

August 23, 2013

Niagara Region Wind Corporation
277 Lakeshore Road East, Suite 211
Oakville, ON L6J 6J3

RE: Natural Heritage Section of the EEMP for Niagara Region Wind Farm

Dear Darren Croghan,

MNR has reviewed the Natural Heritage section of the Environmental Effects Monitoring Plan (EEMP) for the Niagara Region Wind Farm located in the Townships of West Lincoln and Wainfleet, the Town of Lincoln, and within Haldimand County. The final document is titled *Niagara Region Wind Farm Environmental Effects Monitoring Plan for Wildlife and Wildlife Habitat* and dated August 2013.

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

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

MNR expects that information contained in the natural heritage section of the EEMP to be considered in MOE's Renewable Energy Approval decision, and if approved, be implemented by the applicant.

If you have any questions please contact me at Amy.Cameron@Ontario.ca or 613-732-5506.

Sincerely,



Amy Cameron
Renewable Energy Planning Ecologist
Ministry of Natural Resources

cc Kathy Woeller, Regional Land Use Planning Supervisor, MNR
Narren Santos, Environmental Approvals Access & Service Integration Branch, MOE
Zeljko Romic, Environmental Approvals Access & Service Integration Branch, MOE



**NIAGARA REGION WIND FARM
ENVIRONMENTAL EFFECTS
MONITORING PLAN FOR WILDLIFE
AND WILDLIFE HABITAT**

Stantec File No. 160950269
August 2013

Prepared for:

Niagara Region Wind Corporation
277 Lakeshore Road East, Suite 211
Oakville, ON L6J 6J3

Prepared by:

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Purpose of the Environmental Effects Monitoring Plan
August 28, 2013

1.0 Purpose of the Environmental Effects Monitoring Plan

An environmental effects monitoring plan (EEMP) must be prepared to address negative environmental effects that may result from engaging in the renewable energy project. The EEMP must set out:

- Performance objectives in respect of the negative environmental effects.
- Mitigation measures to assist in achieving the performance objectives.
- A program for monitoring negative environmental effects for the duration of the time that the project is engaged in, including a contingency plan to be implemented if any mitigation measures fail.

Furthermore, all Class 3 and 4 wind facilities must prepare an EEMP in respect of birds and bats in accordance with the following publications of the Ministry of Natural Resources:

1. *Bats and Bat Habitats: Guidelines for Wind Power Projects*
2. *Birds and Bird Habitats: Guidelines for Wind Power Projects*

This post-construction monitoring plan is one component of the EEMP submitted to the Ministry of the Environment as part of the REA Application for the Project. This document has been prepared in accordance with O. Reg. 359/09, MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011). This document supports details provided in the Natural Heritage Assessment and Environmental Impact Study.

Niagara Region Wind Corporation retained Stantec Consulting Ltd. (Stantec) to prepare the REA application. The REA application is a requirement under Ontario Regulation 359/09 - Renewable Energy Approvals under Part V.0.1 of the Act of the *Environmental Protection Act* (O.Reg.359/09). According to subsection 6.(3) of O.Reg. 359/09, the Project is classified as a Class 4 Wind Facility and will follow the requirements identified in O.Reg.359/09 for such a facility.

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Project Overview

August 28, 2013

2.0 Project Overview

Niagara Region Wind Corporation (NRWC) is proposing to develop, construct, and operate the 230 Megawatt (MW) Niagara Region Wind Farm (the Project) within the Townships of West Lincoln and Wainfleet and the Town of Lincoln within the Niagara Region and within Haldimand County in Southern Ontario, in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The basic components of the Project include 77 wind turbine generators (80 potential locations identified) each with a rated capacity of approximately 3.0 MW for a maximum installed nameplate capacity of 230 MW. An overhead and/or underground collection system connects each turbine to one of two transformer substations along a series of 34.5 kilovolt (kV) lines. Turbines are grouped into nine collector circuits that bring power (and data via fibre optic lines) to one of the transformer substations. Voltage is stepped up from 34.5kV to 115kV at each transformer substation by means of a 100 MVA base rated transformer with two stages of cooling (via fans). A 115kV transmission line transports power from each of the two transformer substations north to the tap-in location where the Project is connected to the Hydro One Networks Inc. (HONI) owned transmission line, south of the Queen Elizabeth Way (QEW) in the Town of Lincoln. Power generated from this Project will be conveyed along the existing HONI transmission line to the Beach Transformer Station in Hamilton.

Alternate transmission and collector lines routes have been identified and assessed to provide options during detailed design, the final selection of which route to follow will be confirmed following the consultation process with local distribution companies, agency review and detailed design. MNR will be provided with a map showing the final project location once detailed design is complete.

Other Project components include access roads, junction boxes (or pad-mounted disconnect switches) and associated culverts at swales and waterbody crossings. Temporary components during construction may include temporary laydown areas (for storage and staging areas at each turbine location), crane pads or mats, staging areas along access roads, delivery truck turnaround areas, central construction laydown areas and crane paths.

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Post-Construction Monitoring for Significant Natural Features

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3.0 Post-Construction Monitoring for Significant Natural Features

As indicated in the Environmental Impact Study (EIS), prepared in accordance with section 38(2) of the Renewable Energy Approvals Regulation (O.Reg 359/09), the following confirmed significant and provincially significant natural features will receive post-construction monitoring:

- Migratory Land-bird Stopover Area (features: mlsa1, mlsa2, mlsa3, mlsa4)
- Raptor Wintering Area (features: wr1, wr2, wr3, wr4)
- Bat Maternity Colony (features: bmc1, bmc3, bmc6, bmc7, bmc8, bmc9, bmc10, bmc11, bmc12, bmc13, bmc14, bmc15, bmc16, bmc17, bmc18, bmc19, bmc20, bmc23, bmc24, bmc25, bmc26, bmc27, bmc28, bmc29, bmc30, bmc31, bmc32, bmc33, bmc34, bmc35, bmc36, bmc37, bmc38, bmc39, bmc42, bmc43, bmc44, bmc45, bmc46, bmc47, bmc48, bmc49, bmc50, bmc51, bmc52, bmc53, bmc54, bmc55)
- Turtle Nesting Habitat (features: th3, th5, th9, th10, th19, th21, th26, th28, th29, th38, th39, th40, th41, th42, th45, th46, th62, th69)
- Amphibian Breeding Habitat (Woodland). Those features within 30m of access roads. (features: ah2, ah9, ah29, ah31, ah37, ah38, ah49, ah57, ah61, ah89)
- Amphibian Breeding Habitat (Wetland) (features: ah25, ah35, ah83)
- Provincially Significant Wetlands
- Significant Woodlands

The potential negative environmental effects, performance objectives, mitigation strategy, environmental effects monitoring plan along with contingency measures are described in Table 1. All information in this report related to wildlife habitat is also assessed in the Natural Heritage Assessment and Environmental Impact Statement for the Niagara Region Wind Project (Stantec 2013). The environmental effects monitoring plan for each feature includes the post-construction survey methods, monitoring locations, frequency and duration of sample collection, technical and statistical value of the data, and reporting requirements.

Data collection will be conducted by field personnel skilled at identifying birds by song and sight. To the extent possible, the same field personnel who carried out the pre-construction baseline studies will carry out the post-construction monitoring works to assist in standardizing the datasets.

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3.1 CONTINGENCY MEASURES

MNR along with the proponent will be asked to collectively review the results of the post-construction monitoring to determine if an ecologically significant disturbance/avoidance effect has occurred and whether such an effect is attributable to the wind turbines and not external factors. These discussions will determine if and when the contingency plan will be implemented and if any additional measures are warranted. The best available science and information will be considered when determining appropriate mitigation.

Where mitigation measures are found to not be effective, the contingency measure identified in Table 1 will be implemented immediately. If contingency measures need to be implemented MNR and other relevant agencies (where required, or upon the request of the approval holder) will be notified immediately, and if required, MNR and other relevant agencies will be consulted to determine appropriate contingency measures.

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Table 1 Summary of the Environmental Effects Monitoring Plan for significant/provincially significant natural features in and within 120m of the Niagara Region Wind Farm where an operational impact has the potential to occur.

Unique Feature ID	Potential Operational Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
<p>Migratory Landbird Stopover Area</p> <p>(Features: mlsa1, mlsa2*, mlsa3, mlsa4)</p> <p>Note: Turbines within 120m of features marked with an asterisk (*) will be included in the subsample for post-construction mortality monitoring, including T62 and T63. Mlsa2 will not be surveyed due to property access constraints.</p> <p>All turbines within 120m of significant landbird migratory stopover habitat will receive post-construction mortality monitoring from April 1st through November 30th.</p>	<p>Habitat Avoidance/disturbance effects potentially caused by turbines located within 120m of significant migratory landbird stopover areas.</p> <p>Turbines within 120m</p> <p>Mlsa1: T14, T16, T21, T22, T44, T45, T47, T61</p> <p>Mlsa2: T62, T63</p> <p>Mlsa3: T24</p> <p>Mlsa4: T20</p>	<p>Continued use of habitat by species (and abundance of species) that currently inhabits the feature.</p>	<p>No infrastructure located in significant landbird migratory stopover habitat.</p> <p>If a disturbance/avoidance effect is detected, mitigation measures will be determined in consultation with MNR.</p> <p>Turbine lighting will conform to Transport Canada standards but will include lights with the shortest allowable flash durations and the longest allowable pause between flashes</p>	<p>500m transects used during pre-construction will be used during post-construction monitoring.</p> <p>Spring surveys will be conducted twice weekly from early April to late May for a total of 10 visits per transect.</p> <p>Fall surveys will be conducted twice weekly from late August to mid-October with a total of 10 visits per transect.</p> <p>Surveys begin half an hour after sunrise and continue for approximately two hours.</p> <p>All species and their total numbers observed along each transect will be recorded as well as the habitat type being surveyed.</p> <p>See Appendix A for</p>	<p>Transects within mlsa1, mlsa3 and mlsa4</p> <p>See Appendix B for survey locations</p>	<p>Pre-construction (baseline) surveys will be conducted in Fall 2013 for mlsa3 and mlsa4; spring surveys for mlsa 3 and mlsa 4 have been completed; mlsa1 spring and fall pre-construction surveys have been completed; mlsa 2 cannot be surveyed due to property access constraints.</p> <p>Post-construction monitoring will be conducted in all significant migratory landbird stopover areas for a period of 3 years beginning the first year of operation:</p> <p>Year 1 – spring and fall 2015</p> <p>Year 2- spring and fall 2016</p> <p>Year 3 – spring and fall 2017</p>	<p>Determine if there is a displacement or avoidance effect caused by turbines located within 120m of significant landbird migratory stopover areas.</p>	<p>Pre-construction</p> <p>Results of Fall surveys for mlsa3 and mlsa4 will be submitted to MNR on or before January 2014.</p> <p>Post-construction</p> <p>Results will be reported to MNR by the following dates:</p> <p>Year 1 – January 2016</p> <p>Year 2 – January 2017</p> <p>Year 3 – January 2018</p> <p>Should a disturbance/avoidance impact be detected and mitigation be implemented, additional post-construction reporting will be determined in consultation with MNR.</p>	<p>Contingency measures will be determined in consultation with MNR.</p>

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Unique Feature ID	Potential Operational Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
				detailed survey methods					
<p>Raptor Wintering Areas (includes habitat for Short-eared Owls)</p> <p>(Features: wr1, wr2, wr3 and wr4)</p> <p>Note: all features deemed significant through EOS surveys (all features had short-eared owl present; features wr2 and wr4 also met criteria for significant raptor wintering area)</p> <p>All turbines within 120m of significant raptor wintering areas and/or habitat for short-eared owls will receive post-construction mortality monitoring from May 1st through November 30th, and mortality monitoring will be extended to include December 1st through March 31st, specifically for raptors (applies specifically to turbines 1 and 58)</p>	<p>Wr1: Habitat avoidance/disturbance effects potentially caused by access road, collector line and fibre optic line within 120m of short-eared owl habitat.</p> <p><u>or</u></p> <p>Wr2: habitat avoidance/disturbance effects potentially caused by access road, collector line and fibre optic line within 120m of short-eared owl habitat and significant raptor wintering area habitat</p> <p><u>or</u></p> <p>Wr3: Habitat avoidance/disturbance effects potentially caused by access road and cable located <i>within</i> short-eared owl habitat. Also, avoidance/disturbance effects potentially cause by turbine 01 within 120m of significant short-eared owl habitat</p> <p><u>or</u></p> <p>Wr4: Habitat avoidance/disturbance effects potentially caused by access road, collector line, and laydown area within 120m of</p>	<p>For significant raptor wintering areas (wr2 and wr4), continued use of the habitat by the species (and abundance of each species) that inhabits the feature.</p> <p>For significant species of conservation concern habitat, continued use of the habitat by short-eared owls in the abundance detected pre-construction.</p>	<p>Infrastructure sited outside of all candidate significant raptor wintering areas and short-eared owl habitat with exception of road and collection line that is located in short-eared owl habitat at feature wr3.</p> <p>In total 0.33ha of grassland habitat will be temporarily removed but only 0.18ha of grassland habitat will be removed at the edge of feature wr3 for the life of the project. This represents 0.30% and 0.16% of the total identified significant raptor wintering are habitat within wr3. No loss of woodland roost habitat will occur.</p>	<p>Significant Raptor wintering areas will be surveyed following pre-construction methods and will follow the same transect locations.</p> <p>Raptor surveys will be conducted half an hour after sunrise and continue for approximately two hours. Short-eared owl surveys will be conducted shortly before dusk. Surveys will be conducted twice weekly in winter (November through March).</p> <p>The number of individuals of each species observed is recorded and results compared to pre-construction surveys.</p> <p>See Appendix A for detailed survey methods</p>	<p>Transects within features wr1, wr2, wr3 and wr4</p> <p>See Appendix B for survey locations</p>	<p>Post-construction monitoring will be conducted in all significant raptor wintering areas and significant habitats for short-eared owl for a period of 3 years beginning the first year of operation:</p> <p>Year 1 – November 2015 through March 2016</p> <p>Year 2- November 2016 through March 2017</p> <p>Year 3 – November 2017 through March 2018</p>	<p>Determine if there is a displacement or avoidance effect caused by:</p> <p>Infrastructure located in wr3</p> <p><u>or</u></p> <p>Infrastructure located adjacent to wr1 and wr2</p> <p><u>or</u></p> <p>Turbine located within 120m of wr3 and wr4.</p>	<p><u>Post-construction</u></p> <p>Results will be reported to MNR by the following dates:</p> <p>Year 1 – June 2016</p> <p>Year 2 – June 2017</p> <p>Year 3 – June 2018</p> <p>Should a disturbance/avoidance impact be detected and mitigation be implemented, additional post-construction reporting will be determined in consultation with MNR.</p>	<p>Contingency measures will be determined in consultation with MNR.</p>

