Appendix D

Bat Report

APPENDIX D
ACOUSTIC BAT MONITORING
OSTRANDER POINT WIND ENERGY PARK

File No. 160960369

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1.0 Introduction

1.1 PROJECT OVERVIEW

Gilead Power Corporation is proposing a 20MW wind power facility in southeastern Prince Edward County. The Ostrander Point Wind Energy Park will consist of twelve 1.65 MW turbines located on Crown land along the Lake Ontario shoreline.

As part of the Ontario Ministry of the Environment's ("MOE") Environmental Screening Process("ESP") for electricity projects (i.e., Ontario Regulation 116/01), Stantec Consulting Ltd. ("Stantec") undertook acoustic bat monitoring in the July, August and September 2008. The acoustic bat monitoring was completed in conjunction with a radar study completed by Acadia University which is discussed in Appendix C2.

1.2 BACKGROUND

1.2.1 Bats in Ontario

Eight species of bats are known to regularly occur in Ontario, all of which have a range that overlaps the Study Area. A brief summary the habitat preference and behavior of each species is provided below.

Big Brown Bat (Eptesicus fuscus): A species commonly found in buildings and around human habitation. The big brown bat commonly uses building for summer maternity roosts, but willalso use hollow trees, rock crevices or bat boxes where available (Fenton et al., 2005). Thisspecies forages in a variety of habitats and appears to be a habitat generalist (Furlonger et al.,1987). The big brown bat is our only species that will regularly hibernate in buildings, as they appear to be tolerant of greater temperature ranges and do not require the high humidity conditions needed by other species (Gerson, 1984). They will also hibernate in caves or mines (Fenton et al., 2005) with other bat species, but in much fewer numbers. As buildings that provide hibernacula are common across the landscape, this species does not typically migrate long distances. (Barbour and Davis, 1969 and Davis et al 1968 as cited in Gerson, 1984). The big brown bat is ranked S5 (common and secure) in Ontario and is considered one of our most common species.

Hoary Bat (Lasiurus cinereus): The largest and fastest of the Ontario bats, the hoary bat often forages in open habitats (Salcedo et al., 1995 and van Zyll de Jong, 1985 as cited in Fenton,2005). Hoary bats are solitary roosters in the foliage of trees. This species does not hibernate; hoary bats are one of our three bat species in Ontario that are long-distance migrants moving south in the late summer and fall. The hoary bat is ranked S4 (common and apparently secure)in Ontario.

Silver-haired Bats (Lasionycteris noctivagans): This species typically roosts under loose bark or in hollow trees (Gerson, 1984). Small nursery colonies are typically established in hollow trees (Parsons et al., 1986 as cited in Fenton, 2005). Silver-haired bats often forage over woodland lakes and streams (Barbour and Davis, 1969 as cited in Gerson, 1984). As a long distance migrant, this species moves south in the late summer and fall. The silver-haired bat is rankedS4 in Ontario. Although widespread in the province, it is not been commonly encountered(Fenton, 2005).

Eastern Pipistrelle (Pipistrellus subflavus): This species usually roosts in foliage but will also use hollow trees or buildings. Eastern pipistrelles typically forge over watercourses and open habitat such as clearings and fields (Davis and Mumford, 1962 as cited in Fenton, 2005). Thisspecies hibernates in caves and abandoned mines. Like most hibernating bats, they require caves with temperatures above freezing and close to 100% humidity. In late summer and fall they will migrate to suitable hibernacula, which are also used as swarming sites during the autumn mating season (Barbour and Davis, 1969 as cited in Fenton, 2005). The easternpipistrelle is ranked S3? in Ontario (vulnerable in the province with the question mark indicating some uncertainty in the ranking).

Red Bat (Lasiurus borealis): This species roosts solitary in foliage of deciduous trees (Gerson,1984). Red bats are long-distance migrants, moving south in the late summer and fall. This species is ranked S4 in Ontario.

Little Brown Bat (Myotis lucifugus): The little brown bat is a gregarious species that roosts in large numbers (Gerson, 1984). Roost sites and maternity colonies are typically located inpoorly ventilated, dark sites with high temperatures (Humphrey, 1982, as cited in Gerson, 1984), including spaces in buildings such as attics. Little brown bats hibernate in caves or abandoned mines with above freezing temperatures and high humidity. Hibernacula are used as swarming sites in late summer during the breeding season (Fenton, 2005). Little brown bats are rankedS5 and are considered the most common bat species in Ontario (van Zyll de Jong, 1985)

Northern Long-eared Bat (Myotis septentrionalis): This species roosts in tree cavities or under loose bark (Foster and Kurta, 1999, as cited in Fenton, 2005). Northern long-eared bats are typically associated with wooded areas (Dobbyn, 1994). They are a hibernating species,usually using the same caves and abandoned mines as little brown bats for hibernacula and swarming sites (Barbour and Davis, 1969 as cited in Gerson, 1984). The northern long-eared bat is ranked S3? in Ontario.

Small-footed Bat (Myotis leibii): The small-footed bat roosts in a variety of small crevices, usually in rock or amongst boulders but also under loose bark or tight spaces in buildings(Fenton, 2005). This species hibernates in caves or abandoned mines. It can tolerate colder temperatures and lower humidity than other cave-hibernating bats and is often found near cave entrances (Barbour and Davis, 1969, as cited in Fenton, 2005). Small-footed bats typically enter hibernacula in mid-November, later than other species (Fenton, 1972 as cited in Fenton 2005). They are ranked S2S3 (vulnerable to imperiled) in Ontario.

Two other species of bats may occur in Ontario. A single record of an evening bat (Nycticeius humeralis) was made in southwestern Ontario, but was likely a vagrant (Dobbyn, 1994). The Indiana bat (Myotis sodalis), has not been recorded in Ontario but occurs in adjacent areas of New York, Ohio and Pennsylvania.

No bats in Ontario are considered to be at risk by COSEWIC or COSSARO.

1.2.2 Wind Facilities and Bats

Recent developments in wind plant monitoring have raised concerns over the effect these projects may have on local and migratory bat populations. Effects to bats due to wind power plants may be either direct (through injury or death by collision) or indirect (displacement or population declines).

Bat mortality has been documented at wind power facilities in a variety of habitats across North America. Nearly every monitored wind power facility in Canada and the United States has reported bat mortality with annual mortality varying between < 1 and 50 bat fatalities / WTG /year (Arnett et al., 2007). Often the mortality rates of bats are considerably higher than those of birds.

The majority of bat fatalities at wind power facilities occurs in the late summer and fall. The long-distance migratory bats (i.e., hoary bat, eastern red bat, and silver-haired bat) appear to be most vulnerable to collisions with moving turbine blades. Wind speed may also influencemortality rates as bat activity, and thus fatalities, appear to be higher on nights with low wind (Arnett et al., 2007).

Specific factors causing bat mortality and affecting species vulnerability to wind turbine mortality remain unclear, although recent evidence from Alberta suggests that air pressure differences in the blade vortices may be a contributing factor (Baerwald et al., 2008). Ontario specific data is relatively sparse at this time.

Little information is available on the potential indirect effects to bats from wind power plants. At some facilities, forest clearing for turbines, access roads and transmission lines, may actually increase bat habitat by creating forest edge and clearing (Arnett et al., 2007). However, in southern Ontario wind power facilities would rarely require forest clearing.

Potential negative effects to bat habitat could result from removal of roost trees or an increase in human activity. However, no data exist to supporting these concerns. Arnett et al. (2007)hypothesized that noise generated by wind turbines is unlikely to influence roosting bats, butagain no data exist to support the hypothesis.

1.2.3 Project Area Description

The Study Area is situated along the Lake Ontario shoreline. The site sits on a low plateau offlat limestone that projects into the eastern part of Lake Ontario (Chapman and Putnam, 1984). The limestone is covered by a shallow layer of gravelly loam soil (Richards and Morwick, 1948), which is generally less than 50cm deep within the Study Area.

Vegetation within the Study Area was relatively uniform, consisting of open woodlands, shrub thickets and grasslands. Standing snags, which could act as bat roosts, were present but not numerous. Small ephemeral wetland pockets occur throughout the study area, which flood after snowmelt or major rain events. Permanent wetlands, in the form of deciduous swamp and open marsh, occur along the southeastern boundary of the Study Area.

