To: Jenny Burke & Dan DeCaro, Iberdrola Renewables

From: Cris Hein & Todd Mabee, ABR, Inc.–Environmental Research & Services

RE: Field report for Spring 2008 Roaring Brook bat acoustic monitoring study

Date: 5 September 2008

ROARING BROOK BAT ACOUSTIC MONITORING STUDY, SPRING 2008 FIELD REPORT

Introduction

Nine species of bats are known to occur in New York. Of these, 1 (Indiana bat, *Myotis sodalis*) is listed as federally endangered by the U.S. Fish and Wildlife Service (USFWS 2008). The New York Department of Environmental Conservation also lists the Indiana bat as state endangered and the Eastern small-footed myotis (*Myotis lebeii*) as a species of concern (NYDEC 2008). The remaining 7 species (big brown bat , *Eptesicus fuscus*; hoary bat, *Lasiurus cinereus*; Eastern pipistrelle, *Perimyotis subflavus*; Eastern red bat, *Lasiurus borealis*; little brown bat, *M. lucifugus*; Northern long-eared bat, *M. septentrionalis*; and silver-haired bat, *Lasionycteris noctivagans*) are not granted special conservation status in New York. However, several species (i.e., hoary bat, Eastern red bat, and silver-haired bat) are of increasing concern, particularly with respect to wind development, because of the high proportion of fatalities of these species at most wind-energy facilities in the U.S. (Arnett et al. 2008). Because wind-energy development may negatively impact resident and migrating bat species (Arnett et al. 2008, Kunz et al. 2007), it is important to study the nightly and seasonal variations in bat activity.

ABR, Inc. conducted bat acoustic monitoring in Spring 2008 at the proposed Roaring Brook Wind Project, New York to provide baseline information on the activity of bats (i.e., number of bat passes/night) throughout the proposed project area. This study is an extension of previous work conducted by ABR at Roaring Brook during spring 2007 (i.e., a night-vision study of birds and bats; Mabee et al. 2008) and summer and fall 2007 (i.e., a night-vision and bat acoustic monitoring study; Mabee and Schwab 2008). An understanding of the nightly and seasonal activity patterns throughout the proposed area may provide useful information for project siting and for assessing the relative activity of bats at this proposed site. This field report summarizes

preliminary results of the spring 2008 season of our 8 month study at the proposed Roaring Brook Wind Project.

Methods

We used 6 Anabat SD1 acoustic detectors (Titley Electronics, Ballina, New South Wales, Australia) positioned at 3 meteorological towers (Birch, Fairbanks, and Joe's) to record bat echolocation call sequences, or bat passes, onto compact flash cards on a nightly basis. We followed the standard guidelines for pre-construction studies at proposed wind-energy facilities described by Kunz et al. (2007). Microphones were housed in waterproof "bat-hats" (EME Systems, Berkley, California, USA) and positioned at 1.5 m and 44 m agl, respectively at each tower. We enclosed all electronic equipment in waterproof Pelican cases (Pelican Products, Inc., Torrance, California, USA) located at the base of each tower. We used a photovoltaic system (Online Solar, Inc., Hunt Valley, Maryland, USA) to provide continuous power to all detectors. We programmed detectors to record data from 1 hour prior to sunset until 1 hour after sunrise.

We downloaded and analyzed data using Anabat CFC Read and Analook software, respectively. We defined a bat pass as a sequence of ≥2 echolocation calls with a minimum call duration of 10 ms with each sequence separated by >1 second (Fenton 1970; Thomas 1988; Gannon et al. 2003). Because of similarities in the echolocation call structure (e.g., minimum frequency of call, call duration) of many bats, we placed species into 7 phonic groups: 1) big brown/silver-haired bat (EPFU/LANO), 2) Eastern red bat (LABO), 3) hoary bat (LACI), 4) little brown bat/northern long-eared bat/Eastern small-footed bat/Indiana bat (MYOTIS), 5) Eastern pipistrelle (PESU), 6) unidentified low frequency (≤35 kHz; i.e., big-brown, silver-haired, hoary) bat (UNLO), and 7) unidentified high frequency (>35 kHz; i.e., *Myotis* spp., Eastern red, eastern pipistrelle) bat (UNHI), following criteria similar to other studies within the region (Betts 1998, Gannon et al. 2003, Reynolds 2006, Kunz et al. 2007, Mabee and Schwab 2008). We classified bat passes as unidentified if they did not contain sufficient information to determine the species identification. The methods used in this study were similar to those used in our 2007 studies at Roaring Brook (Mabee and Schwab 2008).

