Figure 3

East Durham Wind Energy Centre

Generalized Bat Maternity Colony Habitat

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Date: September 13, 2012
Project: NRSI-1217
NAD83 - UTM Zone 17
Scale: 1:30,000 (11 x 17")

520000 521500 523000 524500 526000 527500 529000 530500

4898500 4897000 4895500 4894000 4892500

N

CONC 4
4TH CONC A
SIDERD 10
TLINE ARTEMESIA GLENELG
2ND CONC
GLENELG RD 23
NORTHLINE
SIDERD 40
SAUGEEN ST
PRINCE ST
TORRY ST
CAMP OLIVER RD
THE GLEN RD
GREY RD 4
GREY RD 23
BOOT JACK RANCH RD
SOUTHLINE
SIDERD 50

1 2 3 4 5 6 7 8 10 11 12 13 14 15 16 17

Legend

- Generalized Bat Maternity Colony Habitat
- Project Area (120m Buffer)
- MET Tower
- Proposed Turbine
- Collection Line
- Access Road
- Substation
- Laydown Area
- Construction Area
- Utility Line
- Highway
- Primary Road
- Secondary Road
- Watercourse
- Waterbody
- Wooded
- Provincially Significant Wetland

Meters
0 500 1,000 1,500

Path: X:\1217_EastDurhamWF\NRSI_1217_Fig3_GeneralizedHabitat_30K_2012_09_05_SWM.mxd

3.5 Site Investigation Summary

NRSI did not identify any candidate bat hibernacula in the East Durham Wind Energy Centre project area. However, 10 potential bat maternity colony habitats were identified in woodlands found within 120m of proposed wind turbines. These are summarized in Table 6 below.

There is one candidate significant habitat (BMA-001) to be carried forward to the Evaluation of Significance phase. Two habitats (BMA-005 and BMA-006) could not be surveyed due to restrictions in site access, while one other habitat (BMA-007) was identified after site investigation surveys had occurred. These three habitats (BMA-005, BMA-006 and BMA-007) will be treated as significant and carried forward to the Evaluation of Significance.

Table 6. Summary of Potential Bat Maternity Colony Habitats within 120m of or Overlapped by the East Durham Wind Energy Centre

Wildlife Habitat ID	Distance to Closest Turbine (from blade tip) (m)	Cavity Tree Density (per ha)	Evaluation of Significance Required (Y/N)
Wind Energy Centre Habitats			
BMA-001	51	10.0	**Yes**
BMA-002	10	5.1	**No**
BMA-003	29	6.4	**No**
BMA-004	Overlapping	2.5	**No**
BMA-005	Overlapping	N/A	**Yes**
BMA-006	7	N/A	**Yes**
BMA-007	100	N/A	**Yes**
BMA-008	17	4.0	**No**
BMA-009	Overlapping	1.2	**No**
BMA-010	10	4.6	**No**

4.0 Evaluation of Significance

In accordance with the REA Regulation, NRSI biologists conducted field surveys to evaluate the significance of the 1 candidate significant and 3 treated as significant bat maternity colony habitats identified as part of the site investigation phase of this project. The evaluation of significance followed the *Bats and Bat Habitats: Guidelines for Wind Power Projects* (OMNR 2011a) bat monitoring protocol.

4.1.1 Staff Roles

The requirements of the REA Regulation indicate that the name and qualifications of all staff participating in the evaluation of significance should be included. As a result, the qualifications and roles of all staff participating in the evaluations of significance at the East Durham Wind Energy Centre have been outlined in the following sections. Qualifications of staff that also assisted in the site investigation are listed in Section 3.1.1.

Jason Kerr, M.Sc.
Jason is a Terrestrial Biologist with six years of experience working in the natural resource sector, primarily conducting research in forestry and terrestrial ecology. Jason completed his Master's degree in Environmental Biology in 2008 from the University of Guelph that examined the impacts of forest operations on the water chemistry of small, headwater boreal lakes. He returned to school in 2010 and completed the Ecosystem Management Technology program at Fleming College. Prior to joining NRSI, Jason has held research technician positions with the Ontario Forest Research Institute and the University of Toronto, Faculty of Forestry.