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Unique Feature ID	Potential Operational Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
	significant short-eared owl habitat and significant raptor wintering habitat. Also avoidance/disturbance effects potentially caused by turbine 58 located within 120m of significant short-eared owl habitat and significant raptor wintering habitat.								
Bat Maternity Colony (features: bmc1, bmc3*, bmc6, bmc7, bmc8, bmc9, bmc10, bmc11, bmc12*, bmc13, bmc14, bmc15*, bmc16, bmc17, bmc18, bmc19*, bmc20, bmc23, bmc24*, bmc25, bmc26, bmc27, bmc28, bmc29, bmc30, bmc31, bmc32, bmc33, bmc34, bmc35, bmc36*, bmc37, bmc38, bmc39*, bmc42, bmc43, bmc44, bmc45*, bmc46*, bmc47, bmc48, bmc49, bmc50, bmc51, bmc52, bmc53, bmc54, bmc55) Note: All candidate	Habitat Avoidance/disturbance potentially caused by turbines within 120m. Turbines within 120m Bmc1: T53 Bmc3*: T81 Bmc6: T97 Bmc7: T97 Bmc8: T98 Bmc9: T98 Bmc10: T93 Bmc11: T93 Bmc12*: T94 Bmc13: T07 Bmc14: T07 Bmc15*: T94 Bmc16: T07 Bmc17: T66 Bmc18: T85 Bmc19*: T66 Bmc20: T91 Bmc23: T11 and T41	Continued use of the habitat by the species (Little brown bat, Eastern Small-footed bat, Northern Long-eared bat, Tricolored Bat, or Silver-haired Bat) that currently inhabit the feature. White nose syndrome may have an impact on the abundance of bats, specifically Northern long-eared and Little Brown bats.	Infrastructure sited outside of all candidate significant bat maternity colonies.	Pre-construction All features listed require pre-construction surveys. Pre-construction surveys will include a determination of snag density. If snag density ≥ 10 snags/ha the feature will be evaluated to determine significance by conducting exit counts. Post-construction All features deemed significant during pre-construction surveys will be surveyed post-construction using the same survey methods applied during pre-	Snag density results will be provided to MNR upon completion of the work. A map illustrating features deemed candidate significant bat maternity colony habitat based on results of snag density work, will be provided to MNR. A map illustrating selected survey trees within candidate significant bat maternity colony habitat will also be provided to MNR. See Appendix B for survey locations	Pre-construction Survey (baseline): Snag density counts in spring 2013 during leaf-off Selection of survey trees in spring 2013 during leaf-off Exit surveys in June 2013 to determine significance in candidate habitats Post-construction monitoring will be conducted in all significant bat maternity colony features for a period of 3 years beginning the first year of operation: Year 1 - June 2015 Year 2 - June 2016 Year 3 - June 2017	Determine if there is a displacement or avoidance effect caused by turbines located within 120m of bat maternity colonies	Pre-construction: April/May 2013 (pre-construction snag density counts and location of trees that will be surveyed for significance) September 2013 (pre-construction exit survey results) Post-construction Reports: Year 1 - September 2015 Year 2 – September 2016 Year 3 – September 2017	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken.

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Unique Feature ID	Potential Operational Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
bat maternity colony features require pre-construction surveys to determine significance. Post-construction monitoring of significant bat maternity colonies is required. Features marked with an asterisk (*) cannot be surveyed due to property access restrictions; therefore these turbines will be included in post-construction mortality monitoring.	Bmc24*: T05 Bmc25: T12 Bmc26: T12 Bmc27: T12 Bmc28: T96 Bmc29: T63 Bmc30: T96 Bmc31: T63 Bmc32: T62 and T63 Bmc33: T74 Bmc34: T95 Bmc35: T01 Bmc36*: T01 Bmc37: T76 Bmc38: T76 Bmc39*: T44 Bmc42: T34 Bmc43: T02 Bmc44: T02 Bmc45*: T02 Bmc46*: T58 Bmc47: T78 Bmc48: T29 Bmc49: T29 Bmc50: T59 Bmc51: T80 Bmc52: T80 Bmc53: T80 Bmc54: T79 Bmc55: T79			construction monitoring (exit counts) See Appendix A for detailed survey methods					
Turtle Nesting Habitat	Habitat Avoidance/disturbance	Continued use of the habitat by nesting	Infrastructure sited outside of all candidate	Pre-construction All features require	Within features th3, th5, th9, th10, th19,	Pre-construction Survey (baseline):	Determine if there is a displacement or avoidance	Estimated Report Submission Dates:	Upon submission of annual post-

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Unique Feature ID	Potential Operational Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
(features th3, th5, th9, th10, th19, th21, th26, th28, th29, th38, th39, th40, th41, th42, th45, th46, th62, th69) NOTE: all features require pre-construction surveys to determine significance	monitoring potentially caused by access roads within 120m.	turtles. No turtle mortality on access roads	significant turtle nesting habitats. Workers will be made aware of the potential occurrence of turtles on access roads and will avoid interaction with any observed individuals to the extent possible. Speed limit signage will be erected to restrict vehicle speeds to 30km/hr	pre-construction surveys. Candidate features will be searched for nesting turtles on warm, sunny days in June as well as evidence of nesting, including scrapes or predated nests. Post-construction All features deemed significant during pre-construction surveys will be surveyed post-construction using the same survey methods applied during pre-construction monitoring See Appendix A for detailed survey methods	th21, th26, th28, th29, th38, th39, th40, th41, th42, th45, th46, th62, th69 See Appendix B for survey locations	Prior to conducting evaluation of significance surveys, additional site investigation work will be conducted to determine if current land use within candidate habitats meet the habitat requirements as outlined in the Ecoregion criterion schedule (exposed sand and gravel deposits). If habitat is than EOS surveys need to be completed. Candidate habitats will be surveyed on two separate dates during the breeding season (June) to make direct observations of turtle nesting and one additional survey in mid-July to make observations of nesting evidence (e.g. hatched eggs and/or nests that have been dug up by predators). Walking surveys will occur between 7:00 and 11:00 pm to systematically inspect all areas of exposed mineral (sand or gravel) substrates, spending a minimum of 15 minutes for every 100m ² of candidate nesting substrate Post-construction	effect caused by access roads located within 120m of turtle nesting habitat	Pre-construction: September 2013 Post-construction Reports: Year 1 - September 2015	construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken.

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Unique Feature ID	Potential Operational Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
						monitoring will be conducted in all significant turtle nesting area features for a period of 1 year beginning the first year of operation: Year 1 - June 2015			
Amphibian breeding Habitat (woodlands) (features: ah2, ah9, ah29, ah31, ah37, ah38, ah49, ah57, ah61, ah89)	Habitat Avoidance/disturbance monitoring potentially caused by access roads within 30m.	Continued use of the habitat by amphibians. No amphibian mortality on access roads	Infrastructure sited outside of all candidate significant amphibian breeding habitat (woodlands) Speed limit signage will be erected to restrict vehicle speeds to 30km/hr	"Marsh monitoring protocol for frogs and toads will be followed See Appendix A for detailed survey methods	Within features ah2, ah9, ah29, ah31, ah37, ah38, ah49, ah57, ah61, ah89 See Appendix B for survey locations	Post-construction monitoring will be conducted in all significant amphibian breeding habitat (woodlands) features for a period of 1 year beginning the first year of operation: Year 1 - Spring 2015	Determine if there is a displacement or avoidance effect caused by access roads located within 30m of amphibian breeding habitat (woodlands)	Estimated Report Submission Dates: Post-construction Reports: Year 1 - September 2015	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken.
Amphibian Breeding Habitat (wetlands) (features: ah25, ah35, ah83)	Habitat Avoidance/disturbance monitoring potentially caused by access roads within 30m.	Continued use of the habitat by amphibians. No amphibian mortality on access roads	Infrastructure sited outside of all candidate significant amphibian breeding habitat (wetlands) Speed limit signage will be erected to restrict vehicle speeds to 30km/hr	"Marsh monitoring protocol for frogs and toads will be followed See Appendix A for detailed survey methods	Within features ah25, ah35 and ah83 See Appendix B for survey locations	Post-construction monitoring will be conducted in all significant amphibian breeding habitat (wetlands) features for a period of 1 year beginning the first year of operation: Year 1 - Spring 2015	Determine if there is a displacement or avoidance effect caused by access roads located within 30m of amphibian breeding habitat (wetlands)	Estimated Report Submission Dates: Post-construction Reports: Year 1 - September 2015	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency

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Unique Feature ID	Potential Operational Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
									measures to be undertaken.
Significant Wetlands	Potential disturbance effects to wetland hydrology and potential sedimentation	Maintain hydrological flows to provincially significant wetlands	Installation of culverts to maintain hydrological conditions	Inspection of culverts to ensure flow maintained	The periphery of significant wetlands See Appendix B for survey locations	Hydrological conditions will be monitored once seasonally in each of spring and summer during the first year post-construction	Determine if there is a disturbance to hydrological conditions that could impact provincially significant wetland features	Notify MNR of hydrological issues and actions taken to resolve the issue. Any negative impacts that occurred to the provincially significant wetland will also be reported to MNR and where necessary will be restored.	Contingency measures will be determined in consultation with MNR.
Significant Woodlands	Potential disturbance effects to woodland hydrology and potential sedimentation cause by access roads	Maintain hydrological flows to significant woodlands	Installation of culverts to maintain hydrological conditions	Inspection of culverts to ensure flow maintained	The periphery of significant woodlands See Appendix B for survey locations	Hydrological conditions will be monitored once seasonally in each of spring and summer during the first year post-construction	Determine if there is a disturbance to hydrological conditions that could impact significant woodland features	Notify MNR of hydrological issues and actions taken to resolve the issue. Any negative impacts that occurred to the significant woodland will also be reported to MNR and where necessary will be restored.	Contingency measures will be determined in consultation with MNR.

4.0 Post-Construction Monitoring for Bat and Bird Mortality

4.1 MORTALITY THRESHOLDS

A threshold approach will be used to identify and mitigate significant bat and bird mortality resulting from the operation of wind turbines.

4.1.1 Bats

Bat mortality is considered to be significant when a threshold of annual bat mortality (averaged across the site) exceeds:

- 10 bats / turbine / year

This threshold has been determined based on bat mortality reported at wind power projects in Ontario and comparison with jurisdictions across North America.

4.1.2 Birds

Bird mortality is considered to be significant when a threshold of annual bird mortality exceeds:

- 14 birds / year at individual turbines or turbine groups
- 0.2 raptors / turbine / year (all raptors) across a wind power project
- 0.1 raptors / turbine / year (provincially tracked raptors) across a wind power project; or

Provincially tracked raptors are defined as raptors of provincial conservation concern by MNR's Natural Heritage Information Centre (NHIC).

4.2 POST-CONSTRUCTION MONITORING METHODS

Post construction bat and bird mortality surveys estimate bird and bat mortality from wind turbines and may identify species and specific periods of high mortality. This knowledge can be used to evaluate the success of mitigation measures, establish protocols for operational mitigation, and inform adaptive management.

Bat and bird mortality surveys identify the number of bats or birds killed per turbine over a known period of time (expressed as bats/turbine/year or birds/turbine/year). This value represents an estimate of bat and bird mortality adjusted for carcass removal rates, searcher efficiency, and percent area searched. Standard methodologies for mortality surveys are identified below.

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For bats and birds, a monitoring year is considered to be from May 1 – October 31, and continues until November 30 specifically for raptor monitoring. Should additional bat or bird mortality be found based on supplemental monitoring (e.g. associated with significant wildlife habitat) and using the same standard protocols, this mortality will be included in the calculation of mortality rates. In this case, the year is all reporting periods in one calendar year (i.e. from January 1 – December 31).