1.2.4 Site Sensitivity

The MNR has provided the guidance document “Guideline to Assist in the Review of Wind Power Proposals: Potential Impacts to Bats and Bat Habitats” (Working Draft, August 2007). This document outlines how to identify the site sensitivity of proposed wind power plants. The site sensitivity helps to determine the scope of the bat monitoring program.

A review of background materials, in conjunction with an on-site evaluation, identified potential factors that would determine site sensitivity. There are no known hibernacula in the vicinity of the Study Area. The project will be located less than 1 km from the Lake Ontario shoreline. According to Table 2 of the MNR’s guidelines, the corresponding site sensitivity would be Level 3 (High).

2.0 Methods

Based on a site sensitivity rating of Level 3 (High), a pre-construction monitoring program was designed that consisted of:

- Radar monitoring in May, August, September and October; and,
- Acoustic surveys at three stations within the Study Area in July, August and September.

This program consisted of monitoring at two stations with a single detector each at tree height (approximately 4 m), and at a third station with two detectors elevated to heights of15m and 30m. Acoustic detectors recorded calls at each station from dusk until dawn. Nights for analysis of acoustic detectors were based on suitable weather conditions (i.e. air temperature above approximately 10°C at sunset, no precipitation and low winds) recorded from the onsite meteorological tower.

This report focuses on the methods and findings of the acoustic bat monitoring program. The radar monitoring study is presented in Appendix C2.

2.1 FIELD SURVEYS

Anabat SD1 acoustic detectors (Titley Electronics PTY Ltd.) were used for the duration of the monitoring program. The detectors had programmed on/off times and stored data on removable 1 GB compact flash cards. Anabat detectors are frequency division detectors, dividing the frequency of ultrasonic calls made by bats by a factor of 16 so that they are audible to humans. The calls are then recorded for subsequent analysis. Anabat detectors were selected based upon their widespread use for this type of survey, their ability to be deployed for long periods of time, and their ability to detect a broad frequency range, which allows detection of all species of bats that could occur in Ontario.

Figure 1.0, Attachment A shows the location of the monitoring stations. Two acoustic detectors were deployed within the study area on July 28, 2008, elevated on the meteorological (MET) tower which was located central within the Study Area. The two MET tower detectors were positioned at heights of 15m (MET15) and 30m (MET30). Following correspondence with the MNR, two additional monitoring stations were established on August 14, 2008. The stations were located in the northeastern (NE4) and southwestern (SW4) portions of the Study Area, each with one acoustic detector, raised to an approximate height of 4 m in a tree. Monitoring continued with all four detectors until September 30, 2008.

The three monitoring stations were distributed north to south through the Study Area to allow for assessment of activity levels at different distances from the Lake Ontario shoreline. SW4 was located 50 m from the shoreline, MET15 and MET30 were located 650 m from the shoreline, and NE4 was located 1490 m from the shoreline (Figure 1, Attachment A)., Placing detectors at two elevations at the MET tower station allowed for a comparison of activity levels at different heights.

Detectors were programmed to record data continuously between 6:30pm and 7:00am each night. Each detector system was powered by 12-volt batteries charged by solar panels and encased in a waterproof housing enabling the detector to record while unattended for the duration of the survey. The housing suspended the Anabat microphone downward to give maximum protection from precipitation. To compensate for the downward position, a reflector shield of smooth plastic was placed at a 45-degree angle directly below the microphone. The angle reflector allows the microphone to record the airspace horizontally surrounding the detector and is only slightly less sensitive than an unmodified Anabat unit.

Maintenance visits were conducted weekly to check on the condition of the detectors and download data to a computer for analysis. The sensitivity of each Anabat system was set at between six and seven to maximize sensitivity while limiting ambient background noise and interference.

2.2 DATA ANALYSIS

Potential call files were extracted from data files using CFCread© software. The default settings for CFCread© were used during this file extraction process, as these settings are recommended for the calls that are characteristic of Ontario bats. This software screens all data recorded by the bat detector and extracts call files using an automatic filter. Using the default setting for this initial screen also ensures comparability between data sets. Settings used by the filter include a maximum time between calls of 5 seconds, a minimum line length of 5 milliseconds, and a smoothing factor of 50. The smoothing factor refers to whether or not adjacent pixels can be connected with a smooth line. The higher the smoothing factor, the less restrictive the filter is and the more noise files and poor quality call sequences are retained within the data set.

A call is a single pulse of sound produced by a bat. A call sequence is a combination of two or more pulses recorded in a call file. Following extraction of call files, each file was visually inspected to ensure that files created by static or some other form of interference that were still within the frequency range of bats were not included in the data set. Call sequences were identified based on visual comparison of call sequences to reference calls provided by Chris Corben, developer of the Anabat system. Bat calls typically include a series of pulses characteristic of normal flight or prey location (“search phase” calls) and capture periods

(“feeding buzzes”) that visually look very different than static, which typically forms a diffuse vibration, or other interference. Using these characteristics, bat files are easily distinguished from non-bat files.

Bat calls sequences were individually marked and categorized by species group, or “guild” based on visual comparisons to reference calls. Qualitative visual comparison of recorded call sequences of sufficient length to reference libraries of bat calls allows for relatively accurate identification of bat species (O’Farrell et al., 1999. O‘Farrell and Gannon, 1999). A call sequence was considered of suitable quality and duration if the individual call pulses were “clean” (i.e. consisting of sharp, distinct lines) and at least five pulses were included within the sequence. Call sequences were classified to species whenever possible, using the reference calls described above. However, due to similarity of call signatures between several species, all classified calls have been categorized into four guilds for presentation in this report. This classification scheme follows that of Gannon et al. (2003) and is as follows:

- Unknown (UNKN) – all call sequences with too few pulses (less than five) or of poor quality (such as indistinct pulse characteristics of background static). These calls were further identified as either “high frequency unknown” (HFUN) for calls above 30 kHz or “low frequency unknown” (LFUN) for calls below 30 kHz;
- Myotid (MYSP) – All bats of the genus Myotis. While there are some general characteristics believed to be distinctive for several of the species in this genus, these characteristics do not occur consistently enough for any one species to be relied upon at all time when using Anabat recordings;
- Red bat / pipistrelle (RBEP) – Eastern red bats and eastern pipistrelles. These two species can produce calls distinctive only to each species. However, significant overlap in the call pulse shape, frequency range, and slope can also occur; and,
- Big brown / silver-haired / hoary bat (BBSHHB) – This guild will be referred to as the big brown guild. These species all have lower call frequencies and have therefore been included as one guild in this report. The hoary bat has more easily recognizable calls whereas calls of silver-haired bats and big brown bats can be difficult to distinguish. Therefore, a sub-classification of big brown / silver-haired bat (BBSH) was used to further define calls in this guild.

This guild grouping represents the most conservative approach to bat call identification (Hayes, 2000). Since some species do sometimes produce calls unique only to that species, all calls were identified to the lowest possible taxonomic level before being grouped into the list guilds. Tables and figures in the body of this report will reflect those guilds. However, since species-species identification did occur in some cases, each guild will also be briefly discussed with respect to potential species composition of recorded call sequences. Nights with unsuitable weather conditions (see Section 2.3) were rejected and not used in the analysis.

Once all the call files were identified and categorized in appropriate guilds, nightly tallies of detected calls were compiled. Mean detection rates (expressed as the number of call sequences, or “passes”, per detector per night) for the entire sampling period were calculated for each detector and for all detectors combined, providing an index of bat activity.

It is important to note that detection rates indicate only the number of calls detected and do not necessarily reflect the number of individual bats in an area. For example, a single individual can produce one or many call files recorded by the bat detector, but the bat detector cannot differentiate between individuals of the same species producing those calls. Consequently, detections recorded by the bat detector system likely over represents the actual number of animals that produced the recorded calls.

2.3 WEATHER DATA

Wind and Temperature

Wind speed and temperature data was obtained from meteorological tower (MET) located centrally within the Study Area (**Figure 1, Attachment A**). Weather conditions were considered unsuitable on nights with sunset temperatures below 10°C, overnight lows below 5°C or wind speeds in excess of 12 km/h (3 or higher on the Beaufort scale).