Results and Discussion

Similar to Reynolds (2006), we monitored bat activity for 65 nights between 18 April (project start date) and 21 June (approximate end of spring season). Because of seasonal and species variations in bat migration (Reynolds 2006), we feel this time frame appropriately encompasses the spring season. During our study, we analyzed 65 nights of acoustic data from Fairbanks and Joe's towers. At Birch tower, we analyzed 36 and 31 nights of acoustic data from 1.5 m and 44 m detectors, respectively. We were unable to collect data at Birch tower on 15 nights from 18 April to 2 May because of tower maintenance and on 14 nights (1.5 m) and 19 nights (44 m) between 3 May and 21 June because of equipment malfunctions.

We recorded 828 total bat passes (range 0–17 bat passes/night) from 7 phonic groups during our spring study (Table 1). Eighty-one percent (n = 671) of bat passes were recorded at 1.5 m with all phonic groups represented at this height. The majority of bat passes were identified as MYOTIS bats (55.0%, n = 455), followed by big brown/silver-haired (EPFU/LANO) bats (25.6%, n = 211), unidentified low frequency (UNLO) bats (10.9%, n = 91), hoary (LACI) bats (4.2%, n = 35), unidentified high frequency (UNHI) bats (4.1%, n = 34), Eastern red (LABO) bats (0.1%, n = 1), and Eastern pipistrelle (PESU) bats (0.1%, n = 1).

The mean (±SE) activity of all bats for spring was 4.9 ± 1.0 passes/tower/night across all detectors. Bat activity differed among phonic groups between 1.5 m and 44 m elevations across all detectors (Fig. 1; comparable to Fig 11, Mabee and Schwab 2008). In general, higher mean bat activity was recorded at the 1.5 m detector for all phonic groups Variability in bat activity also existed among towers (Fig. 2; comparable to Fig. 12, Mabee and Schwab 2008). Overall, more bats were recorded from Joe's tower. However, the mean bat passes/night for EPFU/LANO, UNLO and LABO phonic groups were higher at Birch tower.

Although we can not make direct comparisons to ABR's fall study at Roaring Brook (Mabee and Schwab 2008), we can see similar trends in data. Both studies showed higher bat activity at 1.5 m. Several studies also have documented higher rates of activity, particularly for high frequency-calling bats at lower detectors (Arnett et al. 2006, Reynolds 2006, Woodlot 2006). Both studies also showed slightly higher activity rates for hoary bats at 44 m. Larger, low-frequency calling bats (i.e., hoary bats, big-brown bats, and silver-haired bats) often are recorded

at higher elevations including heights within the rotor swept zone (Arnett et al. 2008). Similar to Mabee and Schwab (2008) we also found higher overall activity rates at Joe's tower. Apparent differences in bat activity rates among the 3 towers are still unclear at this time. However, variations in bat activity across the landscape are not unusual and likely a result of habitat differences (i.e. proximity to edge, roosting sites, or water) among sampling sites.

Because this study is ongoing (end date 15-October 2008), we will continue to collect and analyze data through the summer and fall seasons, and provide a final report upon completion of this project. We appreciate the opportunity to conduct bat studies at the proposed Roaring Brook Wind Project. Please contact us with any questions or comments.

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Table 1. Number of bat passes (N) identified as hoary bats (LACI), big brown/silver-haired bats (EPFU/LANO), Eastern red bats (LABO), Myotis spp. (MYOTIS), Eastern pipistrelle bats (PESU), unidentified high frequency bats (UNHI), and unidentified low frequency bats (UNLO) recorded across all detectors at the proposed Roaring Brook Wind Project, New York, spring, 2008. Percentages represent the proportion of bat passes at a given tower and altitude.