Post-construction monitoring is required for 3 years at all Class 3 and 4 wind power projects. Post-construction monitoring will consist of:

- Regular bat/bird mortality surveys around specific wind turbines
- Monitoring of bat/bird carcass removal rate by scavengers (or other means)
- Monitoring of bird/bat searcher efficiency (i.e. number of bat/bird fatalities present that are actually detected by surveyors)
- Avoidance-disturbance effects monitoring (where a project is located within 120m of bat/bird SWH)
- For birds, subsequent 2 years of scoped mortality and cause and effects monitoring at individual turbines (and unmonitored turbines in near proximity), following any given year where an annual post-construction mortality report identifies significant bird or raptor mortality; and
- For bird/bats, an additional 3 years of effectiveness monitoring where mitigation is applied

All searchers will have updated rabies pre-exposure vaccinations.

4.2.1 Effort and Timing for Bird and Bat Mortality Monitoring

Minimum requirements for post-construction monitoring of birds and bats include:

- Post-construction monitoring (including mortality surveys, carcass removal and searcher efficiency trials) will be conducted during the core season when bats are active, and in coordination of bird mortality monitoring (May 1-October 31) for the first 3 years of wind turbine operation
- Mortality surveys will be conducted at each monitored turbine twice per week (3 and 4 day intervals) from May 1 – October 31; surveys for raptor mortality will be continued once per week from November 1 – November 30.
- Bat and bird mortality surveys will occur at all turbines at wind power projects ≤10 turbines. For wind power projects >10 turbines, a sub-sample of at least 30% of turbines

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(minimum 10 turbines) will be selected to cover representative areas throughout the project location.

- For birds, all turbines within the project location will be monitored once a month during the May 1-October 31 survey period for evidence of raptor mortalities
- Where significant annual bird mortality is identified, subsequent scoped mortality and cause effects monitoring will be conducted for 2 years at individual turbines (and unmonitored turbines in near proximity).
- Should significant bat or bird mortality be observed, and operational mitigation implemented, post-construction monitoring will be conducted for an additional 3 years from the implementation of operational mitigation to evaluate the effectiveness of the mitigation.

A minimum of 23 turbines (30% sample) will be selected in consultation with MNR to cover representative areas throughout the project location. A map showing the monitored turbines will be provided to MNR prior to initiating post-construction mortality monitoring. Post-construction monitoring will begin May 1st of the year that the wind power project is fully operational. The commercial operation date of the Niagara Region Wind Farm is December 2014; therefore, it is anticipated that post-construction monitoring will begin May 1, 2015.

Turbines T01, T02, T05, T44, T53, T58, T62, T63, T66, T94, T81, T94 should be considered for monitoring as part of the 30% sample as they are located within 120m of candidate bat maternity colonies and migratory land bird areas that cannot be evaluated for significance due to access issues and have been assumed to be significant. Also, turbines 1, 2, 4, 7, 11, 12, 14, 16, 20, 21, 22, 24, 29, 34, 44, 45, 47, 59, 61, 62, 63, 74, 76, 78, 79, 80, 81, 85, 91, 93, 95, 96, 97 and 98 will be considered for mortality monitoring if candidate significant bird/bat wildlife habitats within proximity to these turbines are deemed significant, The selection of the turbines to be monitored will be undertaken in consultation with the MNR.

If full project commissioning is delayed, post-construction monitoring of a partially completed project will not be delayed for longer than 1 year. If the project is constructed in phases, monitoring for each phase will coincide with the commencement of operation of that phase. When available, post-construction monitoring data may be useful in considering potential effects on birds/bats and bird/bat habitat in adjacent phases.

4.2.2 Carcass Searches

Carcass removal by scavengers is highly variable among sites (varying by vegetation cover, terrain and season) and must be considered when estimating total bat and bird mortality. Carcass searches will consider the following:

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- The sub-sample of wind turbines that are monitored will include all habitat types and any significant wildlife habitat present at the site, and will cover the spatial distribution of the wind turbines. Wind turbines will be selected through a scientifically defensible system (e.g. stratification).
- The time required to search each turbine will vary depending on the surrounding habitat (e.g. open field vs. forest, etc.) and individual searchers, but searchers will aim for a consistent search time for all surveyed turbines (e.g. 20 minutes per turbine)
- Each surveyed turbine will have a search area that has a 50m radius
- Within this 50m radius, the search area will be examined using transects 5.0-6.0m apart allowing for a visual search of 2.5-3.0m on each side. The search area may be rectangular, square or circular depending on turbine locations and arrangements and surrounding terrain.
- The search area of each turbine will be mapped into visibility classes according to the following table. Where the majority of the search area would not be searchable due to vegetation cover or other impediments (e.g. Visibility Class 4) these turbines will not be included in the sub-sample of monitored turbines.

%Vegetation Cover	Vegetation Height	Visibility Class
≥90% bare ground	≤15cm tall	Class 1 (Easy)
≥25% bare ground	≤15cm tall	Class 2 (Moderate)
≤25% bare ground	≤25% > 30cm tall	Class 3 (Difficult)
Little or no bare ground	≥25% > 30cm tall	Class 4 (Very Difficult)

- Where possible, ground cover around turbines will be maintained at a low level in order to facilitate more accurate bat and bird mortality surveys
- Mortality surveys that incorporate the use of trained dogs (i.e. dog handler teams to locate mortalities) to improve searcher efficiency will be considered, particularly in difficult terrain.
- All carcasses found will be photographed and recorded/labeled with species, sex, date, time, location (UTM coordinate), carcass condition, searcher, injuries, ground cover, and distance and direction to nearest turbine.
- Weather conditions including wind speed and precipitation will be included as part of the data collection.

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- The estimated number of days since death, and condition of each carcass collected will be recorded in one of the following categories:
 - Injured
 - Fresh
 - Early decomposition
 - Moderate decomposition
 - Advanced decomposition
 - Complete decomposition
 - Scavenged
- Bird carcasses found during mortality monitoring will be collected and stored in a freezer and used in carcass removal or searcher efficiency trials, assuming they are in reasonable condition.
- Carcasses of the following species found during bat mortality searches will be stored in a freezer and used in carcass removal or searcher efficiency trials, assuming they are in reasonable condition:
 - *Lasionycteris noctivagans* (Silver-haired Bat)
 - *Lasiurus cinereus* (Hoary Bat)
 - *Lasiurus borealis* (Eastern Red Bat)
- Because of white-nose syndrome contamination risks, the following species will not be used in carcass removal or searcher efficiency trials (carcasses of these species may be sent to the Canadian Cooperative Wildlife Health Centre for analysis of white-nose syndrome):
 - *Myotis septentrionalis* (Northern Long-eared Bat)
 - *Myotis lucifugus* (Little Brown Bat)
 - *Myotis leibii* (Eastern Small-footed Bat)
 - *Perimyotis subflavus* (Tricolored Bat)
 - *Eptesicus fuscus* (Big Brown Bat)

4.2.3 Carcass Removal Trials

The level of carcass scavenging must be determined through carcass removal trials. In these trials carcasses are placed around the wind turbines and monitored until they disappear. The average carcass removal time is a factor in determining the estimated bat or bird mortality. As

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carcass removal rates vary considerably from one site to another and seasonally, removal trials will be conducted at every wind power project for every year of monitoring.

Below are some important considerations for conducting carcass removal rate trials:

- Carcass removal trials will be conducted at least once a season (spring, summer, fall) during the same period as the mortality surveys. Trials will be conducted once per month if vegetation changes occur during the season (e.g. crops grow, harvest, etc.)
- A minimum of 10 carcasses will be used for each trial with **no more than 5 trial carcasses placed at any one time**
- Carcasses will be monitored every 3-4 days in conjunction with carcass searches
- Carcass removal trials will be conducted in a variety of weather conditions. Weather conditions will be recorded
- Carcasses will be distributed across the range of different substrates/habitats and visibility classes of turbines being searched
- To the extent possible, carcass removal trials will be conducted at turbines that are not part of the carcass search sub-sample
- Carcasses will be placed before dusk using gloves and boots to avoid imparting human smell that might bias trial results (e.g. attract scavengers, etc)
- Trials will continue until all carcasses are removed or have completely decomposed (generally 2 weeks)
- To avoid confusion with turbine related fatalities, trial carcasses will be discretely marked (e.g. clipping of ear, wing, fur; hole punching ear; etc.) with a unique identification so they can be identified as trial carcasses
- Carcasses used will be as fresh as possible since frozen or decomposed carcasses are less attractive to scavengers. If frozen carcasses are used, they will be thawed prior to beginning carcass removal trials.
- To the extent possible, bat carcasses will be used for at least one third of the carcass removal trials, and bird carcasses will comprise another third of the trial carcasses. Trials using other small brown mammal or bird carcasses (e.g. mice, brown chicks) may also be used when bird and bat carcasses are not available.
- Scavenging rates may change over time as scavengers become aware of and develop search images for new sources of food beneath turbines

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- Scavenging will be determined on a site-specific basis and rates will not be assumed to be similar between sites or used in calculations for other projects.

4.2.4 Searcher Efficiency Trials

Searcher efficiency is another important factor in creating an estimate of total bat and bird mortality. Searcher efficiency trials require a known number of discretely marked carcasses to be placed around a wind turbine. Searchers examine the wind turbine area, and the number of carcasses that they find is compared to the number of carcasses placed. Searcher efficiency will vary considerably for each searcher and from one site to another (varying by vegetation cover, terrain and season), and will be conducted as part of post-construction monitoring at every wind power project for every year of monitoring.

Below are some important considerations for conducting searcher efficiency trials:

- Searcher efficiency trials will be conducted at least once a season (spring, summer and fall) during the same period as the bat mortality surveys. Trials will be conducted once per month if vegetation changes occur during the season (e.g. crops grow, harvest, etc.)
- A 'tester' will control the trials and return to collect marked trial carcasses at the completion of the trials to determine the number of carcasses remaining and if any carcasses were scavenged or removed during the trial.
- Searcher efficiency trials are to be conducted for each individual searcher or team involved in searching for carcasses (including teams using dogs). The searcher will not be notified when they are participating in an efficiency trial to avoid potential search biases.
- A minimum of 10 carcasses per searcher per season in all applicable visibility classes (see table above) are to be used. The average per searcher across all visibility classes will be used for calculations.
- Trial carcasses will be spread out over the trial period (month or season) and conducted with the mortality surveys. A maximum of 3 trial carcasses will be placed at any one time to avoid bias and flooding the area with carcasses.
- Trial carcasses are placed for one search period only and then removed and recorded by the 'tester'
- Trial carcasses will be randomly placed within the search area and location recorded so that they can be retrieved if they are not found during the trial.

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- Trial carcasses will be discreetly marked (e.g. clipping of ear, wing, leg, fur; hole-punching ear; etc.) with a unique identification so that they can be identified as a trial carcass by the tester.
- To the extent possible, bat carcasses will be used for at least one third of the carcass removal trials, and bird carcasses will comprise another third of the trial carcasses. Trials using other small brown mammal or bird carcasses (e.g. mice, brown chicks) may also be used when bird and bat carcasses are not available.
- If frozen carcasses are used, they will be thawed prior to beginning searcher efficiency trials.
- All observers, even those with trained dogs, will overlook some carcasses. This percentage will vary depending on the observer, the habitat and the area being searched, etc.

4.2.5 Proportion Area Searched

Based on current Ontario post-construction data, most bats and birds appear to fall within 50m of a wind turbine base. This area therefore represents the maximum recommended search area. Since it may not always be possible to search the entire 50m radius because of the presence of thick or tall vegetation, steep slopes, active cultivation, etc. the actual area searched during the mortality surveys will be calculated at each turbine, using a GPS. A map of the actual search area for each turbine searched, and a description of areas deemed to be unsearchable (e.g. vegetation height, type, slope, etc.), will be provided in the mortality report.

4.2.6 Calculations

Scavenger Correction Factor

The following formula will be used to calculate the overall scavenger correction (S_c) factors based on the proportion of carcasses remaining after each search interval are pooled:

$$S_c = \frac{n_{visit1} + n_{visit2} + n_{visit3}}{n_{visit0} + n_{visit1} + n_{visit2}}$$

Where,

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

n_{visit0} is the total number of carcasses placed

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

Searcher Efficiency

Searcher efficiency (S_e) will be calculated for each searcher as follows:

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

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The number of turbines that each individual searches will vary so it will be necessary to calculate a weighted average that reflects the proportion of turbines each searcher searched. The weighted average or overall searcher efficiency will be calculated as follows:

$$S_{e0} = S_{e1}(n_1/T) + S_{e2}(n_2/T) + S_{e3}(n_3/T) \dots$$

Where,

S_{e0} is the overall searcher efficiency
 S_{e1} and S_{e2} and $S_{e3} \dots$ are individual searcher efficiency ratings
 N_1 and N_2 and $N_3 \dots$ are number of turbines searched by each searcher
 T is the total number of turbines searched by all searchers

Proportion Area Searched

Proportion area searched (P_s) is calculated as follows:

$$P_s = \frac{\text{actual area searched}}{\pi r^2}$$

Where $r = 50$ m

Corrected Mortality Estimates

The estimated bat and bird mortality (C) is calculated as follows:

$$C = c / (S_{e0} \times S_c \times P_s)$$

Where,

C is the corrected number of fatalities
 c is the number of carcasses found
 S_{e0} is the weighted proportion of carcasses expected to be found by searchers (overall searcher efficiency)
 S_c is the proportion of carcasses not removed by scavengers over the search period
 P_s is the proportion of the area searched

4.2.7 Other Considerations

- The above calculations will be presented in corrected number of bats/turbine per year and birds/turbine /year. In this context the year is from May 1 to October 31 for all bats and birds and continues until November 30 specifically for raptor monitoring.
- A separate calculation for raptor mortality will use the searcher efficiency and carcass removal results relevant to raptors.
- Carcasses may be discovered incidental to formal searches. These carcasses will be processed (i.e. collected and recorded, etc.) and fatality data will be included with the calculation of fatality rates. If the incidentally discovered carcass is found outside a formal search plot, the data will be reported separately.