Jason completed bat exit surveys within the project area.

Matt Dil, M.E.S.
Matt is a Terrestrial Biologist with five years of experience in avian biology and other areas of environmental research including agriculture and soil science. Matt recently completed his Masters in Environment and Resource Studies at the University of Waterloo and prior to this he completed a Bachelor of Science in Biology at the University of Victoria. He completed a Master's thesis that investigated the use of biochar (charcoal) as a soil amendment and climate change mitigation strategy. Past field technician positions include Species at Risk surveys for the British Columbia Ministry of Environment on Vancouver Island, and endangered songbird research with Texas A&M University in central Texas.

Matt completed bat exit surveys for the East Durham Wind Energy Centre.

Nelson Zabel
Nelson is a Terrestrial Biologist working on contract at NRSI. He is in his third year of undergraduate studies in Environmental Science at the University of Waterloo. Nelson has two months experience working with NRSI, primarily on bat maternity colony monitoring and Species At Risk surveys, as well as ecological community mapping and wetland evaluations. He has field experience regarding kettle hole wetland systems and ecology.

Nelson assisted with bat exit surveys in the project area.

Shawn MacDonald B.A., GIS-AS
Shawn has more than 3 years experience in renewable energy mapping and asset management systems. As a Geographic Information Systems (GIS) Analyst Shawn specializes in projects relating to wind, solar and hydro electric power. Shawn has a variety of project and field experience using GIS, GPS and AutoCAD technology throughout all stages of a renewable energy project. This experience is not limited to renewable energy alone as Shawn has been involved in a number of projects relating to terrestrial and aquatic habitat mapping, environmental restoration and spatial/3D analysis.

Shawn's role in the Project was as GIS technician and map creator. He reviewed and collected all available background mapping resources to compile into Project mapping.

4.1.2 Evaluation Dates

In accordance with the REA Regulation, NRSI recorded dates, times, duration, and weather conditions during each evaluation of significance. This information has been summarized in Table 7, and detailed field forms have been attached in Appendix II. Detailed descriptions of key staff roles and qualifications can be found in Section 4.1.1 of this report.

Table 7. Evaluation of Significance Survey Date for the East Durham Wind Energy Centre

Staff	Purpose	Date (2012)	Feature ID	Start Time	Duration (hours)	Weather Conditions		
						Temp. (°C)	Beaufort Wind Scale	Cloud Cover (%)
Jason Kerr, Nelson Zabel, Matt Dil, John Wood	Bat exit surveys	June 27	BMA-001	18:41	4.25	22	0	15%

4.2 Evaluation of Significance Methods

4.2.1 Identification of Suitable Trees

According to the current guidance document *Bats and Bat Habitats: Guidelines for Wind Power Projects* (OMNR 2011a), woodlands that contain a snag/cavity tree density of ≥10 snags/cavity trees per hectare of trees ≥25 cm dbh are considered candidate maternity colony roosts. The minimum level of effort required to evaluate the significance of these maternity roosts is the following (OMNR 2011a):

- a minimum of 10 snags/cavity trees for areas ≤10 hectares,
- one snag/cavity tree for each hectare for areas ≤30 hectares, and
- a maximum of 30 snags/cavity trees for areas ≥30 hectares

Snags/cavity trees ≥25 cm dbh were selected for evaluation based on the following criteria, in order of importance (OMNR 2011a):

- tallest snag/cavity tree
- exhibits cavities or crevices most often originating as cracks, scars, knot holes or woodpecker cavities
- has the largest diameter at breast height
- is within the highest density of snags/cavity trees (e.g. clusters of snags)
- has a large amount of loose, peeling bark
- cavity or crevice is high in snag/cavity tree (>10m)
- tree species that provide good cavity tree habitat (e.g. white pine, maple, aspen, ash, oak)
- canopy is more open
- exhibits early stages of decay (decay Class 1-3)

