# Appendix E
# Bat Study Report

# McLean's Mountain Wind Farm
# 2008 Bat Monitoring Report

**Prepared for:**
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NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

# *McLean's Mountain Wind Farm*
# 2008 Bat Monitoring Report

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## Appendix

Appendix I – Ministry of Natural Resource Comments on Work Program

# 1.0 Introduction

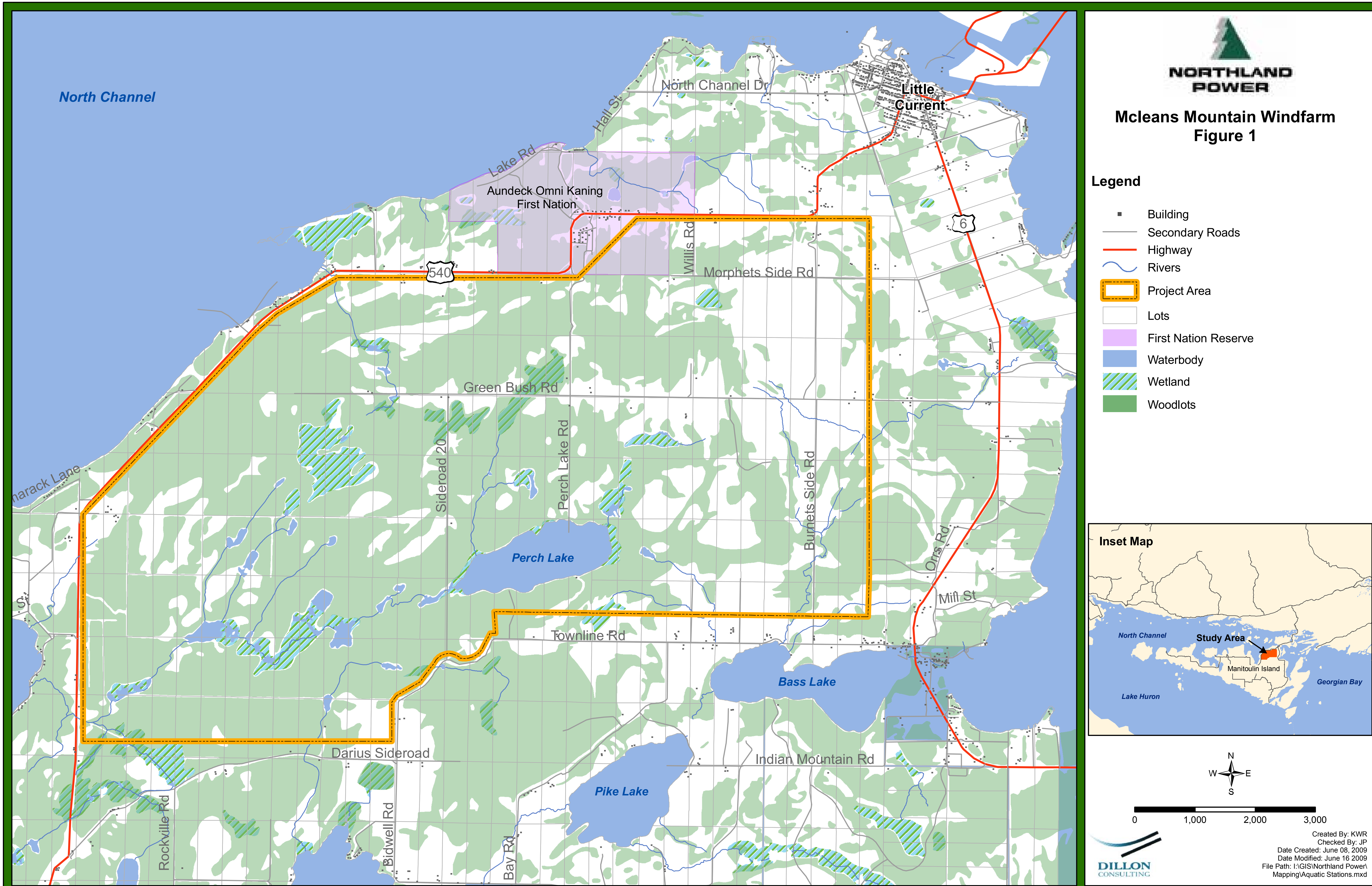
Natural Resource Solutions Inc. (NRSI) was retained in July 2008 by Dillon Consulting on behalf of Northland Power to conduct an assessment of bat activity in the project area for the McLean's Mountain Wind Farm near the Town of Little Current, Ontario.

This report summarizes the detailed findings of the extensive bat monitoring conducted by NRSI in the months of July and September 2008. Reference is also made to other bat studies that have been dondcuted in the area which NRSI is aware of.

## 2.0 Study Area

The McLean's Mountain study area is 3,290ha in size and irregularly rectangular in shape, as can be seen on the attached map (see Figure 1). The northwest corner of the rectangle is 'cut off' by the shoreline of the North Channel, which is less than 1 km away from the study area at its closest point. The Town of Little Current is situated less than 3km northeast of the study area. The project boundary is roughly bordered by Highway 540 to the north and west, and Darius Sideroad/Townline Road to the southwest and east, respectively. Highway 6 lies approximately 2 km east of the study area's eastern border, with the shoreline of Georgian Bay located less than 3 km from the study site. A portion of Aundeck Omni Kaning First Nation land is located within the study area to the north.

The land is mainly forested, with deciduous and mixed woodland. Old fields and grassland/pasture are found in patches within the site. Small pockets of wetlands occur throughout the study area, and the numerous rivers have a northeast to southwest orientation. One large lake, Perch Lake, is located within the boundaries of the study area, while another, Bass Lake, is partially included.



NORTHLAND POWER
Mcleans Mountain Windfarm
Figure 1
Legend
Building
Secondary Roads
Highway
Rivers
Project Area
Lots
First Nation Reserve
Waterbody
Wetland
Woodlots
Inset Map
North Channel
Study Area
Manitoulin Island
Lake Huron
Georgian Bay
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DILLON CONSULTING
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Date Created: June 08, 2009
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North Channel
Little Current
North Channel Dr
Hall St
Lake Rd
Aundeck Omni Kaning
First Nation
540
6
Willis Rd
Morphets Side Rd
Green Bush Rd
Sideroad 20
Perch Lake Rd
Burnets Side Rd
Perch Lake
Orrs Rd
Mill St
Townline Rd
Bass Lake
Darius Sideroad
Indian Mountain Rd
Pike Lake
Rockville Rd
Bidwell Rd
Bay Rd
Tamarack Lane

## 3.0 Background Review and Site Sensitivity

### 3.1 Background Information

Collection and review of background information on biological features of the study area and vicinity have occurred since work commenced in July 2008, and have continued until the completion of this report. Background collection and review included frequent reference to Natural Heritage Information Centre (NHIC), Species at Risk Act (SARA), and liaison with knowledgeable local naturalists and agency staff. Sources used in this study are included in the Reference section of this report.

The proposed work program was submitted to Bruce Richard (MNR District Planner) and Jim Brinsmead (MNR Management Biologist) on July 17, 2008 by Caroline Walmsley (NRSI). Following review of this document and mapping, MNR Biologist Jim Brinsmead provided comments (dated July 28, 2008) on the work program, and suggested the number of monitoring nights and number of stations (7), including one station elevated to a height of 30m. These comments were taken into consideration by NRSI staff and the work program was revised prior to the monitoring period. These comments are appended to this report (see Appendix I)

### 3.2 Project Site Sensitivity

The overall study area, proposed turbine layout, and natural features were compared with the Ministry of Natural Resource's August 2007 Draft Guidance Document for bat monitoring at proposed wind farms (OMNR 2007), and as a result the McLean's Mountain study area has been ranked as having a 'High' site sensitivity for bats. This is due to the study area boundary being located <1 km from the shore of the North Channel, The proposed turbines are located >1.5km from the shoreline. A portion of the wind farm is also located on a forested ridge, which is part of the Niagara Escarpment and could provide suitable habitat for roosting bats.

### 3.3 Ontario Bat Species

There are eight species of bat known to occur within Ontario. Five of these bat species are year-round resident species that overwinter in areas of Ontario, using caves, abandoned mines, buildings, either individually or in groups. The remaining three bat species are migratory bats that spend periods of time during the warmer months in Ontario before flying south to overwinter in warmer climates. None of Ontario's bat species are considered nationally or provincially rare. Brief natural history information for each of Ontario's bat species is provided below. Information is based on Banfield (1974), Gerson (1984), and Dobbyn (1994).

<u>Little Brown Bat</u>

This species is Ontario's most common bat species, and can be found throughout most of the province, with records as far north as James Bay. Little brown bats (*Myotis lucifugus*) will use a variety of different habitats, usually preferring forests with nearby rivers, creeks, or meadows. This species has also adapted to urban settings and will regularly roost in buildings.

Little brown bats will begin hibernating in September, congregating in caves and mines throughout Ontario. Females will move from hibernation sites to nurseries in April, while males will remain in hibernation until mid-May. This species is very common with secure populations in Ontario (NHIC, 2008).

<u>Big Brown Bat</u>

Big brown bats (*Eptesicus fuscus*) are the most urbanized of any Ontario bat species, and are frequently found near cities and towns, foraging along streetlamps. One of the most common Ontario bat species, the big brown bat, is found throughout southern Ontario and as far north as Red Lake, and is a provincially secure species (S5) (NHIC, 2008).

Big brown bats often forage above meadows, ponds, rivers, and along streetlights in towns and cities. Roosting of this species regularly occurs in barns and other buildings. Occasionally they will roost under bark or within small rock crevices. Big brown bats are very cold tolerant, and will often not begin hibernation until late in the fall, sometimes as late as early December. Hibernation of this species occurs within Ontario, often in close proximity to summer roosting sites. Big brown bats are usually the first bat to emerge from hibernation in early April.

<u>Red Bat</u>

Red bats (*Lasiurus borealis*) are a very distinctive, medium-sized, Ontario bat species. An apparently secure Ontario bat species (S4) (NHIC, 2008), red bats are found throughout southwestern Ontario with some isolated sightings further east, and as far north as James Bay. Red bats are known to be strong fliers and many records of this species have been found well outside of its distribution range.

Red bats are one of Ontario's three migrating species, and will usually migrate to Ontario in late May, staying until early September. Foraging of this species often occurs at or above tree height, sometimes as high as 200 m above the ground. Preferred foraging habitats include hilly forest, streams, ponds, and can sometimes be found foraging in towns near streetlights. Roosting of this species will usually occur solitarily in trees.

Hoary Bat

Hoary bats (*Lasiurus cinerus*) are Ontario's largest species of bats, and one of the most distinctive. They are a solitary species, often roosting high in the trees. Hoary bats will emerge from their daytime roosts late in the evening to forage among forested habitats, often near open meadows or lakes within a forested community. Hoary bats are secure within Ontario (S4) (NHIC, 2008), and occupy an extensive range as far north as James Bay but with regular populations throughout southern Ontario.

As one of Ontario's three migratory species, hoary bats do not usually arrive in Ontario until late May. This species can usually be found within Ontario as last as October before migrating to the southern United States.

Silver-haired Bat

As one of Ontario's three migrating species, silver-haired bats (*Lasionycteris noctivagans*) will usually remain in Ontario until August and September before migrating south to the United States. After hibernation, silver-haired bats will usually return to Ontario in late May or June. Range of this species stretches as far north as Thunder Bay and James Bay, with the majority of the known populations occurring in southern Ontario. Populations of this species are apparently secure (S4) within Ontario (NHIC, 2008).

Silver-haired bats can often be found foraging near forested habitats, above lakes and streams, and prefers aquatic insects. Summer roosting will usually occur in hollow trees, loose bark, or large, abandoned bird nests.

Small-footed Bat

Small-footed bats (*Myotis lebii*) are the least common species in Ontario and are classified as vulnerable to impaired within Ontario (NHIC 2008). The range of this species includes most of southern Ontario with some isolated summer sightings as far north as Sault Ste. Marie.

Hibernation of this species does not generally begin until late November, often emerging from hibernation by mid-April. Hibernation sites are often smaller caves with higher rates of air movement than other bat species. Populations of this species appear to show a preference to hilly coniferous forested habitats for foraging. Little is known about roosting site habitat preference.

Northern Long-eared Bat

Northern long-eared bats (*Myotis septentrionalis*) can be found foraging in forested areas with nearby meadows and rivers. Roosting habitats of this species can include under tree bark, rock crevices, and sometimes behind shutters or under shingles.

This species can be found within much of southern Ontario, with individual records reaching Thunder Bay and Moosonee (Dobbyn, 1994). This species is anticipated to be a vulnerable Ontario species indicated by a provincial S-rank of S3? (NHIC, 2005) Northern long-eared bats will often use the same hibernation sites as little brown bats and begin hibernation in late October, emerging again in early May.

Eastern Pipistrelle
Eastern pipistrelles (*Pipistrellus subflavus*) can often be found foraging along slow moving rivers, forest edge, or above open meadows. These bats begin feeding around sunset, often flying high in the canopy hunting flying insects. Eastern pipistrelles are rarely found in heavily wooded areas or open areas unless large trees are present. This species hibernates in Ontario in caves and abandoned mines, usually from mid-October through May.

Range of this species covers much of southern Ontario. Populations are considered vulnerable within Ontario (S3?) (NHIC 2008), and are usually found as single individuals or small groups.

### 3.4 Bat Habitats

Review of background sources, topographic mapping, aerial photographs, on-site vegetation mapping, and agency consultation were all used to analyze the habitats within the study area for the potential to concentrate bat activity.

The MNR lists significant bat habitat as caves and abandoned mines, buildings, snags, and riparian and aquatic habitat (OMNR 2006), and the August 2007 Draft Guidance document lists proximity to major shorelines, forested ridges, and known hibernacula or maternity roosts as features known to concentrate bat activity (OMNR 2007). All of the habitats and landscape features were examined within the study area for the potential to concentrate bat activity. No large concentrations of bats were observed, however suitable bat habitat is found on the cliff edges located along the forested ridge.

### 3.5 Significant Bat Species

None of the species found within Ontario are considered provincially or nationally rare species (NHIC 2008; Environment Canada 2007).

Three of Ontario's bat species, northern long-eared bat, eastern pipistrelle, and eastern small-footed bat, have all been given provincial S-Ranks that suggest they may have sensitive populations and may be at risk in Ontario (NHIC 2008). The eastern small-footed bat is considered an imperiled to vulnerable population that may be at risk within

Ontario.  No suspected calls of this species were recorded within the McLean's Mountain study area.

The northern long-eared bat and eastern pipistrelle are both considered potentially vulnerable species within Ontario and have populations that may be at risk within Ontario.  A total of 4 suspected calls of northern long-eared bat and 1 suspected call of eastern pipistrelle were identified during the monitoring period.  Large populations of these species are not expected to be present due to limited roosting and foraging habitat within the study area.

## 4.0 Baseline Acoustic Bat Monitoring

### 4.1 Acoustic Monitoring Methodology

#### 4.1.1 Station Selection

A total of 7 acoustic bat monitoring stations were selected to collect detailed through-the-night abundance and species data from within the study area (see Figure 2). During the July monitoring period only 6 stations were monitored. In September, based on comments received from the MNR (July 2008), an additional station was added. This station was added as it provided better coverage of the southwest portion of the study area. Each of the monitoring stations was selected in habitats that are representative of the habitats found within the study area. At the time of station placement, exact turbine locations were not known, but the bat monitoring stations were placed in areas being considered for turbine placement. Brief location and habitat descriptions for each station can be found below.

<u>BAT-001</u>
This station was placed approximately 200m east of Willis Road on Morphets Side Road, on the edge of a deciduous sugar maple *(Acer saccharum)* forest. Adjacent to this station is meadow habitat that is used for grazing.

<u>BAT-002</u>
This station was placed at the Metrological Tower located at the corner of Burnet's Side Road and Green Bush Road. The monitoring station was located in agricultural meadow habitat, dominated by herbaceous and low shrub species. Adjacent to this monitoring location was active grazing pasture. An elevated monitoring station was also placed at this station. A pulley system was used to raise the monitoring equipment to a height of approximately 30m within this open meadow area.

