sandy Bay Wetland**
Canada Goose	1	0	2	3	3
Wood Duck	4	2	2		1
Gadwall	1				1
American Wigeon					0
Mallard	8		4	3	4
Blue-winged Teal	0				
Green-winged Teal		2	1		
Bufflehead					0
Common Merganser		1			1
Red-breasted Merganser					1
Pied-billed Grebe	0				
Total	14	5	9	6	11

0 - indicates species was observed but not expected to be breeding based on Calculation of Indicated Pairs

Table 3.20: Comparison of Breeding Densities (pairs/10ha), as measured by point count, in grassland habitat between 2006 and 2007 pre-construction and 2010 post-construction surveys

	Pre-construction		Post-construction
Common name	**2006**	**2007**	**2010**
Bobolink	14.86	15.92	14.90
Red-winged Blackbird	16.50	15.26	10.82
Savannah Sparrow	11.43	12.63	10.22
European Starling	14.37	4.06	3.36
American Robin	4.25	3.95	2.52
Yellow Warbler	3.92	3.51	2.28
Eastern Meadowlark	6.04	5.71	3.12
Mourning Dove	3.43	2.75	1.08
Common Grackle	2.94	2.31	0.72
American Goldfinch	2.94	1.76	0.96
Barn Swallow	3.92	1.10	0.12
Song Sparrow	1.80	3.07	2.40
Brown-headed Cowbird	3.92	1.10	0.84
Horned Lark	1.63	1.43	0.48
Upland Sandpiper	3.10	1.43	0.36
Killdeer	2.29	1.21	0.72
Eastern Kingbird	2.29	1.76	1.92
Tree Swallow	0.82	0.77	0.12
Common Yellowthroat	0.49	0.88	0.96
Gray Catbird	0.16	0.11	0.12

Table 3.21: Comparison of breeding bird densities (pairs/10ha) at three distance regimes from WTG bases, as measured by grassland paired point counts.

Species	Distance from Turbine Base		
	0-100	100-200	200-300
Bobolink	14.97	16.56	16.56
Savannah Sparrow	11.46	11.78	10.83
Red-winged Blackbird	5.41	5.41	7.32
European Starling	7.96	0.32	7.01
Song Sparrow	4.46	2.55	3.82
Yellow Warbler	2.55	1.27	3.50
Grasshopper Sparrow	2.23	1.91	3.18
Eastern Meadowlark	1.59	0.64	3.50
Brown-headed Cowbird	1.27	1.59	2.87
Eastern Kingbird	2.55	0.96	1.59
American Robin	2.23	0.96	1.91
Willow Flycatcher	1.59	0.64	0.96
Mourning Dove	0.64	0.64	1.59
Common Yellowthroat	0.64	0.96	1.27
American Goldfinch	0.64	0.32	0.64
Chipping Sparrow	0.64	0.96	0.00
Mallard	0.00	0.64	0.64
Northern Harrier	0.32	0.00	0.96
Spotted Sandpiper	0.32	0.00	0.64
Warbling Vireo	0.32	0.32	0.32
Baltimore Oriole	0.64	0.00	0.32
Upland Sandpiper	0.32	0.00	0.32
Ring-billed Gull	0.64	0.00	0.00
Horned Lark	0.32	0.00	0.32
House Wren	0.32	0.00	0.32
Gray Catbird	0.32	0.00	0.32
Brown Thrasher	0.32	0.00	0.32
Field Sparrow	0.32	0.00	0.32
Swamp Sparrow	0.00	0.00	0.64
Ring-necked Pheasant	0.00	0.32	0.00
Killdeer	0.00	0.00	0.32
Cedar Waxwing	0.32	0.00	0.00
Vesper Sparrow	0.00	0.32	0.00
Common Grackle	0.00	0.00	0.32

Table 3.22: Comparison of Breeding Bird density (pairs/10ha) between pre-construction (2007) and post-construction (2010) grassland area searches across all sectors

	Southeast Area Search		Northwest Area Search	
	2007 Pre-con	2010 Post-con	2007 Pre-con	2010 Post-con
Northern Harrier	0.1	0.1	0.1	0.1
Killdeer	0.4	0.3	0.1	0.3
Upland Sandpiper	0.2	0.1	0.4	0.5
Wilson's Snipe	0.1	0.0	0.1	0.0
Eastern Kingbird	0.6	0.3	0.3	0.5
Horned Lark	0.8	0.2	0.0	0.3
Field Sparrow	0.0	0.0	0.0	0.0
Vesper Sparrow	0.1	0.0	0.0	0.0
Savannah Sparrow	9.3	9.7	17.5	15.1
Grasshopper Sparrow	0.3	0.2	0.7	0.1
Bobolink	4.3	9.4	22.0	16.6
Eastern Meadowlark	0.4	1.2	0.5	0.2

Table 3.23: Comparison of Breeding Bird density (pairs/10ha) between pre-construction (2007) and post-construction (2010) grassland area searches in only sectors with grassland habitat (i.e. hay or pasture).

	Southeast Area Search		Northwest Area Search	
	2007 Pre-con	2010 Post-con	2007 Pre-con	2010 Post-con
Northern Harrier	0.1	0.1	0.1	0.1
Killdeer	0.1	0.2	0.1	0.1
Upland Sandpiper	0.1	0.1	0.4	0.3
Wilson's Snipe	0.1	0.0	0.1	0.0
Eastern Kingbird	0.8	0.4	0.3	0.6
Horned Lark	0.1	0.0	0.0	0.0
Field Sparrow	0.0	0.0	0.0	0.0
Vesper Sparrow	0.1	0.0	0.0	0.0
Savannah Sparrow	11.6	11.6	17.5	18.4
Grasshopper Sparrow	0.4	0.2	0.7	0.1
Bobolink	5.7	11.1	22.0	22.6
Eastern Meadowlark	0.5	1.5	0.5	0.3

Table 3.24: Comparison of Breeding Species Densities (pairs/10ha), as measured by point count, in wetland habitat between 2006/2007 pre-construction and 2010 post-construction surveys

Species	Pre-construction Results (2006/2007)	Post-construction Results (2010)
Red-winged Blackbird	26.48	12.28
Swamp Sparrow	6.37	8.19
Marsh Wren	5.70	8.19
Yellow Warbler	5.03	5.46
Common Yellowthroat	3.64	9.55
Mallard	3.35	0.45
American Robin	3.02	2.73
Song Sparrow	2.35	4.09
American Goldfinch	2.01	0.91
Common Grackle	2.01	0.91
Great Blue Heron	2.01	0.91
Tree Swallow	2.01	0.45
European Starling	1.68	0.00
Wood Duck	1.01	2.27
Mourning Dove	1.01	0.91
Brown-headed Cowbird	1.01	0.45
Canada Goose	0.67	2.73
Wilson's Snipe	0.67	1.36
Virginia Rail	0.67	0.45
Gray Catbird	0.34	1.36
Willow Flycatcher	0.00	2.73
Least Bittern	0.00	0.45

Table 3.25: Comparison of Wetland Area Search Results between 2007 pre-construction and 2010 post-construction surveys. Results are expressed as number of pairs observed along each route.

	Bayfield Bay		Button Bay		Big Sandy Bay		Reed's Bay		Sandy Bay		Total	
	2007	2010	2007	2010	2007	2010	2007	2010	2007	2010	2007	2010
Wood Duck	5	10	0	2	2	0	0	2	1	1	8	15
Gadwall	0	0	0	0	0	0	0	0	0	1	0	1
American Black Duck	0	0	0	0	0	0	1	0	0	0	1	0
Mallard	10	2	1	2	1	0	3	2	2	1	17	7
Blue-winged Teal	0	0	0	0	1	0	0	0	0	0	1	0
Redhead	0	0	0	0	0	0	1	0	0	0	1	0
Hooded Merganser	0	0	1	0	0	0	0	0	0	0	1	0
Common Loon	1	0	0	0	0	1	1	0	0	0	2	1
Pied-Billed Grebe	0	0	0	1	0	0	0	0	0	0	0	1
American Bittern	0	3	0	0	0	0	0	0	0	1	0	4
Least Bittern	0	0	0	0	0	1	0	0	0	0	0	1
Great Blue Heron	7	8	3	2	2	2	2	5	1	2	15	19
Green Heron	0	0	0	0	2	0	0	0	0	0	2	0
Osprey	0	1	0	0	0	0	0	0	1	0	1	1
Bald Eagle	0	1	0	0	0	0	0	0	0	0	0	1
Northern Harrier	1	2	0	0	0	0	0	0	1	0	2	2
Virginia Rail	0	0	0	0	4	1	0	0	0	0	4	1
Spotted Sandpiper	1	0	1	0	0	2	2	1	3	1	7	4
Least Sandpiper	0	0	0	0	0	0	0	0	0	2	0	2
Wilson's Snipe	0	0	0	0	2	4	1	2	1	0	4	6

Table 3.25: Comparison of Wetland Area Search Results between 2007 pre-construction and 2010 post-construction surveys. Results are expressed as number of pairs observed along each route.

	Bayfield Bay		Button Bay		Big Sandy Bay		Reed's Bay		Sandy Bay		Total	
	2007	2010	2007	2010	2007	2010	2007	2010	2007	2010	2007	2010
Alder Flycatcher	0	0	0	0	0	1	0	0	0	0	0	1
Willow Flycatcher	1	3	2	2	2	5	0	1	1	2	6	13
Marsh Wren	19	40	5	9	3	0	15	14	15	14	57	77
Yellow Warbler	8	16	2	7	8	10	2	2	4	4	24	39
Common Yellowthroat	12	37	3	16	2	14	1	11	3	16	21	94
Swamp Sparrow	26	24	4	6	6	15	7	6	5	6	48	57
Red-winged Blackbird	25	24	26	33	12	24	27	24	24	23	114	128

Table 3.26: Comparison of Forest Breeding Species Densities (pairs/10ha) in Woodland Habitat between 2008 pre-construction and 2010 post-construction surveys

Species	Pre-construction Results (2008)	Post-construction Results (2010)
Yellow Warbler	6.37	4.55
House Wren	4.55	1.82
Mourning Dove	3.64	0.91
American Robin	2.73	5.91
Song Sparrow	2.73	3.18
Swamp Sparrow	2.73	4.09
Wood Thrush	2.73	0.45
American Goldfinch	1.82	1.82
Common Grackle	1.82	0.45
Common Yellowthroat	1.36	4.55
Eastern Wood-Pewee	1.36	2.27
Gray Catbird	1.36	1.82
Great Crested Flycatcher	1.36	1.36
Red-eyed Vireo	1.36	2.27
Rose-breasted Grosbeak	1.36	1.36
Black-capped Chickadee	0.91	1.36
Downy Woodpecker	0.91	1.36
Least Flycatcher	0.91	0.00
Northern Flicker	0.91	0.00
American Crow	0.45	0.45
Baltimore Oriole	0.45	1.36
Black-billed Cuckoo	0.45	0.00
Brown-headed Cowbird	0.45	0.45
Cedar Waxwing	0.45	3.64
Chestnut-sided Warbler	0.45	0.00
European Starling	0.45	0.00
Northern Cardinal	0.45	1.36
Tree Swallow	0.45	0.00
Veery	0.45	1.36
Warbling Vireo	0.00	1.82
Willow Flycatcher	0.00	1.36

Table 3.26: Comparison of Forest Breeding Species Densities (pairs/10ha) in Woodland Habitat between 2008 pre-construction and 2010 post-construction surveys

Species	Pre-construction Results (2008)	Post-construction Results (2010)
Ovenbird	0.00	0.91
American Redstart	0.00	0.45
Blue Jay	0.00	0.45
Brown Thrasher	0.00	0.45
Indigo Bunting	0.00	0.45
Mourning Warbler	0.00	0.45
Northern Waterthrush	0.00	0.45
Ruby-throated Hummingbird	0.00	0.45
Yellow-billed Cuckoo	0.00	0.45

Table 3.27: Summary of Notifications - Reporting Period

Notification No.	Date	Period	Notification	Status
1	April 15	April 9 – April 15	High Annual Mortality - Raptors (3)	
2	May 6	April 16 – May 3	High Annual Mortality - Raptors (2)	
3	May 13	May 11	Mortality of Species at Risk (Chimney Swift)	
4	May 13	March 24 – May 5	Disturbance to Staging Waterfowl	
5	May 18	May 13 - 17	High Annual Mortality - Raptors (2)	
6	May 26	May 3 – May 21	High Annual Mortality – Bats (25)	
7	June 11	June 1 – June 10	High Annual Mortality - Raptors (2)	

Appendix C

Mortality Monitoring Schedule

WEEK	SUBSET	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	Subset A		4, (6, 7, 8, 9, 10, 11), 12, 66	(3, 5), (13, 14), 21, 22, 26, (29, 30, 31, 32), (40, 41), 47, 48, 52, 56, 58, (59, 60, 63), 72, (79, 80, 81), 83, MET 1	(53, 54, 55), (73, 74, 75, 76, 77)	
	Subset B	(1, 2), 23, 24, 27, 28, (33, 34, 35), 36, 37, (38, 39), 42, (43, 44, 45, 46), 50, 64, 65, 78, 82, (84, 85, 86), MET 2	(15, 16, 17, 18, 19, 20), 25, 49, 51, 57, (61, 62), (67, 68, 69), (70, 71)		(1, 2), 23, 24, 27, 28, (33, 34, 35), 36, 37, (43, 44, 45, 46), (84, 85, 86)	(15, 16, 17, 18, 19, 20), 25, (38, 39), 42, 49, 50, 51, 57, (61, 62), 64, 65, (67, 68, 69), (70, 71), 78, 82, MET 2