Rainfall

Unlike wind and temperature, rainfall can vary dramatically over relatively short distances. Therefore, rainfall data from Point Petre would not necessarily related to the Ostrander Point Study Area. Therefore, the occurrence of rain was determined by recordings of rainfall by the acoustic detectors. Static caused by rain differs from other static by being random (not cyclical like insects) and, in the case of isolated showers, occurring for short periods. Rustling leaves in strong winds would cause similar random static, however such nights would have been already rejected based on high wind speed. Recordings on the acoustic detectors provide the duration of rainfall but not the intensity or amount of rain. However, all nights with rain recorded during the monitoring period were considered unsuitable.

3.0 Results

3.1 CALL DETECTOR ANALYSIS

Anabat SD1 detectors were deployed at the MET station from July 28 to September 30 and at the northeast and southwest stations from August 14 to September 30. There were occasional brief periods of missing data when certain detectors did not switch on or powered down during the survey period. However, detectors were repaired or replaced as soon as possible to minimize downtime. Combined, the four detectors at the Ostrander Point sampled a total of 141 detector-nights of suitable weather conditions.

A total of 2915 bat call sequences were recorded during the sampling period (Table 3.1, Attachment B). The overall mean activity for all four detectors was 20.7 call sequences / detector-night. Individual activity levels at each of the four detectors ranged from 9.6 call sequences / detector-night at the MET 30 m detector to 33.3 call sequences / detector-night at the southwest detector.

Attachment C provides a series of tables with more specific information on the nightly timing, number and species composition of recorded bat call sequences. Specifically, Attachment C Tables 1 through 4 provide information on the number of call sequences, by guild and inferred species, recorded at each detector and the weather conditions for that night. Upon request, Stantec will provide a spreadsheet identifying the Analook file name for all 2915 recorded call sequences, which detector recorded the call, the night during which the call sequence was recorded, the timing of the recording, and the inferred identity of the species recorded.

Mean bat activity was lowest at the most elevated detector. MET 30 (9.6 call sequences / detector-night) was found to have considerably lower activity levels than the other 3 detectors, including MET 15 (23.7 call sequences / detector-night) which was located at the same station but at a lower elevation.

Among the lower detectors, mean bat activity was higher closer to the Lake Ontario shoreline. SW4, which was located closest to the shoreline, was found to have the highest activity level (33.3 call sequences / detector-night). Conversely, NE4, located farthest from the shoreline, had the lowest activity level of the lower detectors (17.6 call sequences / detector-night). MET 15, located centrally in the Study Area, had an activity level between that of the southwest and northeast detectors (23.7 call sequences / detector-night).

Figure 2.0, Attachment A shows the average nightly bat activity averaged across all four detectors. There was considerable variation in activity between nights. However, the majority of nights with higher bat activity occurred between August 14 and September 9 with a second period of high activity between September 15 and September 20. The first period of peak activity, between August 14 and September 9, was observed at all four detectors (Figure 3.0, Attachment A). The second peak of activity was influenced by high levels of activity at SW4

Results December 2008 and MET 15 detectors. Activity at all detectors was much reduced after September 25. The high outlier activity on August 5 appears to be the result of a peak number of call sequences recorded at the MET 15 detector, on a night when it was the only detector operating.

Generally, peak call activity occurred between 21:00 and 23:00, approximately 1-2 hours after dark (Figure 4.0, Attachment A). Activity between 00:00 and 4:00 were relatively constant, with a slight increase after 4:00, then a sudden drop in activity before dawn.

Recorded call sequences were identified to guild based on visual analysis. Because acoustic surveys at Ostrander Point were passive, 31% could not be identified to guild and were labeled as unknown due to very short call sequences (less than 5 pulses) or poor call signature formation (probably due to a bat flying at the edge of the detection zone of the detector or flying away from the microphone) (Table 3-2, Attachment B). Of the calls that were identified to species or guild, those in the big brown/silver-haired/hoary guild were most common (38% of all call sequences), followed by the myotid guild (30% of all call sequences). Few calls were identified in the red bat/eastern pipistrelle guild (1%).

Species composition between detectors was similar (Figure 5.0, Attachment A) with approximately equal numbers of big brown/silver-haired/hoary and myotid guild call sequences. Myotid bats appeared to be less active at the elevated MET 30 detector, when compared to the 3 lower detectors. Red bat/eastern pipistrelle, although rare at all detectors, were most common at the elevated MET 30.

4.0 Discussion

4.1 SPATIAL DISTRIBUTION OF BAT ACTIVITY

When comparing the activity levels between the four detectors, the southwest detector near the lakeshore had the highest activity levels. Activity levels became progressively lower, the farther from the lakeshore the detector was placed. The lakeshore has wetland pockets contained behind a rocky beach and the lake itself, factors that would support a high insect population to provide abundant feeding opportunities. The narrow band of tree cover along the shoreline may act as forest edge, attracting foraging bats. Moving away from the lakeshore, the monitoring stations become progressively drier and did not provide potential forest edge habitat.

It was also noted that activity levels were greater at the two tree level detectors and MET 15 (averaging 24.8 call sequences/detection-night) than at the higher MET 30 detector (9.6 call sequences/detection-night). Recent research (Arnett et al., 2006) found that small Myotis species were more frequently recorded at lower heights while larger species were typically recorded at higher heights. This is consistent with the MET 30 detector which had only 5% of the overall MYSP calls but 15% of the BBSH calls. The same pattern was not observed at the MET 15 detector, which had consistently similar proportions of calls from both guilds.

When considering the higher levels of activity at the two tree level and MET 15 detectors, it is important to acknowledge that numbers of recorded bat call sequences are not necessarily correlated with number of bats in an area. Acoustic detectors do not allow for differentiation between a single bat making multiple passes and multiple bats each recorded a single time (Kunz et al., 2007). For example, the peak observed at the MET 15 detector on August 5 (156 call sequences all occurring between 10:04 and 11:57, and then 3:02 and 4:21) consisted of mostly of those classified as big brown, big-brown/silver-haired guild or low frequency unknown calls. It is possible that the majority of these calls represented one or a small number of feeding big brown bats.

4.2 TEMPORAL DISTRIBUTION OF BAT ACTIVITY

Considerable variability between nightly activity levels was observed throughout the survey period with a peak of high activity nights between August 14 and September 9 and then again between September 15 and September 20. This variability in activity between nights could be attributed to weather conditions. Hayes (1997), Reynolds (2006) and Arnett (2008) have reported on various acoustic surveys during the fall migration season that have documented a decrease in bat activity rates as wind speed increase and temperatures decrease. These patterns suggest that bats are more likely to migrate on nights with low wind speed (less than 4-6 m/s) and generally favourable weather (warm temperatures, low humidity, high barometric pressure).

Bat activity also appeared to vary by time of night, with a peak in activity 1 to 2 hours after dark and a second, much smaller peak before dawn. This bimodal nighttime distribution of bat activity seems to be a consistent behavioral trend in a number of species (Hayes, 1997). Anthony et al. (1981) observed that bats appear to leave roosting sites at dusk to forage for a given period, return to roosts during the middle portion of the night, then forage again late in the night before dawn.

4.3 SPECIES COMPOSITION

Bat calls were identified to guild within this report, although calls were provisionally categorized by species when possible during analysis. Certain species, such as the eastern red bat and hoary bat have easily identifiable calls, whereas other species, such as big brown and silver-haired bats are difficult to distinguish acoustically. Similarly, certain members of the Myotis genus, such as little brown bat, are far more common and have slightly more distinguishable calls than other species. The following paragraphs discuss each guild separately and address likely species composition of recorded bats within each guild.

The myotid (MYSP) guild includes 3 species in Ontario, little brown bat, northern long-eared bat and eastern small-footed bat, the first species being by far the most common. Of these, little brown bat and northern long-eared bats have calls that tend to be slightly more distinguishable using the Anabat system. Although northern long-eared bat calls can often be identified to species, this species was not positively identified in the data collected in the Study Area. The only Myotis species positively identified by acoustic calls was the little brown bat. Therefore, it is likely that the majority of the calls identified to myotid guild or high frequency unknown were little brown bats. The southwest detector recorded the highest activity of myotid guild (13.8 call sequences/detector-night), with less activity at the northeast and MET 15m detectors (averaging 5.7 call sequences/detector-night) and little activity at MET 30m (1.2 call sequences/detector night). Species in the genus Myotis tend to fly lower and forage in more forested areas than other bat species, so it is not surprising that activity was found to be higher at tree level detectors than at the elevated MET 30m.