<u>BAT-003</u>
This monitoring station was located approximately 250m north of Townline Road within a deciduous sugar maple forest. This forest was located on a forested ridge and is surrounded by pasture fields that are actively used by cattle.

<u>BAT-004</u>
This station was located at the edge of an old field and swamp wetland approximately 50m north of Green Bush near Sideroad 20. The bat monitoring equipment was placed along the fence line roughly 10m from the road.

<u>BAT-005</u>
This station is located in open meadow habitat on top of a ridge. The bat monitoring equipment was placed at the edge of a pasture field that was actively being used by cattle.

BAT-006
This station was located on top of the ridge in open pasture land. As a result of cattle being present in the field the bat monitoring equipment was placed on a deer hunting platform that was located approximately 3m off the ground. Access to the monitoring stations was through the use of ATV.

BAT_007
This station was located in the southwest portion of the study area. The bat monitoring equipment was placed in a swamp that was dominated mostly by trembling aspen *(Populus tremuloides)*

#### 4.1.2 Abundance Monitoring

NRSI biologists conducted through-the-night (dusk to dawn) bat monitoring on a total of 24 nights, totaling more than 866.2 hours of monitoring data. Monitoring was conducted on the night of July 18/19 to July 23/24 and September 12/13 to September 29/30. Based on the August 2007 Draft Bat Monitoring Guidelines for a High sensitivity site, bat monitoring should have been completed in August, however was not done due to project logistics.

On each monitoring night, a Pettersson D240X ultrasound bat detector was paired with a portable computer to record all bat activity. This monitoring system was powered by marine and/or gel deep cycle batteries and left to record between 2-5 nights of data at a time. The portable computer recorded wave files at a moderate sampling rate of 22.2 kHz/sec, which typically provides ample sonogram resolution to identify the call sonograms of Ontario's bat species.

Monitoring equipment was designed to record both Heterodyne and Time Expansion data simultaneously to allow for a full analysis of activity within the study area. Although Time Expansion records broadband data, the Heterodyne setting typically records narrowband data within approximately 5kHz of the recording frequency. Based on call frequencies of Ontario bat species, a recording frequency of 35kHz was chosen to provide the most accurate representation of bat abundance through the study area. Representative calls of all of Ontario's bat species demonstrate that at least some of the call will overlap with the 30-40kHz detectable range. It is possible that some distant or uncharacteristic calls were not picked up by the Heterodyne recordings, however when paired with the broadband recordings of the Time Expansion data, this data is expected to give an accurate representation of the bat activity through the study area.

#### 4.1.3 Point Count Monitoring

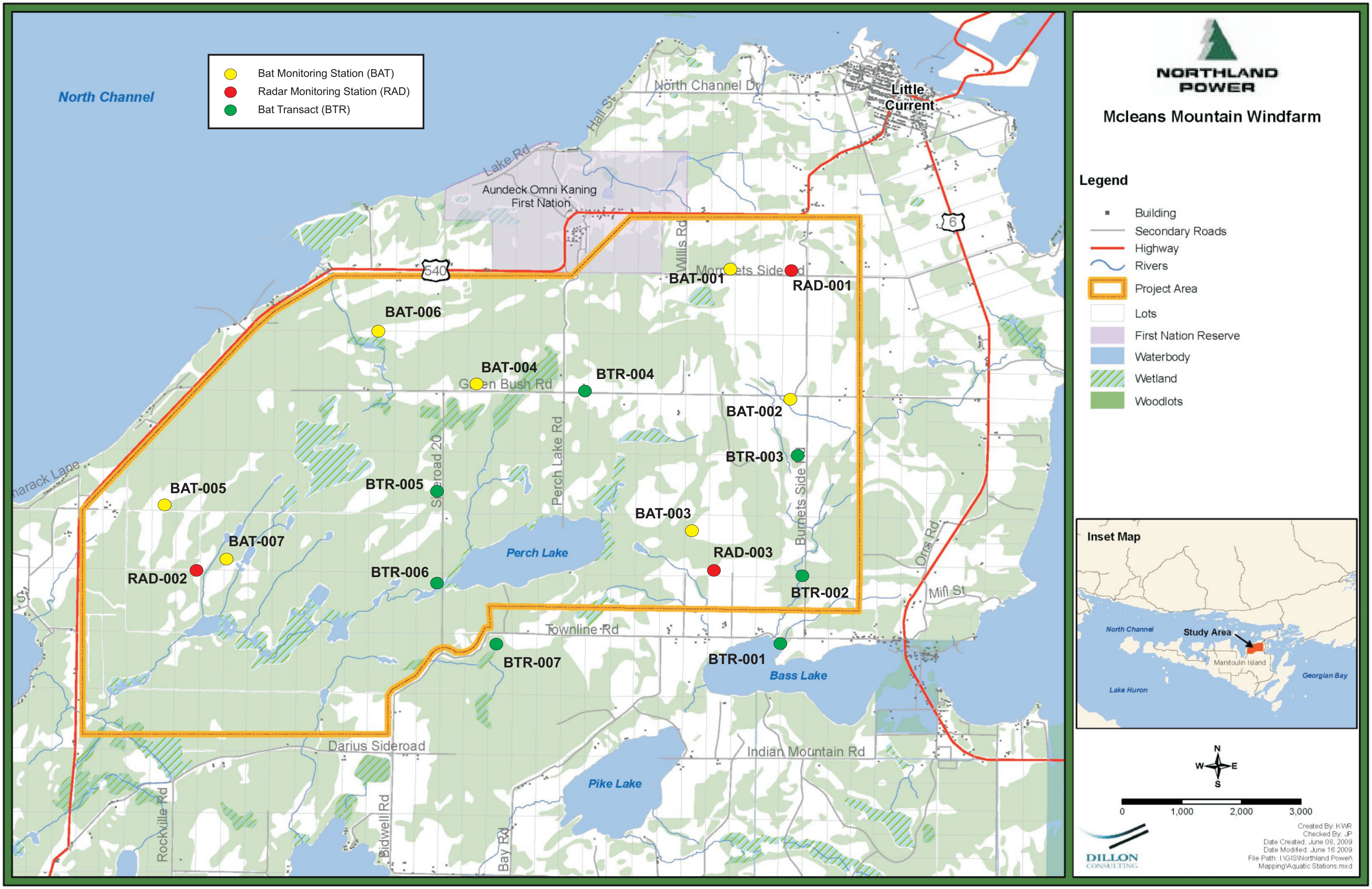
In addition to the monitoring described above, transect-based acoustic monitoring was undertaken to establish any locations or habitats that might support large concentrations of bat activity. These surveys occurred at a total of 7 locations and were conducted once during the monitoring season on September 24, 2008. Point count locations were chosen to represent both agricultural habitat and potential areas of increased bat activity such as forest and woodlot edges, farm buildings, wetland, and open water habitats. These locations were chosen in order to identify any potential bat concentration areas within the study area, and to compare passage rates between different habitat types. Point count locations can be seen on Figure 2. Point counts were conducted between sunset and midnight, and consisted of five minute surveys at each point count location. During each point count, the observer used the Pettersson D240X ultrasound detector to record bat calls while listening to the total number of bat passes during the point count. The Heterodyne data collected from these active monitoring point counts has been analyzed separately to address any potential concentration areas with the study area.

#### 4.1.4 Sonogram Analysis

In conjunction with through-the-night abundance data, the recording equipment was designed to record bat call sequences and sonograms through the Pettersson D240X. The calls were recorded using a time expansion of 10x, and were analyzed with SonoBat software, and were analyzed using numerous acoustic call attributes including characteristic frequency, maximum and minimum frequencies, call duration, bandwidth, and various other call attributes. These parameters were used to compare these calls with recorded calls of known species.

Bat call sonograms are often extremely variable and can change dramatically depending on numerous environmental and behavioural situations. It has been well documented that even expert bat researchers can misidentify bat species based on call sonograms. NRSI biologists have used large call libraries from various sources, including previous monitoring conducted by NRSI, as a basis for call analysis. Wherever possible, bat sonograms were identified to species, however in cases where this was not possible, sonograms were identified to family group or characteristic frequency. Call sonograms were compared on the basis of peak frequency, call length, call shape, harmonics, and other acoustic attributes.

# Figure 2 - 2008 Bat Monitoring Stations




NRSI_0864_ProposedBatStations_Fig2_55K_22Jul09_SWM

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## 4.2 Baseline Acoustic Results

The monitoring period of late July and September overlaps with the peak periods of bat activity, including both the summer swarming and fall migration periods of Ontario bat species.

During the monitoring period, a total of 2797 bat passes were recorded in just over 866.2 hours of monitoring, resulting in an overall average passage rate of 2.9 passes/hr at the McLean's Mountain Wind Farm. Weather data collected during the monitoring period indicated that most of the monitoring nights are considered favourable weather conditions for bat activity, with overnight temperatures above 10°C, slight precipitation, and low wind speeds. The comprehensive data and analysis results have been discussed in greater detail below.

### 4.2.1 Monthly Abundance Trends

Data collected during the entire monitoring period was analyzed by date to determine if periods of increased bat activity were observed within the study area during the monitoring period. Although limited monitoring occurred in the late part of July, peak bat activity was observed on July 18 and 23, 2008 with average passage rates of 12.7 and 9.0 passes/hr. The lowest level of bat activity was observed on July 21, 2008, with 7.5 passes/hr (see Figure 3).

Bat monitoring results from the Mother Earth Renewable Energy Project (MERE) conducted in 2006, near the Town of West Bay, located on Manitoulin Island were compared to the McLean's Mountain 2008 bat monitoring period. This data is being used to provide an indication of the level of bat activity that could potentially be found with the McLean's study area and should only be used as a general guidance. This data indicated peak bat activity on July 25, 2006, when a passage rate of 99.4 passes/hr was recorded. Although the passage rates recorded at this site are substantially higher, the seasonal trends are comparable and give a good indication that the peak period for bat activity on the McLean's Mountain study area was observed.

August bat monitoring for the McLean's Wind Farm needs to be completed to meet the MNR guidelines. The MERE August 2006 survey results indicated an average passage rate of 11.9 passes/hr, with peak periods recorded on August 3, 2006 which were observed to decrease over the monitoring period to 8.6 passes/hr.

Passage rates in September were observed to peak on the night of September 13, with an average passage rate of 7.4 passes/hr. Overall, decreasing passage rates were observed within the study area as the monitoring period progressed.

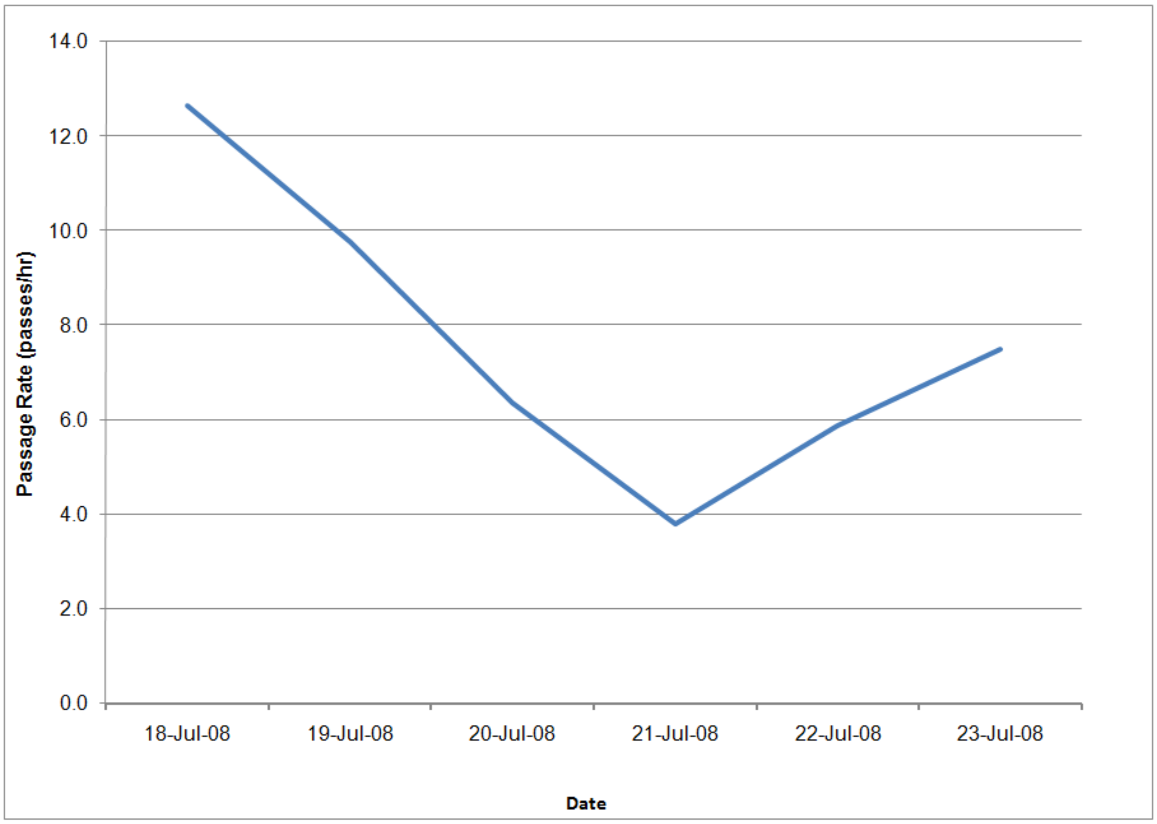


**Figure 3. Passage Rate (passes/hr) by Date during July 2008 Bat Monitoring**

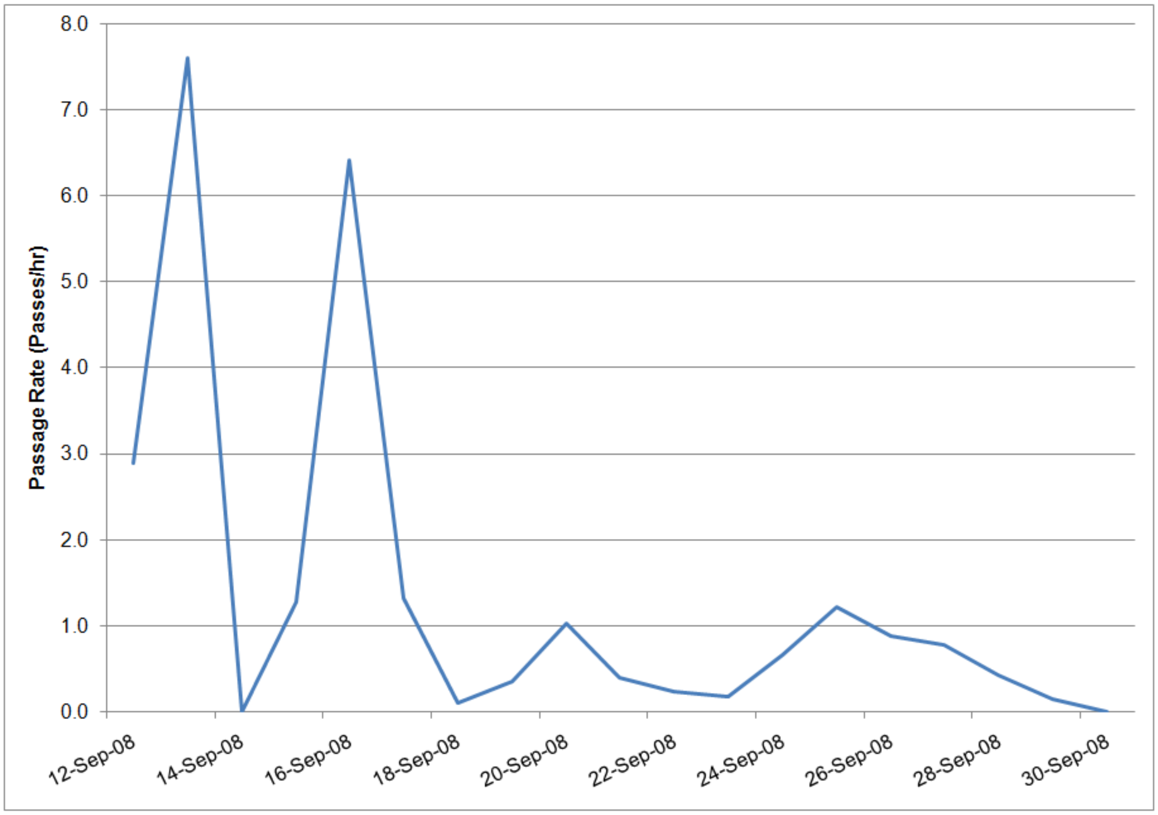


**Figure 4. Passage Rate (passes/hr) by Date during the September 2008 Bat Monitoring**

Abundance data was also separated based on ground and elevated station types and analyzed by date. This information allows the monthly activity patterns to be analyzed based on approximate flight height to determine if bat activity at a greater height showed different activity patterns and peak levels. Figure 5 shows the bat activity levels at both (BAT-002) ground monitoring station and the elevated monitoring station throughout the monitoring period. Activity levels at the elevated monitoring station remain lower than those observed at the ground monitoring stations for the majority of the monitoring period. The peak passage rate at the elevated monitoring station occurred on the night of September 25/26 when an average passage rate of 0.1 passes/hr was recorded at the elevated station. The passage rates on this night at the ground stations had an average, 0.6 passes/hr, and represented the fourth lowest night of activity at the ground monitoring stations. When sampling volume is considered for both ground and elevated stations, the relative passage rate observed at elevated station may be even lower still as more air can be sampled around the bat detector when placed at a height of at least 30m (i.e. no interference from the ground surface). Overall, the patterns observed at the elevated monitoring station mirrored the same relative patterns as the ground stations, with much lower average passage rates throughout most of the monitoring period.