Appendix D

Survey Conditions

Survey Date	Survey Type	Weather	Start Time	End Time
6-Jan-10	Short-eared Owl Survey	Temp: -8 C Wind: 2-3 Cloud: 100% PPT: none Overnight ppt or fog: snow	4:10pm	5:20pm
6-Jan-10	Winter Raptor Survey	Temp: -6 - -8 C Wind: 3 Cloud: 50-80% PPT: none Overnight ppt or fog: snow	1:40pm	3:40pm
21-Jan-10	Short-eared Owl Survey	Temp: -6 - -2 C Wind: 1 Cloud: 0-20% PPT: none Overnight ppt or fog: none	4:00pm	6:00pm
21-Jan-10	Winter Raptor Survey	Temp: -2 C Wind: 1-2 Cloud: 70-10% PPT: none Overnight ppt or fog: none	1:00pm	2:40pm
4-Feb-10	Short-eared Owl Survey	Temp: -6 C Wind: 2-5 W Cloud: 25-50% PPT: none Overnight ppt or fog: none	5:00pm	6:15pm
4-Feb-10	Winter Raptor Survey	Temp: -4 - -6 C Wind: 2-5 W Cloud: 15-50% PPT: none Overnight ppt or fog: none	2:30pm	5:00pm
16-Feb-10	Short-eared Owl Survey	Temp: -3 - -4 C Wind: 1-2 Cloud: 100% PPT: none Overnight ppt or fog: none	4:55pm	6:15pm
16-Feb-10	Winter Raptor Survey	Temp: -3 C Wind: 1-2 Cloud: 95-100% PPT: none Overnight ppt or fog: none	2:30pm	4:45pm
2-Mar-10	Short-eared Owl Survey	Temp: 0-1 C Wind: 0 Cloud: 40-70% PPT: none Overnight ppt or fog: none	5:00pm	6:20pm
2-Mar-10	Winter Raptor Survey	Temp: 1-3 C Wind: 1 Cloud: 50-70% PPT: none Overnight ppt or fog: none	2:30pm	5:00pm
17-Mar-10	Short-eared Owl Survey	Temp: 10 C Wind: 3 Cloud: 0-5% PPT: none Overnight ppt or fog: none	6:00pm	7:25pm
17-Mar-10	Winter Raptor Survey	Temp: 15 C Wind: 3 Cloud: 0% PPT: none Overnight ppt or fog: none	4:00pm	6:15pm
23-Mar-10	Spring Waterfowl - Dusk Movement	Temp: 0-1 C Wind: 3-4 Cloud: 100% PPT: drizzle Overnight ppt or fog: rain	7:35pm	8:00pm
24-Mar-10	Spring Waterfowl - field foraging	Temp: 3 C Wind: 3 Cloud: 50% PPT: Overnight ppt or fog: rain	9:00am	12:00pm
24-Mar-10	Spring Waterfowl - morning movement	Temp: -1 - 0 C Wind: 3 Cloud: 0-5% PPT: none Overnight ppt or fog: rain	7:15am	8:15am
24-Mar-10	Spring Aerial Waterfowl	Temp: 5-12 C Wind: 2 Cloud: 0-5% PPT: none Overnight ppt or fog: none	2:10pm	3:15pm
30-Mar-10	Spring Waterfowl - Dusk Movement	Temp: 5-10 C Wind: 3-4 Cloud: 80-95% PPT: none Overnight ppt or fog: none	7:25pm	8:15pm
31-Mar-10	Spring Waterfowl - field foraging	Temp: 12 C Wind: 2-1 Cloud: 95% PPT: none Overnight ppt or fog: none	9:45am	11:30am
31-Mar-10	Spring Waterfowl - morning movement	Temp: 3-8 C Wind: 4 S Cloud: 95-100% PPT: none Overnight ppt or fog: none	7:00am	8:15am
2-Apr-10	Spring Waterfowl - field foraging	Temp: 15-13 C Wind: 2-3 W Cloud: 0-5% PPT: none Overnight ppt or fog: none	5:00pm	7:30pm
8-Apr-10	Spring Waterfowl - Dusk Movement	Temp: 9-12 C Wind: 1 Cloud: 100% PPT: showers Overnight pp	7:40pm	8:40pm
8-Apr-10	Spring Aerial Waterfowl	Temp: 13 C Wind: 3 Cloud: 95-100% PPT: none Overnight ppt or fog: rain	2:00pm	3:15pm
9-Apr-10	Spring Waterfowl - field foraging	Temp: 5 C Wind: 3-4 Cloud: 90% PPT: none Overnight ppt or fog: showers	9:00am	11:00am
9-Apr-10	Spring Waterfowl - morning movement	Temp: 4-5 C Wind: 3-4 Cloud: 95-100% PPT: none Overnight ppt or fog: rain	6:45am	7:50am
13-Apr-10	Spring Waterfowl - Dusk Movement	Temp: 7-10 C Wind: 1-2 Cloud: 0-5% PPT: none Overnight ppt or fog: none	7:30pm	8:40pm
14-Apr-10	Spring Waterfowl - field foraging	Temp: 8 C Wind: 1 Cloud: 0% PPT: none Overnight ppt or fog: none	8:45am	11:00am
14-Apr-10	Spring Waterfowl - morning movement	Temp: 3-4 C Wind: 1 Cloud: 0% PPT: none Overnight ppt or fog: none	6:25am	7:50am
21-Apr-10	Spring Waterfowl - Dusk Movement	Temp: 8-9 C Wind: 1-2 Cloud: 15-50% PPT: none Overnight ppt or fog: none	7:45pm	8:45pm
21-Apr-10	Spring Aerial Waterfowl	Temp: 14-18 C Wind: 2 Cloud: 5-15% PPT: none Overnight ppt or fog: none	1:00pm	2:10pm
22-Apr-10	Spring Waterfowl - field foraging	Temp: 7 C Wind: 2 Cloud: 90% PPT: none Overnight ppt or fog: showers	9:00am	11:00am
22-Apr-10	Spring Waterfowl - morning movement	Temp: 3-4 C Wind: 1-3 Cloud: 95-100% PPT: none Overnight ppt or fog: rain	6:15am	8:00am

Survey Date	Survey Type	Weather	Start Time	End Time
29-Apr-10	Spring Waterfowl - Dusk Movement	Temp: 11C Wind: 3-4 WNW Cloud: 5-10% PPT: none Overnight ppt or fog: none	7:40pm	8:45pm
30-Apr-10	Spring Waterfowl - morning movement	Temp: 8-10 C Wind: 0-2 Cloud: 90% PPT: none Overnight ppt or fog: none	6:15am	8:30am
4-May-10	Spring Waterfowl - field foraging	Temp: 17 C Wind: 3-4 Cloud: 90-20% PPT: none Overnight ppt or fog: rain	10:30am	7:00pm
4-May-10	Spring Waterfowl - Dusk Movement	Temp: 16-8 C Wind: 3-4 S Cloud: 30% PPT: none Overnight ppt or fog: light rain	7:55pm	9:00pm
4-May-10	Spring Waterfowl - Breeding Pairs	Temp: 16-17 C Wind: 3-4 Cloud: 20-50% PPT: none Overnight ppt or fog: light rain	12:30pm	4:30pm
5-May-10	Spring Waterfowl - morning movement	Temp: 7-10 C Wind: 2 Cloud: 80-100% PPT: none Overnight ppt or fog: none	6:55am	8:15am
5-May-10	Spring Aerial Waterfowl	Temp: 17 C Wind: 2 Cloud: 40-50% PPT: none Overnight ppt or fog: none	11:20am	12:30pm
13-May-10	Spring Waterfowl - field foraging	Temp: 17 C Wind: 2-3 SW Cloud: 100% PPT: none Overnight ppt or fog: rain	3:00pm	4:00pm
13-May-10	Spring Waterfowl - Dusk Movement	Temp: 10 C Wind: 2-3 E Cloud: 100% PPT: rain Overnight ppt or fog: rain	8:05pm	9:10pm
13-May-10	Spring Waterfowl - Breeding Pairs	Temp: 17 C Wind: 2-3 SW Cloud: 40-100% PPT: none Overnight ppt or fog: rain	11:00am	4:45pm
14-May-10	Spring Waterfowl - morning movement	Temp: 8-9 C Wind: 0-3 SE Cloud: 100% PPT: fog early Overnight ppt or fog: rain	5:55am	7:30am
31-May-10	Breeding Bird - Grassland Point Counts	Temp: 14-19 C Wind: 3-2 Cloud: 10% PPT: none Overnight ppt or fog: none	6:30am	6:45am
1-Jun-10	Breeding Bird - Grassland Point Counts and Area Searches	Temp: 17 C Wind: 1-2 Cloud: overcast PPT: light steady rain Overnight ppt or fog: rain overnight	5:45am	9:15am
1-Jun-10	Breeding Bird - Grassland Point Counts	Temp: 18-19 C Wind: 2-3 WNW Cloud: 100% PPT: rain Overnight ppt or fog: rain	6:15am	9:30am
2-Jun-10	Breeding Bird - Marsh Point Counts and Area Search	Temp: 17 C Wind: 1-3 SW Cloud: 0-5% PPT: none Overnight ppt or fog: rain	5:30am	9:00am
3-Jun-10	Breeding Bird - Grassland Point Counts and Area Searches	Temp: 20 C Wind: 2 Cloud: 90% PPT: none Overnight ppt or fog: rain	5:30am	10:30am
3-Jun-10	Breeding Bird - Marsh Point Counts and Area Search	Temp: 17-18 C Wind: 3-4 NNE Cloud: 100% PPT: rain until 0530 Overnight ppt or fog: rain	5:15am	8:00am
4-Jun-10	Breeding Bird - Grassland Point Counts	Temp: 16-18 C Wind: 1-2 Cloud: fog PPT: none Overnight ppt or fog: rain	5:15am	7:30am
5-Jun-10	Breeding Bird - Grassland Point Counts	Temp: 17-19 C Wind: 3-SW Cloud: 100% PPT: early light drizzle Overnight ppt or fog: rain	5:30am	8:45am
8-Jun-10	Breeding Bird - Paired Grassland	Temp: 14 C Wind: 2-3 S Cloud: 70-90% PPT: none Overnight ppt or fog: rain	5:15am	9:00am
9-Jun-10	Breeding Bird - Paired Grassland	Temp: 12-14 C Wind: 2-3 Cloud: 100% PPT: none Overnight ppt or fog: rain yesterday	5:15am	9:30am
10-Jun-10	Breeding Bird - Paired Grassland	Temp: 11-13 C Wind: 2-3 Cloud: 100% PPT: none Overnight ppt or fog: rain	5:15am	9:45am
11-Jun-10	Breeding Bird - Woodland PCs and Area Search	Temp: 9-10 C Wind: 0-1 SW Cloud: Fog + 30% PPT: fog Overnight ppt or fog: rain	5:15am	8:30am
14-Jun-10	Breeding Bird - Grassland Point Counts and Area Searches	Temp: 16 C Wind: 2-3 WSW Cloud: overcast PPT: none Overnight ppt or fog: none	5:00am	10:00am
15-Jun-10	Breeding Bird - Grassland Point Counts	Temp: 15 C Wind: 1 Cloud: 5% PPT: none Overnight ppt or fog: showers	5:45am	6:15am
15-Jun-10	Breeding Bird - Marsh, Woodland and Grassland point counts. Marsh and Woodland Area Searches	Temp: 12-16 C Wind: 2-3 Cloud: 20-60% PPT: none Overnight ppt or fog: rain	5:15am	9:30am

Survey Date	Survey Type	Weather	Start Time	End Time
16-Jun-10	Breeding Bird - Marsh Point Counts and Area Search	Temp: 15-16 C Wind: 0-4 Cloud: 90% PPT: none Overnight ppt or fog: none	5:30am	10:15am
16-Jun-10	Breeding Bird - Grassland Point Counts and Area Searches	Temp: 14-15 C Wind: 2-3 Cloud: 95-100% PPT: none Overnight ppt or fog: none	5:15am	9:00am
17-Jun-10	Breeding Bird - Paired Grassland and Grassland Area Searches	Temp: 15 C Wind: 3-4 NW Cloud: 100% PPT: drizzle Overnight ppt or fog: rain	5:30am	9:15am
18-Jun-10	Breeding Bird - Woodland PCs and Area Search	Temp: 13-16 C Wind: 2-3 S Cloud: 5-15% PPT: none Overnight ppt or fog: none	5:30am	9:15am
19-Jun-10	Breeding Bird - Paired Grassland	Temp: 18-23C Wind: 4-S Cloud: 9-95% PPT: none Overnight ppt or fog: none	5:15am	10:00am
20-Jun-10	Breeding Bird - Paired Grassland	Temp: 17-20 C Wind: 1-2 NW Cloud: 90-100% PPT: none Overnight ppt or fog: none	5:15am	8:45am

Survey Date	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
04-Jan-10	-11	3-4	Partly	None		10:06 AM	3:01 PM
04-Jan-10	-11	3-4	Partly	None		10:07 AM	3:03 PM
05-Jan-10	-6	3-4	Overcast	Snow		2:51 PM	4:25 PM
05-Jan-10	-6	3-4	Overcast	Snow		1:00 PM	4:25 PM
05-Jan-10	-6	3-4	Overcast	Snow	Snow	9:04 AM	1:34 PM
06-Jan-10	-7	2-3	Partly	None		11:45 AM	2:10 PM
06-Jan-10	-7	3-4	Overcast	None		11:44 AM	2:02 PM
06-Jan-10	-11	4		None		8:44 AM	2:57 PM
07-Jan-10	-5	2-4	Overcast	None		10:25 AM	2:27 PM
07-Jan-10	-5	2-3	Overcast	None		10:30 AM	2:30 PM
8-Jan-10	-8	4-6	Overcast	Snow		10:00 AM	11:43 AM
8-Jan-10	-8	4-6	Overcast	Snow		10:00 AM	11:52 AM
8-Jan-10	-12	4	Overcast	Snow		8:26 AM	12:00 PM
11-Jan-10	-6	3-4	Overcast	None		10:28 AM	12:26 PM
11-Jan-10	-3	2-4	Overcast	None		10:25 AM	12:25 PM
11-Jan-10	-6	3	Partly	None		8:47 AM	2:10 PM
12-Jan-10	-8	4	Partly	None		10:00 AM	2:05 PM
12-Jan-10	-9	4		Snow		10:24 AM	1:56 PM
13-Jan-10	-3	2-3	Overcast	None		11:00 AM	1:12 PM
13-Jan-10	-3	2-3	Overcast	Snow		11:14 AM	1:21 PM
13-Jan-10						8:45 AM	12:45 PM
14-Jan-10	2	2-4	Overcast	None		7:45 AM	11:40 AM
14-Jan-10	2	4	Overcast	None		7:51 AM	11:20 AM
15-Jan-10	2	3-4	None	None		7:45 AM	9:54 AM
15-Jan-10	2	2-4	None	None		8:10 AM	10:16 AM
15-Jan-10	2	2	Overcast	Drizzle		8:32 AM	1:00 PM
18-Jan-10	0	2-3	Overcast	None		12:02 PM	3:54 PM
18-Jan-10	0	2-3	Overcast	Fog		12:10 PM	4:03 PM
19-Jan-10	2	2-3	Partly	None		10:22 AM	12:21 PM
19-Jan-10	2					8:25 AM	12:06 PM
19-Jan-10	2	2-4	Overcast	None		10:21 AM	12:25 PM
20-Jan-10	-3	2-3	Overcast	None		9:03 AM	11:00 AM
20-Jan-10	-3	3	Overcast	None		8:39 AM	1:47 PM
20-Jan-10	-3	2-4	Overcast	None		9:01 AM	10:53 AM
21-Jan-10	-10	2-4	Overcast	None	Fog	7:50 AM	11:33 AM
21-Jan-10	-6	3-4	Overcast	Frost	Fog	7:58 AM	11:59 AM
22-Jan-10	-6	4	None	None		9:00 AM	11:03 AM
22-Jan-10	-9	3-4	None	None		8:57 AM	10:41 AM
22-Jan-10	-8	4	None	None		8:39 AM	12:17 PM
25-Jan-10	9	4	Overcast	Rain		9:08 AM	3:00 PM
25-Jan-10	9	4-6	Overcast	Light Rain		9:20 AM	11:21 AM
25-Jan-10	8	6	Overcast	Rain		9:15 AM	11:12 AM
26-Jan-10	0	5-6	Overcast	Flurries		7:50 AM	11:48 AM
26-Jan-10	0	6	Overcast	None		7:56 AM	11:56 AM
27-Jan-10	-1	3	Overcast	Light Snow		8:25 AM	1:32 PM
27-Jan-10	1	4	Overcast	Trace Snow		9:15 AM	11:27 AM
27-Jan-10	1	4	Overcast	None		9:16 AM	11:15 AM
28-Jan-10	-3	4-6	Overcast	Heavy Snow		7:50 AM	11:40 AM
28-Jan-10	-3	4-6	Overcast	Blowing Snow		7:50 AM	12:00 PM
29-Jan-10	-17	3	Partly	None		9:36 AM	11:44 AM
29-Jan-10	-16	3-4	Partly	None		9:35 AM	11:29 AM
29-Jan-10	-18	4	None	None		9:24 AM	1:15 PM
1-Feb-10	-12	4	Overcast	None		9:06 AM	11:45 AM