4.2.2 Bat Exit Surveys

Candidate roost trees were surveyed using criteria specified in the *Bats and Bat Habitats: Guidelines for Wind Power Projects* (OMNR 2011a) guidance document. All bat exit surveys were conducted on June 27, 2012. Each candidate tree was surveyed once, from 30 minutes before dusk until 60 minutes after dusk, in order to best detect bats entering or exiting a cavity tree. Observers set up a viewing station with a clear aspect of the cavity opening or crevice, which consisted of an Infrared video camera (Sony Handycam HDR-PJ710) on a tripod that was equipped with an evening infrared setting and an additional infrared spotlight directed at the cavity entrance. A broadband bat detector (Pettersson D240X) was used in conjunction with the visual observations in order to determine the bat species observed or heard. The same broadband detector was used throughout the surveys, and individually paired with each video camera.

Microphones and video cameras were 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). Video footage was reviewed to analyze the number of bats entering and exiting cavities, as well as identifying the number of 'fly-bys' or bats heard but not observed in the video recording. Audio data collected is analyzed only if bat activity is documented while reviewing the video data.

In addition to the surveys methods outlined above, biologists conducted a five minute visual survey of each selected cavity tree with a spotlight. The light was shined in and around the cavity in order to detect any bats that may be using that habitat. These additional surveys took place during the timing window outlined above and supplemented the survey methods required by the MNR.

For each monitoring event, NRSI recorded the following information:

- level of effort (including date, start and end time, time spent, weather conditions, etc.),
- name of observer(s) conducting field work and number of video recorders used,
- record of bats observed (time of observation, number of passes),
- a bat detector collected audio recordings of bat passes for species identification following the completion of the monitoring,
- description of the snag/cavity tree observed along with photographs,
- GPS point of the survey location.

The number of bats observed during these bat exit surveys was analyzed to determine the significance of the maternity colony habitat. Criteria for evaluating the significance of bat maternity colony habitats can be found in Table 8.

Table 8. Bat Habitat Evaluation of Significance Criteria

Concentration Area	Standards of Significance
Bat Maternity Colony	- Significant maternity colonies include at least 20 northern long-eared bats (*Myotis septentrionalis*) or little brown bats (*Myotis lucifugus*), 10 big brown bats (*Eptesicus fuscus*), or 5 adult, female, silver-haired bats (*Lasionycteris noctivagans*) (OMNR 2011a).

4.3 Evaluation of Significance Results

In accordance with the REA Regulation, the presence of candidate significant bat maternity colonies within the project area has been reviewed by NRSI biologists. NRSI has used the results of the site investigation to evaluate the significance of the candidate significant bat maternity colony habitat identified within the project area. This evaluation of significance has been conducted using evaluation criteria outlined in applicable guidance documents, specifically the Ecoregion Criteria Schedules addendum to the Significant Wildlife Habitat Technical Guide, for Ecoregion 6E (OMNR 2012b).

4.3.1 Bat Maternity Colony Habitats

NRSI biologists have identified a total of 1 candidate significant bat maternity colony habitat located within 120m of wind turbines for the East Durham Wind Energy Centre. In addition, land access was denied at two candidate bat maternity colony habitats to conduct the site investigation and one was identified after the timing window had closed for evaluation of significance studies. As such, these features (BMA-005, BMA-006 and BMA-007) will be treated as significant and carried forward to the EIS, with a commitment to conduct pre-construction surveys, pending approved site access. The results of monitoring that has occurred at the candidate bat maternity colony habitat that is within 120m of proposed wind turbines is indicated below and all candidate and treated as significant sites are summarized in Table 10.

BMA-001

Based on the size of the candidate maternity roost habitat (18ha), 18 cavity trees were monitored within the woodland (see Figure 4 for cavity tree locations). During visual and acoustic surveys, no bats were recorded as entering or exiting the cavities of monitored trees in BMA-001. The survey results from each of the cavity trees are listed below in Table 9. Two bats were observed flying overhead of Tree N during the survey, although these individuals did not fly in or out of a cavity. No additional species calls were recorded during the surveys. As such, this woodland does not meet the criteria for a significant bat maternity colony and will not be carried forward to the Environmental Impact Study.