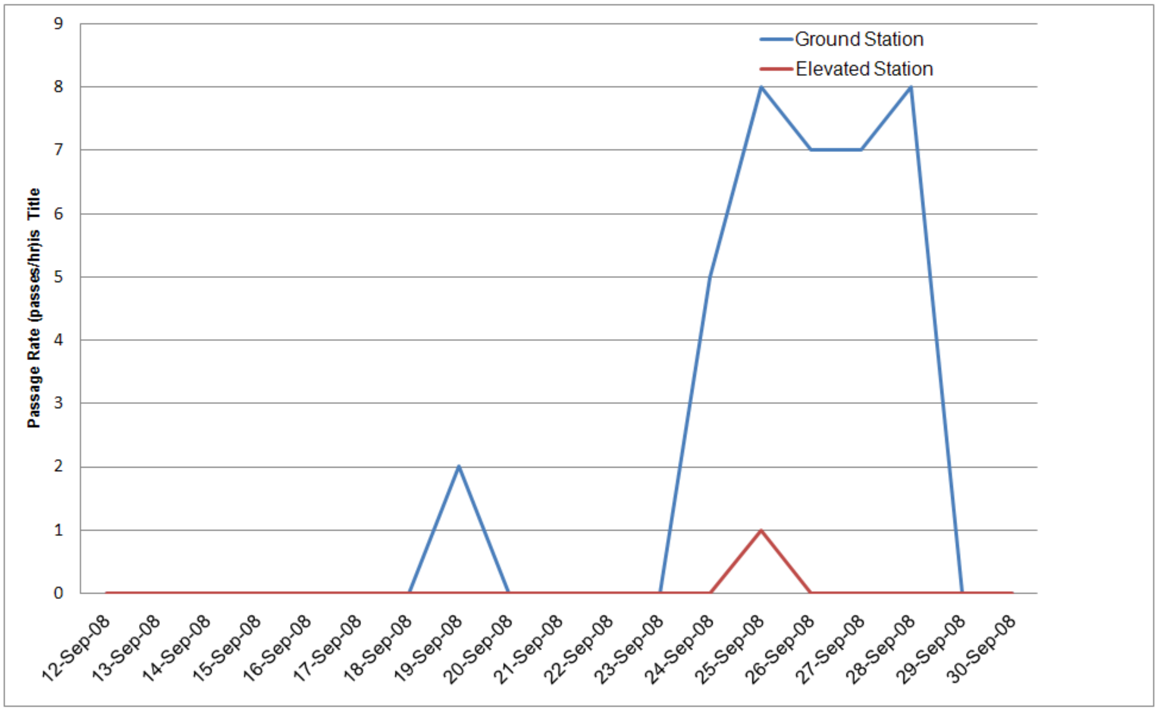


**Figure 5. Monthly Bat Activity Patterns at the Ground and Elevated Monitoring Stations (BAT-002) during September 2008 Bat Monitoring.**

### 4.2.2 Nightly Abundance Trends

Bat abundance data was collected and analyzed by the time of night that each pass was recorded. Within the McLean's study area, overall bat activity began to rise sharply at approximately 2030hrs, which corresponds roughly to the time of sunset at this time of year. This is the time period when bats are known to leave their daytime roosts to forage in nearby areas. Bat activity within the study area was found to decrease at 2130, with an average passage rate of 1.2 passes/hr (see Figure 6). Bat activity remained above 2.0 passes/hr from 2200hrs to 0500hrs, at which point the passage rates began to decline into the early hours of the morning. Following this period of decreased activity, a secondary peak in bat activity was observed from approximately 0600-0630-hrs when slightly higher passage rates were observed just prior to sunrise. Following 0630hrs, bat activity decreased and passage rates declined sharply before ending at approximately 0700hrs. This secondary peak in bat passes is typical of nightly bat activity patterns, and may correlate to nightly fluctuations in insect activity (Reynolds and MacFarland 2001; Shump and Shump 1982).

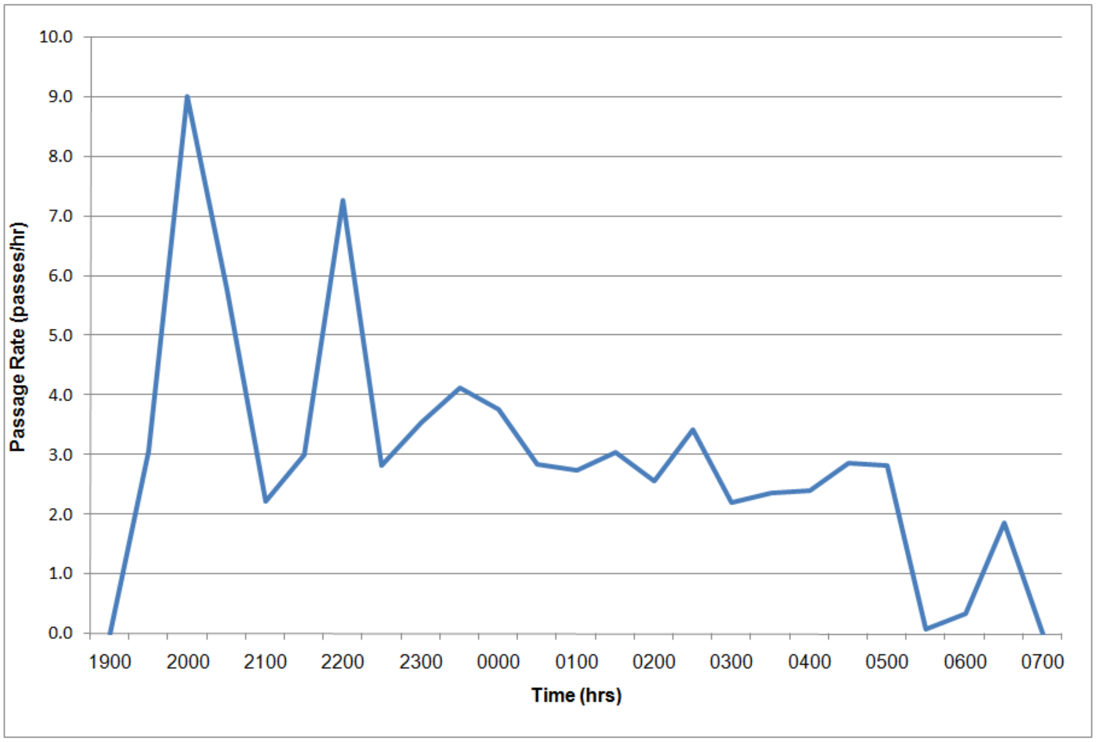


**Figure 6. Nightly Trends of Bat Activity during the July and September Monitoring Period**

### 4.2.3 Abundance Trends by Location and Habitat

The 7 bat monitoring stations used at the McLean's Mountain Wind Farm were selected to represent a variety of habitat types and general locations within the study area. Abundance data was analyzed by monitoring station in order to determine if areas of concentrated bat activity are present within the study area.

The highest passage rate of any station was observed at BAT-004, with a passage rate of 7.4 passes/hr (see Figure 7). BAT-004 was located along the fence line of an old field / wetland, which consisted of trembling aspen, shrub and grass. The second highest average passage rate was observed at BAT-001, which had an average passage rate of 2.7 passes/hr. This station was located on top of a forested ridge, approximately 200m east of Willis Road on Morphets Side Road. The bat monitoring equipment was placed on the edge of a deciduous sugar maple forest. Adjacent to this station is meadow habitat which is used for grazing. Monitoring stations BAT-005, 006 and 007 had the next three highest passage rates of 1.6, 1.2 and 1.7 passes/hr respectively. The remaining two stations, including the elevated BAT-002 and 003, both had average passage rates of below 1.0 passes/hr.

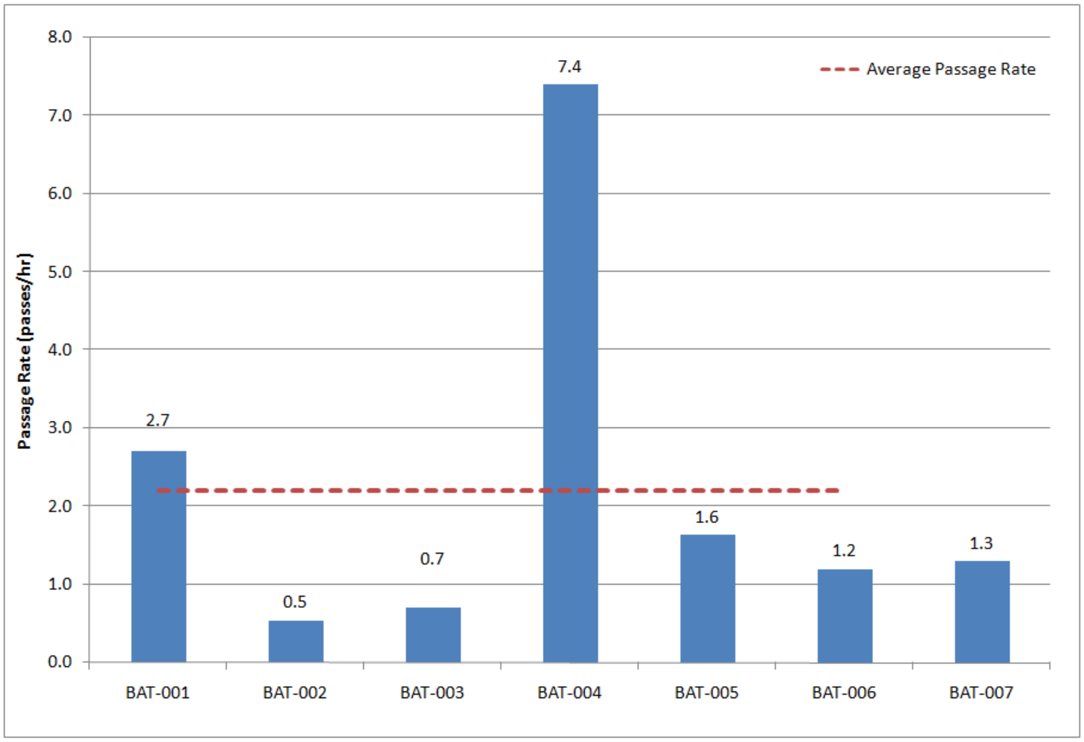


**Figure 7. Bat Passage Rates by Monitoring Station**

The elevated bat monitoring station (BAT-002) was mounted on an existing meteorological tower at a height of approximately 30m, and in a agricultural meadow field located on the corner of Burnett Side Road and Green Bush Road. The elevated monitoring station showed lower average passage rates than all of the ground stations.

### 4.2.4 Transect Point Count Surveys

No large concentrations of bats were observed during the point count surveys. A total of 2 bat species were observed during the transect surveys, which was conducted on September 24, 2009. One hoary bat was observed at point count station BTR-005.

This station was located along an open wetland just south of Perch Lake on Sideroad 20. The other bat species noted was recorded at 40kz but could not be recorded to speices. This Myotis sp. was observed at BTR-006 which is located at a coniferous forest, located on Townline Road, approximately 100m east of Sideroad 20.

#### 4.2.5 Species Results

During the monitoring period, a total of 1,327 call sequences were recorded by the bat monitoring equipment. Of these calls, a total of 276 calls were identified to the species level. The remaining calls could not be identified to individual species and were grouped by characteristic frequency (i.e. 30kHz or 40kHz) or into the *Myotis* family group. It is well documented that species calls are extremely variable and often difficult to distinguish. Even expert bat ecologists can have difficulty distinguishing certain bat species, particularly big brown and silver-haired bats, both exhibiting a characteristic frequency of approximately 30kHz with many other call similarities, such as duration, slope, and maximum frequency.

During the monitoring period, a total of 5 species were identified using recorded call sonograms from both through-the-night and point count monitoring. Although the most abundant call, as seen in Figure 8, are calls recorded at 40kHz that could not be identified to species it is possible that these calls could have consisted of northern-longed eared, little brown bat, eastern small-footed and red bat . The most abundant identified species was red bat that accounted for 7.8% of all recorded bat calls. The next most abundant species was northern long-eared with 6.9 % and little brown representing 4.2% of recorded calls. The hoary and silver-haired bat were observed in relatively low number representing 1.1% and 0.8% of the calls recorded. A marginal number of recorded calls were classified as 30kHz (big brown / silver-haired) or *Myotis* species.

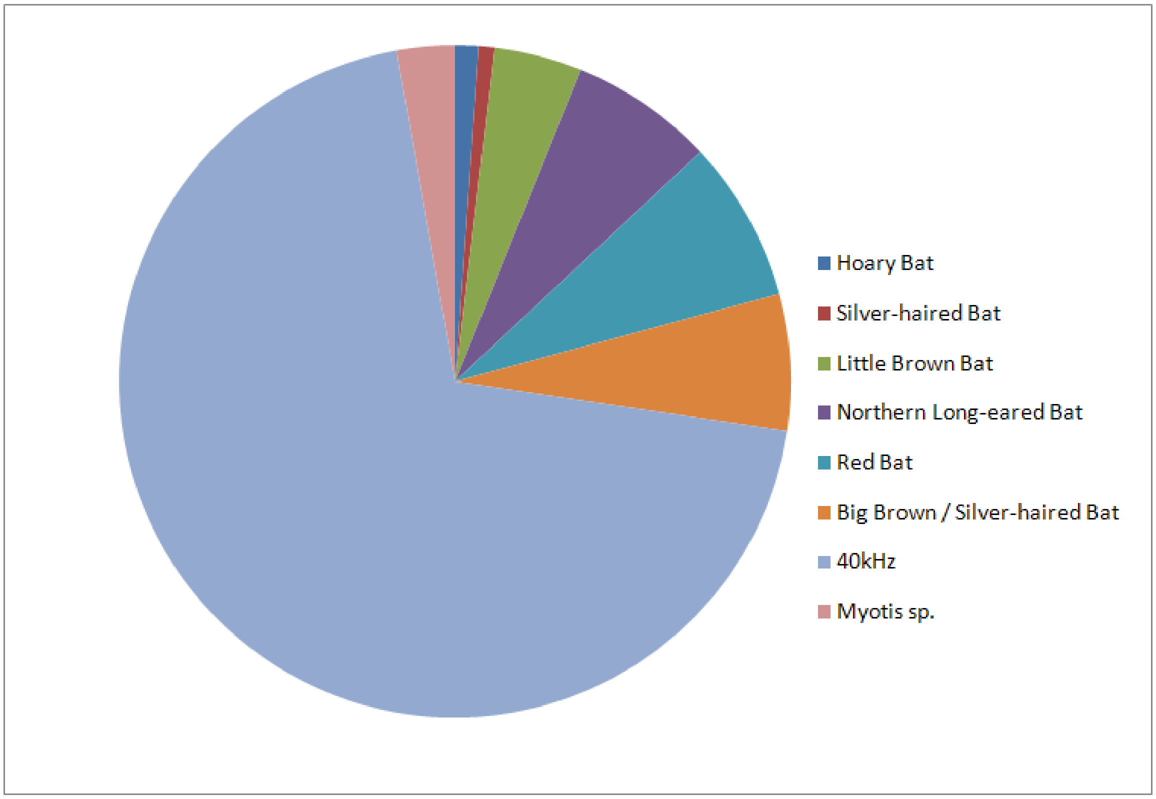


**Figure 8. Bat Species Composition during 2008 Bat Monitoring**

# 5.0 Baseline Radar Bat Monitoring

## 5.1 Radar Monitoring Methodology

### 5.1.1 Station Selection

Radar monitoring was conducted at 3 stations within the McLean's Mountain study site. Only 2 stations (RAD-001 and RAD-02) were monitoring during the month of July. In September, based on recommendations from the MNR, an additional station (RAD-003) was selected in the southwest portion of the project area. This station was selected as it provided better coverage of the study area. The location and habitat for each monitoring station are described in more detail below:

<u>RAD-001</u>
This station was located approximately 50m west of McLean's Mountain Road on an open trail. The radar unit was set-up in the open area, which was surrounded by active grazing pasture.