Survey Date	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
1-Feb-10	-4	4-6	Partly	None		2:35 PM	4:52 PM
1-Feb-10	-4	5-6	Overcast	None		2:36 PM	4:20 PM
2-Feb-10	-3					9:20 AM	12:32 PM
2-Feb-10	-2	1-2	Overcast	None		9:37 AM	11:38 AM
2-Feb-10	-2	2	Partly	None		9:26 AM	11:28 AM
3-Feb-10	-6	2	Overcast	Flurries		7:58 AM	11:42 AM
3-Feb-10	-6	2-3	Overcast	Flurries		8:00 AM	12:25 PM
4-Feb-10	-4	2-3	Partly	None		10:31 AM	2:25 PM
4-Feb-10	-6	2	Partly	None		10:27 AM	2:27 AM
5-Feb-10	-4	3	Partly	None		9:03 AM	10:51 AM
5-Feb-10	-4	2-4	Partly	None		9:02 AM	10:49 AM
5-Feb-10	-8					9:10 AM	12:21 PM
8-Feb-10	-8	3-4	Partly	None		9:15 AM	11:03 AM
8-Feb-10	-8	3-4	Partly	None		9:15 AM	11:13 AM
8-Feb-10	12	3	None	None		9:18 AM	1:45 PM
9-Feb-10	-5	2	Overcast	None		2:32 PM	4:21 PM
9-Feb-10	-4	1-3	Partly	None		2:35 PM	4:40 PM
9-Feb-10						9:03 AM	12:45 PM
10-Feb-10	-3	3-4	Overcast	None		7:46 AM	11:44 AM
10-Feb-10	-4	4	Overcast	None		7:50 AM	11:29 AM
11-Feb-10	-2	3-4	None	None		12:23 PM	4:00 PM
11-Feb-10	-4	4-6	None	None		12:15 PM	3:55 PM
12-Feb-10	-8	1	None	None		9:03 AM	12:40 PM
12-Feb-10	-12	3-4	None	None		2:45 PM	4:10 PM
12-Feb-10	-3	2-3	None	None		2:47 PM	4:09 PM
15-Feb-10	-2	4	Overcast	None		8:37 AM	11:03 AM
15-Feb-10	-3	4-6	Overcast	None		7:45 AM	10:28 AM
15-Feb-10	-3	6	Overcast	None		7:58 AM	10:34 AM
16-Feb-10	-2	4	Overcast	None		9:06 AM	12:38 PM
16-Feb-10	2	1-3	Overcast	None		12:10 PM	2:10 PM
16-Feb-10	3	2-3	Overcast	None		2:44 PM	4:25 PM
17-Feb-10	-3	3-4	Overcast	Flurries		8:19 AM	10:03 AM
17-Feb-10	-3	3-4	Overcast	Flurries		8:15 AM	10:04 AM
17-Feb-10	-1					9:09 AM	1:35 PM
18-Feb-10	-1	4	Overcast	None		8:00 AM	4:44 PM
18-Feb-10	0	3-4	Overcast	None		7:44 AM	10:40 AM
19-Feb-10	-1	4	Overcast	None		7:54 AM	10:45 AM
19-Feb-10	-1	4	Overcast	None		8:00 AM	10:36 AM
22-Feb-10	-8	3-4	None	None		6:53 AM	9:15 AM
22-Feb-10	-2	3-4	Partly	None		10:24 AM	2:02 PM
23-Feb-10	1	3-4	Overcast	None		8:13 AM	11:31 AM
23-Feb-10	2	4	Overcast	Light Rain		8:12 AM	8:28 PM
24-Feb-10	0	2-3	Overcast	Light Wet Snow		9:12 AM	11:50 AM
25-Feb-10	1	2-3	Overcast	Heavy Wet Snow		8:22 AM	9:29 AM
25-Feb-10	1	2-4	Overcast	Light Wet Snow	Light Snow	8:16 AM	9:35 AM
24-Feb-10	-1	3	Overcast	Snow	Snow	8:03 AM	11:35 AM
25-Feb-10	0	1		None	Snow	8:10 AM	12:15 PM
26-Feb-10	2	6+	Partly	None		10:18 AM	1:05 PM
26-Feb-10	2	5		None	Snow	7:46 AM	11:19 AM
1-Mar-10	3	3	Overcast	None		2:53 PM	5:22 PM
1-Mar-10	3	2-4	Partly	None		9:10 AM	11:48 AM
2-Mar-10	0	0-2	Partly	None		8:06 AM	10:33 AM

Survey Date	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
2-Mar-10	-1	1-3	Partly	None		8:05 AM	10:29 AM
3-Mar-10	1	6	Partly	None		8:00 AM	10:34 AM
3-Mar-10						8:03 AM	1:32 PM
4-Mar-10	-1	4	Light	None		7:50 AM	10:26 AM
4-Mar-10	-2	4		None		8:07 AM	11:32 AM
5-Mar-10	7	2-4		None		12:23 PM	1:53 PM
5-Mar-10	4	2-3		None		3:45 PM	5:05 PM
5-Mar-10	-2	4		None		7:37 AM	10:47 AM
8-Mar-10	4	2-4	Partly	None		6:54 AM	9:35 AM
8-Mar-10	2	3-4		None		6:50 AM	9:30 AM
9-Mar-10	6	1-2		None		2:51 PM	5:27 PM
9-Mar-10	4	3		None		8:36 AM	12:00 PM
10-Mar-10	5	2-3		None		9:10 AM	10:30 AM
10-Mar-10						7:34 AM	11:45 AM
10-Mar-10	11	2-4		None		11:13 AM	12:49 PM
11-Mar-10	4	3-4	Overcast	None		7:16 AM	9:47 AM
11-Mar-10	4	2-3	Overcast	None		7:10 AM	9:45 AM
12-Mar-10	8	4	Overcast	Light Rain		2:42 PM	5:21 PM
12-Mar-10	9	4	Overcast	Light Rain		10:13 AM	12:46 PM
15-Mar-10	10	4	Partly	None		2:50 PM	5:33 PM
15-Mar-10	7	4	Partly	None		9:21 AM	1:30 PM
16-Mar-10	4	2-4		None		9:16 AM	10:43 AM
16-Mar-10						8:50 AM	12:28 PM
16-Mar-10	9	3-4	Partly	None		2:49 PM	4:07 PM
17-Mar-10	10	1-3		None		9:47 AM	1:50 PM
17-Mar-10	10					11:18 AM	2:00 PM
18-Mar-10	12	4	Light	None		2:39 PM	5:09 PM
18-Mar-10						8:11 AM	10:40 AM
18-Mar-10						6:09 PM	7:29 PM
19-Mar-10	9	4-6	Partly	None		11:11 AM	2:10 PM
19-Mar-10	11			None		10:30 AM	1:01 PM
22-Mar-10	6	4	Overcast	Light Rain		1:05 PM	3:44 PM
23-Mar-10	3	4-6	Overcast	Rain		2:42 PM	5:34 PM
23-Mar-10						8:36 AM	12:31 PM
24-Mar-10	6	1-3	None	None		10:05 AM	11:36 AM
24-Mar-10	2	4	Overcast	Rain		7:38 AM	10:42 AM
24-Mar-10	1	4	None	None		7:53 AM	9:21 AM
25-Mar-10	5	3-4	Partly	None		7:11 AM	9:46 AM
25-Mar-10	2	4	Partly	None		7:10 AM	9:46 AM
25-Mar-10	4	3	None	None		8:24 AM	12:25 PM
26-Mar-10	-7	4-6	None	None		9:13 AM	11:49 AM
26-Mar-10	-1	4	None	None		2:35 PM	5:30 PM
29-Mar-10	5	2-4	Overcast	None		10:36 AM	2:10 PM
29-Mar-10	4	4-5	Overcast	Light Rain		10:36 AM	2:12 PM
30-Mar-10	5	4-5	Partly	None		10:18 AM	2:15 PM
30-Mar-10	4	4-6	Partly	None		10:20 AM	1:58 PM
31-Mar-10	11	1-3	Partly	None		10:34 AM	2:17 PM
31-Mar-10	10	3-4	Partly	None		10:40 AM	2:15 PM
1-Apr-10	15	1-3	Partly	None		11:15 AM	3:09 PM
1-Apr-10	16	2-3	Light	None		11:18 AM	3:00 PM
2-Apr-10	15	4		None		8:00 AM	11:00 AM
2-Apr-10	16	3-4		None		7:46 AM	11:35 AM
5-Apr-10	11	4	Overcast	Light Rain		8:35 AM	11:35 AM

Survey Date	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
5-Apr-10	12					8:53 AM	1:17 PM
6-Apr-10	12	2	Partly	Light Rain		11:15 AM	2:43 PM
6-Apr-10						7:07 AM	12:33 PM
7-Apr-10	12	4-5	Overcast	Rain		11:11 AM	1:46 PM
7-Apr-10	9	4-6	Overcast	Rain		9:47 AM	1:43 PM
8-Apr-10	9	4-6	Overcast	None		9:11 AM	10:51 AM
8-Apr-10	9	4-5	Overcast	Rain	Rain	9:15 AM	10:52 AM
8-Apr-10						8:32 AM	1:55 PM
9-Apr-10	5	4-6	Partly	None		10:58 AM	2:21 PM
9-Apr-10	7	6	Partly	None		11:29 AM	3:01 PM
12-Apr-10	11	3-4	Partly	None		1:21 PM	4:38 PM
12-Apr-10						10:59 AM	3:33 PM
13-Apr-10						8:34 AM	1:15 PM
13-Apr-10	12	3-4	Partly	None		1:04 PM	4:10 PM
14-Apr-10						8:39 AM	2:05 PM
14-Apr-10	11	2-3	None	None		11:14 AM	1:03 PM
14-Apr-10	13	1-3	None	None		11:09 AM	1:03 PM
15-Apr-10	12	1-2	Overcast	Light Rain		11:25 AM	2:21 PM
15-Apr-10	13	1-3	Overcast	None		11:15 AM	2:43 PM
16-Apr-10	8	2-3	Overcast	Rain		8:04 AM	11:20 AM
16-Apr-10	8	3-4	Partly	Rain		10:08 AM	1:12 PM
19-Apr-10	14	2-4	Partly	None		2:42 PM	6:37 PM
19-Apr-10	14	4	Partly	None		2:40 PM	5:39 PM
20-Apr-10						8:55 AM	1:46 PM
20-Apr-10	16	4	Partly	None		3:00 PM	6:20 PM
21-Apr-10	16	3-4	Light	None		2:23 PM	5:54 PM
21-Apr-10	15	3-4	None	None		11:10 AM	2:38 PM
22-Apr-10		3-4	Overcast	Light Rain		7:58 AM	9:32 AM
22-Apr-10						9:06 AM	2:04 PM
23-Apr-10	7	2-3	None	None		8:05 AM	11:28 AM
23-Apr-10							
26-Apr-10	14	4	Light	None		10:10 AM	2:19 PM
26-Apr-10						9:07 AM	2:48 PM
27-Apr-10	3	4-6	Overcast	Flurries		9:18 AM	10:32 AM
27-Apr-10						9:03 AM	1:50 PM
27-Apr-10	4	4-6	Overcast	Wet Snow		10:10 AM	11:38 AM
28-Apr-10	10	4-6	Partly	None		9:12 AM	1:00 PM
28-May-10	10	4-6		None		9:20 AM	12:39 PM
29-Apr-10						8:59 AM	1:56 PM
29-Apr-10	16	4-6	None	None		11:36 AM	3:18 PM
30-Apr-10	14	1-3	Overcast	None		9:20 AM	2:55 PM
30-Apr-10	9	2-3	Partly			6:30 AM	2:34 PM
3-May-10	20	4-5	Partly	None		12:10 PM	2:04 PM
3-May-10						9:46 AM	3:09 PM
3-May-10	20	4	Light	None		10:18 AM	11:43 AM
4-May-10							
4-May-10	11	4-5	Overcast	None		6:20 AM	10:08 AM
5-May-10	11	2-4	Overcast	Light Rain		8:01 AM	11:35 AM
5-May-10	15	3-4	Partly	None		10:24 AM	2:18 PM
6-May-10						10:09 AM	3:28 PM
6-May-10	10	4-5	Partly	None		6:25 AM	9:28 AM
7-May-10	8	2-3	None	None		8:05 AM	11:35 AM
7-May-10	13	1-3	Partly	None		8:57 AM	12:48 PM

Survey Date	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
10-May-10	9	3-4	Light	None		10:35 AM	1:51 PM
10-May-10	13	1-3	Partly	None		10:26 AM	2:03 PM
11-May-10	11	3-4	Hazy	None		10:16 AM	11:43 AM
11-May-10	13	1-3		None		10:26 AM	11:38 AM
11-May-10						8:10 AM	12:10 PM
12-May-10	12	2-4	Overcast	None		10:24 AM	1:42 PM
12-May-10	10	3-4	Overcast	None		7:15 AM	11:44 AM
13-May-10	11	2-4	Light	None		9:27 AM	1:52 PM
13-May-10							
14-May-10						8:39 AM	12:28 PM
14-May-10	15	4-6	None	None		2:50 PM	5:45 PM
17-May-10	12	2-3	Light	None		8:01 AM	11:06 AM
17-May-10	17	1-3	None	None		10:23 AM	2:03 PM
18-May-10	15	2-4	Partly	None		8:15 AM	11:19 AM
18-May-10	17	1-3	Partly	None		10:18 AM	12:56 PM
19-May-10	21	1-3	Partly			3:25 PM	5:15 PM
19-May-10						8:08 AM	12:16 PM
19-May-10	19	2-3	Partly	None		8:10 AM	9:34 AM
20-May-10			None	None		7:49 AM	12:56 PM
20-May-10	19	2-3	Partly	None		1:15 PM	3:51 PM
21-May-10			None	None		7:13 AM	12:24 PM
21-May-10	27	2-3	Light	None		3:50 PM	6:40 PM
24-May-10	23	2-4	None	None		10:12 AM	11:50 AM
24-May-10	19	4	None	None		7:00 AM	8:47 AM
24-May-10			None	None		6:34 AM	11:47 AM
25-May-10			None	None		7:13 AM	10:51 AM
25-May-10	15	2-3	None	None		6:15 AM	9:42 AM
26-May-10	30	2-4	Partly	None		11:00 AM	2:18 PM
26-May-10	24	2-3	None	None		10:55 AM	1:56 PM
27-May-10			None	None		7:20 AM	12:31 PM
27-May-10	24	2-3	Overcast	None		5:40 AM	8:27 AM
28-May-10	21	2-4	Overcast	None		11:20 AM	2:25 PM
28-May-10	16	2-3	Partly	None		6:00 AM	9:53 AM
31-May-10	22	2-3	Light	None		9:55 AM	12:40 PM
31-May-10			None	None		7:20 AM	12:17 PM
1-Jun-10			None	None		10:04 AM	1:45 PM
1-Jun-10	22	3-4	Partly	None		10:15 AM	11:29 AM
1-Jun-10	22	1-3	Overcast	None		10:15 AM	11:43 AM
2-Jun-10	21	3-5	None	None		10:30 AM	1:14 PM
2-Jun-10			None	None		6:35 AM	12:54 PM
3-Jun-10	20	2-3	Overcast	None		9:40 AM	12:32 PM
3-Jun-10	21	1-3	Overcast	None		11:26 AM	3:09 PM
4-Jun-10	16	1-2	Light	None		6:15 AM	10:00 AM
4-Jun-10	22	1-3	Partly	None		10:14 AM	1:00 PM
7-Jun-10	15	2-3	None	None		7:45 AM	10:50 AM
7-Jun-10			None	None		8:09 AM	12:03 PM
8-Jun-10			None	None		7:25 AM	11:10 AM
8-Jun-10	15						
8-Jun-10	21	2-4	Partly	None		4:05 PM	6:03 PM
9-Jun-10	17	2-4	Overcast	Light Rain		10:30 AM	2:05 PM
9-Jun-10	14	4-6	Overcast	Rain		10:30 AM	1:40 PM
10-Jun-10	17	3-4	Overcast	Light Rain		10:27 AM	1:41 PM
10-Jun-10	15	2-3	Overcast	Rain		10:19 AM	1:11 PM