Table 9. Bat Exit Survey Results for Candidate Bat Maternity Colony Habitat BMA-001

Tree ID	Number of Bats Entering/Exiting the Cavity	Species Composition	Number of Fly-bys	Species Composition	Total Number of Bats Observed
Tree A	0	N/A	0	N/A	0
Tree B	0	N/A	0	N/A	0
Tree C	0	N/A	0	N/A	0
Tree D	0	N/A	0	N/A	0
Tree E	0	N/A	0	N/A	0
Tree F	0	N/A	0	N/A	0
Tree G	0	N/A	0	N/A	0
Tree H	0	N/A	0	N/A	0
Tree I	0	N/A	0	N/A	0
Tree J	0	N/A	0	N/A	0
Tree K	0	N/A	0	N/A	0
Tree L	0	N/A	0	N/A	0
Tree M	0	N/A	0	N/A	0
Tree N	0	N/A	2	Unknown	2
Tree O	0	N/A	0	N/A	0
Tree P	0	N/A	0	N/A	0
Tree Q	0	N/A	0	N/A	0
Tree R	0	N/A	0	N/A	0

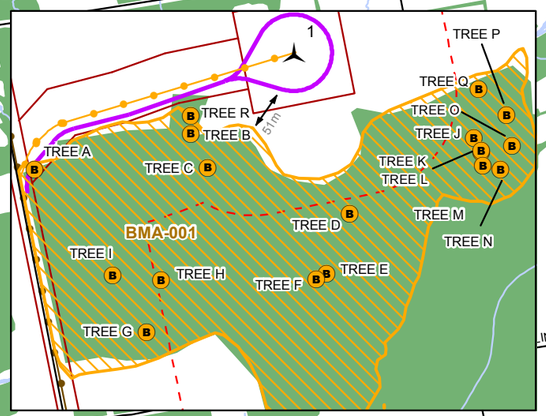
Figure 4

East Durham Wind Energy Centre

Candidate Significant Bat Maternity Colony Exit Survey Locations

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Date: October 17, 2012
Project: NRSI-1217
NAD83 - UTM Zone 17
Scale: 1:30,000 (11 x 17")



Meters
0 500 1,000 1,500

Legend

- Candidate Significant Bat Maternity Colony Habitat
- Project Area (120m Buffer)
- Cavity Tree Location
- MET Tower
- Proposed Turbine
- Collection Line
- Access Road
- Substation
- Laydown Area
- Construction Area
- Utility Line
- Highway
- Primary Road
- Secondary Road
- Watercourse
- Waterbody
- Wooded
- Provincially Significant Wetland

Path: X:\1217_EastDurhamWF\NRSI_1217_Fig4_BatExitSurveys_measurements_30K_2012_10_17_SWM.mxd

Table 10. Evaluation of Significance for Candidate Significant Bat Maternity Colony Habitats within 120m of the East Durham Wind Energy Centre

Wildlife Habitat ID	Size (ha)	Composition	Distance to Wind Turbine (from blade tip) (m)	Evaluation Methods	Evaluation Results	Provincial Criteria	Significance	EIS Required (Y/N)
BMA-001	15.2	Dominated by sugar maple, with some white ash and few American beech, eastern hemlock and ironwood.	51	Visual and acoustic monitoring	**Acoustic Results:** None observed **Fly-bys:** 2 individual bats, species unknown	20 N. Long-eared Bats 20 Little Brown Bats 10 Big Brown Bats 5 adult, female Silver-haired Bats	Not Significant	**No**
BMA-005	7.3	This woodland is dominated by sugar maple species.	Overlapping	No property access to conduct studies	No property access to conduct studies		Treated as Significant	**Yes**
BMA-006	6.2	This woodland is dominated by scotch pine and contains some sugar maple and black cherry.	7	Pre-construction surveys to be completed	Pre-construction surveys to be completed		Treated as Significant	**Yes**
BMA-007	1.5	This woodland is dominated by sugar maple.	100	Pre-construction surveys to be completed	Pre-construction surveys to be completed		Treated as Significant	**Yes**

4.4 Evaluation of Significance Summary

Following criteria in the Significant Wildlife Habitat Ecoregion Criterion Schedules for Ecoregion 6E (OMNR 2012b), and *Bats and Bat Habitats: Guidelines for Wind Power Projects* (OMNR 2011a), NRSI identified 1 woodland as candidate significant bat maternity colony habitat, which was surveyed following the appropriate provincial guidelines at the correct time of year. Surveys could not be conducted at 3 additional habitats and will be carried forward to the EIS as treated as significant habitats.