<u>RAD-002</u>
This station was conducted at the same location as BAT-003, which is located approximately 250m north of Townline Road within a deciduous sugar maple forest, located on a forested ridge, which is surrounded by pasture fields that are actively used by cattle.

<u>RAD-003</u>
This station was located approximately 250m from the acoustic bat monitoring station BAT-007. The radar unit was set-up in an area that was surrounded by mixed forest that which is dominated mostly by trembling aspen and balsam fir (*Abies balsamea*).

### 5.1.2 Monitoring Period

Radar monitoring was carried out during the months of July and September 2008. A total of 4 nights of radar monitoring were conducted in July and another 15 nights were conducted during September. The monitoring effort was conducted based on recommendations received from the MNR on July 17, 2008. Table 1 shows the dates (nights) monitored at each station.

**Table 1. Radar Monitoring Dates**

| Station | Monitoring Period | |
|---|---|---|
| | July | September |
| RAD-001 | 19/20,<br>20/21 | 16/17,<br>19/20,<br>22/23,<br>23/24,<br>28/29 |
| RAD-002 | 21/22,<br>22/23 | 15/16,<br>18/19,<br>21/22,<br>24/25,<br>27/28 |
| RAD-003 | -------- | 12/13,<br>17/18,<br>20/21,<br>25/26,<br>26/27 |

### 5.1.3 Methodology

Radar monitoring consisted of through-the–night monitoring using NRSI's mobile radar system. The mobile radar lab consists of a12kw Furuno marine radar (Model 1964C) with a parabolic antenna that was mounted at a constant angle of 30 degrees. Data were collected every hour on the hour for a 15 minute period from 21:00 – 05:00hrs within a sampling range of 0.96km to a maximum height of 695m agl. This setting was chosen to ensure that targets below and within the blade spheres were not overlooked. The NRSI radar system provides data on flight altitude, direction, and speed while at the same time minimizing potential ground interference. The differentiation of birds, bats, and insects is based on a series of sophisticated algorithms that take into account parameters such as flight pattern. This system was developed by NRSI over the past 3 years.

Hourly acoustic surveys were conducted on location in conjunction with radar monitoring. A Pettersson ultrasound detector D240x was placed approximately 5m from the radar unit and was used to record bat abundance over a 15 minute period every hour on the hour from 21:00 – 05:00hrs. The sampling range of the Pettersson detector is dependent on a number of variables including habitat, weather, and bat call amplitude. Based on these variables the range can vary from 30-60 metres from the unit. This acoustic data is used to calibrate the analysis algorithm.

Weather data, including temperature, precipitation, wind direction, and wind speed, were collected hourly during the monitoring period. These values were used in data analysis.

## 5.2 Radar Bat Monitoring Results

The radar system provides information on flight patterns that include time, altitude, speed, direction, as well as changes to these parameters. Since the radar samples a volume of air that varies with altitude, the results of the radar monitoring are expressed as flight densities by time period (typically passes per $m^3$ per hour). The analysis of radar data can include the elimination of multiple flights per individual with some confidence, however since risk of bat-turbine collisions are a reflection of activity level more than number of individuals, potential multiple flights of individuals have been left in for this analysis.

### 5.2.1 Monthly Abundance Trends

Data collected during the July and September monitoring periods was analyzed by date to determine if periods of increased bat activity were found within the study area. Although limited monitoring occurred in the late part of July an increase in bat activity was observed on July 21/22, with $4.4 \times 10^{-08}$ passes/$m^3$/hr. This peak period corresponds with the summer swarming of Ontario's local bat populations.

Spring flight density at the MERE Wind Farm indicated a higher level of bat activity with flight density of $4.9 \times 10^{-6}$ passes/$m^3$/hr. During the September monitoring period, peak bat activity was observed on September 16/17, with $3.0 \times 10^{-07}$ passes/$m^3$/hr, with a second peak of bat activity noted in the later part of the month on September 25/26, with 2.3x10-07 passes/$m^3$/hr. These peaks correspond with the early fall migration of migrant bat species. Overall, decreasing passage rates were observed within the study area as the monitoring period progressed.

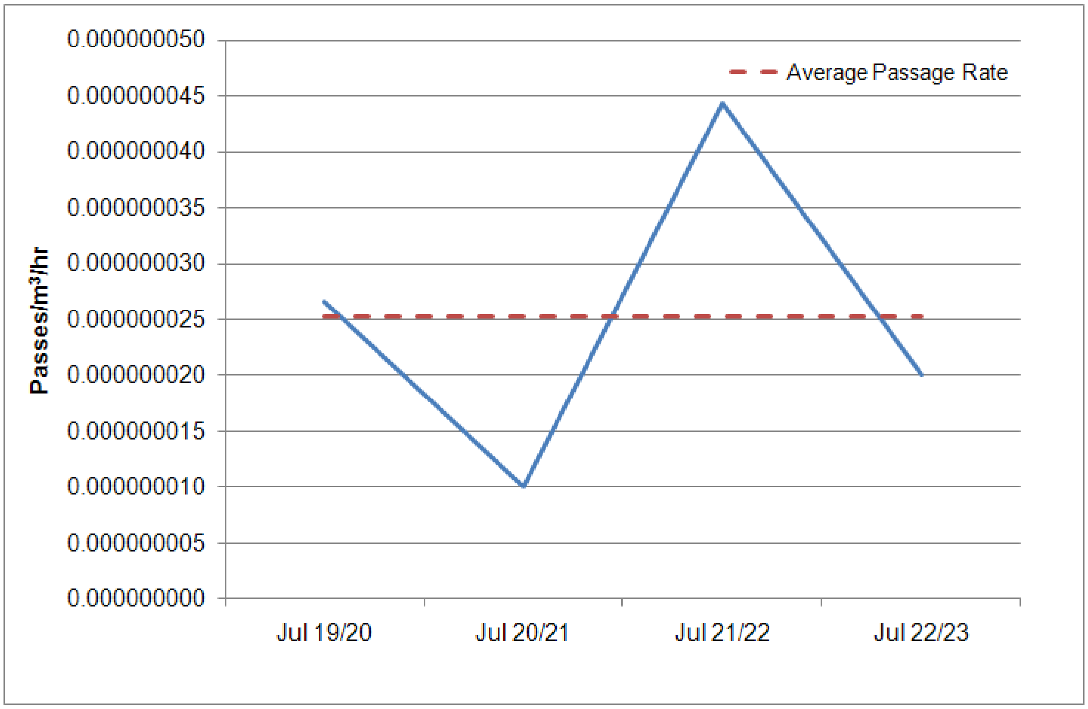


**Figure 9. Average Radar Passage Rate (Passes/m$^3$/hr) for the July Monitoring Period.**

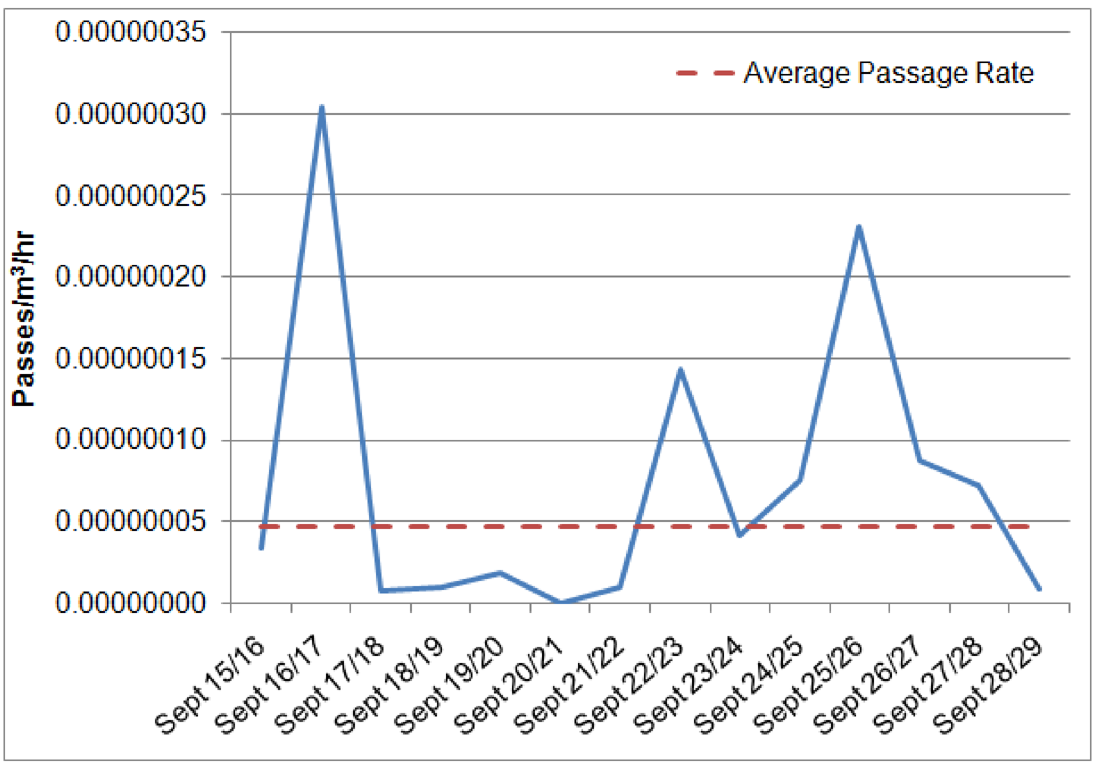


**Figure 10. Average Radar Passage Rate (Passes/m$^3$/hr) for the September Monitoring Period.**

5.2.2 Abundance Trends by Time of Night

Hourly flight densities for the July and September monitoring period are shown on Figure 11 and Figure 12. In most cases peak bat activity was observed in the first few hours of monitoring during the early morning hours with a decrease in activity during the midnight hours. This is consistent with the acoustic monitoring results and typical of nightly bat activity and may correspond to peaks in nocturnal insect fluctuations (Reynolds and McFarland 2001, Shump and Shump 1982).

A slightly different activity pattern can be seen on the night of July 22/23, 2009. This pattern involved a decrease in bat activity during the evening hours, peaking in the midnight hours, and gradually decreasing in the early morning hours. The absence of the evening peak may be caused by less than ideal weather conditions (i.e. low temperatures) (Arnett et al. 2008, Erickson and West 2002, Grindal et al. 1992).

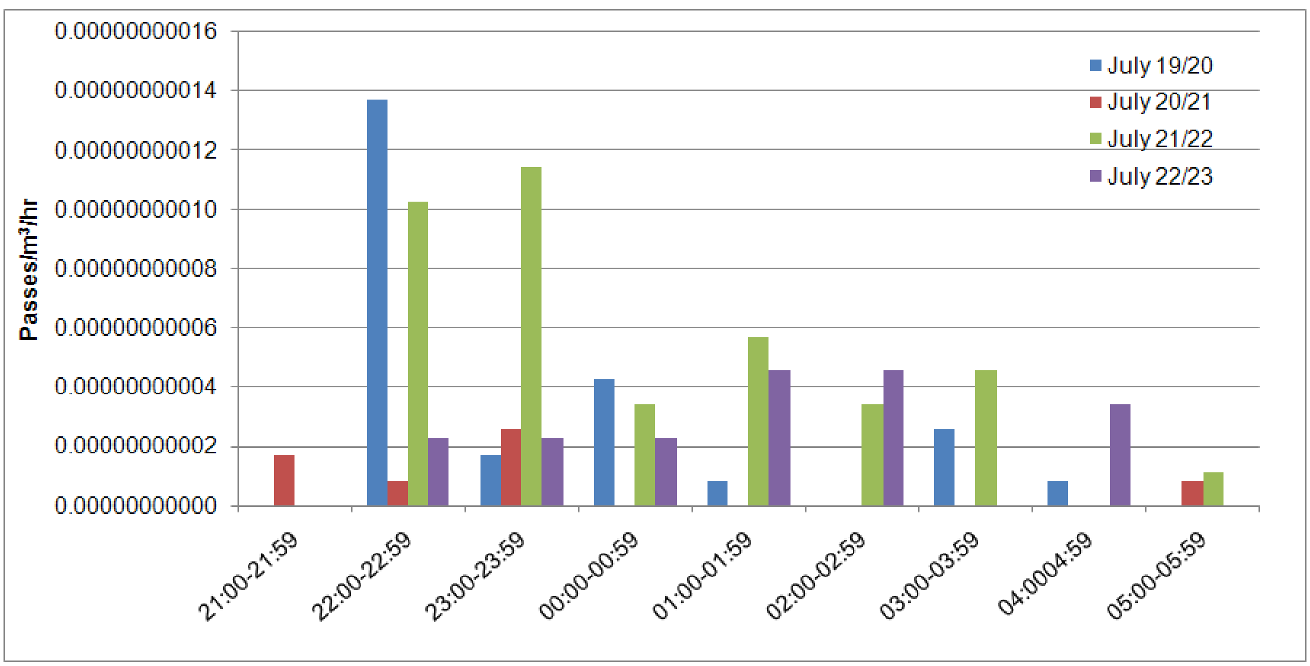


**Figure 11. Hourly Flight Densities for the July Monitoring Period**

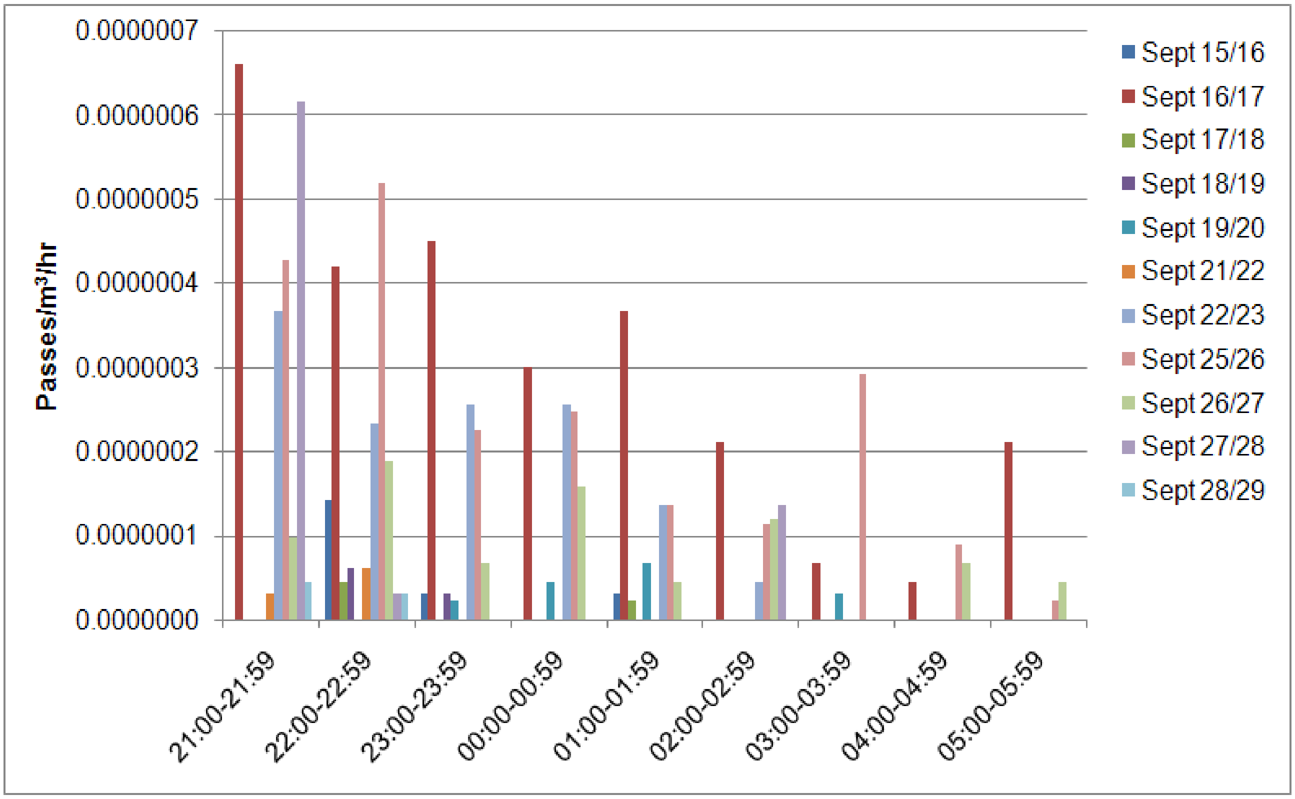


**Figure 12. Hourly Flight Densities for the September Monitoring Period.**

### 5.2.3 Flight Heights

Figure 13 shows the flight density values for the July monitoring period. Flight density was found to be the highest at lower altitudes and decrease at high altitudes. This pattern is typical of bat activity (Arnett et al. 2008, Reynolds and McFarland 2001). The average density within the sample range of 0 – 700m agl was $1.2x10^{-08}$ passes/$m^3$/hr. The overall highest flight densities were observed at 20 - 40m agl, with $1.1x10^{-05}$ passes/$m^3$/hr and 40 – 60m agl with $6.0x10^{-06}$ passes/$m^3$/hr. As expected, the lowest flight densities were observed at the highest altitudes (200-700m agl) and shown to be $1.1x10^{-08}$ passes/$m^3$/hr.