Survey Date	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
11-Jun-10	16	2-3	Partly	None		7:19 AM	10:31 AM
11-Jun-10			None	None		8:12 AM	12:43 PM
14-Jun-10			None	None		7:47 AM	11:14 AM
14-Jun-10			Overcast	Rain		2:45 PM	5:58 PM
15-Jun-10			None	None		8:10 AM	12:33 PM
15-Jun-10	19	1-3	None	None		10:13 AM	11:43 AM
15-Jun-10	19	2-3	None	None		10:12 AM	11:45 AM
16-Jun-10	17	2-3	Overcast	Light Rain		7:10 AM	10:22 AM
16-Jun-10	15	1-3	Overcast	None		7:11 AM	10:43 AM
17-Jun-10	15	2-4	Overcast	None		7:50 AM	11:02 AM
17-Jun-10	14	3-4	Overcast	Light Rain		8:00 AM	11:24 AM
18-Jun-10			None	None		7:24 AM	12:38 PM
18-Jun-10	22	3-4	None	None		9:17 AM	12:40 PM
21-Jun-10	24	3-4	None	None		2:45 PM	6:01 PM
21-Jun-10			None	None		7:34 AM	12:09 PM
22-Jun-10	20					8:05 AM	9:37 AM
22-Jun-10	23	2-4	Partly	None		10:26 AM	11:53 AM
22-Jun-10			None	None		6:55 AM	10:55 AM
23-Jun-10	20		Overcast	None		7:05 AM	9:54 PM
23-Jun-10			None	None		7:58 AM	12:55 PM
24-Jun-10	25	3-4	Partly	None		3:35 PM	6:40 PM
24-Jun-10	25	3-5	Partly	None		3:35 PM	6:33 PM
25-Jun-10	21	1-3	Partly	None		8:05 AM	11:12 AM
25-Jun-10	21	1-3	Partly	None		7:57 AM	10:55 AM
28-Jun-10	22	3-4	Partly	None		8:18 AM	10:08 AM
28-Jun-10	22	3-4	Overcast	None		8:35 AM	10:27 AM
28-Jun-10			None	None		8:08 AM	12:09 PM
29-Jun-10			None	None		7:33 AM	11:30 AM
29-Jun-10	20		Overcast	Rain		11:25 AM	2:23 PM
30-Jun-10	18	4	Partly	None		9:44 AM	12:53 PM
30-Jun-10	14	4	None	None		6:40 AM	9:50 AM
1-Jul-10	19	4	Partly	None		10:35 AM	12:35 PM
1-Jul-10			None	None		8:15 AM	10:21 AM
2-Jul-10	18	2-3	None	None		8:00 AM	10:58 AM
2-Jul-10	20	2-4	None	None		7:55 AM	10:53 AM
5-Jul-10			None	None		6:26 AM	9:57 AM
5-Jul-10	24	3-4	None	None		10:10 AM	12:13 PM
6-Jul-10			None	None		7:25 AM	9:30 AM
6-Jul-10			None	None		7:36 PM	8:36 PM
6-Jul-10	28	3-4	Hazy	None		11:08 AM	12:18 PM
6-Jul-10	27	3-4	Hazy	None		11:10 AM	12:05 PM
7-Jul-10	24	3-4	None	None		7:30 AM	1:03 PM
7-Jul-10			None	None		6:37 AM	9:30 AM
8-Jul-10	24	2-3	None	None		5:52 AM	7:52 AM
8-Jul-10	29	2-3	Hazy	None		11:00 AM	2:21 PM
9-Jul-10	28	4	Hazy	None		9:24 AM	11:12 AM
9-Jul-10	28	4	Hazy	100%	100%	9:16 AM	11:40 AM
12-Jul-10			None	None		6:36 AM	11:04 AM
12-Jul-10	32	4	Hazy	None		3:10 PM	5:16 PM
13-Jul-10	26	4	Overcast	Yes		10:18 AM	11:22 AM
13-Jul-10	26	3-4	Overcast	None		10:20 AM	11:21 AM
13-Jul-10			None	None		11:23 AM	2:02 PM
14-Jul-10	23	4	Overcast	Light Rain		7:00 AM	9:21 AM

Survey Date	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
14-Jul-10	29	2-4	Partly	None		4:55 PM	7:28 PM
15-Jul-10	21	2-3	None	None		6:50 AM	8:53 AM
16-Jul-10	28	4	None	None		2:35 PM	4:52 PM
16-Jul-10			None	None		6:14 AM	1:21 PM
19-Jul-10	23	4	Overcast	None		9:42 AM	12:13 PM
19-Jul-10			None	None		7:37 AM	12:53 PM
20-Jul-10			None	None		7:00 AM	9:45 AM
20-Jul-10	24	2-3	Overcast	Rain Periods		10:36 AM	12:26 PM
21-Jul-10	26	3-4	Partly	None		8:50 AM	11:22 AM
21-Jul-10			None	None		6:47 AM	10:04 AM
22-Jul-10	21	2-3	None	None		8:00 AM	10:18 AM
22-Jul-10			None	None		6:24 AM	10:59 AM
23-Jul-10			None	None		6:29 AM	9:34 AM
23-Jul-10	20	4	Overcast	None		8:05 AM	10:14 AM
26-Jul-10	21	2-4	None	None		7:05 AM	9:33 AM
26-Jul-10	19	2-3	None	None		7:08 AM	9:26 AM
27-Jul-10	22	3-4	None	None		8:00 AM	10:07 AM
27-Jul-10	22	2-3	None	None		8:00 AM	9:44 AM
28-Jul-10	21	2-4	Light	None		5:40 AM	7:41 AM
28-Jul-10			None	None		6:34 AM	10:47 AM
29-Jul-10	20	3-4	None	None		7:10 AM	11:04 AM
29-Jul-10	21	2-4	None	None		9:21 AM	1:05 PM
30-Jul-10	18	2-3	None	None		6:10 AM	9:41 AM
30-Jul-10	20	3-4	Partly	None		9:20 AM	12:54 PM

Appendix E

NRCan Report on Ensuring Implementation of the Wolfe Island PCFP

Report on Ensuring Implementation of the Wolfe Island ecoPower Centre's Post Construction Follow up Plan for Bird and Bat Resources (PCFP)

September 23, 2010

1. Background

Transalta operates a 197.8 megawatt (MW) wind plant on Wolfe Island, Township of Frontenac Islands, Frontenac County, Province of Ontario. The project consists of Eighty-six 2.3 MW wind turbine generators and ancillary facilities are over the western portion of Wolfe Island with additional supporting electrical infrastructure on the Kingston mainland.

The project was subject to both a federal and a provincial environmental assessment (EA). The development and implementation of the PCFP was a requirement of both processes. The PCFP was developed among CREC, NRCan, EC, MNR and Ducks Unlimited Canada. CREC, NRCan, EC and the MNR are the parties to the PCFP.

The implementation of the PCFP will verify the predictions of the EA reports prepared in accordance with the Ontario *Environmental Assessment Act* ("EAA") and the *Canadian Environmental Assessment Act* (the "CEA Act"). Should any unanticipated potentially significant adverse environmental effects be identified, the provisions of the PCFP will mitigate those effects so they do not become significant.

As a Responsible Authority for this Project under the CEA Act, NRCan is responsible for ensuring the implementation of the PCFP as per subsection 38(1) of the CEA Act. In its role of ensuring the implementation of the PCFP NRCan is drawing on the expertise of EC and the MNR in accordance with their jurisdiction and areas of expertise.

NRCan developed an MOU with EC and the MNR to formalise and support the work to be carried out by EC and the MNR for ensuring implementation of the PCFP.

The following is a summary of the findings of the site visits conducted by EC and the MNR to ensure the implementation of the PCFP.

2. Summary of Site Visits Conducted

Three site visits were conducted to observe the survey work being carried out by the proponent through their consultant, Stantec.

Site Visit #	Work Observed	Timing of Surveys	Observer	Date of Site Visit
1	Bird and Bat Mortality Monitoring	year round	EC/MNR	January 6, 2010
1	Winter Raptor Use Surveys	2nd week Nov – March (every 2 weeks)	EC/MNR	January 6, 2010
2	Inland Waterfowl Foraging Surveys	April – mid May Sept – mid Dec	EC	May 4, 2010
2	Waterfowl Pairs Surveys	May	EC	May 4, 2010
3	Grassland Point Counts and Area Searches	June	EC	June 15 & 16, 2010
3	Wetland Point Counts and Area Searches	June	EC	June 15 & 16, 2010
3	Woodland Point Counts and Area Searches	June	EC	June 15 & 16, 2010

2.1 Site Visit #1 Summary

The first site visit conducted was to observe the bird and bat mortality monitoring, winter raptor use surveys and short-eared owl surveys. Please refer to sections 2.2.1, 2.2.2 and 2.2.3 of the PCFP for a detailed description of these surveys.

This site visit was conducted on January 6, 2010 and representatives from EC and MNR with appropriate expertise observed the monitoring work being carried out by the proponent's consultant, Stantec. Following the site visit, EC and MNR reported back to NRCan on their conclusion and the letters provided can be found in the Appendix to this report. Both EC and the MNR concluded that the work was being carried out as outlined in the PCFP.

During this site visit, representatives from the Wolfe Island Residents for the Environment (WIRE) were also invited by Transalta to observe the monitoring taking place. This invitation was extended in response to comments received on the draft PCFP which indicated an interest in increased stakeholder involvement in the PCFP. WIRE representatives observed the mortality monitoring, but opted not to observe the raptor use surveys and short eared owl surveys. Discussions were held with WIRE representatives on the general approach to the monitoring taking place and roles of NRCan, EC and the MNR in it's implementation.

2.2 Site Visit #2 Summary

The second site visit conducted was to observe Waterfowl Pairs Surveys and Inland Waterfowl Foraging Survey. Please refer to sections 2.2.6 and 2.2.7 of the PCFP for a detailed description of these surveys.

The site visit was conducted on May 4, 2010 by EC. EC's report to NRCan on their conclusions can be found in the Appendix to this report. EC indicated that they were satisfied that the monitoring was being conducted in accordance with the PCFP and made two recommendations:

- Field foraging surveys should be completed as early as possible in the day or in late afternoon. Surveys should not be conducted at mid-day.
- Waterfowl breeding pair surveys should be conducted in late April and should be completed by May 1 for optimal timing if only one survey is done. Ideally, if time and resources are available, two surveys could be done, one at mid-too-late-April and another at around the end of the month.

2.3 Site Visit #3 Summary

The third site visit conducted was to observe Grassland Point Counts and Area Searches and Wetland Point Counts and Area Searches. Please refer to sections 2.2.5 and 2.2.6 for a detailed description of these surveys.

The site visit was conducted on June 15 and 16, 2010 by EC. EC's report to NRCan on their conclusions can be found in the Appendix to this report. EC indicated that they were satisfied that the surveys were being conducted by skilled birders in accordance with EC recommendations and made one observation:

- EC was impressed by how dense the vegetation was, which grew practically up to the turbine base. The thickness and height of the grasses, at the site observed, creates obvious challenges for mortality searches. Even large-bodied birds like Red-tailed Hawk could be difficult to spot in these conditions. EC suggested that searcher efficiency trials be conducted for raptors where vegetation is sufficiently high and thick to obscure carcasses (the MNR should provide guidance in this regard).

NRCan forwarded this recommendation to the MNR for consideration on September 8, 2010.

3 Conclusions

EC and MNR have both indicated that the PCFP is being implemented as expected and provided some recommendations for future surveys which will be considered. This has been a useful exercise to confirm proper implementation of the PCFP and allow for improvements on the protocols established.

APPENDIX – LETTERS FROM EC AND MNR

Environment Canada | Environnement Canada

Environmental Protection Operations Division -Ontario
Environmental Assessment Section
Environment Canada
P.O. Box 5050, 867 Lakeshore Rd.
Burlington, Ontario L7R 4A6

File No.: 2002-060

March 11, 2010

Julie Harris
Senior Environmental Assessment Officer
Natural Resources Canada
615 Booth Street, Room 160
Ottawa, Ontario K1A 0E9

Dear Ms. Harris,

Re: January 6, 2010 Site Visit to Audit Post-Construction Monitoring at the Wolfe Island EcoPower Centre

Environment Canada participated in a site visit to the Wolfe Island EcoPower Centre on January 6, 2010 to observe and audit portions of the post-construction bird and bat monitoring that is being conducted at the site. In particular, we observed the mortality monitoring and winter raptor use surveys which also included specific surveys for Short-eared Owl.

In the morning, a group comprised of staff from Environment Canada and the Ontario Ministry of Natural Resources as well as representatives from Lake Ontario Waterkeeper and the Wolfe Island Residents for the Environment observed a carcass search being conducted at a turbine in the south-western portion of the project area. Representatives from TransAlta and Stantec Consulting were also present. The person conducting the carcass search walked around the base of the turbine in concentric circles that were spaced approximately 8 metres apart up to a distance of 50 metres from the turbine base. The searcher carried a device that look like a ski pole in order to search through the snow periodically in areas of interest. No avian or bat mortality was discovered during the search.

In the afternoon of the same day we participated in winter raptor use and targeted Short-eared Owl surveys which took place around dusk. Representatives from the Lake Ontario Waterkeeper and the Wolfe Island Residents for the Environment did not participate in the surveys that were conducted in the afternoon. The winter raptor use surveys involved two crews that travelled in two separate vehicles while surveying different halves of the project study area. The survey crew recorded the location and raptor species observed as well as the distance travelled. This information was to be process afterward to estimate the density of winter raptor use in the study area to allow comparison between pre and post-construction conditions.

Later in the afternoon, as dusk approached, the winter raptor use surveys were concluded and the two survey crews travelled to areas where Short-eared Owls were identified to congregate during the pre-construction surveys. As each crew approached these areas the vehicles speeds were reduced and stopped so that observers could record the number of Short-eared Owl observed. Like the data collected from the winter raptor use surveys, this information was to be processed afterwards in order to compare results between pre and post-construction conditions.