The red bat/eastern pipistrelle (RBEP) guild includes the eastern red bat and eastern pipistrelle. Eastern red bats have relatively unique calls which span a wide range of frequencies and have a characteristic hooked shape and variable minimum frequency. Eastern pipistrelles tend to have relatively uniform calls, with a constant minimum frequency and a sharply curved profile. Most calls in this guild could be identified to species, with approximately equal numbers of eastern red bats (n=13) and eastern pipistrelles (n=8). The majority of calls from this guild were recorded at either the MET 30m or MET 15m, suggesting they are occurring at higher elevations. However, very few calls from this guild were recorded overall, making it difficult to identify trends with confidence.

The BBSHHB guild includes the big brown bat, silver-haired bat and hoary bat. Within this grouping, the hoary bat has easily distinguishable calls characterized by highly variable minimum frequencies often extending below 20 kHz, and a hooked profile similar to the eastern red bat. Calls of silver-haired bats and big brown bats are occasionally distinguishable, but often overlap in range and can be difficult to distinguish, especially when comparing short duration calls typical of those recorded during passive monitoring. Of the 1111 call sequences recorded in this guild, 1% were classified as hoary bats (n=14), 42% were classified as big brown bats (n=464), 1% were classified as silver-haired bats (n=13), and 56% were not distinguishable between big brown and silver-haired bats (BBSH) (n=620). The activity levels in this guild were similar at the northeast, southwest and MET 15m stations (7.5, 9.9 and 9.5 call sequences/detector-night respectively) with the elevated MET 30m detector recording approximately half the activity level (4.5 call sequences/detector-night). However, the hoary bat showed an opposite trend to the other species in this guild. Although only a very small number of calls were identified as hoary, the majority of these (10 out of 14) were recorded by the MET 30 detector.

Of the 2915 total calls recorded at Ostrander Point, 912, or 31% were classified as UNKN, due to their short duration or poor quality. These calls were further identified as “high frequency” or “low frequency”. For the purposes of this analysis, “high frequency” call fragments were defined as having a minimum frequency above 30 kHz, and “low frequency” calls were defined as having a minimum frequency below 30 kHz. Low frequency calls made up 56% of the calls in the UNKN guild (n=509). High frequency calls made up 44% of calls in the UNKN guild (n=403). The distribution of calls in the UNKN guild is similar to that of all recorded calls, with highest activity at the southwest detector (9.5 call sequences/detector-night), followed by MET 15m (7.7 call sequences/detector-night) then northeast detector (5.1 call sequences/detector-night) and MET 30m having the lowest activity (3.6 call sequences/detection-night).

4.4 POTENTIAL EFFECTS

The majority of bat fatalities at wind power facilities occur in the late summer and fall, and the long-distance migratory bats (i.e., hoary bat, eastern red bat, and silver-haired bat) appear to be most vulnerable to collisions with moving turbine blades. Due to the small sample size of long-distance migratory bat call sequences recorded on the Ostrander Point detectors, it is difficult to show trends in movement with a high degree of confidence. However, some observations in the temporal and spatial distribution of long-distance migratory bat call sequences are worth mentioning. MET 30, although having the lowest overall activity, had the highest activity of long-distance migrants (.53 call sequences/detector-night or 50% of long-distance migrant bat call sequences). NE4 had the second highest activity of long-distance migrants (.44 call sequences/detector-night or 28% of long-distance migrant call sequences). Both the MET 15 and SE4 detectors had considerably less activity of long-distance migrants (.14 and .07 call sequences/detector-night respectively).

Hoary bats were identified at the MET 30 and NE4 detectors only. The night with the highest activity was August 17 with 7 call sequences. No hoary bats were identified after August 22, suggesting the majority of migrating hoary bats had moved south by this time.

Most calls identified as silver-haired bats were recorded by the MET 30m and NE4 detectors. The night with the highest number of call sequences was August 17 (6 call sequences), the same night as the hoary bat peak. Aside from the one peak night, silver-haired bat calls were generally evenly distributed between July 29 and September 11. Although relatively few silver-haired bats were identified to species (n=13), some of the calls in the BBSH guild (n=620) are likely to be silver-haired bats.

Very few call sequences were identified as eastern red bat calls or RBEP guild. The distribution of these calls was relatively even between July 29 and September 18.

Risk to long-distance migratory bats seems to be related to weather conditions. Bat collision mortality rates documented at two facilities in the southwestern United States negatively correlated with both wind speed and relatively humidity and positively correlated with barometric pressure (Arnett, 2005). Although peak activity was noted by two of the long-distance migratory species on August 17, there did not appear to be any correlation with favourable weather conditions, when looking at the measured parameters (i.e. wind, temperature, rainfall). Had barometric pressure been measured, it may have provided insight into correlations between weather and migratory activity. Baerwald and Barclay (2008) found that mortality of migratory bats at a wind power facility in Alberta increase following a drop in barometric pressure.

Overall, the activity of long-distance migrants appeared to increase at higher elevations and with farther distance from the lakeshore. Bats flying between approximately 35 and 125 m would be at the height of wind turbine blade sweep and thus would be a higher risk of collision. However, due to the small sample size, trends in detection height can not be identified with high confidence.

Landscape features such as lakeshores, ridges or escarpments may concentrate migratory movement of bats. As such, the proposed Ostrander Point Wind Energy Park was considered to have higher site sensitivity, based on its close proximity to the Lake Ontario shoreline. However, there was not an abundance of call sequences from long-distance migratory bats recorded by the detectors during the study. It was noted however, that activity of foraging, non-migratory bats was positively correlated with proximity to the lakeshore. This relationship appears to be related to insect abundance and woodland edge habitat along the lakeshore. The majority of such foraging along the tree line is likely to occur at tree height (Arnett et al., 2006) and is not likely to frequently reach wind turbine blade sweep height.

Potential indirect negative effects could result from an increase in human activity or the removal of habitat element, such as roost trees or wetland vegetation.

5.0 Conclusions

Results of acoustic surveys must be interpreted with caution. A conservative approach to species identification was taken, as there is considerable overlap in call frequencies among bats that occur in Ontario. Also, detections rates provide only an index of activity levels, and are not necessarily representative of the numbers of individual bats (Hayes, 2000). However, some general trends in the acoustic data appear to be evident.

Long-distance migratory bats, a group which appears to be at higher risk of collision with wind turbines, have been theorized to concentrate near the shorelines of the Great Lakes. However, despite the presence of the Lake Ontario shoreline within 1.5 km of the stations, the acoustic data would suggest that activity of long-distance migratory bats was not unusually high. The few hoary bats that were observed appeared to have passed through the Study Area by late August and thus were no longer at risk. However, the other two long-distance migrants (eastern red bat and silver-haired bats) were observed until mid to late September.

Higher bat activity was observed at detectors that were closer to the shoreline. The activity along the shoreline was likely indicative of foraging bats and high activity levels may have been cause by multiple detections of individual bats.

Bat activity levels were much lower at the detector elevated to 30 m, indicating that the majority of bat flight in the Study Area is occurring at lower elevations, below wind turbine blade sweep height.