Figure 14 shows the flight density values for each station monitoring during July. Radar monitoring station (RAD-002) had the highest flight density values in sample range 20 – 40m agl with $1.0x10^{-05}$ passes/$m^3$/hr.

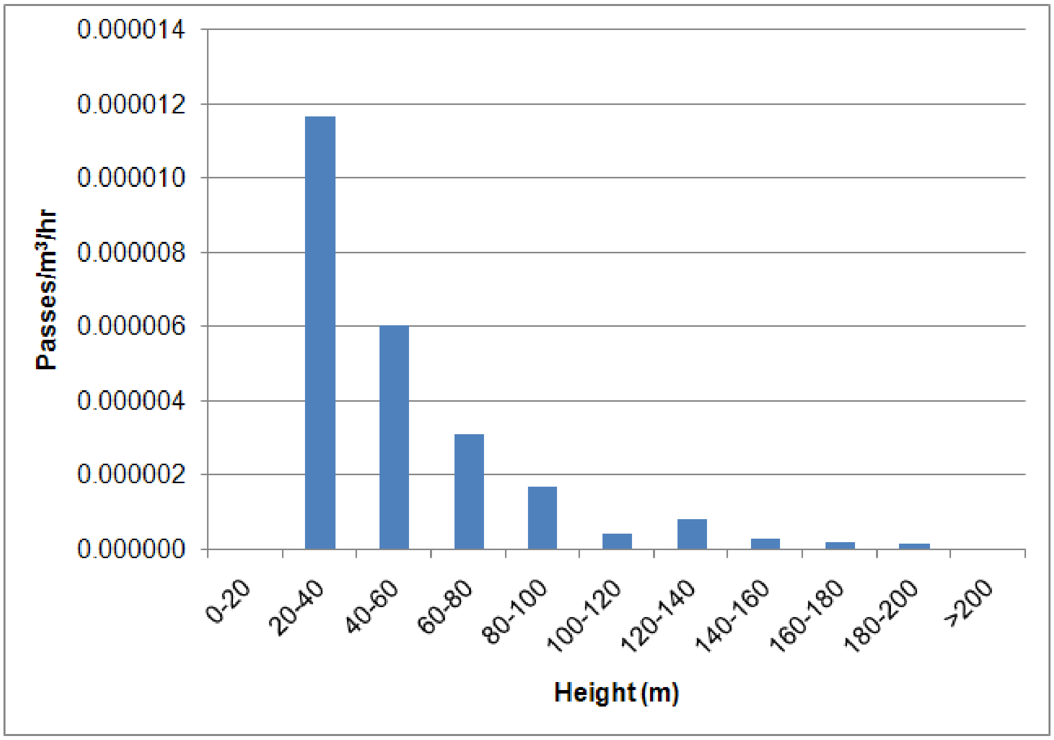


**Figure 13. Overall Flight Density by Height for the July Monitoring Period**

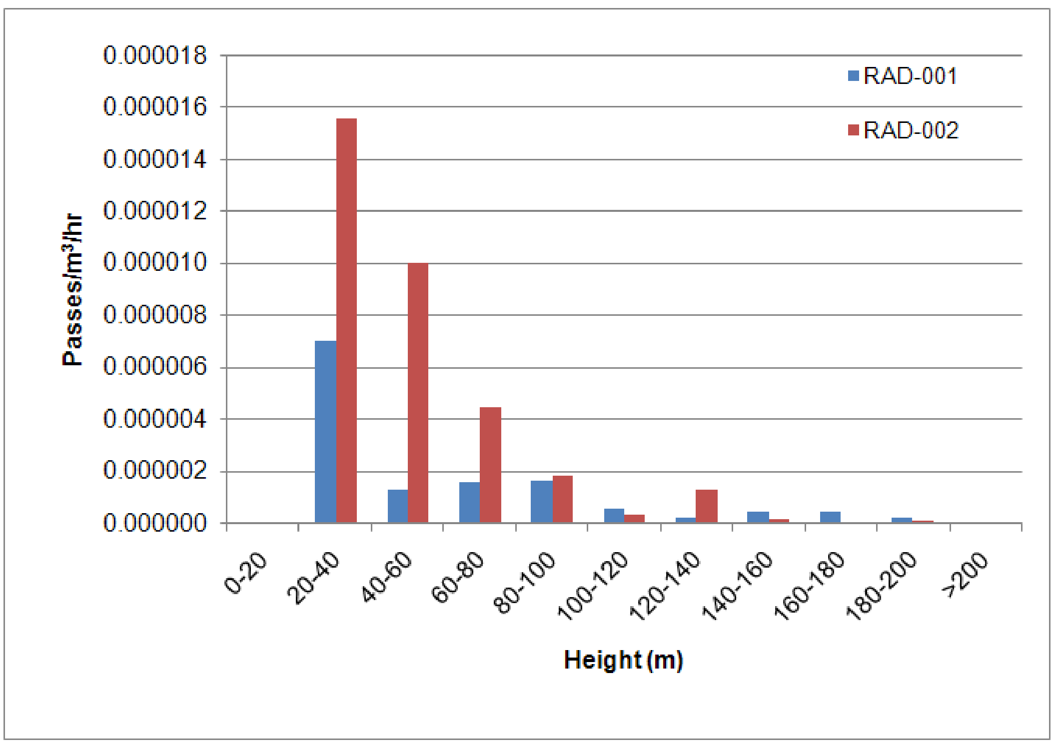


**Figure 14. Flight Densities by Height and Station for the July Monitoring Period**

Flight density values in September were found to be greater at higher altitudes (see Figure 15), which is consist with bat migration. This is opposite to the July monitoring period, where flight densities were observed at lower altitudes were observed a lower heights. Higher flight The average density within the sample range of 0 – 700m agl was $4.6x10^{-08}$ passes/$m^3$/hr. The overall highest flight densities were observed at 100 - 120m agl, with $1.4x10^{-07}$ passes/$m^3$/hr and 180 - 200m agl with $2.0x10^{-07}$. The lowest flight densities were observed at the lowest altitudes (20 - 40m agl) and shown to be $5.2x10^{-08}$ passes/$m^3$/hr.

Figure 16 shows the flight density values for each station monitoring during September. Radar monitoring station (RAD-003) had the highest flight density values within the sample range 120 – 140m agl with $3.6x10^{-08}$ passes/$m^3$/hr. This station was located in an area that was surrounded by mixed forest which is dominated mostly by trembling aspen and balsam fir .

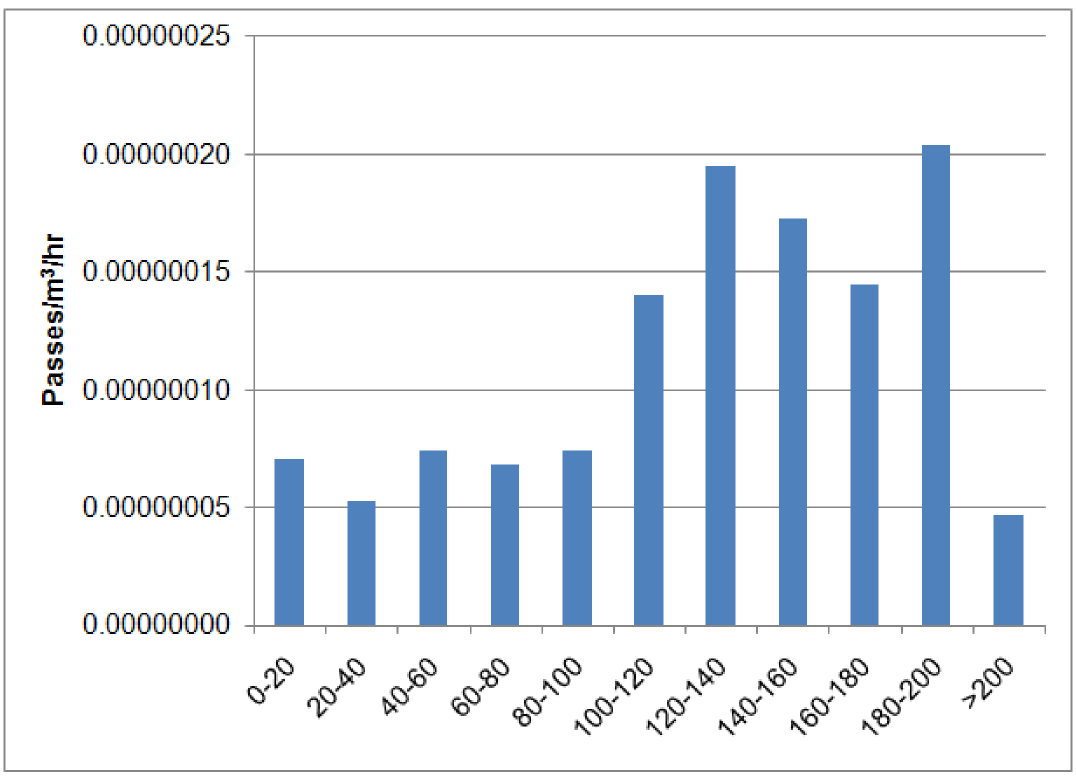


**Figure 15. Overall Flight Densities by Height for the September Monitoring Period**

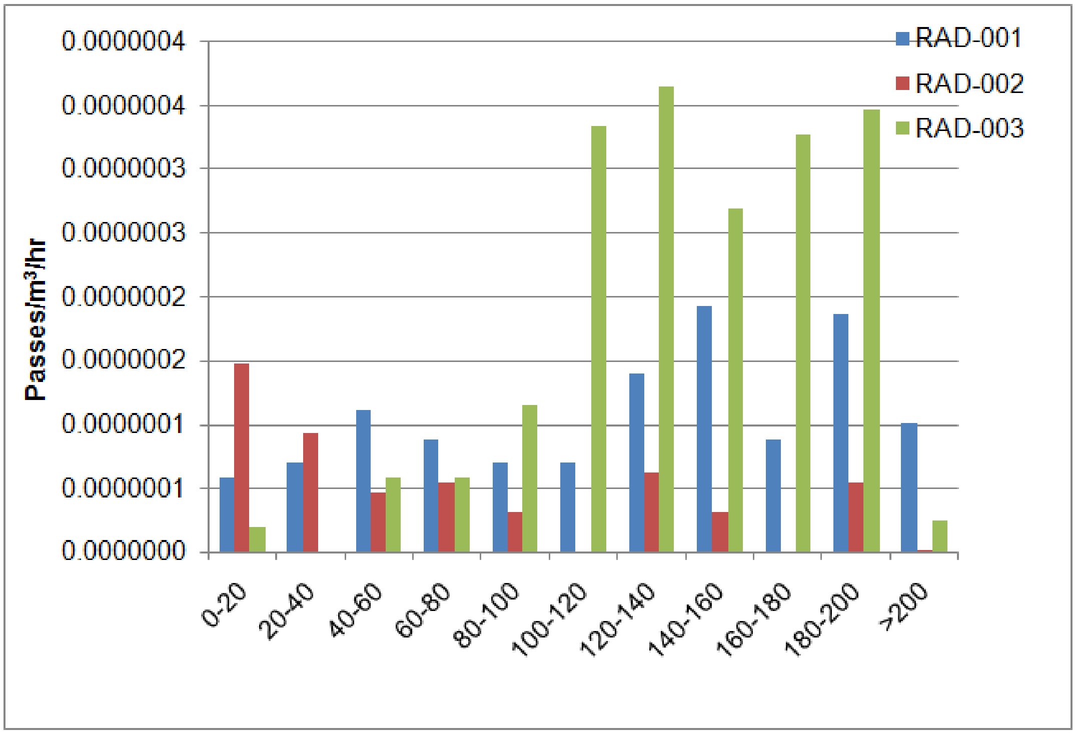


**Figure 16. Flight Densities by Height and Station for the September Monitoring Period.**

### 5.2.4 Flight Directions

Flight directions during the 2008 monitoring period revealed flight patterns to have a north – south axis going in both directions. During the July monitoring period, approximately 42.5% of the bats recorded were observed flying in a southerly direction, another 42.5% were noted flying in a northerly direction (see Figure 17). The remaining 15% of observations were recorded flying southwesterly. Since the majority of flights recorded were at altitudes below 40m agl, it is likely that the flight directions were responding to ground conditions such as forests and clearings.

Figure 18 shows the flight direction for the September monitoring period. Flight patterns revealed that the majority of bat passes were observed to be flying in a southerly direction, consisting of approximately, 94% of the total observations. The remaining 6% of observations were noted to be flying southwesterly. Flight altitudes were noted to be high than the July monitoring period with the majority being observed 100m agl or higher. These higher flight altitudes could reflect a southward migratory pattern, as bats are known to fly at high altitudes during migration.