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- Should additional bat or bird mortality be found based on supplemental monitoring (e.g. associated with SWH) and using the same standard protocols, this mortality will be included in the calculation of mortality rates. In this case, the year is all reporting periods in one calendar year (i.e. from January 1 to December 31).
- Tissue samples from bat and bird carcasses may be used in a number of DNA analyses to provide insight into population size and structure, as well as the geographic origin of migrants. The local MNR office may be contacted prior to disposing bat and bird carcasses, to determine if this type of research is occurring in the area.

4.3 POST-CONSTRUCTION MITIGATION

4.3.1 Bats

Post-construction mitigation will be required where post-construction monitoring identifies disturbance effects associated with bat SWH. Operational mitigation is required if post-construction monitoring shows that a wind power project is causing significant bat mortality. Bat mortality is considered significant when mortality levels at a project location exceed 10 bats / turbine / year.

Operational mitigation refers to adjustments made to the operation of wind turbines to help mitigate potential negative environmental effects on bats (i.e. significant bat mortality). Operational mitigation for bat mortality consists of changing the wind turbine cut-in speed to 5.5 m/s (measured at hub height), or feathering of wind turbine blades when wind speeds are below 5.5 m/s.

The majority of bat mortalities from wind turbine operations occur during fall migration. Across North America, it is estimated that 90% of bat fatalities occur from mid-July through September. Where a post-construction monitoring annual report indicates the annual bat mortality threshold of 10 bats/turbine/year has been exceeded, operational monitoring will be implemented across the wind power project (i.e. at all turbines) from sunset to sunrise, from July 15 to September 30. This mitigation will continue for the duration of the project. Should site-specific monitoring indicate a shifted peak mortality period, operational mitigation may be shifted to match the peak mortality, with mitigation maintained for a minimum 10 weeks. Any shift in the operational mitigation period to match peak mortality should be determined in coordination with and confirmed by MNR and other relevant agencies.

Where post-construction monitoring is applied, an additional 3 years of effectiveness monitoring is required. Monitoring the effectiveness of any post-construction mitigation techniques will help to evaluate the success of this mitigation.

4.3.2 Birds

Post-construction mitigation or additional scoped monitoring will be required at individual turbines or groups of turbines where post-construction monitoring identifies significant annual bird mortality, disturbance effects associated with bird SWH, or significant bird mortality events.

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For turbines located outside 120m of bird SWH, 2 years of subsequent scoped mortality and cause and effects monitoring is required where a significant annual mortality threshold has been exceeded. Following scoped monitoring, post-construction monitoring (e.g. operational mitigation) and effectiveness monitoring may be required at individual turbines where a mortality effect has been identified or significant annual mortality persists.

For turbines located within 120m of bird SWH, immediate post-construction mitigation (including operational mitigation), as identified in the Environmental Impact Study, and 3 years of effectiveness monitoring will be required where monitoring identifies significant annual bird mortality or disturbance effects associated with bird SWH.

Operational mitigation techniques may include periodic shut-down of select turbines and/or blade feathering at specific times of the year when mortality risks to the affected bird species is particularly high (e.g. migration). Emerging and new technologies will be considered that may reduce bird fatalities.

4.3.3 Contingency Plans

A contingency plan addresses immediate actions necessary in case of a significant bat or bird mortality event, or if mitigation actions fail. A contingency plan allows additional mitigation measures to be implemented in the event that unanticipated negative environmental effects are observed during a single mortality monitoring survey.

4.3.4 Bats

Should cut-in speed mitigation be implemented and the bat mortality threshold continue to be exceeded, additional mitigation and scoped monitoring requirements will be determined in consultation with MNR and other relevant agencies.

4.3.5 Birds

A significant bird mortality event is defined to have occurred when bird mortality during a single mortality monitoring survey (as observed in the field on a single day) exceeds:

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

NOTE: These numbers are actual carcasses found (not corrected numbers)

MNR and other relevant agencies (where required, or upon the request of the approval holder) will be notified within 48 hours if one of the thresholds above is exceeded during a single mortality monitoring survey. MNR and other relevant agencies will be consulted to determine appropriate contingency plans should a significant bird mortality event occur or if mitigation actions fail.

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5.0 Additional Post-construction Commitments

Winger Provincially Significant Earth Science ANSI

Prior to construction, a topographic survey will be completed for the portion of the Winger Provincially Significant Earth Science ANSI that is in and within 30m of the proposed access road, buried collector lines, fibre optic lines and temporary construction area associated with turbine 89. In addition to the topographic information, the location of the following project components will be identified on a map and provided to the MNR prior to construction:

- Access road, buried collector lines, fibre optic lines and temporary construction area associated with Turbine 89;
- Proposed erosion and sediment control measures;
- Boundaries of the Winger Provincially Significant Earth Science ANSI; and
- Portion of the construction area and access road where the limit of disturbance/construction activities will be minimized to protect existing topography and sand dune formations.

Photographs taken during construction of the access road, buried collector lines, fibre optic lines and temporary construction area associated with Turbine 89 will be submitted to MNR following construction. The pre-construction photographs and topographic information will be used to illustrate compliance with the proposed mitigation measures (Stantec, April 2013). Pre-construction information will also be used to ensure appropriate post-construction rehabilitation of the Winger Provincially Significant Earth Science ANSI is completed.

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6.0 Reporting Requirements

Data collected during post-construction mortality monitoring for birds and bats will be submitted in accordance with MNR data standards and templates. Post-construction reports will be prepared and submitted as per within 3 months of the end of each monitoring year. This post-construction monitoring plan will be reviewed and updated when changes to guidelines occur, including changes methods and/or thresholds.

Table 2 Schedule for post-construction Reports for mortality monitoring for birds and bats detailing results of the Environmental Effects Monitoring Plan.

Monitoring Year [*]	Report Submission Date
Year 1: May 1 – Nov 30, 2015	February 2016
Year 2: May 1 – Nov 30, 2016	February 2017
Year 3: May 1 – Nov 30, 2017	February 2018

^{*}If additional years of monitoring are required the additional report submissions will follow a similar schedule as listed above. Mortality monitoring at specific turbines may be extended to include additional months as indicated in Table 1, specifically for turbines located within 120m of significant landbird migratory stopover habitats or significant raptor wintering area/habitat for short-eared owls.

All bat and bird monitoring data and associated reports will be submitted to the Ministry of the Environment and MNR, consistent with MNR’s procedures and protocols, and satisfy the data standards and requirements of the Wind Energy Bird and Bat Monitoring Database (see Appendix C for data template). Bat survey data submitted will be entered into the database, analyzed, reported and used to address knowledge gaps and create public data summaries. Standardized templates available online through the Wind Energy Bird and Bat Monitoring Database found at http://www.bsc-eoc.org/birdmon/wind/wind_templates.jsp will be used to record and report all field data.

Reports will also include maps of areas searched for each surveyed turbine and raw data for all carcass searches, searcher efficiency trials and carcass removal trials will be required as part of the annual report. A data sheet sample will also be provided with the mortality report.

A summary of when information about a particular mortality event or threshold is reported to Ministry of Natural Resources is included in Table 3.

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Table 3 Timeline for reporting mortality to Ministry of Natural Resources.

Mortality Threshold	How mortality is calculated	Reporting Timeline for Results
10 bats / turbine / year	Based on calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR as outlined in Table 3.
14 birds / turbine / year	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR as outlined in Table 3.
10 birds / turbine	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 48 hours of detection
33 birds (including raptors) at any multiple turbines	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 48 hours of detection
0.2 raptors / turbine / year (all raptors) across a wind power project	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR within 3 months of completing mortality monitoring for birds and bats.
0.1 raptors / turbine / year (provincially tracked raptors) across a wind power project	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR within 3 months of completing mortality monitoring for birds and bats.
Endangered and Threatened Species	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 24 hours of detection or next business day.

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HABITAT**

Conclusions
August 28, 2013

7.0 Conclusions

This Environmental Effects Monitoring Plan for the Niagara Region Wind Farm has been prepared in accordance with section 23 of O. Reg. 359/09 to identify the proposed measures to confirm the accuracy of predicted effects outlined in the NHA and EIS (Stantec, 2013).

Stantec Consulting Ltd. prepared this EEMP for NRWC. NRWC is committed to implementing all of the recommended monitoring measures appropriate protection, mitigation and monitoring measures as they apply to the construction and operation of the Project.

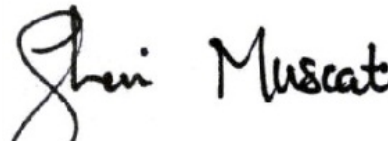
This information is respectfully submitted in support of the proposed Niagara Region Wind Farm on behalf of NRWC.

Sincerely,

STANTEC CONSULTING LTD.



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8.0 References

OMNR. July 2011. *Bats and Bat Habitats: Guidelines for Wind Power Projects*. First Edition. Queen's Printer for Ontario, Canada.

OMNR. December 2011. *Birds and Bird Habitats: Guidelines for Wind Power Projects*. First Edition. Queen's Printer for Ontario, Canada.

Stantec. March 2013. Niagara Region Wind Farm -Natural Heritage Assessment and Environmental Impact Study

Stantec. April 8, 2013. Niagara Region Wind Farm NHA/EIS Addendum to Address the Winger Provincially Significant Earth Science ANSI

APPENDIX A

SURVEY METHODS

Appendix A Survey Methods

A.1 LANDBIRD MIGRATORY STOPOVER HABITAT

Monitoring locations

This survey protocol applies to the following features:

- **mlsa1** (post-construction surveys)
- **mlsa3** (fall pre-construction survey; spring and fall post-construction surveys if deemed significant)
- **mlsa4** (fall pre-construction survey; spring and fall post-construction surveys if deemed significant)

Transects locations 500m in length were chosen during pre-construction surveys. Transect locations correspond to the major habitats likely to be utilized by migratory songbirds. A handheld GPS unit will be used to georeference transect start and end points. A detailed map of each transect location is included in Appendix Y of the Environmental Effects Monitoring Plan.

Monitoring Frequency and Timing:

Surveys will be conducted during spring (April and May) and fall (late August through end of October) migration periods. Surveys will be undertaken twice per week for a total of 10 visits per season (10 visits in spring and 10 visits in fall).

Data Collection:

All surveys will be conducted by a qualified biologist. Data should include the start and stop times along each transect, the species, numbers and locations of all species observations (including the distance from the transect location). In addition, weather conditions, and any other relevant information (i.e. surveyor names, survey date, etc) should be recorded.

Analysis and Reporting:

Post-construction data will be compared to pre-construction data to determine if any negative environmental effects have occurred. The following criteria will be used to determine significance of the feature:

- use of the woodlot by an average of more than 200 birds per day in either the spring or fall surveys, and

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- with at least 35 or more migratory* species recorded over the seasonal survey periods (i.e. spring and fall), and
- at least 10 different species should be recorded on at least 5 different survey dates.

*Species include all migratory songbirds and raptors, see the following websites for migratory lists

<http://www.ec.gc.ca/nature/default.asp?lang=En&n=421B7A9D-1> or

<http://www.ec.gc.ca/nature/default.asp?lang=En&n=496E2702-1>.

A.2 RAPTOR WINTERING AREAS AND SHORT-EARED OWL HABITATS

Monitoring locations

This survey protocol applies to the following features:

- **wr1** (post-construction surveys)
- **wr2** (post-construction surveys)
- **wr3** (post-construction surveys)
- **wr4** (post-construction surveys)

Transects locations 500m in length were chosen during pre-construction surveys. A handheld GPS unit will be used to georeference transect start and end points.

Monitoring Frequency and Timing

Surveys will be conducted every 7-10 days in significant raptor wintering areas in January and February for a total of 6 visits per significant habitat. Surveys will be conducted twice weekly in winter (November through March)

- For significant raptor wintering area habitats (wr2 and wr4) surveys will be conducted during daylight hours (9:00-16:00). Surveys will begin half an hour after sunrise and continue for approximately two hours.
- For significant short-eared owl habitats (wr1, wr2, wr3 and wr4) surveys will be conducted shortly before dusk.

Data Collection

All surveys will be conducted by a qualified biologist. Data should include the start and stop times along each transect, the species, numbers and locations of all species observations (including the distance from the transect location). In addition, weather conditions, habitat description of locations where raptors are observed, and any other relevant information (i.e. surveyor names, survey date, etc) will be recorded.