Attachment A

Figures

Stantec

N
W
E
S

0 100 200 300 400
Meters
1:10,000

Acoustic Bat Monitoring Station
Ontario Road Network
Property Lines
Watercourse
Study Area

PREPARED FOR:

GILEAD POWER
OSTRANDER POINT WIND PROJECT
PRINCE EDWARD COUNTY, ONTARIO

FIGURE NO. 1.0

ACOUSTIC BAT MONITORING STATIONS

Initiated: November 21, 2008
Revised:

W:\active\60960369\graphics\GIS\MXD\60960369_19_AnimalObservations3.mxd

Figure 2.0. Average Nightly Bat Activity - All Detectors

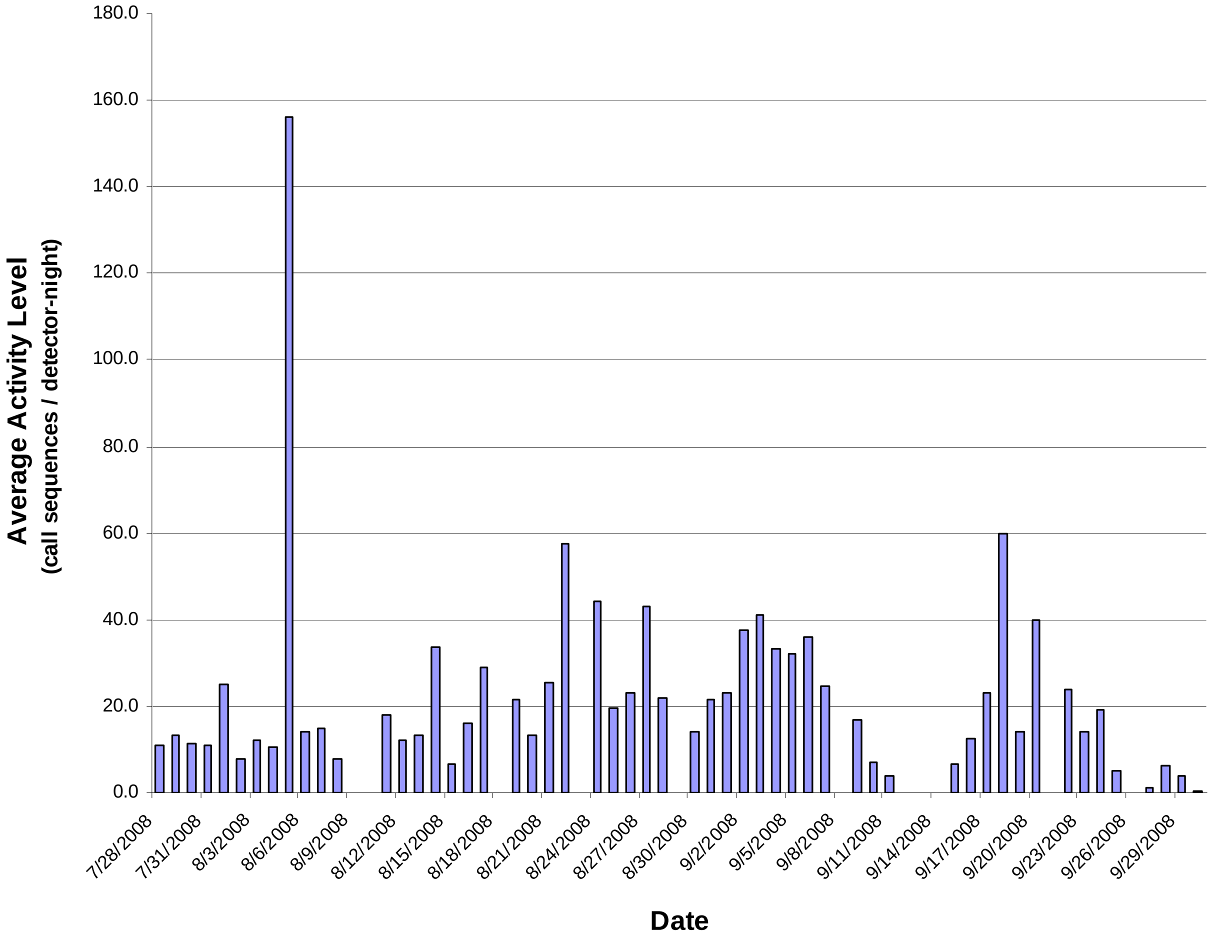


Figure 3.0. Nightly Number of Bat Call Sequences

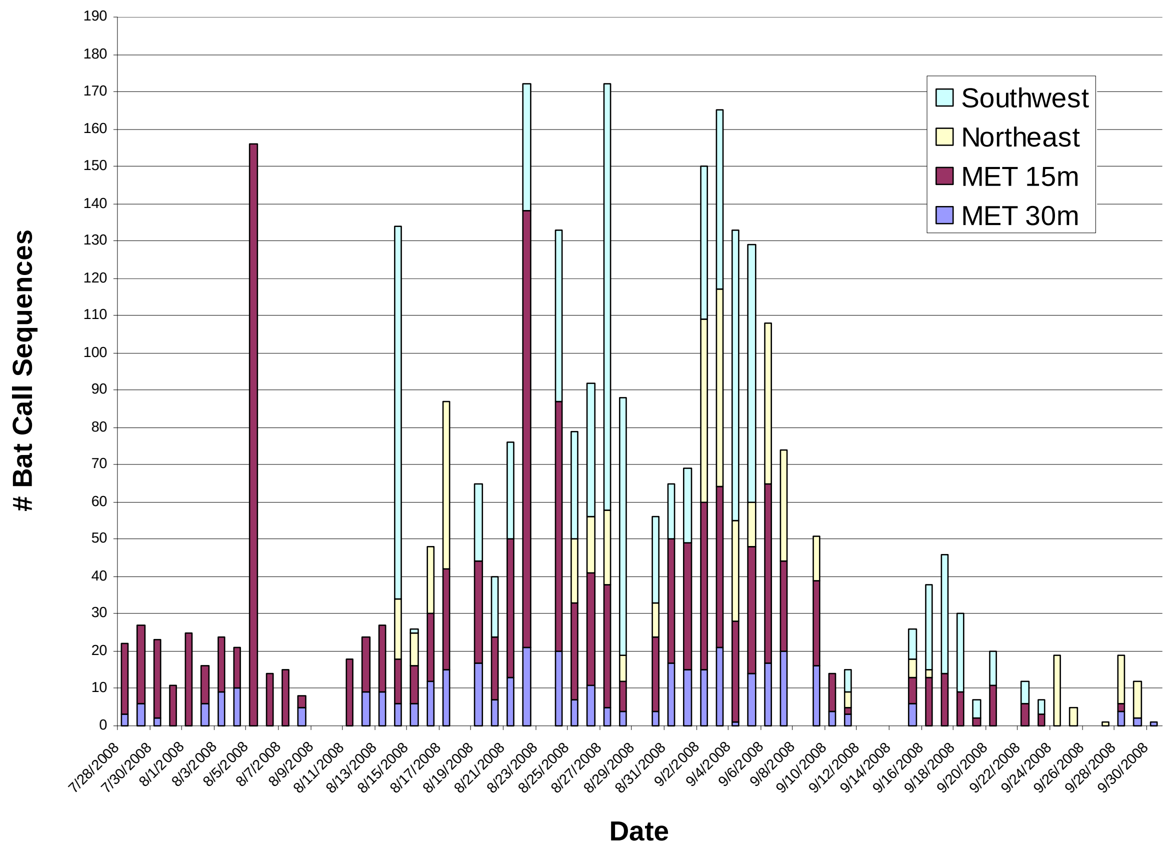


Figure 4.0. Overall Timing of Bat Activity

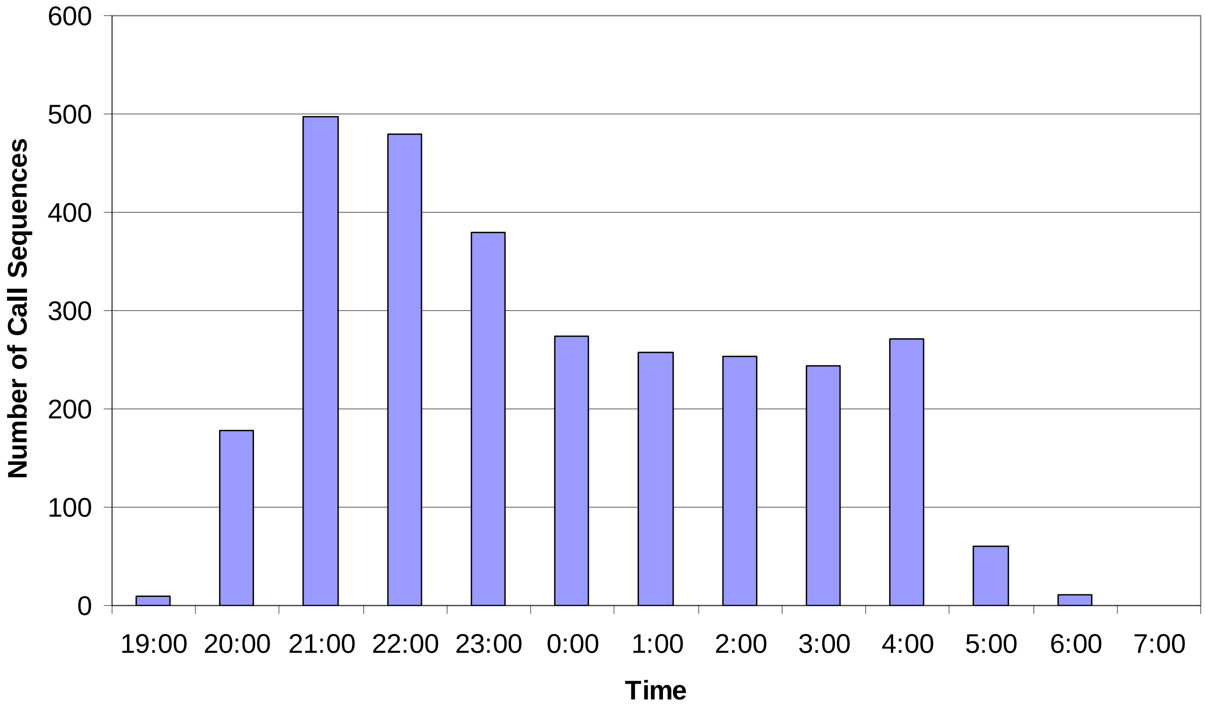
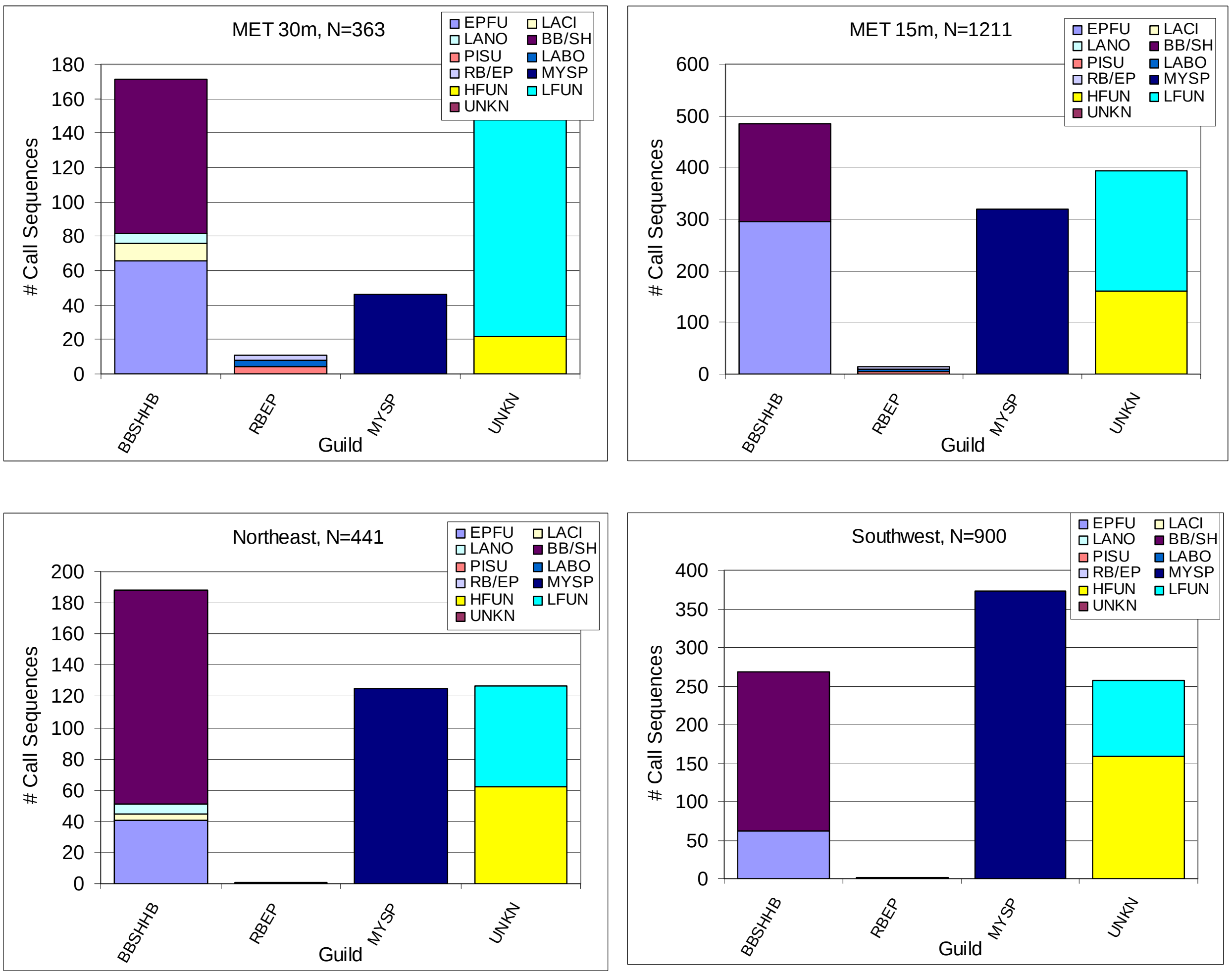


Figure 5.0 Summary of Species Composition at Each Detector



EPFU (Big Brown Bat); LACI (Hoary Bat); LANO (Silver-haired Bat); BB/SH (Big Brown / Silver-haired Bat); PISU (Eastern Pipistrelle); LABO (Eastern Red Bat); RB/EP (Eastern Red Bat / Eastern Pipistrelle); MYSP (Myotis Species); HFUN (High Frequency Unknown); LFUN (Low Frequency Unknown).

Attachment B

Tables

Table 3.1 Summary of Bat Detector Field Survey Effort and Results

Location	Dates	# Detector-Nights*	# Recorded sequences	Detection Rate **	Maximum No. Calls Recorded ***