Based upon our observations and discussions with the proponent and the consultants that are conducting the monitoring, Environment Canada is satisfied that the mortality monitoring and winter raptor use portions of the monitoring are being conducted in accordance with the Post-Construction Follow-up Plan (PCFP) that has been developed for the project. We recommend that these aspects of the post-construction monitoring continue as outlined in the PCFP.

Thank you for providing us with the opportunity to observe and audit the mortality monitoring and winter raptor use surveys. Please let me know if you have any questions.

Sincerely,

Rob Read
Environmental Assessment Officer

cc: R. Dobos, Environment Canada
J. Fischer, Environment Canada
E. Cotnam, Ontario Ministry of Natural Resources
G. Perfect, TransAlta

Ministry of
Natural Resources
Peterborough District Office
300 Water Street
1st Floor, South Tower
Peterborough, Ontario K9J 8M5

Ministère des
Richesses naturelles

Telephone: (705) 755-2001
Facsimile: (705) 755-3125

Ontario

March 26, 2010

Julie Harris
Seniour Environmental Assessment Officer
Natural Resources Canada
Room 160-29, 615 Booth St.
Ottawa, ON K1A 0E9

Dear Ms. Harris:

On January 6, 2010 MNR participated in a site visit with representatives from Environment Canada, Natural Resources Canada, Stantec and TransAlta to observe post-construction monitoring. Specifically, we observed staff from Stantec complete mortality monitoring, raptor winter-use and Short-eared Owl surveys.

In the morning we observed a Stantec employee conduct mortality monitoring which consisted of the individual walking slow, concentric circles around the base of the turbine using the assistance of a ski pole to clear snow and allow for closer investigation. No bird or bat mortalities were found during our observation.

In the afternoon our group divided into two vehicles, each with a driver and each with a Stantec employee, experienced in raptor identification. One vehicle slowly traveled all the north-south roads and most of the east-west roads in the east side of the study area while the other vehicle did the same in the west side. The Stantec employee observed and recorded the number, species and location of raptors observed.

Immediately after the raptor use survey (late afternoon), the same survey protocol was completed to monitor Short-eared owls. Similar to above, the Stantec employee observed and recorded the number, species and location of Short-eared owls observed. The survey was completed at dusk.

For both the raptor use and owl surveys binoculars and a spotting-scope were used for closer inspection of birds. The distance traveled during the survey(s) was recorded.

MNR is confident that monitoring is being conducted as per the Post-Construction Follow-Up Plan and recommends that monitoring continue as per the Plan.

Sincerely,

Original signed by

Erin Cotnam
Peterborough District
Ministry of Natural Resources

cc Rob Read, Environment Canada

Environment Canada Environnement Canada

Canadian Wildlife Service
Environmental Stewardship Branch
Environment Canada
335 River Road
Ottawa, Ontario K1A 0H3

September 21, 2010

Julie Harris
Senior Environmental Assessment Officer
Natural Resources Canada
615 Booth Street, Room 160
Ottawa, Ontario K1A 0E9

Re: May 4, 2010 Site Visit to Audit Post-Construction Monitoring at the Wolfe Island EcoPower Wind Plant

Dear Ms Harris,

Environment Canada (EC) participated in a site visit to the Wolfe Island EcoPower Wind Plant on May 4, 2010 to observe and audit portions of the post-construction bird monitoring that is being conducted at the site. In particular, we observed the waterfowl monitoring surveys.

The site visit was conducted by two representatives of Stantec Consulting, Andrew Taylor and Nicole Kopysh who were charged with conducting the surveys and myself, Jack Hughes, of EC. We began the audit at around 10:30 am on May 4 with a survey of field-foraging waterfowl. We drove slowly along most of the roads on the western half of Wolfe Island where the turbines have been erected. The survey appeared to be as complete as possible without requiring leaving the roads. We observed a few flocks of Canada geese, a flock of Ring-billed gulls and only very small numbers of other waterfowl foraging in the fields, sometimes in close proximity to turbine towers. The small number of waterfowl was not surprising since the audit was conducted after the peak of spring migration. The view of some fields was obscured by roadside trees and shrubs, but this would have been less of a problem during the peak migration period, when most of the trees would not yet have been fully leafed-out. At around 11:40 am, we observed a small number of geese flying from fields to roosting areas on Lake Ontario. Geese and other waterfowl typically forage in the morning and late-afternoon/early evening spending the middle part of the day roosting on water. **Recommendation: Field foraging surveys should be completed as early as possible in the day or in late afternoon. Surveys should not be conducted at mid-day.** At 12:00, we stopped the field foraging survey, even though it was incomplete. We resumed the survey later in the day at around 5:30 pm. Should these surveys reveal a pattern of avoidance of turbines by field-foraging waterfowl, more in depth studies should be considered to better understand the interactions between waterfowl and turbines, location and food sources.

After lunch, we searched several wetlands for breeding pairs of waterfowl by paddling through them in a canoe or scanning them with binoculars from roadside vantage points. We observed either breeding pairs or lone males (a lone male is an indicator of a breeding pair) of Mallard,

Wood duck, Green-winged teal and Canada goose with the greatest numbers in the marshes at the west end of Bayfield Bay. Observing both pairs and lone males is a good indication that the timing of the survey was adequate, although based on information from EC surveys elsewhere in southern Ontario, it could have been done earlier. **Recommendation: Waterfowl breeding pair surveys should be conducted in late April and should be completed by May 1 for optimal timing if only one survey is done. Ideally, if time and resources are available, two surveys could be done, one at mid-to-late-April and another at around the end of the month.**

Beginning at around 7:50 pm and continuing until dusk, we conducted surveys of movements of field-foraging waterfowl – flights to return to roosting areas. These surveys were conduced from two fixed points allowing a view across a fairly broad stretch of the western half of Wolfe Island. Few birds were observed for two reasons: 1) the survey was conducted after the peak of migration so few waterfowl were foraging in the fields of Wolfe Island and 2) some Canada geese remained in the fields until it was too dark to see them leave. This survey could not possibly document the complete patterns of movement of waterfowl between foraging and roosting sites. To do this, more observers at more locations equipped with night vision binoculars and/or telescopes would be required. Nevertheless, the few flocks of Canada geese that were observed from the point where I was stationed did reveal that the birds appear to have adopted flight paths that allow them to easily avoid the turbines. We are not recommending any enhancement of these surveys at this time.

Aerial surveys of the shorelines of Wolfe Island and the surrounding area during the spring and fall migration periods are also part of the post-construction monitoring program. These surveys were based on EC protocols and Stantec Consulting staff were trained by EC in the field. EC is wholly satisfied with the usefulness and quality of these surveys to date and we are not recommending any enhancement of these surveys at this time.

Based upon my observations and discussions with the consultants conducting the monitoring, Environment Canada is satisfied that the waterfowl monitoring is being conducted in accordance with the recommendations of the Post-Construction Follow-up Plan developed for the project. I recommend that these elements of the post-construction monitoring continue as outlined in the plan, taking into account the recommendations above.

Please let me know if you have any questions.

Sincerely,

Jack Hughes
Head, Population Management

cc. J. Fischer, Environment Canada
R. Read, Environment Canada

CWS Audit Wolfe Island Ecopower Centre: June 15/16, 2010-09-08

I accompanied Stantec survey crews on two formal avian surveys at the Wolfe Island study area during the breeding bird season. The first survey occurred on June 15 from 05:00 to 09:00. At this time, I accompanied Andrew Taylor on a combination of transect surveys and 10-minute point counts in a large field lying south of Baseline Road between the 2nd and 3rd Lines. Incidental observations of species were also recorded (e.g. Northern Harrier). This was an area subject to intensive pre-construction surveys and which was being surveyed post-construction to assess possible disturbance impacts to Bobolinks, Savannah Sparrows, Upland Sandpipers, and other grassland species. This is a difficult area to survey given the soaking-wet, waist-high vegetation that covers the area. Andrew employed a GPS device to ensure that the same transects were visited, used a stop-watch to ensure the proper listening period during the point counts, and recorded the data on standardized data forms. Andrew is a skilled birder and the surveys were competently conducted in accordance with the recommendations provided by CWS. Large numbers of Bobolink and Savannah Sparrow were present in the area, and the aerial movements of Bobolinks in particular made it a challenge to avoid double-counting some of the displaying birds. However, Andrew was patient and in his observations and conservative in his estimations (i.e. if there was any doubt about double counting, he dropped the bird in question from his total).

- I was impressed by how dense the vegetation was, which grew practically up to the turbine base. The thickness and height of the grasses, at least at this site, creates obvious challenges for mortality searches. Even large-bodied birds like Red-tailed Hawk could be difficult to spot in these conditions. I would suggest that searcher efficiency trials be conducted for raptors where vegetation is sufficiently high and thick to obscure carcasses (the OMNR should provide guidance in this regard).

The second survey, on June 16 from 05:00 to 09:00, was conducted in two wetlands, one in Bayfield Bay on the eastern edge of the study area and the other on both sides of the 2nd Line on the western edge. Two Stantec surveyors – Andrew Taylor and Val Wyatt – were involved. A series of 10-minute point counts, followed by taped playback of selected species, were conducted at sites where preconstruction surveys had been completed. Incidental observations (i.e.Bald Eagle, American Bittern) were made during the paddle between stations. Andrew identified the species during the surveyors and Val functions as data recorder and operated the audio equipment. The surveys were well designed, well conducted, and consistent with the recommendations provided by CWS.

Based on my observations of the grassland and wetland surveys, the post-construction surveys are being conducted by skilled birders in accordance with CWS recommendations. A third individual, also a highly skilled birder, was employed full-time by Stantec on Wolfe Island throughout the breeding season. His daily morning routine was to revisit roadside point count stations and wetlands from 05:00 to 09:00. CWS is satisfied that the post-construction surveys carried out by the Stantec staff are sound, rigorous, and consistent with the recommendations provided in the post-construction monitoring plan.

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Appendix F

Mortality Monitoring Results

Mortality Data - Detailed Results Birds

Date	# checks/ week	Turbine #	GPS Location Zone Easting Northing	Observer	Species	Guild	Condition/Estimated Time Since Death	Injuries Sustained	Distance (m)	Direction (°)	Direction (compass)	Ground Cover
01-Feb-10		46	0389918 4890696	CF	Bird Sp.	bird	old - at least 3 days		13	62	E	Soil
08-Feb-10		81	0389704 4894002	WS	Red-tailed Hawk	bird	frozen - less than 5 days	bent wing	23	253	W	Soil
09-Feb-10		30	0384145 4890364	WS	Bird Sp.	bird	complete - >30 days		44	40	N	Soil
16-Feb-10		69	0384733 4886852	WS	Bird Sp.	bird	Bodyless, Wing - >30 days		12	18	N	Soil
22-Feb-10		72	0385840 4892986	CF	European Starling	bird	Fresh, partially scavenged - 1-2 days	Wing	16	166	S	Gravel
04-Mar-10		55	0387550 4889924	JL	Bird Sp.	bird	Fresh, 1-2 days		40	270	W	Soil / Veg
10-Mar-10		65	0384733 4886852	WS	Bird Sp.	bird	Skeleton w/ Feathers, >30 days		43	110	E	Swamp
11-Mar-10		61	0390023 4894173	CF	European Starling	bird	Fresh, 1-2 days	Neck	15	194	S	Soil
23-Mar-10		43	0390564 4891503	JL	Killdeer	bird	Fresh, 1-2 days	Wing / Neck	34	350	N	Gravel
29-Mar-10		1	0381112 4890726	CF	Starling	bird	Fresh, 1-3 days	Neck	12	270	W	Soil
31-Mar-10		29	0384748 4886878	JL	Blue Jay	bird	Old, 3-4 days		14	210	SW	Soil / Veg
31-Mar-10		41	0387552 4886656	CF	Starling	bird	Fresh, 1-2 days	Neck	44	44	NE	Soil / Soybean Veg
05-Apr-10		72	0387700 4892945	WS	Horned Lark	bird	Fresh, < 3 days	Trauma, left side	31	215	S	Soil
06-Apr-10		30	0385820 4892985	WS	Killdeer	bird	Fresh, 3-5 days	Chest trauma	15	319	N	Grass
08-Apr-10		18	0381634 4888714	JL	Grackle	bird	Fresh, 1-2 days	Neck (?)	19	110	E	Mud/Veg
09-Apr-10		81	0384123 4890372	JL	Red-tailed Hawk	bird	Fresh, < 2 days	Neck / Leg	31	105	E	Veg / Soil
12-Apr-10		38	0387277 4888061	JL	Horned Lark	bird	Fresh, 1-2 days	Head	9	90	E	Gravel
13-Apr-10		9	0380923 4890046	JL	Wilson's Snipe	bird	Fresh, 1-2 days	Beak / Body	19	270	W	Gravel
14-Apr-10		29	0384729 4886854	WS	Red-tailed Hawk	bird	Fresh, < 3 days	Decapitated	26	110	E	Soil
14-Apr-10		30	0384732 4886839	WS	Wilson's Snipe	bird	Old, > 5 days		6	160	SE	Grass
15-Apr-10		27	0382244 4891308	JL	Red-tailed Hawk	bird	Fresh, <1 day	Neck (?)	8	330	N	Soil / Rock
16-Apr-10		64	0388550 4893697	JL	Red-tailed Hawk	bird	Fresh, 1-2 days	Wing / Neck	40	330	N	Hay / Mud
21-Apr-10		49	0387565 4886688	CF	Wilson's Snipe	bird	Fresh, 1-2 days	Neck	1	158	S	Gravel
22-Apr-10		9	0380924 4890065	WS	Wilson's Snipe	bird	Decaying, >3 days		28	260	W	Grass
23-Apr-10		56	0385846 4890236	JL	Mallard ♀	bird	Fresh, < 1 day	Neck / Head	10	235	SW	Soil
23-Apr-10		79	0384852 4889368	JL	Wilson's Snipe	bird	Fresh, 2-3 days	Neck	10	50	NE	Soil / Veg
26-Apr-10		2	0382125 4891651	WS	Double-crested Cormorant	bird	Fresh, 3-5 days	Headless	31	320	N	Swamp
26-Apr-10		1	0380953 4891108	WS	Mallard ♀	bird	Fresh, < 3 days	Footless	35	320	N	Grass
26-Apr-10		65	0381077 4890730	WS	Ring-billed Gull	bird	Unknown	Bodyless, wings only	31	60	N	Grass
26-Apr-10		28	0382110 4891660	WS	Wilson's Snipe	bird	Fresh, < 3 days	Broken neck	0	40	N	Tower base
28-Apr-10		63	0388780 4893376	JL	Tree Swallow	bird	Old, 2-3 days		40	350	N	Soil / Veg
29-Apr-10		73	0387728 4892954	WS	Bird Sp.	bird	Fresh, < 3 days	Broken neck	22	100	E	Soil
29-Apr-10		24	0382773 4890019	JL	Ring-billed Gull	bird	Fresh, 1 day	Split in half	49	300	NW	Veg / Soil
03-May-10	2	43	0390538 4891543	JL	Osprey	bird	Really Fresh, < 12 hours	Head	15	135	SE	Soil
04-May-10	2	71	0384293 4893473	WS	Ring-billed Gull	bird	Unknown		40	110		Mud
05-May-10	1	31	0384867 4886113	CF	Mallard ♂	bird	Fresh, 1-3 days	Neck	27	62	E	Soil
05-May-10	1	72	0385878 4892975	CF	Upland Sandpiper	bird	Fresh, 1-2 days	Wing	44	262	W	Vegetation
06-May-10	2	34	0384070 4887239	WS	Black & White Warbler	bird	Fresh, < 3 days	Nothing visible	38	220		Rock
06-May-10	2	34	0384008 4893473	WS	Savannah Sparrow	bird	Fresh, 3-5 days		27	86		Soil
07-May-10	2	71	0386358 4894067	JL	Nashville warbler	bird	Fresh, 1-2 days	Neck?	31	315	NW	Soil
11-May-10	1	4	0380294 4890715	CF	Chimney Swift	bird	Fresh, 1-2 days	Neck?	40	238	W	Vegetation
12-May-10	1	72	0385868 4892992	CF	Yellow Warbler	bird	Fresh, 1-2 days	Neck	36	244	W	Soil / Veg
13-May-10	2	46	0383933 4893057	WS	Northern Harrier	bird	Fresh, 3-5 days	Broken neck	40	150	S	Gravel
17-May-10	2	85	0381871 4892264	CF	Baltimore oriole	bird	Fresh, 1-2 days	Neck?	21	104	E	Soil