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Appendix A - Survey Methods

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Analysis and Reporting

Post-construction data will be compared to pre-construction data to determine if any negative environmental effects have occurred. The following criteria will be used to determine significance of the feature:

- One or more short-eared owl using the habitat
- At least 10 individuals and two of the listed indicator species
- Site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birds

A.3 BAT MATERNITY COLONY HABITAT

Monitoring locations

This survey protocol applies to the following features:

- **Bmc1**
- **Bmc6**
- **Bmc7**
- **Bmc8**
- **Bmc9**
- **Bmc10**
- **Bmc11**
- **Bmc13**
- **Bmc14**
- **Bmc16**
- **Bmc17**
- **Bmc18**
- **Bmc20**
- **Bmc23**
- **Bmc25**
- **Bmc26**
- **Bmc27**
- **Bmc28**
- **Bmc29**
- **Bmc30**
- **Bmc31**
- **Bmc32**
- **Bmc33**
- **Bmc34**
- **Bmc35**
- **Bmc37**
- **Bmc38**
- **Bmc42**
- **Bmc43**
- **Bmc44**
- **Bmc47**
- **Bmc48**
- **Bmc49**
- **Bmc50**
- **Bmc51**
- **Bmc52**
- **Bmc53**
- **Bmc54**
- **Bmc55**

Pre-Construction Surveys

Site Investigation: Snag Density Counts

Thirty nine (39) ELC communities will be surveyed to determine if they meet snag density criteria to be considered candidate significant bat maternity colony habitat. All ELC communities that meet or exceed 10 snags/ha will be considered candidate significant bat maternity colony habitat. Snag density counts will be completed during leaf-off conditions in spring 2013 so the view of the tree cavities and crevices are not obscured by foliage.

The following steps will be taken to calculate the number of snags per hectare:

- Establish test plot locations throughout the ELC community and ensure no test plots overlap. Test plots
- Count the number of snags/cavity trees $\geq 25\text{cm dbh}$ in each plot
- Use formula πr^2 to determine number of snags per hectare
- Survey a minimum of 10 plots for sites ≤ 10 ha and add another plot for each extra hectare up to a maximum of 35 plots

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- If snag/cavity tree density is ≥ 10 snags/ha of trees ≥ 25 cm dbh the site is candidate significant bat maternity colony habitat.

Evaluation of Significance: Exit Surveys

Exit surveys must be conducted in the month of June within candidate bat maternity colony habitat. Each selected snag/cavity tree will be monitored from 30 minutes before dusk until 60 minutes after dusk in order to observe evidence of bats exiting the candidate snag/cavity tree. Each candidate roost tree will be monitored once.

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

The following criteria will be used to determine the number of snag/cavity trees that will be included in the exit surveys:

- A minimum of 10 snags/cavity trees for areas ≤ 10 ha;
- One snag/cavity tree fore each hectare for areas ≤ 30 ha and
- A maximum of 30 snags/cavity trees for areas ≥ 30 ha

The best candidate snag trees are selected according to the following criteria (in order of importance):

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

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

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

Monitoring Frequency and Timing

Snag density counts will be conducted in the leaf-off period.

Exit surveys will be conducted in June. Each candidate roost tree will be monitored once. Cavity/crevice openings will be monitored from 30 minutes before dusk until 60 minutes after dusk for evidence of bats exiting.

Data Collection

All surveys will be conducted by a qualified biologist. Data should include the start and stop times of each survey, a description of the equipment used (note: each survey location should use the same acoustic equipment on the same settings for comparison purposes), species, numbers and locations of all species observations. In addition, weather conditions, and any other relevant information (i.e. surveyor names, survey date, etc) should be recorded.

Analysis and Reporting

**NIAGARA REGION WIND FARM
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HABITAT**

Appendix A - **Survey Methods**

August 28, 2013

Post-construction data will be compared to pre-construction data to determine if any negative environmental effects have occurred. Results will be submitted to MNR. Additional monitoring requirements and need for post-construction mitigation will be determined in consultation with MNR upon review of the annual survey results.

A.4 TURTLE NESTING HABITAT

Monitoring locations (pre-construction spring and post-construction surveys if deemed significant)

This survey protocol applies to the following features:

- th3
- th10
- th26
- th38
- th41
- th46
- th5
- th19
- th28
- th39
- th42
- th62
- th9
- th21
- th29
- th40
- th45
- th69

Monitoring Frequency and Timing

Prior to conducting evaluation of significance surveys, additional site investigation work will be conducted to determine if current land use within candidate habitats meet the habitat requirements as outlined in the Ecoregion criterion schedule (exposed sand and gravel deposits). If habitat is, then EOS surveys need to be completed as follows.

Candidate habitats will be surveyed on three separate dates during the breeding season (June to July) to make direct observations of turtle nesting and/or nesting evidence (e.g. hatched eggs and/or nests that have been dug up by predators).

Walking surveys will occur to systematically inspect all areas of exposed mineral (sand or gravel) substrates, spending a minimum of 15 minutes for every 100m² of candidate nesting substrate.

Data Collection

All surveys will be conducted by a qualified biologist. Data should include the start and stop times of each survey, a description of the equipment used (note: each survey location should use the same acoustic equipment on the same settings for comparison purposes), species, numbers and locations of all species observations. Surveyors will map and photo-document areas of exposed substrates, and photo-document any observed nesting evidence. Additional information that will be recorded on the appropriate data forms include:

- Weather conditions (temperature, wind speed (on a Beaufort scale), % cloud cover, and presence of any precipitation should be recorded);
- Date and time of day;

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HABITAT**

Appendix A - Survey Methods

August 28, 2013

- GPS coordinates of the point location; and
- Name of the observer doing field work.

Analysis and reporting

These surveys will be conducted for a period of one year commencing the first spring following completion of construction activities. MNR, along with the proponent and other relevant agencies, will be asked to collectively review the results of the post-construction monitoring to determine if an ecologically significant disturbance / avoidance effect is occurring, and whether such an effect is attributable to the construction of the transmission line and not external factors. These discussions will determine if and when the contingency plan will be implemented and if any additional measures are warranted. The best available science and information will be considered when determining appropriate mitigation.

A.5 AMPHIBIAN BREEDING HABITAT (WOODLAND AND WETLAND)

Monitoring Locations (post-construction surveys)

- | | | |
|--------|--------|--------|
| • ah2 | • ah29 | • ah31 |
| • ah9 | | |
| • ah37 | • ah38 | • ah49 |
| • ah57 | • ah61 | • ah89 |
| • ah25 | • ah35 | • ah83 |

Data Collection

Post-construction habitat use surveys will be conducted in the spring to determine the use of significant amphibian habitat within 30m of proposed access roads and to assess potential impacts during construction.

Surveys to confirm breeding activities will be undertaken during the spring (April-June) when amphibians are concentrated around suitable breeding habitat within or near the woodlands and wetland communities. Evaluation methods to determine significance follow the Marsh Monitoring protocol (BSC, 2003). Similar methods (i.e. location, protocols, timing) will be used for the post-construction monitoring.

Monitoring Frequency and Timing

Based on the protocols set out in the Marsh Monitoring Program (BSC, 2003), three separate call surveys will be completed for breeding amphibians (frogs and toads) in woodland ponds. Surveys are temperature dependent. The first survey window will fall between April 1 and April 30, or when the night-time temperatures are consistently above 5°C. The second survey window will fall between May 1 and May 31, or when the night-time temperatures are consistently above 10°C. The third survey window will fall between June 1 and June 30, or when the night-time temperatures are consistently above 17°C.

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ENVIRONMENTAL EFFECTS MONITORING PLAN FOR WILDLIFE AND WILDLIFE
HABITAT**Appendix A - **Survey Methods**

August 28, 2013

Surveys are time sensitive, and will be conducted half an hour after sunset, with appropriate temperature conditions (as noted above). Surveys will be repeated at the stations established during the pre-construction surveys discussed in the NHA/EIS. For each survey, the surveyor will observe for 3 minutes at each station, recording the different amphibian species heard and observed, and the approximated level of calling heard by each individual(s). Additional information that will be recorded on the appropriate data forms include:

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

Analysis and Reporting

These surveys will be conducted for a period of one year commencing the first spring following completion of construction activities. MNR, along with the proponent and other relevant agencies, will be asked to collectively review the results of the post-construction monitoring to determine if an ecologically significant disturbance / avoidance effect is occurring, and whether such an effect is attributable to the construction of the transmission line and not external factors. These discussions will determine if and when the contingency plan will be implemented and if any additional measures are warranted. The best available science and information will be considered when determining appropriate mitigation.

A.6 WETLAND AND WOODLAND HYDROLOGY

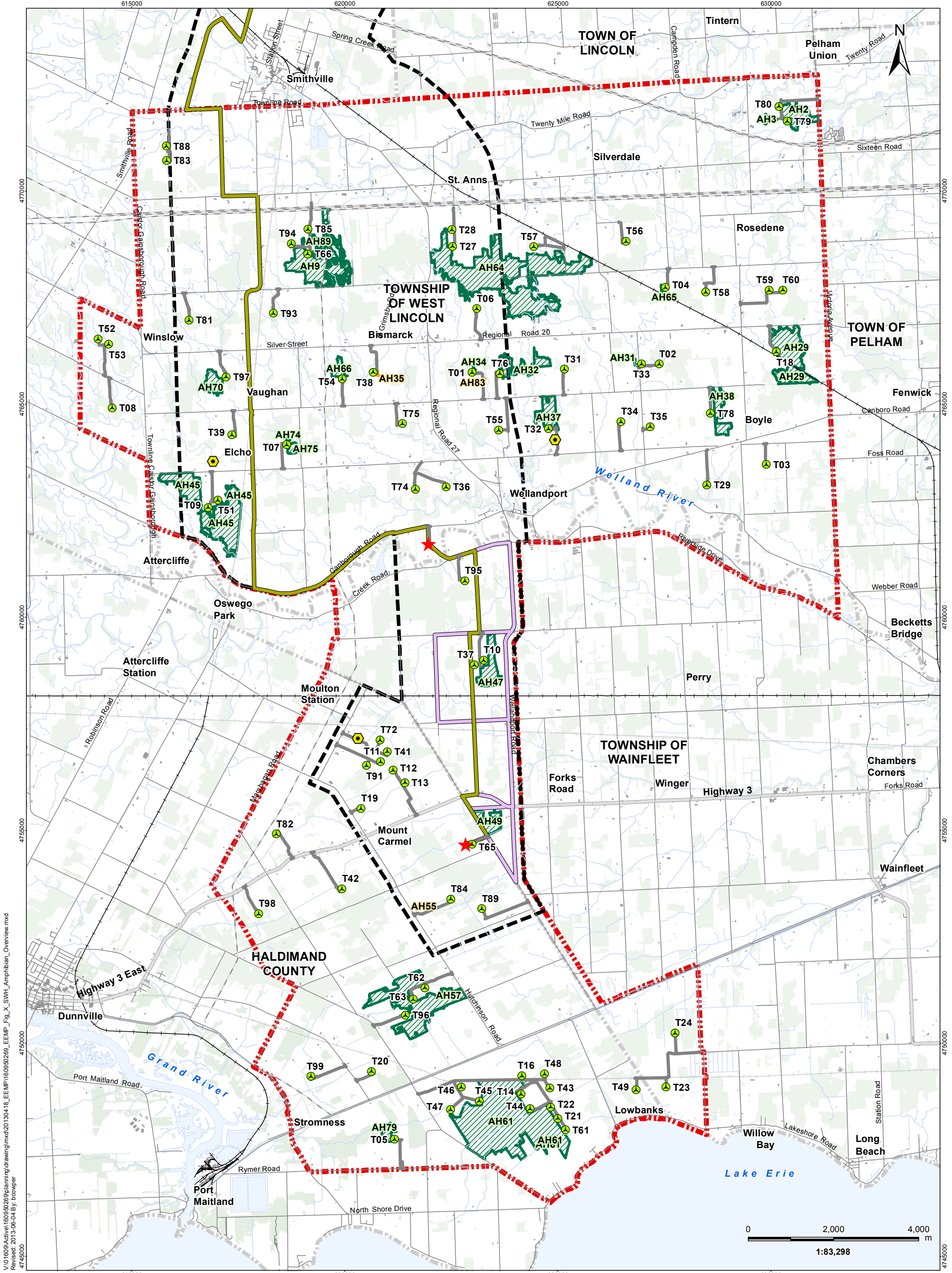
All components of the Project are sited outside significant wetlands and significant woodlands; therefore, there will be no direct loss or fragmentation of significant wetland or significant woodland habitat. Potential indirect effects may arise through changes to hydrology during or after construction as a result of the construction of access roads.

Data Collection

Each significant wetland and significant woodland located within 30 m of an access road will be inspected once seasonally in Spring and Summer during the first year post-construction for signs of sedimentation resulting from the access roads and / or signs of hydrologic changes (i.e., flooding, drying) as a result of access road construction.