MET 30m	July 28 - Sept 30	38	363	9.6	21
MET 15m	July 28 - Sept 30	51	1211	23.7	156
Northeast	Aug 14 - Sept 30	25	441	17.6	53
Southwest	Aug 14 - Sept 30	27	900	33.3	114
Overall Results		***141***	***2915***	***20.7***	--

* Detector-night is a sampling unit during which a single detector is deployed overnight.
** Number of bat passes recorded per detector-night.
*** Maximum number of bat passes recorded from any **single** detector for a 12.5-hour sampling period.

Table 3.2 Summary of the Composition of Recorded Bat Call Sequences

Detector	Guild				Total
	Big brown guild	Red bat/ E. pipistrelle	Myotid	Unknown	
MET 30m	171 (47%)	11 (3%)	46 (13%)	135 (37%)	363
MET 15m	484 (40%)	14 (1%)	320 (26%)	393 (32%)	1211
Northeast	188 (43%)	1 (0%)	125 (28%)	127 (29%)	441
Southwest	268 (30%)	2 (0%)	373 (41%)	257 (29%)	900
Total	***1,111 (38%)***	***28 (1%)***	***864 (30%)***	***912 (31%)***	***2915***

Note: Cells represent numbers of call sequences, with percentage of total calls at the detector in brackets

Attachment C

Summary of Acoustic Bat Data and Weather during each Survey Night

Attachment C Table 1. Summary of acoustic bat data and weather during each survey night at the MET 30m detector