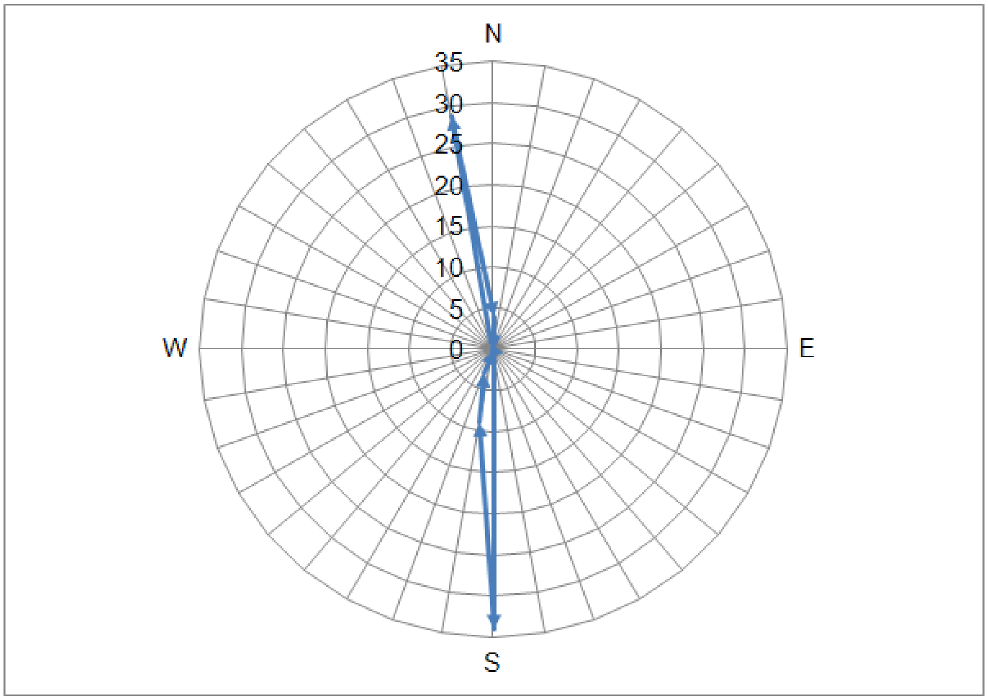


**Figure 17. Number of Passes (passes/m$^3$/hr) by Direction of Flight for the July Monitoring Period**

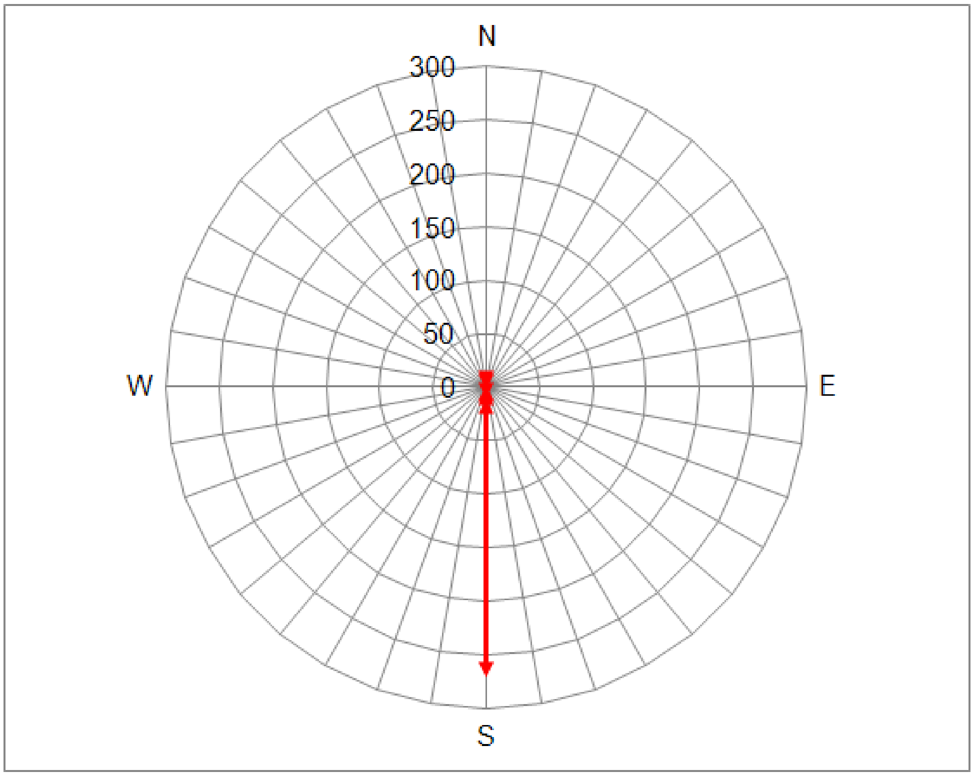


**Figure 18. Number of Recorded Passes by Flight Direction for the September Monitoring Period.**

## 6.0 Weather Data

Environmental conditions can strongly influence bat activity, and can help to explain nights of high or low activity levels. Overnight temperature, wind speed, and precipitation are the three weather parameters that are thought to show the most influence on bat activity. As a result, weather data has been collected throughout the monitoring period from numerous sources and locations in order to properly address bat activity levels and analyze bat patterns throughout the study area. If possible, meteorological towers are often used as a source of weather data. For the McLean's Mountain study area, meteorological tower weather information was collected from the Burnet's tower, which is located in the southeast portion of the study area. Weather data was also collected from the following sources:

- EC National Climate Archive (Gore Bay AWOS)
- Eastern Canada Visible Satellite Images
- Weather Network Weather Maps
- Last 24hrs Weather Data (Gore Bay, ON)
- Local Field Observations

Specific weather data for the McLean's Mountain Wind Farm has been obtained from Environment Canada`s National Climate Archive, using the Gore Bay weather station (Environment Canada 2009) and the from the Town of Gore Bay (The Weather Network 2009). As these stations are located approximately 36km west of the proposed study area, additional weather data, (wind speed and direction) was obtained from the Meteorological Tower, which is located within the study area on the corner of Burnett Road and Green Bush Road.

Based on the large size of this study area and its proximity to the shoreline of the North Channel, large variations in weather conditions are expected to have occurred within the study area. For the general comparisons made in this report and the proximity of nearby weather stations, this extensive weather data should provide adequate representation of the weather within the McLean's Mountain study area.

In July, nightly low temperatures ranged from 8.9C to 18°C, averaging 14.5°C throughout the monitoring period.  For the month of September, nightly temperatures ranges from 4.4 $^{o}$C, averaging 9.3$^{o}$C. As expected, average temperature showed small but steady declines later in the monitoring period, with a slightly lower average minimum temperature for the month of September than observed in August.

Precipitation values during the July and September monitoring period varied greatly, with peaks of approximately 15.5mm of precipitation falling on July 18, 2008 and 32.5 falling on September4, 2008. Another peak was observed on September 14, 2008 with approximately 19.2mm.  Figure 19 and Figure 20 displays the temperature and precipitation recordings for the McLean's Mountain study area during the 2008 bat monitoring period of July and September.

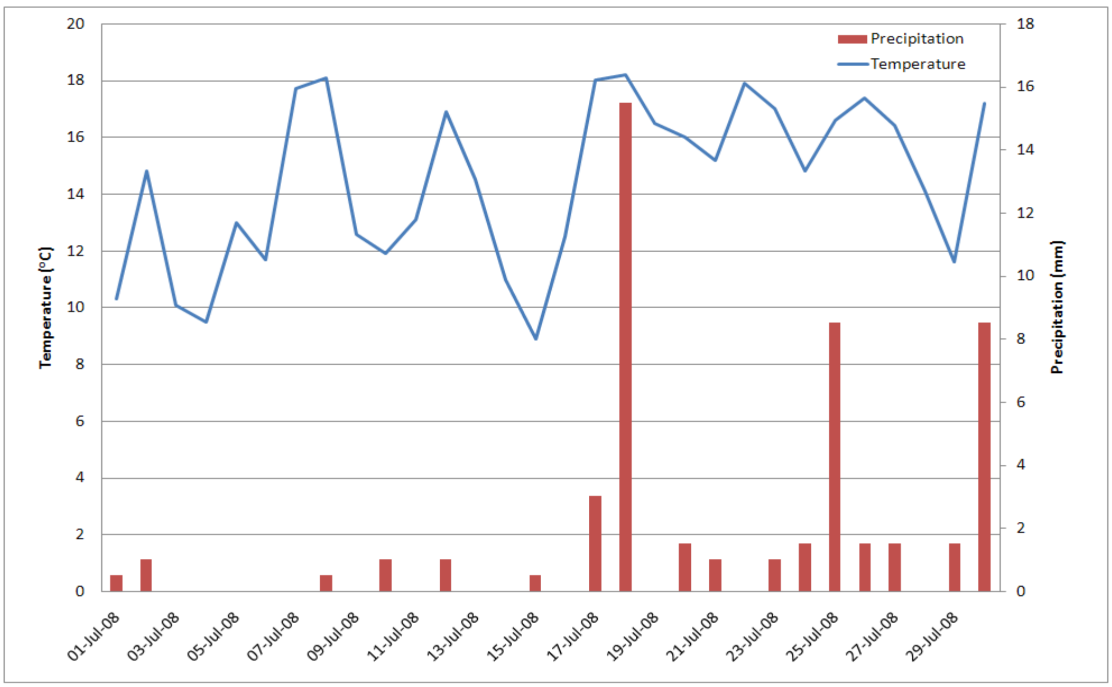


**Figure 19.  Temperature ($^{o}$C) and Precipitation (mm) Values recorded during for the July 2008 Bat Monitoring Period.**

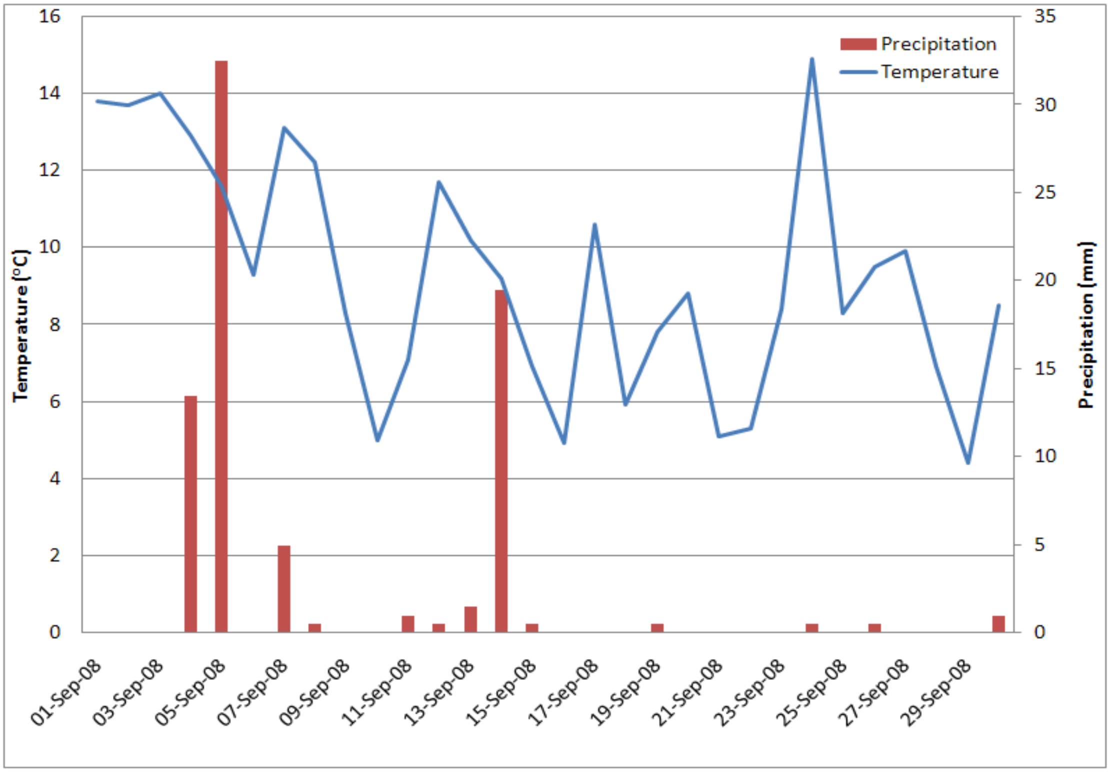


**Figure 20. Temperature (°C) and Precipitation Values during the September 2008 Bat Monitoring Period.**

## 6.1 Weather Results

Weather patterns, particularly overnight temperatures, precipitation, and wind speeds, are known to have a strong influence on local and migratory bat activity levels (Arnett et. al. 2007). These weather conditions have been recorded in detail based on numerous sources including field observations, Environment Canada weather stations, satellite imagery, and local weather conditions.

Overnight temperatures are known to influence bat activity as bats are less likely to be active when temperatures are recorded below 10.5°C (Arnett et. al. 2007; Reynolds 2006). The Bat Monitoring Guidance Document (OMNR 2007b) recommends that monitoring occur at temperatures greater than 10°C due to decreased bat activity at lower temperatures. Figure 21 and Figure 22 shows the relationship of overnight temperature to bat activity patterns in July and September. Small patterns can be observed between the temperature and bat activity during the monitoring period, particularly on July 18 and September 13, 2008 were a decrease in temperature and bat activity was observed. Similarities between temperature and bat activity were also observed on July 21 and September 18, 24, 2008. On these dates, increases in both temperature and bat activity were observed.

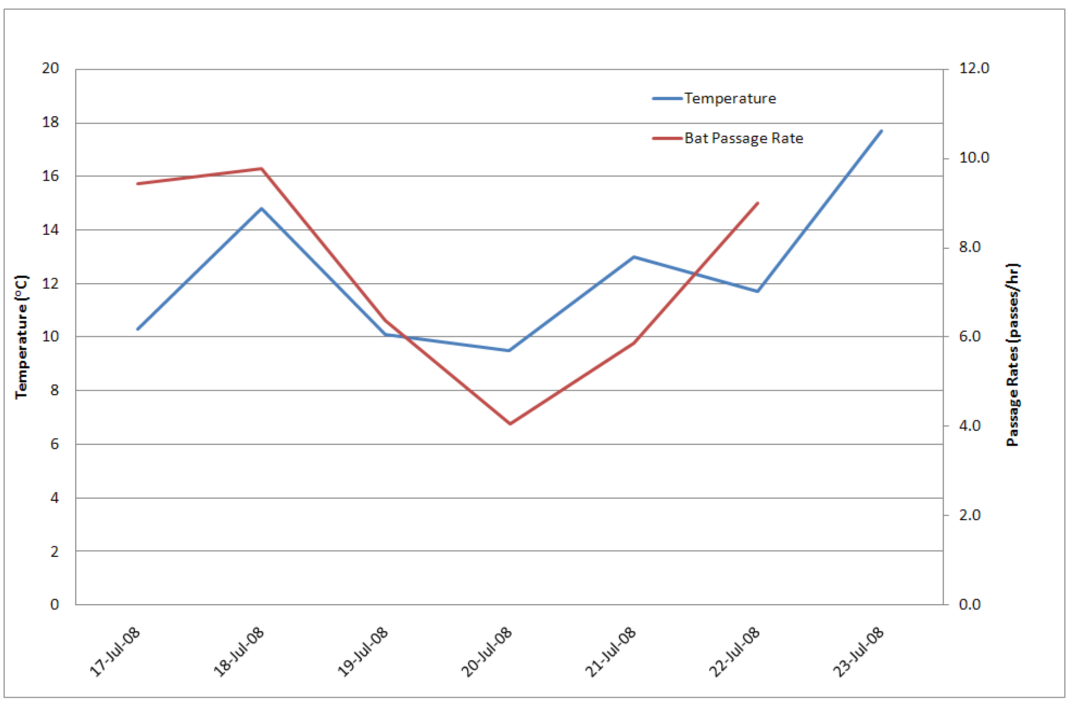


**Figure 21. Bat Passage Rates (passes/hr) and Overnight Minimum Temperatures (°C) for July 2008 Bat Monitoring.**

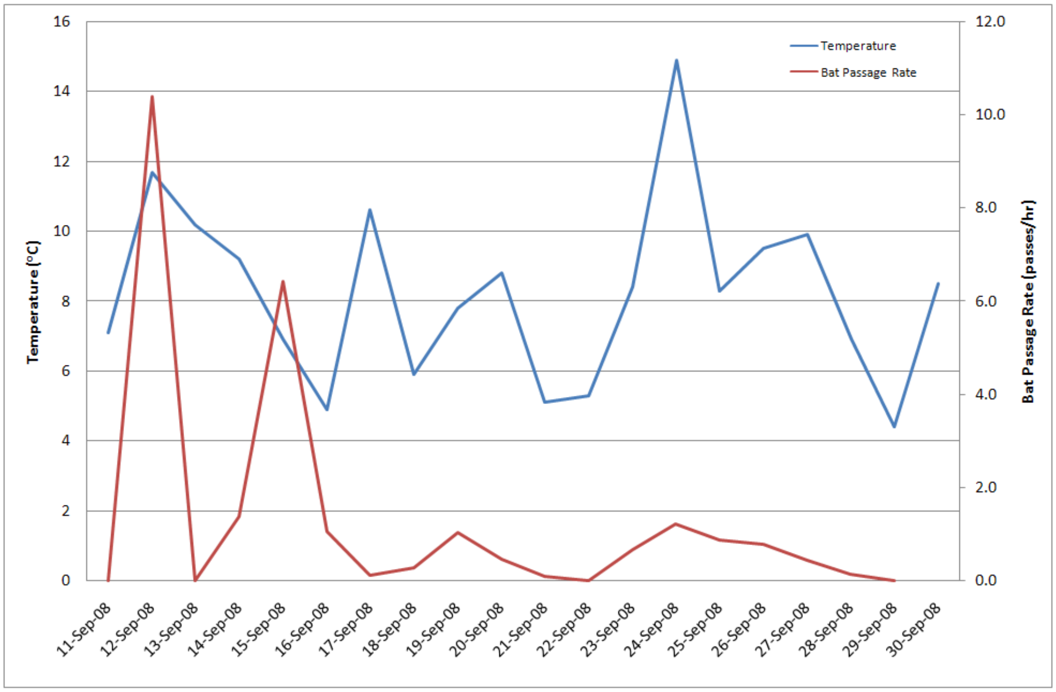


**Figure 22. Acoustic Bat Passage Rates (passes/hr) and Overnight Minimum Temperatures ($^o$C) for September 2008 Bat Monitoring.**