APPENDIX B

FIGURES



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 Revised: 2013-06-04 By: bczwper



Legend

- Project Study Area
- Interconnector Study Area
- Proposed Turbine Location
- Potential Access Road
- Transformer Substation
- Tap-in Location
- Existing Met Tower
- Preferred Transmission Line Route
- Alternate Transmission Route
- Road
- Expressway / Highway
- Active Railway
- Abandoned Railway
- Existing Structures
- Existing Transmission Line
- Watercourse
- Waterbody
- Wooded Area
- Municipality Lower Tier
- Significant Woodland Amphibian Breeding Habitat - All Requiring Pre-construction Survey
- Significant Wetland Amphibian Breeding Habitat - All Requiring Pre-construction Survey

Notes

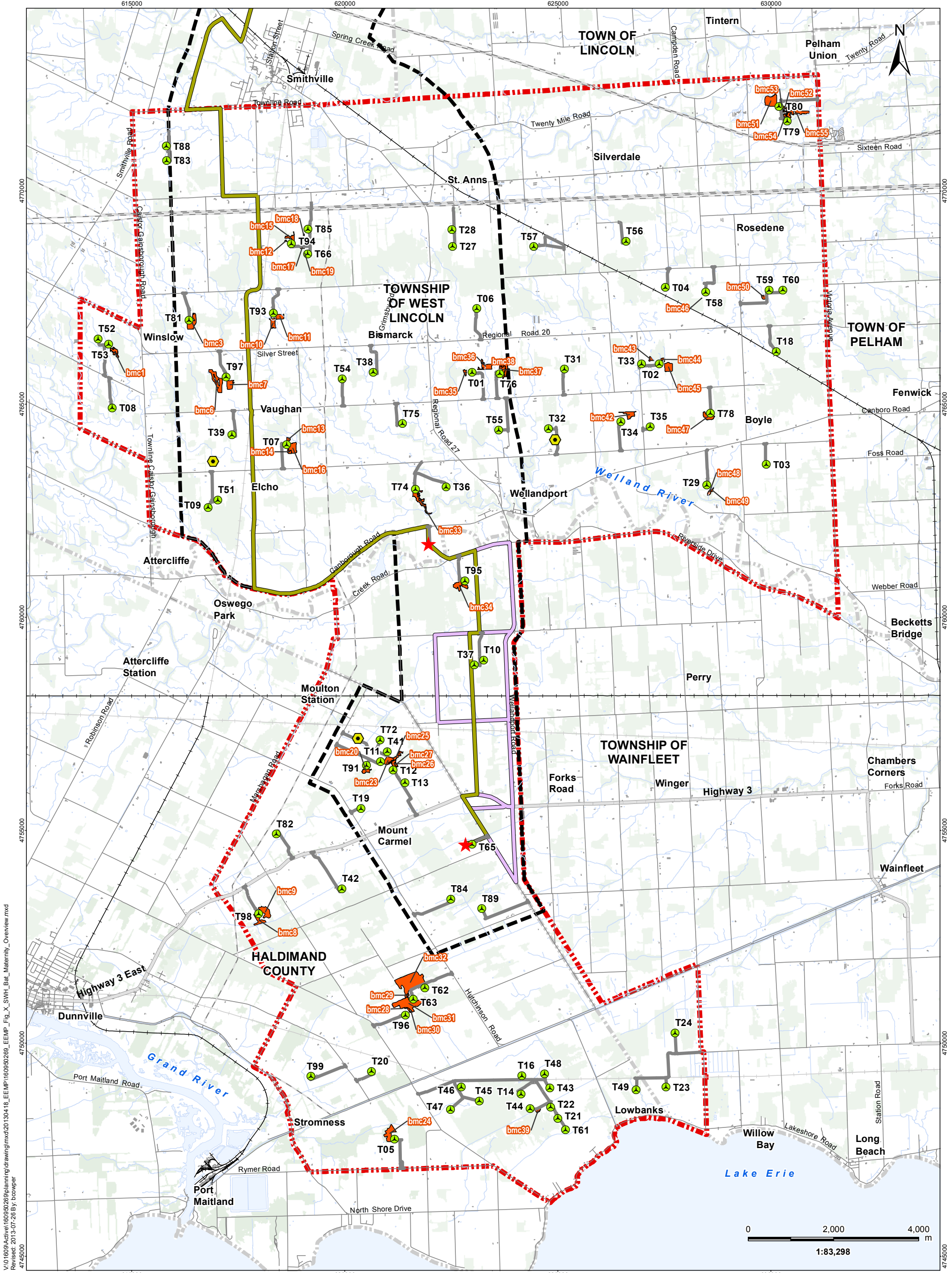
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2012.

Client/Project
 Niagara Region Wind Corporation
 Niagara Region Wind Farm

Figure No.
 1

Title
Amphibian Habitats

June 2013
 160950269



V:\101609\Active\160950269\planning\drawing\mxd\20130418_EEMP\160950269_EEMP_Fig_X_SWH_Bat_Maternity_Overview.mxd
 Revised: 2013-07-26 By: bobwper



Legend

- Project Study Area
- Interconnector Study Area
- Proposed Turbine Location
- Potential Access Road
- Transformer Substation
- Tap-in Location
- Existing Met Tower
- Preferred Transmission Line Route
- Alternate Transmission Route
- Road
- Expressway / Highway
- Active Railway
- Abandoned Railway
- Existing Structures
- Existing Transmission Line
- Watercourse
- Waterbody
- Wooded Area
- Municipality Lower Tier
- Bat Maternity Colonies - All Requiring Pre-construction Survey

Notes

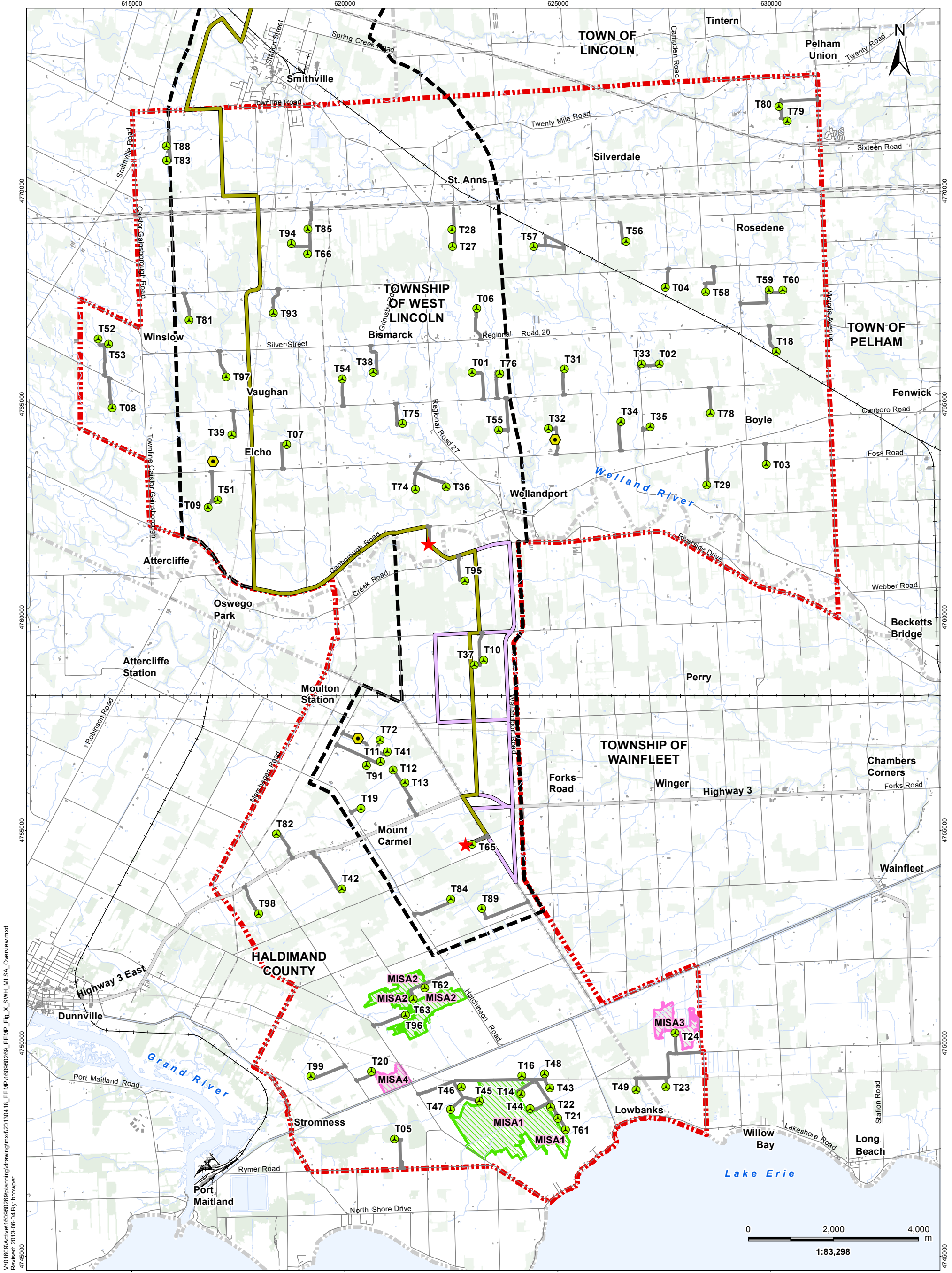
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 Niagara Region Wind Farm

Figure No.
 2

Title
Bat Maternity Colonies

July 2013
 160950269



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Legend

- Project Study Area
- Interconnector Study Area
- Proposed Turbine Location
- Potential Access Road
- Transformer Substation
- Tap-in Location
- Existing Met Tower
- Preferred Transmission Line Route
- Alternate Transmission Route
- Road
- Expressway / Highway
- Active Railway
- Abandoned Railway
- Existing Structures
- Existing Transmission Line
- Watercourse
- Waterbody
- Wooded Area
- Municipality Lower Tier
- Landbird Migratory Stopover
- Significant
- Pre-construction Survey

Notes

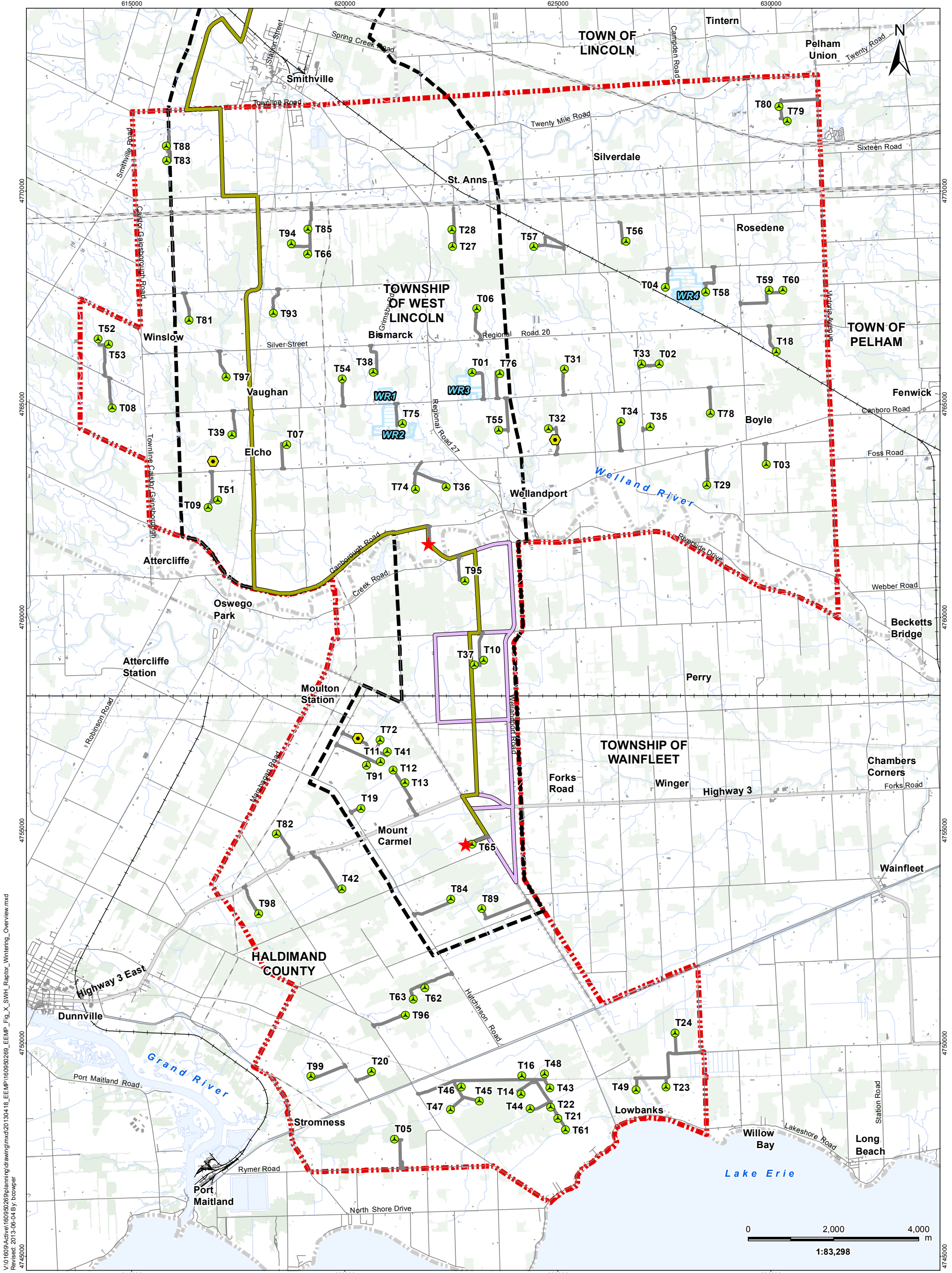
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 Niagara Region Wind Farm

Figure No.
3

Title
Landbird Migratory Stopover

June 2013
 160950289



V:\101609\Active\160950289\planning\drawing\mxd\20130418_EEMP\160950289_EEMP_Fig_X_SWH_Raptor_Wintering_Overview.mxd
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Legend

- Project Study Area
- Interconnector Study Area
- Proposed Turbine Location
- Potential Access Road
- Transformer Substation
- Tap-in Location
- Existing Met Tower
- Preferred Transmission Line Route
- Alternate Transmission Route
- Road
- Expressway / Highway
- Active Railway
- Abandoned Railway
- Existing Structures
- Existing Transmission Line
- Watercourse
- Waterbody
- Wooded Area
- Municipality Lower Tier
- Raptor Wintering Areas - All Significant