Night of	Operated Okay?	BBSHHB				RBEP			MYSP			UNKN			Total	Wind Speed (m/s)	Wind Direction (degrees)	Relative Humidity (%)	Temperature (celsius)
		big brown bat	hoary bat	silver-haired bat	silver-haired/big brown	eastern pipistrelle	eastern red bat	pipistrelle/red bat	little brown bat	northern long-eared bat	MYSP	high-frequency	low-frequency	unknown					
7/28/08	Y	1	0	0	0	0	0	0	2	0	0	0	0	0	**3**				
7/29/08	Y	1	1	1	0	0	0	0	1	0	0	1	1	0	**6**				
7/30/08	Y	2	0	0	0	0	0	0	0	0	0	0	0	0	**2**				
7/31/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/1/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/2/08	Y	1	0	0	1	0	0	1	0	0	0	0	3	0	**6**				
8/3/08	Y	0	2	0	0	0	0	0	1	0	0	1	5	0	**9**				
8/4/08	Y	2	0	0	0	1	1	0	2	0	0	2	2	0	**10**				
8/5/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/6/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/7/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/8/08	Y	2	1	0	0	0	0	0	0	0	0	0	2	0	**5**				
8/11/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/12/08	Y	4	0	0	1	0	0	0	0	0	1	0	3	0	**9**				
8/13/08	Y	2	0	1	2	1	0	0	1	0	0	0	2	0	**9**				
8/14/08	Y	1	0	0	2	0	0	0	0	0	1	0	2	0	**6**				
8/15/08	Y	0	0	0	0	0	0	0	0	0	1	0	5	0	**6**				
8/16/08	Y	2	2	0	3	1	0	2	0	0	0	0	2	0	**12**				
8/17/08	Y	3	2	0	5	0	0	0	0	0	0	2	3	0	**15**				
8/19/08	Y	4	1	0	5	0	0	0	2	0	0	2	3	0	**17**				
8/20/08	Y	1	0	0	1	0	0	0	4	0	0	0	1	0	**7**				
8/21/08	Y	2	0	0	1	0	0	0	2	0	0	2	6	0	**13**				
8/22/08	Y	3	1	0	5	0	0	0	2	0	1	2	7	0	**21**				
8/24/08	Y	1	0	0	6	0	0	0	1	0	0	1	11	0	**20**				
8/25/08	Y	1	0	0	1	0	0	0	2	0	0	1	2	0	**7**				
8/26/08	Y	4	0	0	1	0	0	0	4	0	0	1	1	0	**11**				
8/27/08	Y	2	0	0	1	0	0	0	1	0	0	0	1	0	**5**				
8/28/08	Y	0	0	0	2	0	0	0	0	0	0	1	1	0	**4**				
8/30/08	Y	0	0	0	0	0	0	0	2	0	0	1	1	0	**4**				
8/31/08	Y	2	0	0	4	0	1	0	1	0	1	0	8	0	**17**				
9/1/08	Y	2	0	1	4	0	0	0	3	0	1	1	3	0	**15**				
9/2/08	Y	5	0	0	0	0	1	0	3	0	0	2	4	0	**15**				
9/3/08	Y	3	0	2	6	0	0	0	1	0	0	0	9	0	**21**				
9/4/08	Y	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**				
9/5/08	Y	5	0	0	7	0	0	0	0	0	0	0	2	0	**14**				
9/6/08	Y	6	0	0	7	1	0	0	1	0	0	0	2	0	**17**				
9/7/08	Y	3	0	0	11	0	0	0	0	0	0	0	6	0	**20**				
9/9/08	Y	0	0	0	9	0	0	0	0	0	0	1	6	0	**16**				
9/10/08	Y	0	0	0	1	0	0	0	1	0	1	1	0	0	**4**				
9/11/08	Y	1	0	1	1	0	0	0	0	0	0	0	0	0	**3**				
9/15/08	Y	0	0	0	1	0	1	0	1	0	0	0	3	0	**6**				
9/16/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/17/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/18/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/19/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/20/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/22/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/23/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/24/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/25/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/27/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/28/08	Y	0	0	0	1	0	0	0	0	0	0	0	3	0	**4**				
9/29/08	Y	0	0	0	0	0	0	0	0	0	0	0	2	0	**2**				
9/30/08	Y	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**				
By Species		**66**	**10**	**6**	**89**	**4**	**4**	**3**	**39**	**0**	**7**	**22**	**113**	**0**	**363**				
By Guild		**171**				**11**			**46**			**135**							
		BBSHHB				**RBEP**			**MYSP**			**UNKN**			**Total**				

n/o - indicates that detector was not operating on that night

Attachment C Table 2. Summary of acoustic bat data and weather during each survey night at the MET 15m detector

Night of	Operated Okay?	BBSHHB: big brown bat	BBSHHB: hoary bat	BBSHHB: silver-haired bat	BBSHHB: silver-haired/big brown	RBEP: eastern pipistrelle	RBEP: eastern red bat	RBEP: pipistrelle/red bat	MYSP: little brown bat	MYSP: northern long-eared bat	MYSP: MYSP	UNKN: high-frequency	UNKN: low-frequency	UNKN: unknown	Total	Wind Speed (m/s)	Wind Direction (degrees)	Relative Humidity (%)	Temperature (celsius)
7/28/08	Y	1	0	0	1	0	0	0	7	0	1	4	5	0	**19**				
7/29/08	Y	2	0	0	1	0	1	0	6	0	2	8	1	0	**21**				
7/30/08	Y	5	0	0	9	0	0	0	1	0	0	3	3	0	**21**				
7/31/08	Y	3	0	0	0	1	0	0	3	0	0	3	1	0	**11**				
8/1/08	Y	0	0	0	3	0	0	0	8	0	8	3	3	0	**25**				
8/2/08	Y	1	0	0	1	0	1	0	2	0	1	2	2	0	**10**				
8/3/08	Y	0	0	0	2	0	0	0	1	0	3	4	5	0	**15**				
8/4/08	Y	1	0	0	3	1	0	0	3	0	1	2	0	0	**11**				
8/5/08	Y	58	0	0	21	0	0	0	0	0	1	0	76	0	**156**				
8/6/08	Y	2	0	0	0	0	0	0	0	0	0	7	5	0	**14**				
8/7/08	Y	1	0	0	1	1	0	0	0	0	1	9	2	0	**15**				
8/8/08	Y	1	0	0	1	0	0	0	0	0	0	0	1	0	**3**				
8/11/08	Y	4	0	0	0	0	0	0	0	0	3	2	9	0	**18**				
8/12/08	Y	1	0	0	6	0	0	0	0	0	0	2	6	0	**15**				
8/13/08	Y	2	0	0	5	0	0	0	3	0	1	3	4	0	**18**				
8/14/08	Y	1	0	0	2	1	0	0	2	0	1	4	1	0	**12**				
8/15/08	Y	2	0	1	4	0	0	0	2	0	0	1	0	0	**10**				
8/16/08	Y	3	0	0	4	0	0	0	4	0	3	4	0	0	**18**				
8/17/08	Y	3	0	0	16	0	0	0	3	0	1	1	3	0	**27**				
8/19/08	Y	1	0	0	7	0	0	0	7	0	3	6	3	0	**27**				
8/20/08	Y	2	0	0	1	0	0	0	11	0	2	1	0	0	**17**				
8/21/08	Y	7	0	0	6	0	0	1	9	0	0	11	3	0	**37**				
8/22/08	Y	62	0	0	5	0	1	0	2	0	0	0	47	0	**117**				
8/24/08	Y	33	0	0	7	0	0	1	5	0	0	3	18	0	**67**				
8/25/08	Y	6	0	0	3	0	1	0	3	0	5	7	1	0	**26**				
8/26/08	Y	7	0	0	2	0	0	0	12	0	2	6	1	0	**30**				
8/27/08	Y	3	0	0	4	0	0	0	15	0	1	7	3	0	**33**				
8/28/08	Y	0	0	0	3	0	0	0	2	0	0	0	3	0	**8**				
8/30/08	Y	5	0	0	3	0	0	0	6	0	0	6	0	0	**20**				
8/31/08	Y	6	0	0	1	0	0	0	10	0	8	6	2	0	**33**				
9/1/08	Y	6	0	0	6	0	0	0	11	0	4	6	1	0	**34**				
9/2/08	Y	13	0	0	6	0	0	0	15	0	1	7	3	0	**45**				
9/3/08	Y	13	0	0	6	0	0	0	13	0	5	4	2	0	**43**				
9/4/08	Y	4	0	0	0	0	0	0	13	0	4	4	2	0	**27**				
9/5/08	Y	5	0	0	1	0	1	0	16	0	1	9	1	0	**34**				
9/6/08	Y	12	0	0	18	0	0	0	8	0	1	5	4	0	**48**				
9/7/08	Y	5	0	0	5	0	0	2	6	0	1	3	2	0	**24**				
9/9/08	Y	6	0	0	10	0	0	0	1	0	0	1	5	0	**23**				
9/10/08	Y	4	0	0	0	0	0	0	3	0	2	1	0	0	**10**				
9/11/08	Y	1	0	0	1	0	0	0	0	0	0	0	0	0	**2**				
9/15/08	Y	0	0	0	0	0	0	0	4	0	1	1	1	0	**7**				
9/16/08	Y	2	0	0	3	0	0	0	6	0	0	1	1	0	**13**				
9/17/08	Y	1	0	0	7	0	1	0	3	0	1	1	0	0	**14**				
9/18/08	Y	0	0	0	1	0	0	0	5	0	3	0	0	0	**9**				
9/19/08	Y	0	0	0	0	0	0	0	2	0	0	0	0	0	**2**				
9/20/08	Y	0	0	0	1	0	0	0	6	0	2	1	1	0	**11**				
9/22/08	Y	0	0	0	0	0	0	0	5	0	0	1	0	0	**6**				
9/23/08	Y	0	0	0	0	0	0	0	2	0	0	1	0	0	**3**				
9/24/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/25/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/27/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/28/08	Y	0	0	0	1	0	0	0	0	0	0	0	1	0	**2**				
9/29/08	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/30/08	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
By Species		**295**	**0**	**1**	**188**	**4**	**6**	**4**	**246**	**0**	**74**	**161**	**232**	**0**	**1211**				
By Guild		**484**				**14**			**320**			**393**							
		BBSHHB				**RBEP**			**MYSP**			**UNKN**			**Total**				

n/o - indicates that detector was not operating on that night

Attachement C Table 3. Summary of acoustic bat data and weather during each survey night at the northeast detector