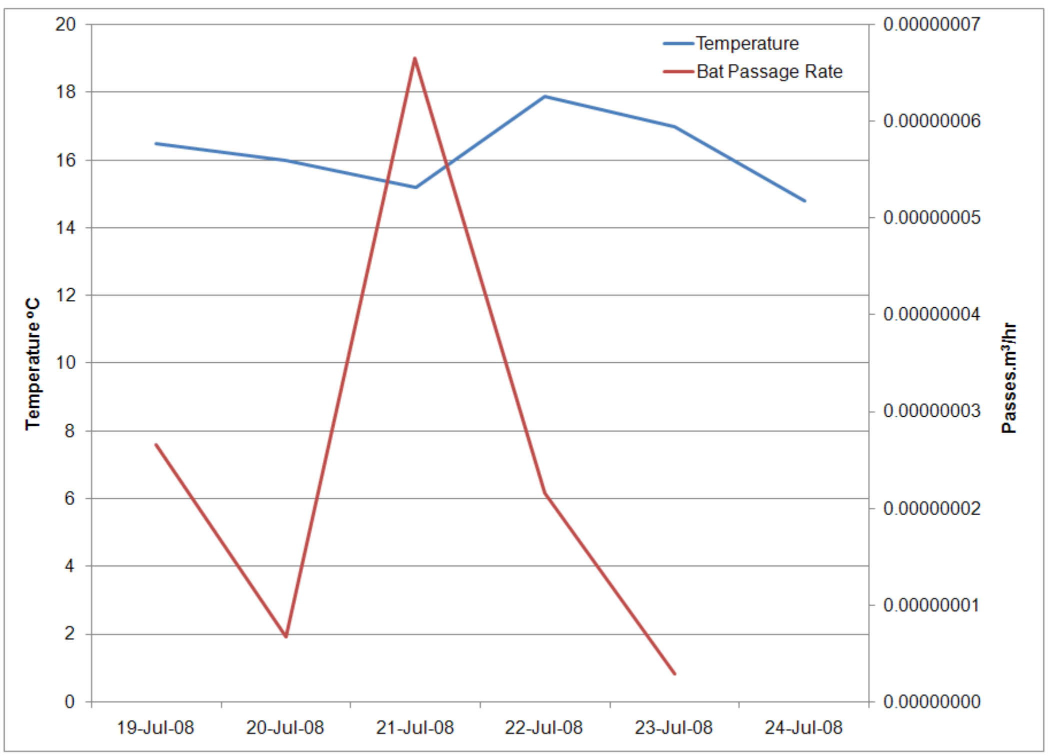


**Figure 23. Radar Passage Rates (passes/m$^3$/hr) by Overnight Minimum Temperature for the July Monitoring Period.**

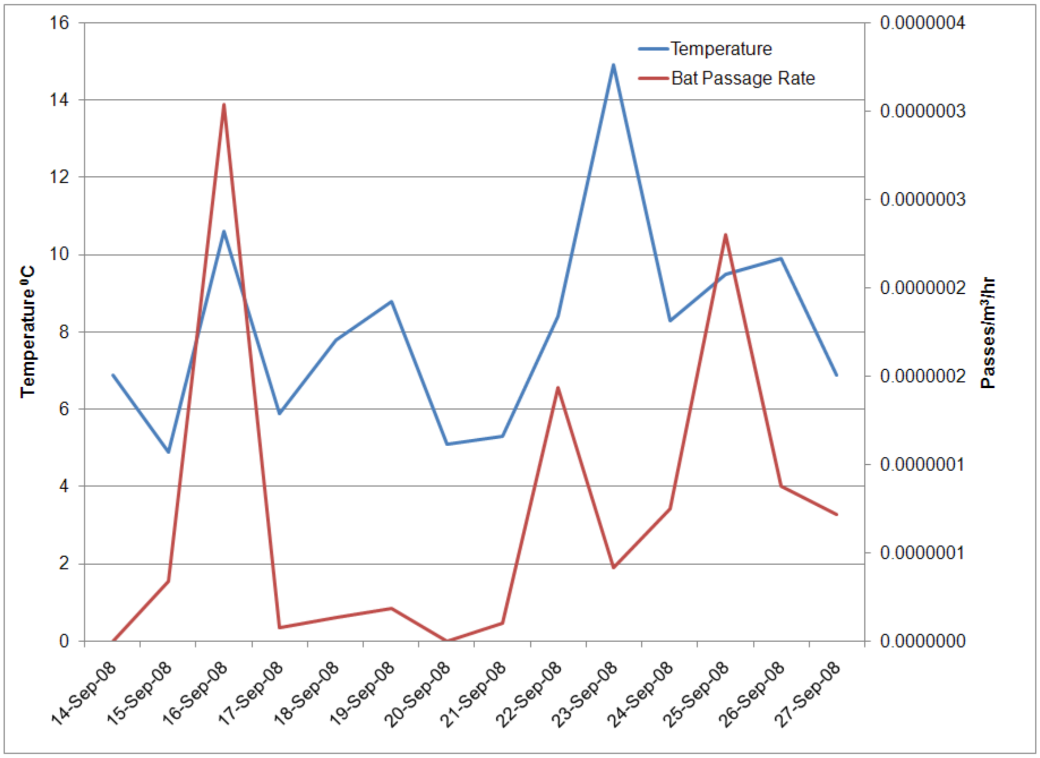


**Figure 24. Radar Bat Passage Rate (passes/m$^3$/hr) by Overnight Minimum Temperature for the September Monitoring Period.**

Another weather condition that may influence bat activity is precipitation. Figure 25 and Figure 26 show the precipitation values throughout the monitoring period compared to bat passage rates. Some local patterns can be observed, as seen on July 18 and September 14, 2008, when increased precipitation can be associated with a decreased bat activity level.

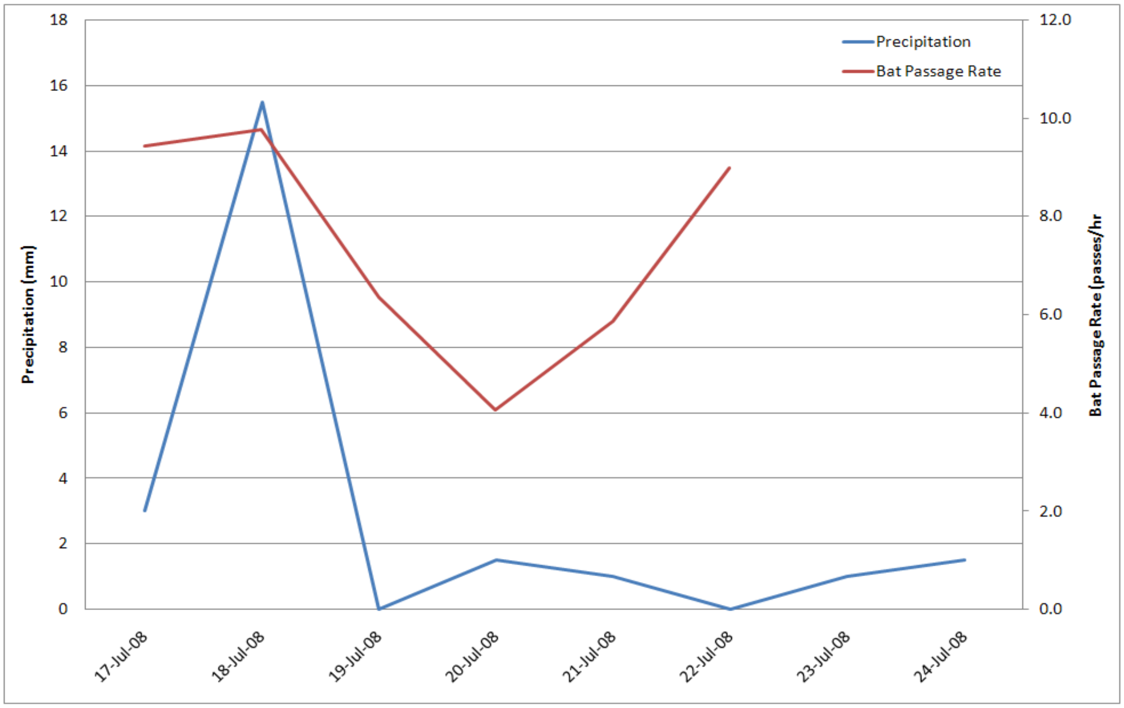


**Figure 25. Precipitation (mm) and Bat Passage Rates (passes/hr) for the July 2008 Monitoring Period.**

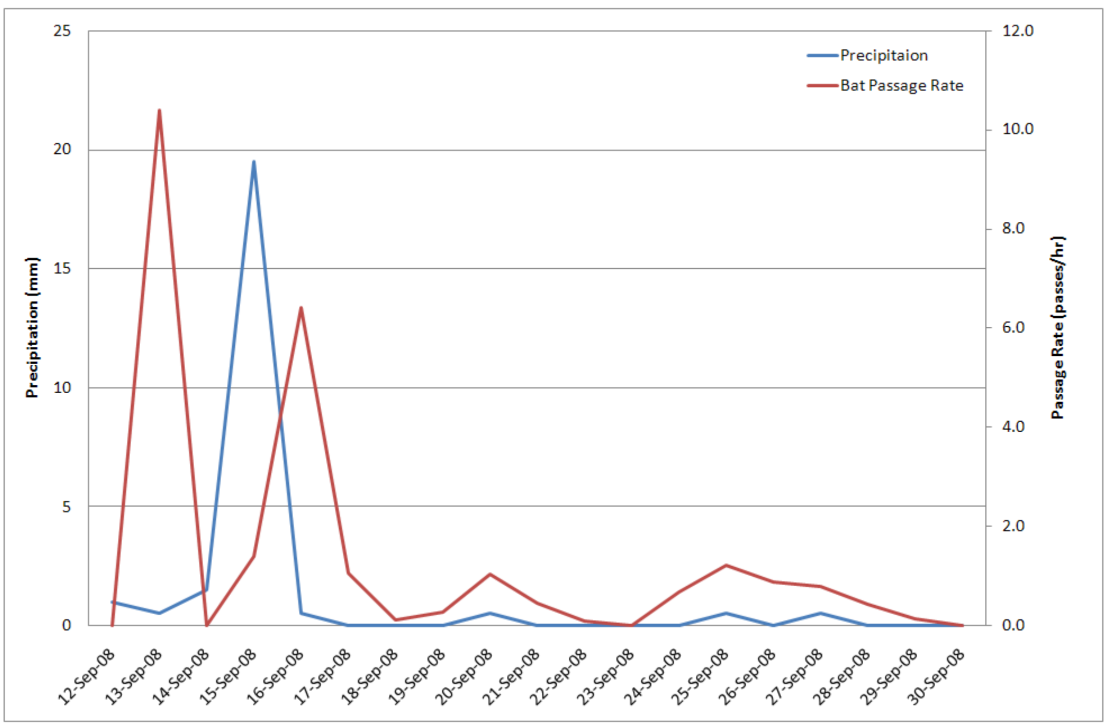


**Figure 26. Precipitation (mm) and Bat Passage Rates (passes/hr) for September 2008 Monitoring Period.**

In addition to precipitation and overnight low temperatures, high wind speeds are also reported to discourage bat activity (Reynolds 2006). As a result, wind speed from the metrological tower were obtained, and compared with bat activity levels throughout the monitoring period (see Figure 27 and Figure 28). Reynolds (2006) suggests that most bat activity occurred when wind speeds were below 5.4m/s.

Review of the wind speed values and bat passage rates at the McLean's study area indicate that low bat activity levels are observed when wind speeds are recorded higher than approximately 6m/s. Although it is apparent in some cases that wind speeds higher than 6m/s influence bat activity, this data does not provide overwhelming evidence to support this weather effect on bat activity