Notes

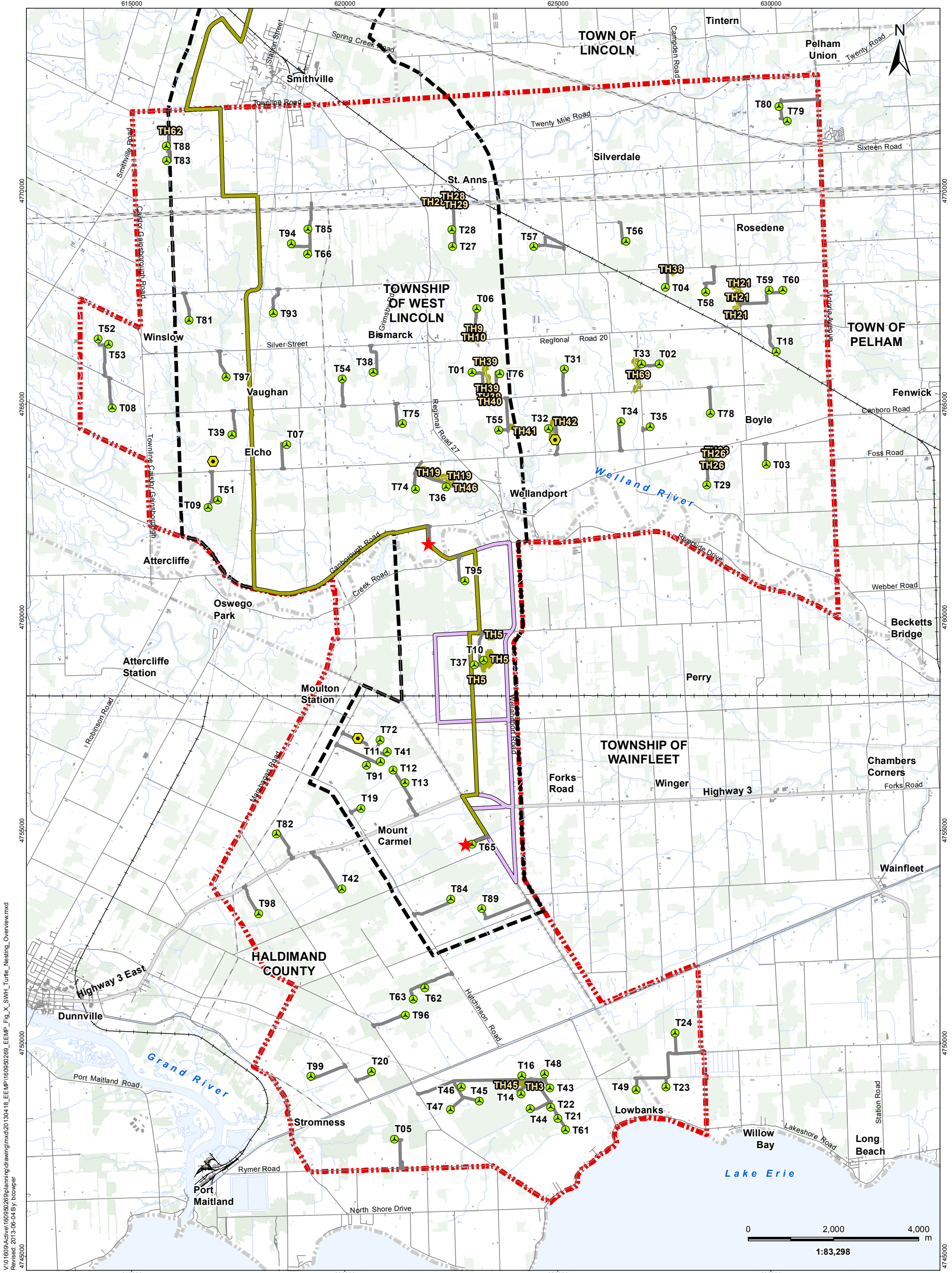
1. Coordinate System: NAD 1983 UTM Zone 17N
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 Niagara Region Wind Farm

Figure No.
4

Title
Raptor Wintering Areas

June 2013
 160950289



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 Revised: 2013-06-04 By: bczwper
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Legend

- Project Study Area
- Interconnector Study Area
- Proposed Turbine Location
- Potential Access Road
- Transformer Substation
- Tap-in Location
- Existing Met Tower
- Preferred Transmission Line Route
- Alternate Transmission Route
- Road
- Expressway / Highway
- Active Railway
- Abandoned Railway
- Existing Structures
- Existing Transmission Line
- Watercourse
- Waterbody
- Wooded Area
- Municipality Lower Tier
- Turtle Nesting Habitat/Shapping Turtle Habitat - All Requiring Pre-construction Survey
- Turtle Habitat 30m Buffer

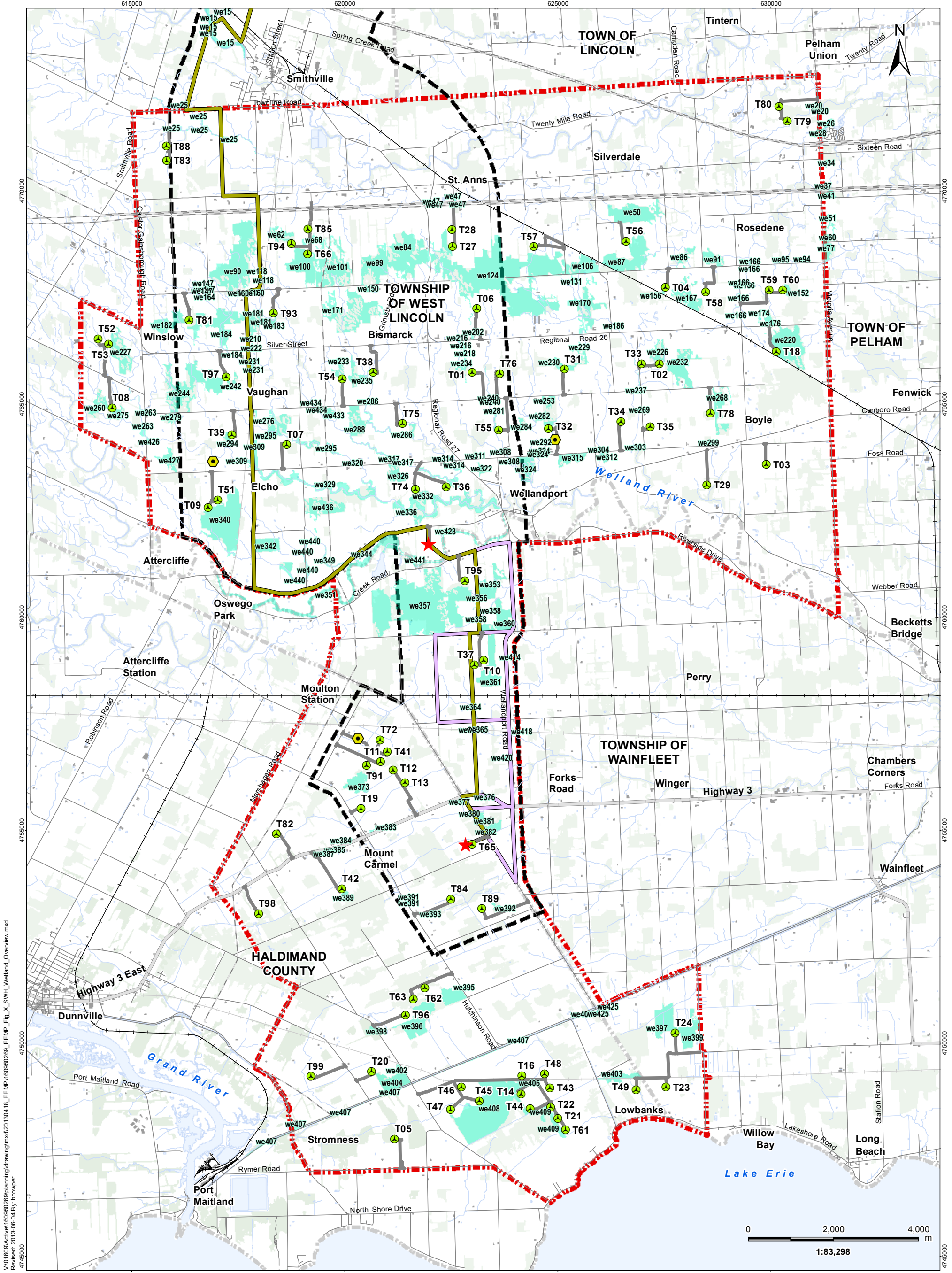
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 Niagara Region Wind Farm

Figure No.
5
 Title
Turtle Nesting Habitat

June 2013
 160950269



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 Revised: 2013-06-04 By: bcbwper
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Legend

- Project Study Area
- Interconnector Study Area
- Proposed Turbine Location
- Potential Access Road
- Transformer Substation
- Tap-in Location
- Existing Met Tower
- Preferred Transmission Line Route
- Alternate Transmission Route
- Road
- Expressway / Highway
- Active Railway
- Abandoned Railway
- Existing Structures
- Existing Transmission Line
- Watercourse
- Waterbody
- Wooded Area
- Municipality Lower Tier
- Significant Wetland Communities

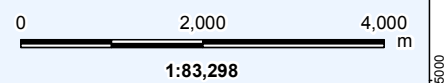
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1. Coordinate System: NAD 1983 UTM Zone 17N
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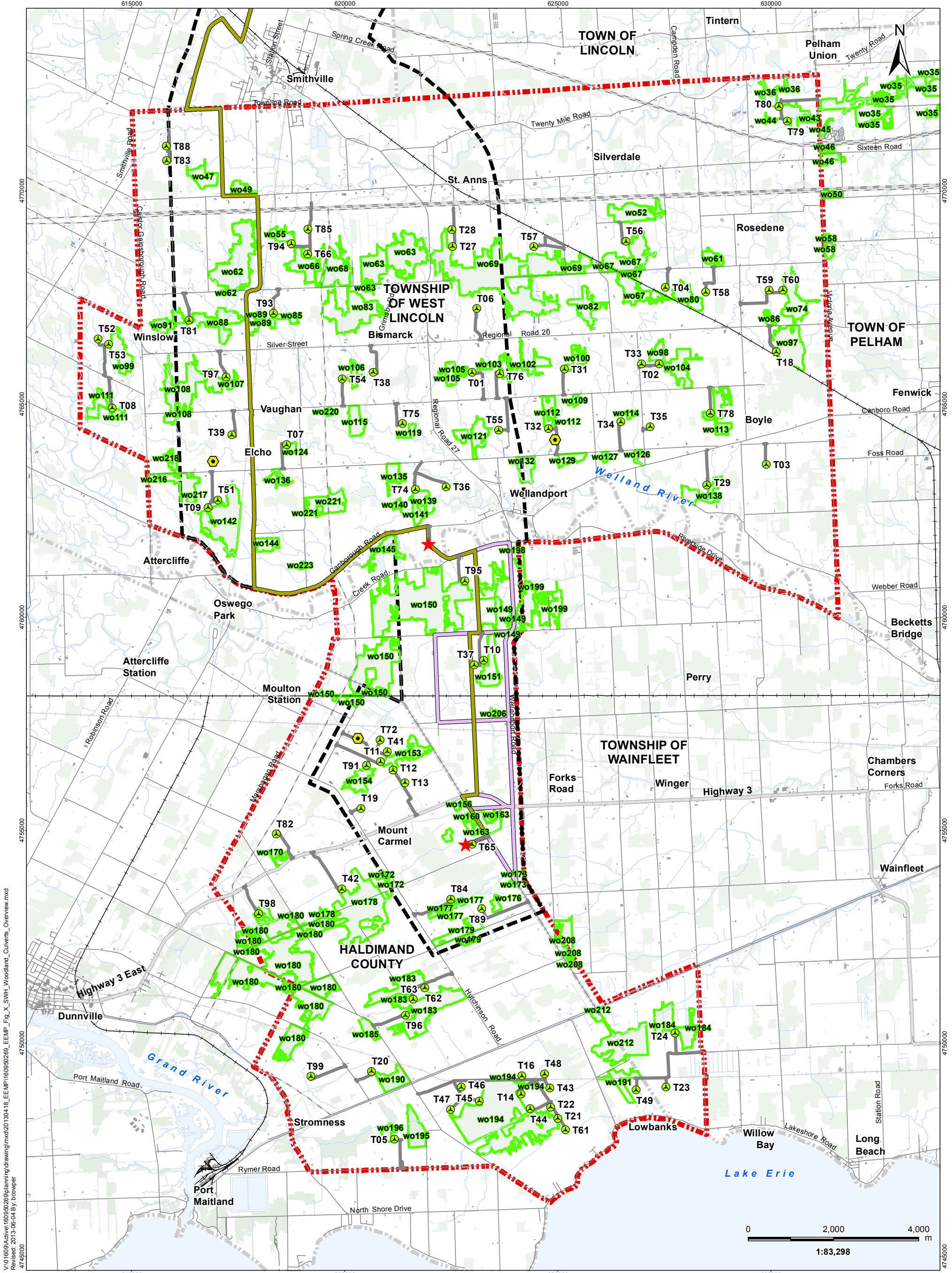
Client/Project
 Niagara Region Wind Corporation
 Niagara Region Wind Farm

Figure No.
6

Title
Significant Wetland



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- ### Legend
- Project Study Area
 - Interconnector Study Area
 - Proposed Turbine Location
 - Potential Access Road
 - ★ Transformer Substation
 - ★ Tap-in Location
 - Existing Met Tower
 - Preferred Transmission Line Route
 - Alternate Transmission Route
 - Road
 - Expressway / Highway
 - Active Railway
 - Abandoned Railway
 - Existing Structures
 - Existing Transmission Line
 - Watercourse
 - Waterbody
 - Wooded Area
 - Municipality Lower Tier
 - Significant Woodland Communities