Based on information collected during the evaluation of significance, the surveyed habitat (BMA-001) was confirmed to not be significant habitat for bat maternity colonies according to provincial criteria. Surveys during the appropriate timing window could not be completed at BMA-005 and BMA-006, due to constraints in site accessibility at the time surveys were to be conducted. In addition, potential bat maternity colony habitat was identified at BMA-007 after the timing window to complete studies. Therefore, these features have been treated as significant for the purposes of the Environmental Impact Study. The evaluation of significance of these 4 habitats has been summarized in Table 11 below.

Table 11. Summary of Bat Habitats within 120m of the East Durham Wind Energy Centre

Wildlife Habitat ID	Feature Type	Distance to Closest Turbine (from blade tip)	Distance to Nearest Infrastructure	Type of Significance	EIS Required (Y/N)
BMA-001	Candidate Significant Bat Maternity Colony	51m (T1)	Overlapping (AR, CB)	Not Significant	**No**
BMA-005	Significant Bat Maternity Colony	Overlapping (T10)	Overlapping (WT)	Treated as Significant	**Yes**
BMA-006	Significant Bat Maternity Colony	7m (T11)	Overlapping (AR, CB)	Treated as Significant	**Yes**
BMA-007	Significant Bat Maternity Colony	100m (T16)	100m (WT)	Treated as Significant	**Yes**

Legend:
WT-Wind Turbine
AR- Access Road
CB- Cabling (below ground)

According to the REA Regulation, if any significant natural features are present within 120m of the project location an Environmental Impact Study (EIS) must be completed. Potential impacts, mitigation measures, and follow-up programs associated with the significant bat habitats are discussed in the EIS section below.

Other woodlands that are located within 120m of, but not overlapping, access roads, connection cabling, temporary construction and laydown areas, substation and the operations and maintenance buildings may also contain suitable habitat for bat maternity colonies. These habitats will be treated as generalized and mitigation measures for these habitats will be applied. Generalized mitigation measures have been detailed as part of the EIS.

5.0 Environmental Impact Study

In accordance with the REA Regulation, any significant bat maternity colony habitats found within 120m of the project location require an Environmental Impact Study (EIS) to identify potential impacts and mitigation measures. The Evaluation of Significance for the East Durham Wind Energy Centre has identified 3 treated as significant bat maternity colony habitats are located within 120m of the project location, with the potential to incur operational impacts from this proposed development. The potential impacts on these features are discussed in more detail in the following sections.

5.1 Overview of EIS

Based on current layouts, minor vegetation removal may occur during the construction of the East Durham Wind Energy Centre and associated infrastructure, with the removal of portions of some woodlands associated with the installation of wind turbines, access roads and cabling. The extent of vegetation clearing, if any, and potential impacts of this project on vegetation communities and other significant wildlife habitat have been examined by LGL, and is discussed in more detail in the full Natural Heritage Assessment (LGL 2012).

A summary of the potential impacts that the proposed development may have on significant bat habitat is provided in Table 12 below.

Table 12. Summary of Potential Impacts to Significant Bat Habitat within the East Durham Wind Energy Centre Project Area

Project Phase	Project Component	Description of Activity	Potential Impact(s)
Construction	Supporting Infrastructure	Installation of access roads, cabling, maintenance yards, auxiliary buildings, etc.	• Habitat Loss • Noise • Direct Bat Mortality or Disturbance (Habitat Loss)
Construction	Wind Turbine Erection	Turbine pad grading, concrete pouring, turbine assembly.	• Noise
Operation	Wind Turbine Operation	Operation of up to 16 wind energy generating turbines.	• Noise • Direct Bat Mortality
Decommissioning	Wind Turbine Removal	Removal of and disassembly of up to 16 wind energy generating turbines.	• Noise