Mortaility Data - Detailed Results Birds

Date	# checks/ week	Turbine #	GPS Location Zone Easting Northing	Observer	Species	Guild	Condition/Estimated Time Since Death	Injuries Sustained	Distance (m)	Direction (°)	Direction (compass)	Ground Cover
17-May-10	2	33	0384514 4887219	JL	Magnolia warbler	bird	Fresh, 1-2 days	Wing/Neck	40	315	NW	Soil
17-May-10	2	78	0385183 4890985	CF	Red-tailed Hawk	bird	Fresh, 1-2 days	Neck	31	78	E	Vegetation
18-May-10	2	25	0382723 4890484	CF	Philadelphia Vireo	bird	Fresh, 1-2 days	Abdomen	9	40	NE	Vegetation
20-May-10	2	23	0382112 4890206	JL	Horned Lark	bird	Old, > 7 days		41	180	S	Soil / Veg
21-May-10	2	64	0388499 4893739	JL	Red-winged Blackbird	bird	Fresh, 1-2 days	Neck?	29	130	SE	Gravel
24-May-10	2	65	0382179 4892621	WS	Upland Sandpiper	bird	Fresh, < 5 days	Entirely	39	180		Soil
27-May-10	2	46	0389906 4890719	WS	Mourning Dove	bird	3-5 days	Mangled	37	172		Weeds
31-May-10	2	35	0384235 4887843	JL	Ring-billed Gull	bird	Fresh, 2-3 days	Neck	20	95	E	Soil / Veg
31-May-10	2	24	0389903 4890711	WS	Ring-billed Gull	bird	Old, > 5 days	Entirely	34	220		Grass
08-Jun-10	2	68	0386462 4891880	WS	Bobolink	bird	Old, 2-5 days	Entirely	38	234		Cornfield
10-Jun-10	1	75	0384512 4892590	CF	Red-tailed Hawk	bird	Fresh, 1-2 days	Neck	18	22	N	Soil / Veg
10-Jun-10	2	24	0382751 4890005	JL	Ring-billed Gull	bird	Fresh, 1-2 days	Wing / Neck	35	345	N	Soil / Veg
11-Jun-10	2	38	0387304 4887585	WS	Ring-billed Gull	bird	Unknown, feathers only, body has been scavenged		17	234		Soil
16-Jun-10	1	56	0385779 4890243	CF	Ring-necked Pheasant	bird	Fresh, 1-2 days	Neck?	1	194	S	Soil / Veg
18-Jun-10	2	20	0381832 4889279	WS	Killdeer	bird	Feathers only	? Scavenged	40	249		Grass
21-Jun-10	2	42	0386325 4889071	JL	Tree swallow	bird	Fresh, 1-2 days	Wing / Neck	23	320	NW	Veg / Soil
22-Jun-10	1	9	0380911 4890059	JL	Common Grackle	bird	Old, 3-4 days		16	255	W	Gravel
22-Jun-10	2	67	0386811 4891257	WS	Mourning Dove	bird	Fresh, < 3 days		1	200		Soil
23-Jun-10	1	31	0384874 4886158	WS	Wood Thrush	bird	Old, > 3 days	Entirely	29	185		Gravel
24-Jun-10	2	46	0389914 4890729	CF	Tree swallow	bird	Fresh, 1-2 days	Wing?	30	172	S	Gravel
25-Jun-10	2	42	0386302 4889048	CF	Wilson's Snipe	bird	Completely (maggots) 3-4 d	Neck	32	78	E	Gravel

Mortality Data - Detailed Results Bats

Date	#checks/ week	Turbine #	GPS Location Zone Easting Northing	Species	Guild	Condition/Estimated Time Since Death	Injuries Sustained	Distance (m)	Direction (°)	Direction (compass)	Ground Cover
03-May-10	2	34	0384046 4887210	Silver-haired Bat	bat	Fresh, 1-3 days	Neck	2	297	W	Soil
03-May-10	2	37	0388784 4887840	Silver-haired Bat	bat	Fresh, 1-2 days	Wing	37	162	S	Soil
04-May-10	2	18	0381637 4888739	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	34	165	S	Gravel
04-May-10	2	20	0381828 4889268	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	25	250	W	Gravel
04-May-10	1	10	0381229 4890224	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	18	135	SE	Soil / Veg
04-May-10	1	4	0380286 4890698	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	24	270	W	Soil
04-May-10	1	6	0380777 4889443	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	32	180	S	Soil
04-May-10	1	6	0380791 4889428	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	14	225	SW	Soil / Veg
05-May-10	1	79	0384834 4889365	Silver-haired Bat	bat	Old, 2-3 days	No visible trauma	28	75	E	Gravel
05-May-10	1	40	0388026 4886999	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	20	280	W	Soil
05-May-10	1	40	0388023 4887032	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	42	210	SW	Gravel
05-May-10	1	48	0389232 4889722	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	45	250	SW	Gravel
05-May-10	1	58	0389380 4892202	Silver-haired Bat	bat	Fresh, 1 day	No visible trauma	30	200	S	Soil
05-May-10	1	58	0389378 4892193	Silver-haired Bat	bat	Fresh, 1 day	No visible trauma	18	180	S	Soil
05-May-10	1	22	0382229 4887716	Silver-haired Bat	bat	Fresh, 1-2 days	Wing	41	152	S	Soil
06-May-10	2	34	0384293 4893473	Silver-haired Bat	bat	Old, > 5 days		21	270		Grass
06-May-10	2	35	0384059 4887212	Silver-haired Bat	bat	Old, > 5 days		19	240		Grass
06-May-10	1	76	0383939 4893072	Silver-haired Bat	bat	Old, > 5 days		31	250		Gravel
07-May-10	2	39	0387308 4887590	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	32	238	W	Soil
07-May-10	2	17	0381105 4888998	Silver-haired Bat	bat	Old, 2-4 days	Wing	41	240	W	Gravel
12-May-10	1	31	0384862 4886145	Silver-haired Bat	bat	Old, 2-4 days	Rear end	17	126	ESE	Soil / Veg
18-May-10	1	12	0381827 4890340	Silver-haired Bat	bat	Fresh, < 1 day	No visible trauma	20	175	S	Gravel
20-May-10	2	28	0382153 4891662	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	43	280	W	Soil
21-May-10	2	82	0389889 4890748	Big Brown Bat	bat	Fresh, 3-5 days	No visible trauma	14	240		Gravel
21-May-10	2	38	0387290 4888058	Silver-haired Bat	bat	Fresh, < 3 days	No visible trauma	3	190		Soil
24-May-10	2	86	0387274 4888061	Silver-haired Bat	bat	Dessicated, > 5 days	Broken neck	44	280		Soil
26-May-10	1	58	0389385 4892169	Big Brown Bat	bat	Fresh, 1-2 days	No visible trauma	1 to 2	300	W	Gravel
27-May-10	1	75	0387762 4892964	Big Brown Bat	bat	Old, > 5 days		18	310		Grass
01-Jun-10	2	51	0387750 4890480	Silver-haired Bat	bat	Old, > 5 days	Entirely	16	262		Gravel
02-Jun-10	1	48	0389219 4889709	Red bat	bat	Fresh, 1-2 days	No visible trauma	44	240	W	Gravel
04-Jun-10	2	17	0381046 4888970	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	21	70	E	Soil / Veg
08-Jun-10	1	9	0380925 4890037	Red bat	bat	Old, 3-4 days		33	290	W	Gravel
11-Jun-10	2	71	0386322 4894087	Silver-haired Bat	bat	Fresh, 1-2 days	No visible trauma	12	170	S	Gravel
28-Jun-10	2	78	0385256 4891011	Big Brown Bat	bat	Completely, > 5 days		44	248		Gravel

Appendix G

Aerial Waterfowl Data

2010 Aerial Waterfowl Summary

Table 1: Waterfowl Guild by Sector, 2010

	C7	C8	C9	C10	C11	Total
Swans	71	469	14	14	14	582
Geese	2,485	35	521	20,570	2,541	26,152
Large dabblers	736	3,401	10,022	1,162	962	16,282
Small dabblers	210	210	765	0	0	1,185
Bay ducks	12,337	15,517	116,540	58,867	2,634	205,895
Sea ducks	0	0	0	0	1,050	1,050
Goldeneye	24,819	9,379	9,868	15,843	23,201	83,109
Mergansers	6,376	9,130	4,746	4,786	4,740	29,777
Unknown	27	953	3,321	108	280	4,688
Total	**47,060**	**39,092**	**145,796**	**101,349**	**35,422**	**368,718**

Table 2: Waterfowl Guild by Major Staging Area, 2010

	Bayfield	Button	Pyke's	Reed's	Total
Swans	0	0	0	0	0
Geese	318	7,720	3,492	2,370	13,900
Large dabblers	9,448	733	278	138	10,596
Small dabblers	765	0	0	0	765
Bay ducks	34,831	53,225	0	103	88,158
Sea ducks	0	0	0	0	0
Goldeneye	4,025	4,118	1,992	3,314	13,448
Mergansers	1,773	1,332	382	780	4,266
Unknown	1,780	0	0	0	1,780
Total	**52,939**	**67,126**	**6,143**	**6,705**	**132,912**

2009 Aerial Waterfowl Summary

Table 3: Waterfowl Guild by Sector, 2009

	C7	C8	C9	C10	C11	Total
Swans	29	29	15	0	142	214
Geese	5,076	3,668	9,782	1,588	3,667	23,779
Large dabblers	851	1,355	3,002	1,171	1,942	8,321
Small dabblers	0	0	45	0	33	78
Bay ducks	7,985	10,974	134,288	22,994	3,465	179,704
Sea ducks	118	200	2,508	281	1,011	4,118
Goldeneye	11,930	3,017	6,079	9,867	23,200	54,093
Mergansers	9,624	11,869	12,805	9,242	12,199	55,737
Unknown	86	0	43,800	1,350	0	45,236
Total	**35,696**	**31,110**	**212,323**	**46,492**	**45,658**	**371,278**

Table 4: Waterfowl Guild by Major Staging Area, 2009

	Bayfield	Button	Pyke's	Reed's	Total
Swans	0	0	0	0	0
Geese	4,430	638	40	2,550	7,657
Large dabblers	2,559	230	800	645	4,234
Small dabblers	45	0	0	0	45
Bay ducks	110,989	7,737	1,600	165	120,490
Sea ducks	0	0	0	63	63
Goldeneye	2,400	1,165	2,014	3,341	8,919
Mergansers	4,487	1,760	906	1,830	8,982
Unknown	33,300	0	0	0	33,300
Total	**158,209**	**11,529**	**5,359**	**8,593**	**183,689**

2008 Aerial Waterfowl Summary

Table 5: Waterfowl Guild by Sector, 2008

	C7	C8	C9	C10	C11	Total
Swans	0	0	0	8	27	35
Geese	0	88	1,256	747	5,161	7,251
Large dabblers	203	231	237	395	149	1,214
Small dabblers	0	0	54	8	0	62
Bay ducks	8,485	18,620	119,933	24,027	15,260	186,325
Sea ducks	0	0	0	0	108	108
Goldeneye	20,840	11,779	19,844	25,781	46,815	125,058
Mergansers	3,836	3,128	4,594	3,461	2,229	17,247
Unknown	0	0	2,750		59	2,809
Total	**33,363**	**33,846**	**148,667**	**54,425**	**69,806**	**340,105**

Table 6: Waterfowl Guild by Bay, 2008

	Bayfield	Button	Pyke's	Reed's	Total
Swans	0	0	0	0	0
Geese	0	222	375	2,912	3,509
Large dabblers	87	225	75	27	414
Small dabblers	54	8	0	0	62
Bay ducks	50,460	11,985	5,625	4,850	72,920
Sea ducks	0	0	0	0	0
Goldeneye	8,956	5,202	6,958	11,712	32,828
Mergansers	737	601	150	347	1,835
Unknown	2,500	0	0	59	2,559
Total	**62,794**	**18,242**	**13,183**	**19,905**	**114,124**

1999 Aerial Waterfowl Summary

Table 7: Waterfowl Guild by Sector, 1999

	C7	C8	C9	C10	C11	Total
Swans	0	0	68	150	0	218
Geese	3,097	607	3,099	2,919	8,146	17,867
Large dabblers	1,458	696	9,254	8,019	3,933	23,360
Small dabblers	0	25	116	69	453	663
Bay ducks	19,912	112,954	245,418	2,545	777	381,605
Sea ducks	0	0	0	75	14	89
Goldeneye	6,523	3,361	4,745	5,701	10,299	30,628
Mergansers	5,326	3,980	3,533	3,577	3,236	19,651
Unknown						
Total	**36,316**	**121,622**	**266,231**	**23,054**	**26,857**	**474,079**

Appendix H

Waterfowl Breeding Pairs Survey Results

Wetland	Date	Species	Gender in each grouping	# of Breeding Pairs*
Bayfield Bay Marsh	5/4/10	Canada Goose	UU	1
		Wood Duck	M	1
		Wood Duck	M	1
		Wood Duck	MF	1
		Wood Duck	MF	1
		Mallard	M	1
		Mallard	M	1
		Mallard	F	0
		Mallard	MF	1
		Blue-winged Teal	U	0
		Pied-billed Grebe	U	0
	5/13/10	Wood Duck	F	0
		Wood Duck	F	0
		Wood Duck	F	0
		Gadwall	M	1
		Mallard	MF	1
		Mallard	MF	1
		Mallard	MF	1
		Mallard	MMF	2
		Mallard	MMF	2
		Mallard	M	1
Button Bay Wetland	5/4/10	Canada Goose	UUUU	0
		Green-winged Teal	MF	1
		Green-winged Teal	M	1
	5/13/10	Wood Duck	M	1
		Wood Duck	M	1
		Common Merganser	MF	1
Big Sandy Bay Wetland	5/4/10	Canada Goose	UU(with 8 young)	1
		Canada Goose	UU	1
		Wood Duck	MMF	2
		Mallard	MF	1
		Mallard	MF	1
		Mallard	MMF	2
		Green-winged Teal	MF	1
	5/13/10	Canada Goose	UU	1
Reed's Bay Wetland	5/4/10	Canada Goose	Flock of 35	0
		Mallard	MF	1
		Mallard	MF	1
		Mallard	MF	1
	5/13/10	Canada Goose	UU	1
		Canada Goose	UU	1
		Canada Goose	UU	1
		Canada Goose	Flock of 12	0
Sandy Bay Wetland	5/4/10	Canada Goose	UUU	1
		Canada Goose	UU	1
		Canada Goose	U	1
		Gadwall	MF	1
		Mallard	MMF	2
		Mallard	MMF	2
		Mallard	FF	0
	5/13/10	Canada Goose	U	1
		Wood Duck	MF	1
		Gadwall	MF	1
		American Wigeon	MMMFF	0
		Mallard	MMMF	0
		Mallard	M	1
		Bufflehead	F	0
		Common Merganser	MF	1
		Red-Breasted Merganser	MFFF	1