	Joe's		Birch		Fairbanks		Total	
Altitude/Phonic Group	N	%	N	%	N	%	N	%
1.5 m								
LACI	7	0.9	6	0.7	2	0.2	15	1.8
EPFU/LANO	49	5.9	57	6.9	41	5.0	147	17.8
LABO	0	0.0	1	0.1	0	0.0	1	0.1
MYOTIS	216	26.1	73	8.8	130	15.7	419	50.6
PESU	1	0.1	0	0.0	0	0.0	1	0.1
UNHI	19	2.3	6	0.7	4	0.5	29	3.5
UNLO	20	2.4	23	2.8	16	1.9	59	7.1
TOTAL	*312*	*37.7*	*166*	*20.0*	*193*	*23.3*	*671*	*81.0*
44 m								
LACI	11	1.3	0	0.0	9	1.1	20	2.4
EPFU/-LANO	18	2.2	7	0.9	39	4.7	64	7.8
LABO	0	0.0	0	0.0	0	0.0	0	0.0
MYOTIS	20	2.4	4	0.5	12	1.5	36	4.4
PESU	0	0.0	0	0.0	0	0.0	0	0.0
UNHI	4	0.5	0	0.0	1	0.1	5	0.6
UNLO	21	2.5	1	0.1	10	1.2	32	3.8
TOTAL	*74*	*8.9*	*12*	*1.5*	*71*	*8.6*	*157*	*19.0*
All altitudes								
LACI	18	2.2	6	0.7	11	1.3	35	4.2
EPFU/LANO	67	8.1	64	7.8	80	9.7	211	25.6
LABO	0	0.0	1	0.1	0	0.0	1	0.1
MYOTIS	236	28.5	77	9.3	142	17.2	455	55.0
PESU	1	0.1	0	0.0	0	0.0	1	0.1
UNHI	23	2.8	6	0.7	5	0.6	34	4.1
UNLO	41	4.9	24	2.9	26	3.1	91	10.9
TOTAL	***386***	***46.6***	***178***	***21.5***	***264***	***31.9***	***828***	***100.0***