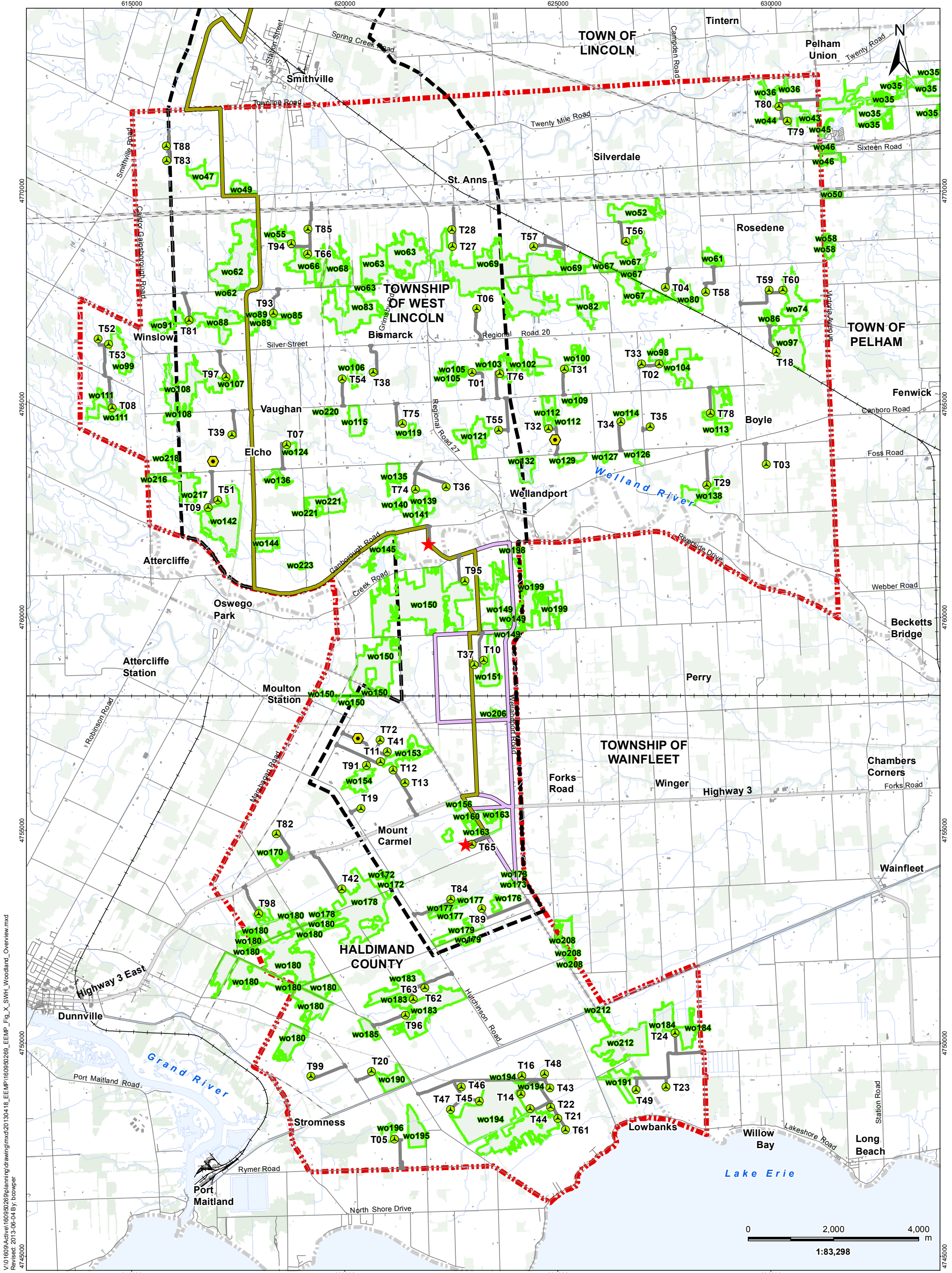
- ### Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
 2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2012.

Client/Project
 Niagara Region Wind Corporation
 Niagara Region Wind Farm

Figure No.
 7

Significant Woodland and Proposed Culvert Locations

June 2013
 160950269



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Legend	
	Project Study Area
	Interconnector Study Area
	Proposed Turbine Location
	Potential Access Road
	Transformer Substation
	Tap-in Location
	Existing Met Tower
	Preferred Transmission Line Route
	Alternate Transmission Route
	Road
	Expressway / Highway
	Active Railway
	Abandoned Railway
	Existing Structures
	Existing Transmission Line
	Watercourse
	Waterbody
	Wooded Area
	Municipality Lower Tier
	Significant Woodland Communities

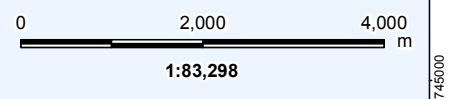
Notes

- Coordinate System: NAD 1983 UTM Zone 17N
- Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2012.

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Figure No.
 8

Title
Significant Woodland



APPENDIX C

WIND ENERGY BIRD AND BAT MONITORING DATABASE TEMPLATES

Overview of templates for Natural Heritage Assessment Reports and Post-construction Mortality Monitoring Reports

Report the data from these forms onto the provided Excel templates. Each form correspond to at least one Excel sheet. Refer to the instructions in the Excel templates and at the top of each form.

Pre-construction Field Forms

1. Site Description Form (Bird and Bat Habitat Monitoring)
- 2a. Bird Monitoring Field Form (one record per species)
- 2b. Bird Monitoring Field Form (alternative version, for reporting details on individual birds)

Wind Energy Bird and Bat Monitoring Database (pre-construction)

1. Site Description Form (Bird and Bat Habitat Monitoring)

Complete one Site Description Form for each monitoring site (i.e. each monitoring site sampled, once per season). Every monitoring site should have a unique site number, also referenced in other field sheets. A monitoring site may be used to conduct point counts, transect, area searches, migration monitoring, etc. Report each Site Description Form as a record in the data template (site_descr_monitoring).

Project name : _____

Province : _____ **Site number :** _____

Date completed (dd/mm/yyyy): ____/____/20____

UTM coordinates of the monitoring site (e.g., center of monitoring area)

Zone: _____ **Easting:** _____ **Northing :** _____

Slope : _____ ° **Orientation of slope :** _____ (e.g., SSW)

Type of monitoring (e.g., point count) : _____ **pre/post:** _____

Survey area : _____ m² **Transect length :** _____ m

Habitat description :

Distance from the site to the following features:

Distance to nearest wood : _____ m

Distance to nearest shoreline : _____ m

Distance to nearest wetland : _____ m

Distance to nearest Significant Wildlife Habitat : _____ m

Type of Significant Wildlife Habitat (e.g. hibernacula) _____

Overview of templates for Natural Heritage Assessment Reports and Post-construction Mortality Monitoring Reports

Report the data from these forms onto the provided Excel templates. Each form correspond to at least one Excel sheet. Refer to the instructions in the Excel templates and at the top of each form.

Post-construction Field Forms

1. Site Description Form (Carcass searches)
2. Site Description and Carcass
Distribution Form (Carcass searches)
3. Bird/Bat Carcass Searches Form
4. Searcher Efficiency Trials Form
5. Searcher Efficiency Trials Summary Form
6. Carcass Removal Trials Form
7. Carcass Removal Trials Summary Form

Wind Energy Bird and Bat Monitoring Database (post-construction)

1. Site Description Form (Carcass Searches)

Complete one Site Description Form for each turbine search (i.e. Each turbine sampled, once per season). Every turbine should have a unique turbine number, also referenced in other field sheets. Report each Site Description Form as a record in the data template (site_descr_carcass).

Project name : _____

Province : _____ **Turbine number :** _____

Date completed (dd/mm/yyyy) : ____/____/20____

UTM coordinates of the turbine :

Zone: _____ **Easting:** _____ **Northing :** _____

Slope : _____ ° **Orientation of slope :** _____ (e.g., SSW)

Required survey area : _____ m² (e.g. 7,854 m² for 50 m radius)

Transect separation : _____ m

Habitat description :

Distance from the turbine to the following features:

Distance to nearest wood : _____ m

Distance to nearest shoreline : _____ m

Distance to nearest wetland : _____ m

Distance to nearest Significant Wildlife Habitat : _____ m

Type of Significant Wildlife Habitat (eg. hibernacula): _____

Turbine details :

Power : _____ Megawatts

Turbine height (from ground to top of nacelle) : _____ m

Turbine blade diameter : _____ m

Wind Energy Bird and Bat Monitoring Database (post-construction)

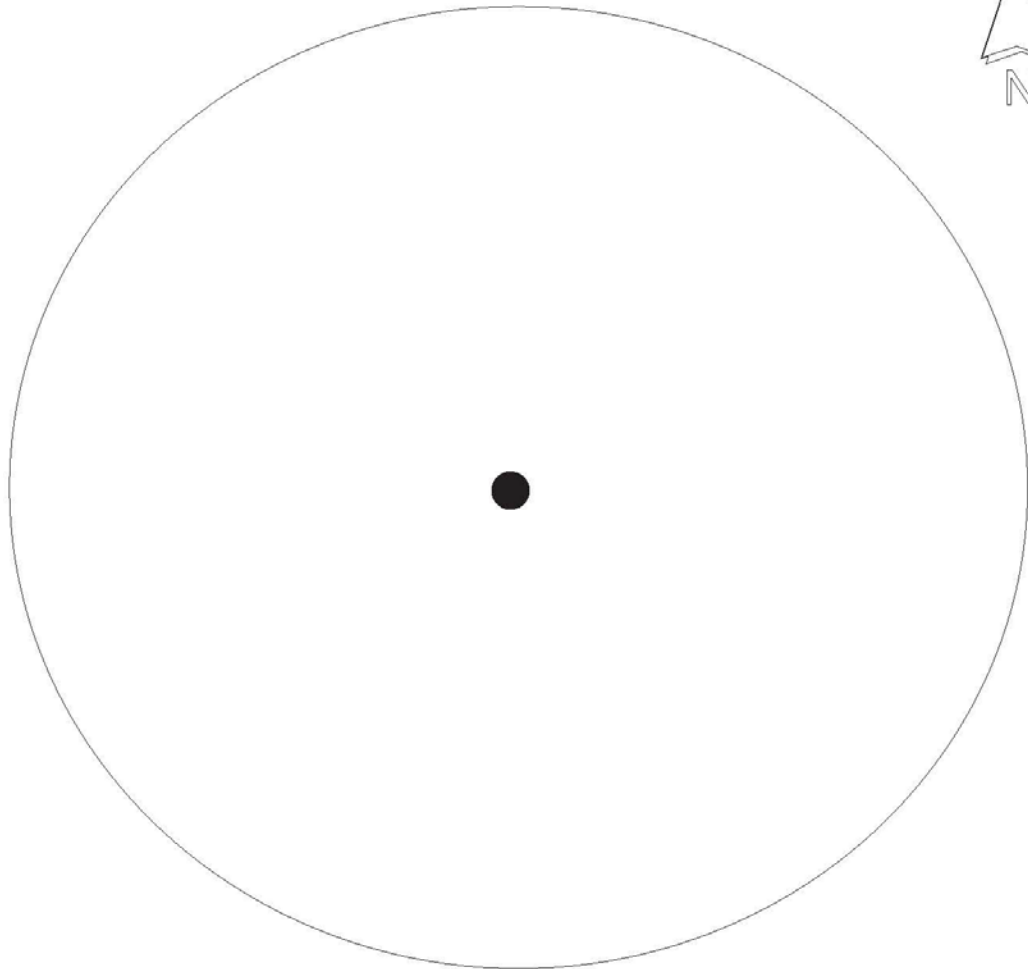
2. Site Description and Carcass Distribution Form (Carcass Searches)

Map the search plot, indicating visibility classes, substrate, carcass locations and area searched
This form should be provided for information with the reports, and does not contain information that
needs to be transferred to the Excel data templates.

Project name: _____

Site number : _____

Year : _____



Wind Energy Bird and Bat Monitoring Database (post-construction)

5. Searcher Efficiency Trials Summary Form

Project name: _____ Year : _____

Spring (May-June)

Searcher	Number of carcasses placed	Number scavenged	Number found	Proportion found	Proportion turbines searched	Weighted searcher efficiency Se
Spring Total					100%	

Summer (July-August)

Searcher	Number of carcasses placed	Number scavenged	Number found	Proportion found	Proportion turbines searched	Weighted searcher efficiency Se
Summer Total					100%	

Fall (September-October)

Searcher	Number of carcasses placed	Number scavenged	Number found	Proportion found	Proportion turbines searched	Weighted searcher efficiency Se
Fall Total					100%	

Wind Energy Bird and Bat Monitoring Database (post-construction)

7. Carcass Removal Trials Summary Form

Project name: _____ Year : _____

Spring (May-June)

Turbine Number	Number of carcasses placed (N0)	Number of carcasses found per visit			Scavenger correction SC
		N1	N2	N3	

Spring Total

Summer (July-August)

Turbine Number	Number of carcasses placed (N0)	Number of carcasses found per visit			Scavenger correction SC
		N1	N2	N3	

Summer Total

Fall (September-October)

Turbine Number	Number of carcasses placed (N0)	Number of carcasses found per visit			Scavenger correction Sc
		N1	N2	N3	

Fall Total