M - Male
F - Female
U - Gender indetermined
* - # of breeding pairs as determined by Calculation of Indicated Pairs

Appendix I

Grassland Breeding Bird Survey Results

Detailed Results of Grassland Area Searches

Table 1: Summary of Grassland Species Observations in Southeast Area Search

Southeast Area Search (Sectors 1–6)

Sector	1			2			3			4			5			6		
Habitat (area in ha)	Pasture (11.1)		Density	Hay (15.1)		Density	Wheat (7.6)		Density	Pasture (46.5)		Density	Hay (8.4)		Density	Hay (10.6)		Density
Dates	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	4-Jun	18-Jun	(pair/10ha)
BIRDS																		
Northern Harrier	1		0.9			0.0			0.0		1	0.2			0.0			0.0
Killdeer		1	0.9			0.0	1	1	1.3	1	2	0.4			0.0			0.0
Upland Sandpiper		2	1.8			0.0			0.0			0.0			0.0			0.0
Wilson's Snipe			0.0			0.0			0.0			0.0			0.0			0.0
Eastern Kingbird	1	1	0.9			0.0			0.0	2		0.4			0.0			0.0
Horned Lark			0.0			0.0	1	3	4.0			0.0			0.0			0.0
Field Sparrow			0.0			0.0			0.0			0.0			0.0			0.0
Vesper Sparrow			0.0			0.0			0.0			0.0			0.0			0.0
Savannah Sparrow	7	10	9.0	12	12	7.9	5	5	6.6	42	36	9.0	8	7	9.5	7	28	26.5
Grasshopper Sparrow			0.0			0.0			0.0	3		0.6			0.0			0.0
Bobolink	13	14	12.6	17	18	11.9			0.0	44	49	10.5	17	8	20.2	19	3	18.0
Eastern Meadowlark	3	1	2.7	2		1.3			0.0	4	1	0.9	2	1	2.4	2		1.9

Southeast Area Search (Sectors 7–12 and Totals)

Sector	7			8			9			10			11			12			Totals			Density
Habitat (area in ha)	Pasture (24.2)		Density	Pasture (19.0)		Density	Barnyard (6.3)		Density	Hay (24.4)		Density	Hay (11.4)		Density	Wheat (22.9)		Density				
Dates	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	3-Jun	14-Jun	(pair/10ha)	**round 1**	**round 2**	**Max**	**(pairs/10ha)**
BIRDS																						
Northern Harrier			0.0		1	0.5			0.0			0.0			0.0			0.0	1	2	**2**	**0.10**
Killdeer			0.0	1		0.5	1	1	1.6			0.0			0.0			0.0	4	5	**5**	**0.26**
Upland Sandpiper			0.0			0.0			0.0			0.0			0.0			0.0	0	2	**2**	**0.10**
Wilson's Snipe			0.0			0.0			0.0			0.0			0.0			0.0	0	0	**0**	**0.00**
Eastern Kingbird	2	4	1.7		1	0.5			0.0			0.0	1		0.9			0.0	6	6	**6**	**0.31**
Horned Lark			0.0			0.0			0.0			0.0			0.0			0.0	1	3	**3**	**0.15**
Field Sparrow			0.0			0.0			0.0			0.0			0.0			0.0	0	0	**0**	**0.00**
Vesper Sparrow			0.0			0.0			0.0			0.0			0.0			0.0	0	0	**0**	**0.00**
Savannah Sparrow	29	37	15.3	23	29	15.3	4	7	11.2	11	7	8.9	7	4	6.2	12	8	5.2	167	190	**190**	**9.72**
Grasshopper Sparrow			0.0			0.0			0.0			0.0			0.0			0.0	3	0	**3**	**0.15**
Bobolink	26	31	12.8	26	9	13.7			0.0	13	12	10.5	8	11	9.7			0.0	183	155	**183**	**9.36**
Eastern Meadowlark	6	2	2.5	1	1	0.5	1	1	1.6	2		1.6	1		0.9			0.0	24	7	**24**	**1.23**

Table 2: Summary of Grassland Species Observations in Northwest Area Searcl

Northwest Area Search (Sectors 1–4)

Sector	1			2			3			4		
Habitat (area in ha)	Tall Grass (19.6)	Tall Grass (20.7)	Density	Fallow (28.7)		Density	Hay (13.1)		Density	Plowed (24.4)		Density
Dates	1-Jun	17-Jun	(pair/10ha)	1-Jun	17-Jun	(pair/10ha)	1-Jun	17-Jun	(pair/10ha)	31-May	17-Jun	(pair/10ha)
BIRDS												
Northern Harrier			0.0			0.0			0.0			0.0
Killdeer			0.0		3	1.0			0.0	3	1	1.2
Upland Sandpiper	1	1	0.5		2	0.7	1		0.8	2	3	1.2
Wilson's Snipe			0.0			0.0			0.0			0.0
Eastern Kingbird	3		1.4	1		0.3	1		0.8			0.0
Horned Lark			0.0		3	1.0			0.0	5	3	2.0
Field Sparrow			0.0			0.0			0.0			0.0
Vesper Sparrow			0.0			0.0			0.0			0.0
Savannah Sparrow	11	9	5.3	25	18	8.7	16	3	12.3	7	9	3.7
Grasshopper Sparrow			0.0			0.0			0.0			0.0
Bobolink	32	32	15.5			0.0	23	16	17.6			0.0
Eastern Meadowlark	1		0.5			0.0	1		0.8			0.0

Northwest Area Search (Sectors 5–8 and Totals)

Sector	5			6			7			8			Totals			Density
Habitat (area in ha)	Hay (16.4)		Density	Hay (25.8)		Density	Hay (33.4)		Density	Hay (37.2)		Density				
Dates	31-May	15-Jun	(pair/10ha)	31-May	15-Jun	(pair/10ha)	31-May	15-Jun	(pair/10ha)	31-May	15-Jun	(pair/10ha)	**round 1**	**round 2**	**Max**	**(pairs/10ha)**
BIRDS																
Northern Harrier	1		0.6			0.0		1	0.3	1	1	0.3	2	2	**2**	**0.1**
Killdeer			0.0			0.0		1	0.3	2		0.5	5	5	**5**	**0.3**
Upland Sandpiper		1	0.6	1	1	0.4	1	1	0.3			0.0	6	9	**9**	**0.5**
Wilson's Snipe			0.0			0.0			0.0			0.0	0	0	**0**	**0.0**
Eastern Kingbird	1		0.6		1	0.4	2		0.6	2		0.5	10	1	**10**	**0.5**
Horned Lark			0.0			0.0			0.0			0.0	5	6	**6**	**0.3**
Field Sparrow			0.0			0.0			0.0			0.0	0	0	**0**	**0.0**
Vesper Sparrow			0.0			0.0			0.0			0.0	0	0	**0**	**0.0**
Savannah Sparrow	38	30	23.2	91	49	35.2	55	56	16.8	59	93	25.0	302	267	**302**	**15.1**
Grasshopper Sparrow			0.0			0.0			0.0	2	1	0.5	2	1	**2**	**0.1**
Bobolink	47	34	28.7	63	72	27.9	85	78	25.4	81	89	23.9	331	321	**331**	**16.6**
Eastern Meadowlark			0.0	1		0.4			0.0	1	1	0.3	4	1	**4**	**0.2**

Table 3: Summary of all species observed in both the Southeast and Northwest Area Searches

	Southeast Area Search				Northwest Area Search			
	Round 1	Round 2	**MAX**	**Density (pairs/10ha)**	Round 1	Round 2	**MAX**	**Density (pairs/10ha)**
Canada Goose	8		**8**	**0.4**	52		**52**	**2.6**
Gadwall	1		**1**	**0.1**		1	**1**	**0.1**
Mallard	5	1	**5**	**0.3**			**0**	**0.0**
Wild Turkey			**0**	**0.0**	6		**6**	**0.3**
Common Loon			**0**	**0.0**		1	**1**	**0.1**
Double-crested Cormorant			**0**	**0.0**	1		**1**	**0.1**
Great Blue Heron	3	2	**3**	**0.2**			**0**	**0.0**
Northern Harrier	1	2	**2**	**0.1**	2	2	**2**	**0.1**
Red-tailed Hawk	1		**1**	**0.1**		1	**1**	**0.1**
American Kestrel	1		**1**	**0.1**			**0**	**0.0**
Killdeer	4	5	**5**	**0.3**	5	5	**5**	**0.3**
Upland Sandpiper		2	**2**	**0.1**	6	9	**9**	**0.5**
Spotted Sandpiper			**0**	**0.0**	1	1	**1**	**0.1**
Ring-billed Gull	13		**13**	**0.7**	28		**28**	**1.4**
Mourning Dove	3	1	**3**	**0.2**		7	**7**	**0.4**
Willow Flycatcher	2	1	**2**	**0.1**		1	**1**	**0.1**
Eastern Kingbird	6	6	**6**	**0.3**	10	1	**10**	**0.5**
Warbling Vireo	2	1	**2**	**0.1**	3	1	**3**	**0.2**
American Crow	1	1	**1**	**0.1**			**0**	**0.0**
Horned Lark	1	3	**3**	**0.2**	5	6	**6**	**0.3**
Tree Swallow		4	**4**	**0.2**	1	7	**7**	**0.4**
Barn Swallow	5	7	**7**	**0.4**	2	1	**2**	**0.1**
House Wren		1	**1**	**0.1**			**0**	**0.0**
American Robin	15	10	**15**	**0.8**	25	21	**25**	**1.3**
Gray Catbird			**0**	**0.0**		1	**1**	**0.1**
European Starling	10	6	**10**	**0.5**			**0**	**0.0**
Yellow Warbler	8	9	**9**	**0.5**	14	12	**14**	**0.7**
Common Yellowthroat	4	2	**4**	**0.2**	1		**1**	**0.1**
Savannah Sparrow	167	190	**190**	**9.7**	302	267	**302**	**15.1**
Grasshopper Sparrow	3		**3**	**0.2**	2	1	**2**	**0.1**
Song Sparrow	8	5	**8**	**0.4**	17	2	**17**	**0.9**
Bobolink	183	165	**183**	**9.4**	331	321	**331**	**16.6**
Red-winged Blackbird	133	116	**133**	**6.8**	153	120	**153**	**7.7**
Eastern Meadowlark	24	7	**24**	**1.2**	4	1	**4**	**0.2**
Common Grackle	3	1	**3**	**0.2**	2		**2**	**0.1**
Brown-headed Cowbird			**0**	**0.0**	8	1	**8**	**0.4**
Baltimore Oriole	2		**2**	**0.1**	3		**3**	**0.2**
American Goldfinch	2	6	**6**	**0.3**		4	**4**	**0.2**

Visitor; not anticipated to be breeding in the searched area.

Appendix J

Woodland Breeding Bird Survey Results

Woodland Area Search Species List

COMMON NAME	SCIENTIFIC NAME	Pre-construction (2008)	Post-construction (2010)	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC	AREA (ha)	REGION	Local Status PIF Priority Species	COMMENTS	Area Sensitive Reference		
Canada Goose	*Branta canadensis*	X	X	S5	G5									
Wood Duck	*Aix sponsa*		X	S5	G5									
Mallard	*Anas platyrhynchos*	X	X	S5	G5									
Ring-necked Pheasant	*Phasianus colchicus*		X	SNA	G5									
Wild Turkey	*Meleagris gallopava*	X	X	S5	G5									
Wilson's Snipe	*Gallinago delicata*	X	X	S5B	G5									
American Woodcock	*Scolopax minor*	X		S4B	G5									
Mourning Dove	*Zenaida macroura*	X	X	S5	G5									
Yellow-billed Cuckoo	*Coccyzus americanus*		X	S4B	G5									
Black-billed Cuckoo	*Coccyzus erythropthalmus*	X		S5B	G5					X				
Ruby-throated Hummingbird	*Archilochus colubris*		X	S5B	G5									
Red-bellied Woodpecker	*Melanerpes carolinus*		X	S4	G5									
Downy Woodpecker	*Picoides pubescens*	X	X	S5	G5									
Northern Flicker	*Colaptes auratus*	X	X	S4B	G5					X				
Pileated Woodpecker	*Dryocopus pileatus*	X		S5	G5			30-50*				Naylor et al., 1996		
Eastern Wood-Pewee	*Contopus virens*	X	X	S4B	G5					X				
Willow Flycatcher	*Empidonax traillii*		X	S5B	G5					X				
Least Flycatcher	*Empidonax minimus*	X	X	S4B	G5									
Great Crested Flycatcher	*Myiarchus crinitus*	X	X	S4B	G5									
Eastern Kingbird	*Tyrannus tyrannus*	X	X	S4B	G5					X				
Warbling Vireo	*Vireo gilvus*	X	X	S5B	G5									
Red-eyed Vireo	*Vireo olivaceus*	X	X	S5B	G5									
Blue Jay	*Cyanocitta cristata*	X	X	S5	G5									
American Crow	*Corvus brachyrhynchos*	X	X	S5B	G5									
Tree Swallow	*Tachycineta bicolor*	X	X	S4B	G5									
Black-capped Chickadee	*Poecile atricapillus*	X	X	S5	G5									
White-breasted Nuthatch	*Sitta carolinensis*	X	X	S5	G5			10						
House Wren	*Troglodytes aedon*	X	X	S5B	G5									
Blue-gray Gnatcatcher	*Polioptila caerulea*		X	S4B	G5			30						
Veery	*Catharus fuscescens*	X	X	S4B	G5			10-20						
Wood Thrush	*Hylocichla mustelina*	X	X	S4B	G5					X				
American Robin	*Turdus migratorius*	X	X	S5B	G5									
Gray Catbird	*Dumetella carolinensis*	X	X	S4B	G5									
Brown Thrasher	*Toxostoma rufum*	X	X	S4B	G5					X				
European Starling	*Sturnus vulgaris*	X	X	SNA	G5									
Cedar Waxwing	*Bombycilla cedrorum*	X	X	S5B	G5									
Yellow Warbler	*Dendroica petechia*	X	X	S5B	G5									
Chestnut-sided Warbler	*Dendroica pensylvanica*	X		S5B	G5									
American Redstart	*Setophaga ruticilla*		X	S5B	G5			20-30						
Northern Waterthrush	*Seiurus noveboracensis*		X	S5B	G5			20						
Mourning Warbler	*Oporornis philadelphia*		X	S4B	G5			30						
Common Yellowthroat	*Geothlypis trichas*	X	X	S5B	G5									
Eastern Towhee	*Pipilo erythrophthalmus*	X	X	S4B	G5					X				
Chipping Sparrow	*Spizella passerina*	X	X	S5B	G5									
Field Sparrow	*Spizella pusilla*	X	X	S4B	G5					X				
Song Sparrow	*Melospiza melodia*	X	X	S5B	G5									
Swamp Sparrow	*Melospiza georgiana*	X	X	S5B	G5									
Northern Cardinal	*Cardinalis cardinalis*	X	X	S5	G5									
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	X	X	S4B	G5					X				
Indigo Bunting	*Passerina cyanea*	X	X	S4B	G5									
Red-winged Blackbird	*Agelaius phoeniceus*	X	X	S5	G5									
Common Grackle	*Quiscalus quiscula*	X	X	S5B	G5									