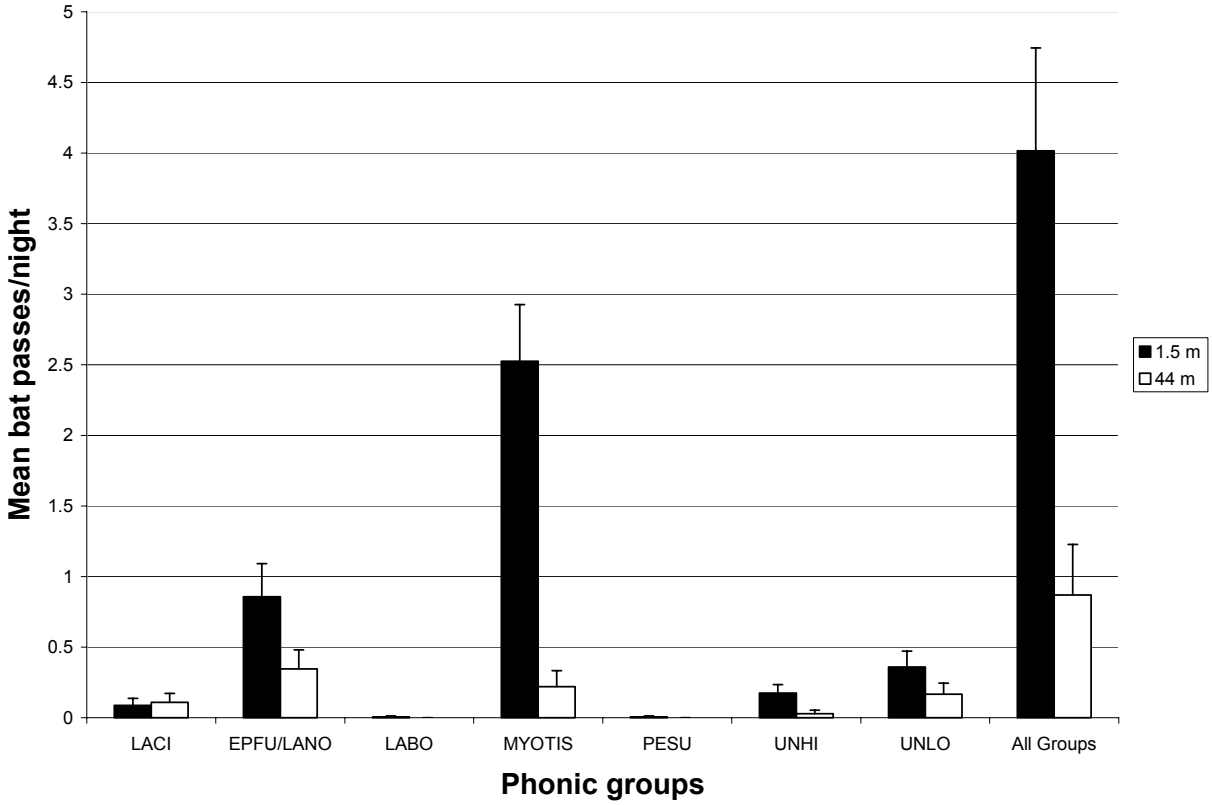

Figure 1. Mean (±SE) bat passes/night identified as hoary bats (LACI), big brown/silver-haired bats (EPFU/LANO), Eastern red bats (LABO), Myotis spp. (MYOTIS), Eastern pipistrelle bats (PESU), unidentified high frequency bats (UNHI), and unidentified low frequency bats (UNLO) recorded across all towers for 1.5 m and 44 m detectors at the proposed Roaring Brook Wind Project, New York, spring 2008.

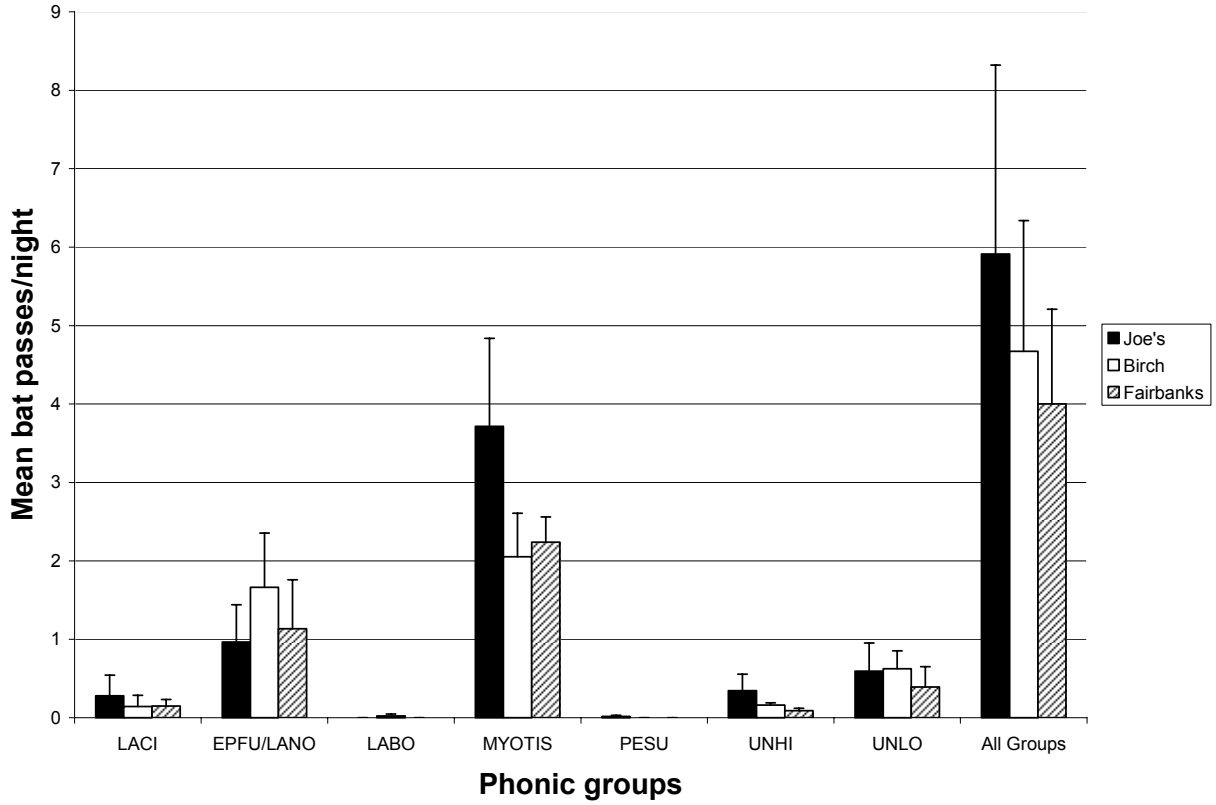

Figure 2. Mean bat passes/night identified as hoary bats (LACI), big brown/silver-haired bats (EPFU/LANO), Eastern red bats (LABO), Myotis spp. (MYOTIS), Eastern pipistrelle bats (PESU), unidentified high frequency bats (UNHI), and unidentified low frequency bats (UNLO) recorded across all detectors for 3 meteorological towers at the proposed Roaring Brook Wind Project, New York, spring 2008.