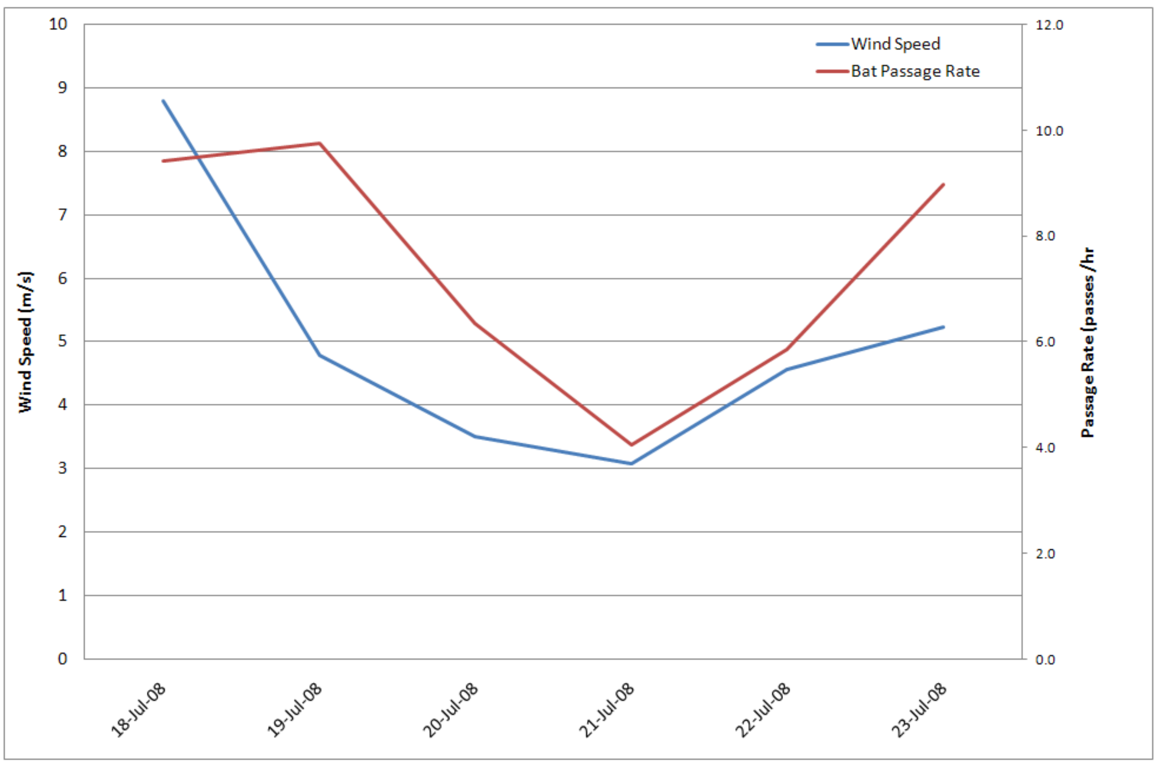


**Figure 27. Bat Passage Rates (passes/hr) and Recorded Wind Speeds (m/s) for the July 2008 Bat Monitoring Period.**

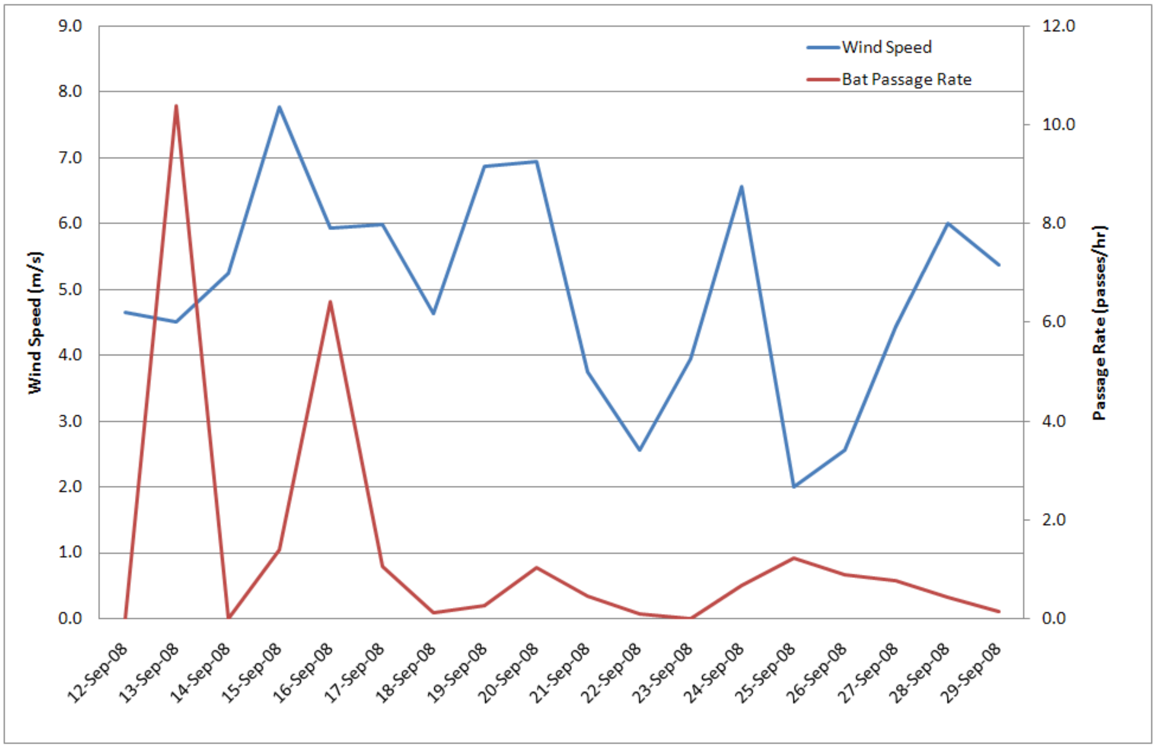


**Figure 28. Passage Rate (passes/hr) and Recorded Wind Speed (m/s) for the September 2008 Bat Monitoring Period.**

## 7.0 Monitoring Summary

This report discusses the results of the bat monitoring conducted on the McLean's Mountain Wind Farm during the months of July and September 2008. This includes surveys of bat habitat, abundance trends, and bat species within the study area.

The habitat found within the study area is a, mix of forest and agricultural lands. Old fields and grassland/pasture are found in patches within the site, along with small pockets of wetlands. Also present within the study area are hedgerows, snags, and farm structures. These habitat types are all expected to provide limited potential roosting habitat for local bat populations. Snags, buildings, and riparian and aquatic habitat are considered significant bat habitat (OMNR 2006) and are all present within the study area. Other significant bat habitats, caves and abandoned mines, are not present within the proposed study area. However the north-western boundary of the study area is located on forested ridge, which is part of the Niagara Escarpment and could provide suitable habitat within the cliff rock face. The northwestern boundary is also in close proximity to the shoreline of the North Channel, which could provide potential migration routes for migrating bats.

***Acoustic Monitoring***

The average passage rate for the 2008 monitoring period on the McLean's Mountain Wind Farm was 3.0 passes/hr. The July monitoring period had an overall average passage rate of 7.4 passes/hr. This overall passage rate is typical based on the location and habitat type found within the study area. Peak bat activity was noted on July 19 and 23, 2008 with average passage rates of 9.8 and 9.0 passes/hr respectively. The lowest level of bat activity was observed on July 21, 2008, with 3.8 passes/hr. The overall average passage rate in September was 2.9 passes/hr, with a peak passage rate being observed on the night of September 13, with an average 7.6 passes/hr. Overall, decreasing passage rates were observed within the study area as the monitoring period progressed.

Species analysis indicated the presence of 5 of the 8 species known to occur in Ontario, including hoary bat, red bat, silver-haired bat, little brown bat, and northern long-eared bat. In addition to these identified species, numerous calls were recorded at a frequency of 30kHz that could not be identified to species due to very strong similarities between silver-haired bat and big brown bat call characteristics. All of these species, with the exception of northern long-eared bat, are all common with secure populations in Ontario. The northern long-eared bat is thought to be a potentially vulnerable species in Ontario, but is currently not considered a provincially or nationally rare species (NHIC 2008, Environment Canada 2007, OMNR 2008). Calls of this species were few in number, and large concentrations of these species are not expected to occur, based on limited roosting and foraging habitat, within the study area.

There is little known about bat passage rates and migration routes within Ontario, making comparison of passage rates with known areas of concentrated bat activity difficult. However, based on additional bat monitoring conducted by NRSI within similar geographical areas and habitats, some comparison in bat activity levels can be made. The MERE Wind Farm, which is located in West Bay near the McLean's Mountain study area had an overall average passage rate of 10.3 passes/hr (NRSI 2007), which is much higher than the results from the 2008 monitoring at the McLean's' Wind Farm. Bat acoustic monitoring results from the Prince Wind Farm, located in Sault Ste. Marie, Ontario had slightly lower bat activity recorded with an average passage rate of 6.8 passes/hr (NRSI 2008). The average passage rate of 2.9 passes/hr was observed at the McLean's Mountain Wind Farm and represents low level of bat activity for this part of Ontario. This passage rate is based on results for the July and September monitoring period only, as monitoring was not conducted in August. As a result it is likely that the average passage rate including August may be higher and more consistent with other sites.. Abundance trends and recorded species calls indicated that some summer swarming and fall migration may occur within the study area in late July and mid September, however it is expected to be limited in numbers and not represent large concentrations of local or migratory bat species.

Other data trends and species identified within the study area are generally consistent with data found by NRSI at other monitoring sites within Ontario.

### ***Radar Monitoring***

The overall average flight density for the 2008 monitoring period (July & September) on the McLean's Mountain Wind Farm was $6.1x10^{-08}$ passes/$m^3$/hr. The July monitoring period had an average flight density of $2.6x10^{-08}$ passes/$m^3$/hr. Average flight densities for the month of September were found to be slightly higher with $7.3x10^{-08}$ passes/$m^3$/hr.

In most cases bat activity patterns peaked within the first few hours of darkness, decreased during the midnight hours, and peaked again in the early morning. This is typical bat activity. The highest hourly peak, $3.0x10^{-07}$ passes/$m_3$/hr, was seen between 22:00-22:59 on the night of September 16/17. The dominant flight direction in July followed a north – south axis with approximately 42.5% of the passes recorded moving in a southerly direction and 42.5% in a northerly direction. In September 94% of bat passes were observed to be southerly direction. Flight patterns are likely a combination of local foraging movements along forest road clearings, as well as migration activity.

In July flight density were found to be the highest at lower altitudes and decrease at higher altitude. The average density within the sample range of 0 – 700m agl was $1.2x10^{-08}$ passes/$m^3$/hr. The overall highest flight densities were observed at 20 - 40m agl, with $1.1x10^{-05}$ passes/$m^3$/hr and 40 – 60m agl with $6.0x10^{-06}$. Flight density values in September were found to be greater at higher altitudes, which is opposite to the July monitoring period, when higher flight densities were observed at lower altitudes. The average flight density value within the sample range of 0 – 700m agl was $4.6x10^{-08}$ passes/$m^3$/hr. The overall highest flight densities were observed at 100 - 120m agl, with $1.4x10^{-07}$ passes/$m^3$/hr and 180 - 200m agl with $2.0x10^{-07}$. These higher flight altitudes could reflect the southward migratory pattern, as bats are known to fly at high altitudes during migration.

NRSI has conducted radar monitoring at several central Ontario wind farms, all of which exhibit similar habitat and topography, and thus can be compared to the McLean's Mountain study area. Based on comparison of radar data between these sites, the McLean's Mountain study area was found to have a relatively low level of bat activity with ($6.1\ x10^{-08}$ passes/hr/$m^3$) throughout the July and September monitoring period.

The July monitoring period had a flight density of $2.6 x10^{-08}$ passes/$m^3$/hr. Spring flight density at the MERE Wind Farm indicated a higher level of bat activity with flight density of $4.9 x10^{-6}$ passes/hr/$m^3$. This is likely due in part to the MERE study area is location on the Niagara Escarpment and its proximity to the North Channel.

At the Prince Wind Farm, located approximately 200km northwest of the McLean's Mountain study area, the flight density during the spring monitoring period was $3.3 x10^{-6}$ passes/$m^{3/}$hr which is also slightly higher than the McLean's Mountain study site. Radar monitoring conducted between July and October at another, unnamed northern Ontario wind farm, located approximately 50km north of the Prince Wind Farm, also resulted in a lower flight density ($1.3 x10^{-6}$ passes/$m^3$/hr) than found at McLean's Mountain Wind Farm. As this unnamed wind farm is located at the edge of the physical range of migratory bats, these results are to be expected.

Based on results from the 2008 monitoring period the McLean's Mountain Wind Farm is found to have a low level of bat activity.

## 8.0 Conclusion and Recommendations

The 2008 bat monitoring conducted by Natural Resource Solutions Inc. at the McLean's Mountain study area was conducted in late July and (throughout) September, which is expected to overlap with peak periods of bat movement, for these monthly periods. The level of bat monitoring that was conducted was based on recommendations from Sudbury district MNR (2008). The total number of stations, including one elevated station, within the study area was also approved by local MNR staff.

Based on the habitat and landscape features present within the study area and the placement of 7 monitoring stations, 3 radar stations and 7 point count locations, data collected by Natural Resource Solutions adequately characterizes bat populations and activity patterns within McLean's Mountain study area. Data has been collected in such a way to allow for accurate comparison with post-construction monitoring results and easy study replication during the operational phase of this wind facility to determine the extent of impact.

Based on the result from the 2008 monitoring period the McLean's Mountain Wind Farm is found to have a relatively low level of bat activity. However, as the monitoring schedule for 2008 did not include sampling in August, which is known for peak bat activity (MNR 2007), as well as results from other wind farm studies that have been conducted on proposed wind farm in central Ontario. As a result we recommend the following additional survey work which is based on the Ministry of Natural Resource's August 2007 Draft Guidance Document for bat monitoring at proposed wind farms (MNR 2007):

- 15 nights of monitoring in August at the same 7 stations, including one elevated station, which were used in the 2008 monitoring period.
- 5 nights of radar monitoring at the same 3 stations used for the 2008 monitoring period.

## 9.0 References

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### *Personal Communication*

Brinsmead, J. K, Management Biologist, Ministry of Natural Resources, Sudbury, Ontario. Personal Communication on September 15, 2009

## Appendix I
Ministry of Natural Resources Comments on Work Program

**Ministry of Natural Resources**

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Ontario

July 28, 2008

Caroline Walmsley, Terrestrial & Wetland Biologist
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N2L 2R5

RE: Little Current Wind Energy Project Bat Monitoring Work Plan

Dear Ms. Walmsley:

Thank you for submitting your bat monitoring work plan for the Little Current Wind Energy Project dated July 17, 2008. It should be noted that while MNR is more than willing to review your work plan and provide comments, MNR does not approve monitoring work plans (as per the text at the bottom of page 3 of your letter). Regarding the aforementioned study design, MNR offers the following comments:

General:

- It is difficult to fully comment on the proposal without knowing the final layout of the turbines or the exact number of turbines in the study area. As this information becomes available, please forward to my attention on behalf of MNR as this may impact the number or location of monitoring sites. Currently, it is assumed that the monitoring site locations are based on the most likely configuration for the turbines and thus are appropriate. However, if all the turbines were to be located in a linear fashion along the edge of the escarpment, for example, it may be appropriate to monitor this area more intensively and expend less sampling effort in areas away from the escarpment.
- Some type of habitat assessment for bats in the vicinity of the wind farm should be included. Since Manitoulin Island is mostly private land, MNR's values information is incomplete relative to other parts of Sudbury District. The habitat assessment should include a search for potential hibernacula, roosting and swarming sites. This assessment should mainly focus on the escarpment that runs along the north edge of the study area and any other areas within the study boundaries where such habitat is likely to occur.
- MNR agrees with the preliminary screening that resulted in a 'High' sensitivity for bats. Due to the proximity of the study area to the North Channel, compounded by the presence of the escarpment, it is likely that this site is a migratory route for bats. Pending the results of a habitat assessment and the degree of bat activity at the site, it may be appropriate in the future to consider this site as a 'Very High' sensitivity for bats.

- While it is noted that the summary provided is only intended to cover bat monitoring work, other monitoring plans for wildlife should be submitted to MNR for review as they are available. In particular, MNR will require monitoring for birds (while Environment Canada is responsible for the management of many bird species, MNR is responsible to managing other species such as gamebirds and raptors), Species At Risk and wildlife. Some assessment of habitat types within the study area, such as Ecological Land Classification or a similar system, should be completed to aid in assessing habitat suitability for Species at Risk and other wildlife. (Note: Based on our conversation of July 30, 2008, I understand that NRSI is a sub-consultant and is not responsible for these other studies, but I have chosen to leave this point in the correspondence hoping the message will be forwarded to the primary consultant.)

Acoustic Bat Monitoring:

- MNR notes that 6 acoustic monitoring stations are appropriate for a development of 40 turbines. The current proposal is for 40 to 50 turbines. If the final number of proposed turbines is closer to 50, then a 7th monitoring station should be considered.
- A minimum of one additional monitoring site away from the proposed location of the turbines should be included as a control. This will enable comparison with data collected in the post-construction monitoring period. This site could be located on a property adjacent to the study area, or within the study area where no turbines are proposed.
- One or more of the acoustic monitoring stations should have an elevated microphone. It is unclear if this is planned given the work summary submitted. Elevating the microphones to a height within the turbine blade sweep will allow the monitoring of bat activity in the area where bats will be most at risk.
- As noted previously, due to the landforms present at the study site there is a strong probability that this site is a migratory route. Adding additional sampling nights in late May should be considered to monitor the spring migration of bats.
- It is difficult to tell from the map provided, but it appears that station BAT-006 may be located near the bottom of the escarpment. Unless a turbine is planned at this location (i.e. below or on the slope of the escarpment), the monitoring station should be located at the top of the escarpment.
- It is noted that the study proposes to use two different types of bat detectors, Avisoft 4-channel and Petersson D240x. Are the data from these two types of detector comparable to one another?

Acoustic Transect Surveys:

- The text notes that a second transect survey will be completed in August/September. When will the initial survey be completed?

RADAR Monitoring:

- It is MNR's opinion that RADAR monitoring will be needed in the pre-construction monitoring. With the site being very close to the shoreline of Lake Huron and with the escarpment running parallel to the shoreline, it is quite probable that this is a migration route for bats. RADAR monitoring is much more likely to detect migrating bats than the acoustic monitoring.

…/3

- The study area is quite large (approximately 13 km x 8 km at the widest points). Two RADAR sites with a radius of approximately 1 km does not provide very thorough coverage. MNR would prefer to see at least one or possibly two extra sites plus a control site. Similar to the acoustic monitoring, the control site should either be adjacent to the study area or in a portion of the study area that is away from the turbines. This will facilitate the comparison of the pre- and post-construction monitoring data.
- With only 15 sample nights per site for the RADAR monitoring, there are concerns with small sample sizes and low statistical power for any comparisons. This could also cause problems if monitoring occurs on a marginal night. That is, if few bats are detected on a night, for example, in late July, does that mean that there are few bats using the habitat in late July, or does it mean that that conditions were not right for bat activity that night? It would be difficult to tell as only one other July sampling night is planned. MNR suggests that sampling effort for the RADAR survey should be similar to the acoustic survey effort.
- Similar to the comment regarding the acoustic monitoring program, additional sampling nights in late May should be considered to monitor the spring migration of bats.

Again, thank you for providing MNR the opportunity to comment on this bat monitoring work proposal. If you have any questions, or if you wish to discuss these comments further, please do not hesitate to contact me at the number below.

Sincerely,

*- original signed by -*

Jeff K. Brinsmead
Management Biologist
Sudbury District MNR
(705) 564-7868

cc. Brian Riche, Espanola MNR
Wayne Selinger, Espanola MNR
Sheryl Lusk, Environment Canada