Woodland Area Search Species List

COMMON NAME	*SCIENTIFIC NAME*	Pre-construction (2008)	Post-construction (2010)	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC	AREA (ha)	REGION	Local Status PIF Priority Species	COMMENTS	Area Sensitive Reference		
Brown-headed Cowbird	*Molothrus ater*	X	X	S4B	G5									
Baltimore Oriole	*Icterus galbula*	X	X	S4B	G5					X				
American Goldfinch	*Carduelis tristis*	X	X	S5B	G5									
Explanation of Status and Acronymns														
COSSARO: Committee on the Status of Species at Risk in Ontario														
COSEWIC: Committee on the Status of Endangered Wildlife in Canada														
REGION: Rare in a Site Region														
S1: Critically Imperiled—Critically imperiled in the province (often 5 or fewer occurrences)														
S2: Imperiled—Imperiled in the province, very few populations (often 20 or fewer),														
S3: Vulnerable—Vulnerable in the province, relatively few populations (often 80 or fewer)														
S4: Apparently Secure—Uncommon but not rare														
S5: Secure—Common, widespread, and abundant in the province														
SX: Presumed extirpated														
SH: Possibly Extirpated (Historical)														
SNR: Unranked														
SU: Unrankable—Currently unrankable due to lack of information														
SNA: Not applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.														
S#S#: Range Rank—A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species														
?: Indicates uncertainty in the assigned rank														
G1: Extremely rare globally; usually fewer than 5 occurrences in the overall range														
G1G2: Extremely rare to very rare globally														
G2: Very rare globally; usually between 5-10 occurrences in the overall range														
G2G3: Very rare to uncommon globally														
G3: Rare to uncommon globally; usually between 20-100 occurrences														
G3G4: Rare to common globally														
G4: Common globally; usually more than 100 occurrences in the overall range														
G4G5: Common to very common globally														
G5: Very common globally; demonstrably secure														
T: Denotes that the rank applies to a subspecies or variety														
END: Endangered														
THR: Threatened														
SC: Special Concern														
2, 3 or NS after a COSEWIC ranking indicates the species is either on Schedule 2, Schedule 3 or No Schedule of the Species At Risk Act (SARA)														
NAR: Not At Risk														
IND: Indeterminant, insufficient information to assign status														
DD: Data Deficient														
6: Rare in Site Region 6														
7: Rare in Site Region 7														
Area: Minimum patch size for area-sensitive species (ha)														
H- highly significant in Hamilton Region (i.e. rare)														
m- moderately significant in Hamilton Region (i.e. uncommon)														
L1- extremely rare locally (Toronto Region)														
L2- very rare locally (Toronto Region)														
L3- rare to uncommon locally (Toronto Region)														
HR- rare in Halton Region, highly significant														
HU- uncommon in Halton Region, moderately significant														
* The Pileated Woodpecker will incorporate smaller woodlots into its homerange, therefore it may not be a true area-sensitive species (Naylor et al. 1996)														
LATEST STATUS UPDATE														

Woodland Area Search Species List

COMMON NAME	*SCIENTIFIC NAME*	Pre-construction (2008)	Post-construction (2010)	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC	AREA (ha)	REGION	Local Status PIF Priority Species	COMMENTS	Area Sensitive Reference		
Butterflies: September, 2009														
Reptiles: September, 2009														
Birds: September, 2009														
Mammals: September, 2009														
S and G ranks and explanations: September, 2009														
NOTE														
All rankings for birds refer to breeding birds unless the ranking is followed by N														
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Appendix K

Notifications and Agency Responses

NOTIFICATIONS #1+#2 p.1

Wyatt, Valerie

From: Cotnam, Erin (MNR) [erin.cotnam@ontario.ca]
Sent: Thursday, May 13, 2010 1:13 PM
To: Garry Perfect; Read,Rob [Burlington]; rob.dobos@ec.gc.ca; Harris, Julie
Cc: Wyatt, Valerie; Durst, Ken (MNR)
Subject: RE: Wolfe Island Notification

Hello Garry,

Thank you for your email regarding the notification for the period of April 16 – May 3 and the earlier notification of April 9-15 (sent by Valerie Wyatt, April 23).

During the two reporting periods, notifications indicate that four Red-tailed hawks were found and were likely migrants and one Osprey was found, and was potentially a territorial bird.
To date, MNR is aware of 17 raptors/vultures; 6 Turkey Vultures, 2 American Kestrel, 1 Merlin, 1 Osprey and 7 Red-tailed Hawks.
The first full year of post-construction monitoring has been completed which will allow for more fulsome discussion and valid comparison with other wind facilities.

At this time, MNR recommends that raptor monitoring continue as per the Plan and requests that the proponent maintain frequent communication with our office.

MNR suggests that the discussion regarding raptor/vulture mortality continue, with TransAlta and the Parties to the Plan, when we discuss the second Biannual Post-Construction Monitoring Report for birds and bats.

Erin

From: Garry Perfect [mailto:Garry_Perfect@transalta.com]
Sent: May 6, 2010 10:02 AM
To: Cotnam, Erin (MNR); Durst, Ken (MNR); 'Read,Rob [Burlington]'; 'rob.dobos@ec.gc.ca'; 'Harris, Julie'
Cc: Wyatt, Valerie
Subject: Wolfe Island Notification

Good morning all:
This e-mail provides the details of one notification threshold that has been met at the Wolfe Island Wind Plant during the period April 16 - May 3, 2010.

<u>High Annual Mortality Rates - Raptors</u>

The Post-Construction Follow-Up Plan for Bird and Bat Resources at the Wolfe Island Wind Plant states that NRCan, MNR, and EC will be contacted if two raptor fatalities are noted over a six week period.
On April 16, one Red-tailed Hawk carcass was discovered at turbine 64 during the on-going mortality searches. This individual was likely a migrant. An Osprey carcass was discovered at turbine 43 on May 3. It is possible that this individual was a territorial bird, as other Ospreys were observed at a nest in the Study Area in early April.

Please feel free to contact me should you wish to discuss this notification.

Best regards,

Garry Perfect
Environmental Specialist

Ph: 519-826-4645 x225 Cell:519-820-8204 Fax:519-826-4745

NOTIFICATIONS #1 + #2 p.2

34 Harvard Road, Guelph, Ontario, N1G 4V8
Garry_Perfect@transalta.com

TransAlta

www.transalta.com

Hello everyone,

On behalf of Garry Perfect and TransAlta, I am providing the details of one notification threshold that has been met at the Wolfe Island Wind Plant during the period April 9-15, 2010.

High Annual Mortality Rates – Raptors

The Post-Construction Follow-Up Plan for Bird and Bat Resources at the Wolfe Island Wind Plant states that NRCan, EC, and MNR will be contacted if two raptor fatalities are noted over a six week period.

On April 9, one Red-tailed Hawk carcass was discovered at turbine 81 during the on-going mortality searches. A second Red-tailed Hawk carcass was discovered at turbine 29 on April 14, and a third Red-tailed Hawk carcass was discovered at turbine 27 on April 15. These individuals were likely migrants.

Please feel free to contact Garry directly should you wish to discuss this notification.

Thank you,

Valerie Wyatt, M.Sc.
Senior Project Manager
Stantec
Suite 1 - 70 Southgate Drive
Guelph ON N1G 4P5
Ph: (519) 836-6050 Ext. 237
Fx: (519) 836-2493
valerie.wyatt@stantec.com
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NOTIFICATIONS #3 + #4

Wyatt, Valerie

From: Garry Perfect [Garry_Perfect@transalta.com]
Sent: Thursday, May 13, 2010 2:10 PM
To: 'Read,Rob [Burlington]'; 'rob.dobos@ec.gc.ca'; 'Cotnam, Erin (MNR)'; 'ken.durst@ontario.ca'; Harris, Julie
Cc: Wyatt, Valerie
Subject: Wolfe Island Notification

Good afternoon all:

This e-mail provides the details of two notification thresholds that have been met at the Wolfe Island Wind Plant.

Mortality of Species at Risk

As stated in the plan, NRCan, EC and MNR will be notified if mortality of species at risk is observed. On May 11, 2010 a single Chimney Swift fatality was recorded at T04. This species is listed as Threatened on Schedule 1 of the federal *Species at Risk Act* and on the Species at Risk in Ontario list of the provincial *Endangered Species Act (2007)*. This individual was likely a migrant; Cink and Collins (2002) indicate that this species arrives in Ontario in late April or early May, and begins nest building in late May or early June in nearby New York.

Cink, Calvin L. and Charles T. Collins. 2002. Chimney Swift (*Chaetura pelagica*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/646doi:10.2173/bna.646

Disturbance to Staging Waterfowl

As stated in the Plan, NRCan, EC and MNR will be contacted in the event of a 30% decline in the staging numbers of any of the listed waterfowl guilds over a period of more than one month. The measure of abundance is "waterfowl days" per guild, compared between the average of 2008/2009 pre-construction surveys and the 2010 post-construction surveys.

Over the period March 24-May 5, 2010, waterfowl days for the sea duck guild (which includes Long-tailed Duck, scoters and eiders) were 1050, which represents a 50.3% decline over the pre-construction average of 2113. These numbers should be viewed with some caution, as they are small and a relatively small deviation of hundreds of waterfowl days results in a large percentage change. For comparative purposes, all other listed guilds are present in numbers that are one or two orders of magnitude higher (i.e., tens of thousands or hundreds of thousands of waterfowl days over the same period). Percentage change for all other listed guilds ranged from -18% to +261%, with an overall increase in staging waterfowl of 3.7% under post-construction conditions.

Four surveys were conducted between March 24 and May 5. Following the first two surveys, sea duck waterfowl days in 2010 were nearly double the number of sea duck waterfowl days observed under pre-construction conditions. Following the third survey, sea duck waterfowl days were approximately equivalent under pre- and post-construction conditions. The decline in numbers observed following the fourth survey strongly suggests that the sea ducks arrived and departed the area earlier than in previous years, probably as a result of weather or other factors unrelated to the wind plant. Overall, the data suggest that similar numbers of sea ducks were present in 2010 but that they were present over a shorter period of time, which was reflected in reduced waterfowl days.

Please feel free to contact me should you wish to discuss these notifications.

Best regards,

Garry Perfect
Environmental Specialist

Ph: 519-826-4645 x225 Cell:519-820-8204 Fax:519-826-4745
34 Harvard Road, Guelph, Ontario, N1G 4V8
Garry_Perfect@transalta.com

NOTIFICATION #5

From: Garry Perfect [Garry_Perfect@transalta.com]
Sent: Tuesday, May 18, 2010 4:17 PM
To: 'Cotnam, Erin (MNR)'; 'ken.durst@ontario.ca'; 'Read,Rob [Burlington]'; 'rob.dobos@ec.gc.ca'; Harris, Julie
Cc: Wyatt, Valerie
Subject: Wolfe Island Notification

Good afternoon all:
This e-mail provides the details of one notification threshold that has been met at the Wolfe Island Wind Plant during the period May 13 to May 17, 2010.

High Annual Mortality Rates - Raptors

The Post-Construction Follow-Up Plan for Bird and Bat Resources at the Wolfe Island Wind Plant states that NRCan, MNR, and EC will be contacted if two or more raptor fatalities are noted over a six week period.
On May 13, one Northern Harrier carcass was discovered at turbine 46 during the on-going mortality searches. One Red-tailed Hawk carcass was discovered at turbine 78 on May 17. It is possible that these two individuals were territorial birds.

Please feel free to contact me directly should you wish to discuss this notification.

Best regards,

Garry Perfect
Environmental Specialist

Ph: 519-826-4645 x225 Cell:519-820-8204 Fax:519-826-4745
34 Harvard Road, Guelph, Ontario, N1G 4V8
Garry_Perfect@transalta.com

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NOTIFICATION #6

Wyatt, Valerie

From: Garry Perfect [Garry_Perfect@transalta.com]
Sent: Wednesday, May 26, 2010 9:17 AM
To: 'Cotnam, Erin (MNR)'; 'ken.durst@ontario.ca'; 'Read,Rob [Burlington]'; 'rob.dobos@ec.gc.ca'; Harris, Julie
Cc: Wyatt, Valerie
Subject: Wolfe Island Notification
Attachments: Wolfe Island bat fatalities May 3-21 2010.xlsx

Good morning all:
This e-mail provides the details of one notification threshold that has been met at the Wolfe Island Wind Plant during the period from May 3 to May 21, 2010.

High Annual Mortality Rate - Bats

As stated in the Post-Construction Follow-Up Plan, MNR, EC and NRCan will be notified if 144 bats fatalities are noted over a consequtive three-week period. This threshold value is intended to represent the estimated actual number of fatalities corrected for projected scavenger removal and searcher efficiency.

Twenty-five bat carcasses have been recovered during the period of May 3 and May 21, 2010. Corrected for percent area searched (78% based on a 50-m radius circle), searcher efficiency (55%), and scavenger removal (average of 2009 scavenger trials indicate 39% of test carcasses are not removed by scavengers), this translates to 150 bat fatalities over this period.

A list of dates, wind turbines and species of the fatalities are provided in the attached spreadsheet.

Please contact me directly should you wish to discuss this notification.

Best regards,

Garry Perfect
Environmental Specialist

Ph: 519-826-4645 x225 Cell:519-820-8204 Fax:519-826-4745
34 Harvard Road, Guelph, Ontario, N1G 4V8
Garry_Perfect@transalta.com

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NOTIFICATION #7

Wyatt, Valerie

From: Garry Perfect [Garry_Perfect@transalta.com]
Sent: Friday, June 11, 2010 12:38 PM
To: 'Cotnam, Erin (MNR)'; 'dave.richards@ontario.ca'; 'Read,Rob [Burlington]'; 'rob.dobos@ec.gc.ca'; Harris, Julie
Cc: Wyatt, Valerie
Subject: Wolfe Island Notification

Good afternoon all:
This e-mail provides the details of one notification threshold that has been met at the Wolfe Island Wind Plant.

High Annual Mortality Rates - Raptors/Turkey Vultures

The Post-Construction Follow-Up Plan for Bird and Bat Resources at the Wolfe Island Wind Plant states that NRCan, MNR, and EC will be contacted if two raptor fatalities are noted over a six week period.
On June 1, one Turkey Vulture carcass was reported at turbine 83 by the golf course operator prior to the regularly-scheduled carcass search. A Red-tailed Hawk carcass was discovered at turbine 75 on June 10 during the course of regular searches. Both are likely resident birds.

Please feel free to contact me should you wish to discuss this notification.

Best regards,

Garry Perfect
Environmental Specialist

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