Night of	Operated Okay?	BBSHHB				RBEP			MYSP			UNKN			Total	Wind Speed (m/s)	Wind Direction (degrees)	Relative Humidity (%)	Temperature (celsius)
		big brown bat	hoary bat	silver-haired bat	silver-haired/big brown	eastern pipistrelle	eastern red bat	pipistrelle/red bat	little brown bat	northern long-eared bat	MYSP	high-frequency	low-frequency	unknown					
7/28/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
7/29/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
7/30/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
7/31/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/1/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/2/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/3/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/4/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/5/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/6/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/7/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/8/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/11/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/12/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/13/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/14/08	Y	0	0	0	0	0	0	0	3	0	3	5	5	0	**16**				
8/15/08	Y	0	0	0	3	0	1	0	0	0	3	1	1	0	**9**				
8/16/08	Y	1	0	0	0	0	0	0	1	0	2	12	2	0	**18**				
8/17/08	Y	9	4	6	8	0	0	0	2	0	0	1	15	0	**45**				
8/19/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/20/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/21/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/22/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/24/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/25/08	Y	0	0	0	6	0	0	0	4	0	2	4	1	0	**17**				
8/26/08	Y	0	0	0	6	0	0	0	0	0	4	4	1	0	**15**				
8/27/08	Y	0	0	0	5	0	0	0	6	0	4	5	0	0	**20**				
8/28/08	Y	0	0	0	0	0	0	0	2	0	3	2	0	0	**7**				
8/30/08	Y	2	0	0	1	0	0	0	3	0	0	2	1	0	**9**				
8/31/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/1/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/2/08	Y	0	0	0	14	0	0	0	16	0	9	7	3	0	**49**				
9/3/08	Y	8	0	0	24	0	0	0	6	0	7	5	3	0	**53**				
9/4/08	Y	0	0	0	8	0	0	0	5	0	8	5	1	0	**27**				
9/5/08	Y	0	0	0	2	0	0	0	3	0	5	0	2	0	**12**				
9/6/08	Y	14	0	0	9	0	0	0	6	0	3	3	8	0	**43**				
9/7/08	Y	2	0	0	14	0	0	0	2	0	4	1	7	0	**30**				
9/9/08	Y	0	0	0	6	0	0	0	0	0	0	2	4	0	**12**				
9/10/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/11/08	Y	0	0	0	0	0	0	0	0	0	0	1	3	0	**4**				
9/15/08	Y	0	0	0	1	0	0	0	3	0	1	0	0	0	**5**				
9/16/08	Y	0	0	0	0	0	0	0	0	0	0	1	1	0	**2**				
9/17/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/18/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/19/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/20/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/22/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/23/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/24/08	Y	0	0	0	15	0	0	0	1	0	0	1	2	0	**19**				
9/25/08	Y	0	0	0	0	0	0	0	3	0	0	0	2	0	**5**				
9/27/08	Y	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**				
9/28/08	Y	4	0	0	9	0	0	0	0	0	0	0	0	0	**13**				
9/29/08	Y	1	0	0	6	0	0	0	0	0	0	0	3	0	**10**				
9/30/08	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
By Species		**41**	**4**	**6**	**137**	**0**	**1**	**0**	**67**	**0**	**58**	**62**	**65**	**0**	**441**				
By Guild		**188**				**1**			**125**			**127**							
		BBSHHB				**RBEP**			**MYSP**			**UNKN**			**Total**				

n/o - indicates that detector was not operating on that night

Attachment C Table 4. Summary of acoustic bat data and weather during each survey night at the southwest detector – Fall 2007

		BBSHHB				RBEP			MYSP			UNKN							
Night of	Operated Okay?	big brown bat	hoary bat	silver-haired bat	silver-haired/big brown	eastern pipistrelle	eastern red bat	pipistrelle/red bat	little brown bat	northern long-eared bat	MYSP	high-frequency	low-frequency	unknown	Total	Wind Speed (m/s)	Wind Direction (degrees)	Relative Humidity (%)	Temperature (celsius)
7/28/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
7/29/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
7/30/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
7/31/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/1/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/2/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/3/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/4/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/5/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/6/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/7/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/8/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/11/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/12/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/13/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/14/08	Y	36	0	0	59	0	0	0	0	0	0	1	4	0	**100**				
8/15/08	Y	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**				
8/16/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/17/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
8/19/08	Y	1	0	0	9	0	0	0	1	0	0	3	7	0	**21**				
8/20/08	Y	0	0	0	6	0	0	0	0	0	0	7	3	0	**16**				
8/21/08	Y	0	0	0	5	0	0	0	0	0	1	12	8	0	**26**				
8/22/08	Y	0	0	0	16	0	0	0	1	0	0	2	15	0	**34**				
8/24/08	Y	0	0	0	24	0	0	0	0	0	0	7	15	0	**46**				
8/25/08	Y	1	0	0	13	0	0	0	5	0	1	4	5	0	**29**				
8/26/08	Y	3	0	0	4	0	0	0	14	0	3	12	0	0	**36**				
8/27/08	Y	3	0	0	9	0	0	0	76	0	4	20	2	0	**114**				
8/28/08	Y	1	0	0	7	0	0	0	31	0	5	22	3	0	**69**				
8/30/08	Y	0	0	0	1	0	0	0	13	0	2	5	2	0	**23**				
8/31/08	Y	0	0	0	4	0	0	0	4	0	1	3	3	0	**15**				
9/1/08	Y	5	0	0	5	0	0	0	4	0	4	1	1	0	**20**				
9/2/08	Y	3	0	0	6	0	0	0	18	0	3	7	4	0	**41**				
9/3/08	Y	5	0	0	7	0	0	0	24	0	2	9	1	0	**48**				
9/4/08	Y	1	0	0	3	0	0	0	57	0	3	14	0	0	**78**				
9/5/08	Y	1	0	0	1	0	0	0	51	0	0	13	3	0	**69**				
9/6/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/7/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/9/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/10/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/11/08	Y	0	0	0	0	0	0	0	4	0	0	1	1	0	**6**				
9/15/08	Y	1	0	0	3	0	0	0	0	0	0	1	3	0	**8**				
9/16/08	Y	0	0	0	2	0	0	0	15	0	0	4	2	0	**23**				
9/17/08	Y	0	0	0	14	0	0	0	4	0	0	4	10	0	**32**				
9/18/08	Y	0	0	0	6	0	2	0	10	0	0	0	3	0	**21**				
9/19/08	Y	0	0	0	0	0	0	0	3	0	0	1	1	0	**5**				
9/20/08	Y	1	0	0	0	0	0	0	1	0	2	4	1	0	**9**				
9/22/08	Y	0	0	0	0	0	0	0	6	0	0	0	0	0	**6**				
9/23/08	Y	0	0	0	2	0	0	0	0	0	0	0	2	0	**4**				
9/24/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/25/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/27/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/28/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/29/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
9/30/08		0	0	0	0	0	0	0	0	0	0	0	0	0	**0**				
By Species		**62**	**0**	**0**	**206**	**0**	**2**	**0**	**342**	**0**	**31**	**158**	**99**	**0**	**900**				
By Guild		**268**				**2**			**373**			**257**							
		BBSHHB				**RBEP**			**MYSP**			**UNKN**			**Total**				

n/o - indicates that detector was not operating on that night