

**Exhibit B** (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

# **Pre and Post-Construction Monitoring of Bat Populations at Industrial Wind Turbines Sites**

**Commonwealth of Pennsylvania  
Pennsylvania Game Commission  
February 23, 2007**

## **I. Classification of Monitoring Effort for Bats for Pre and Post-Construction Monitoring**

Pre- and post-construction bat monitoring efforts will be scaled to the type of bat activity on or within 5 miles of the proposed wind power project area, as identified in the following three site types. A **Hibernacula of Concern** is identified as a known hibernaculum that houses a large number of bats (1000+ counted in an internal survey or 100+ captured via trapping), one that supports a diverse number of bat species (4 or more species), or which houses the state threatened small-footed bat (*Myotis leibii*) or the state and federally listed endangered Indiana bat (*Myotis sodalis*) in Pennsylvania.

Sites are classified in the following three categories:

### **A. High Priority Sites:**

- 1) Hibernacula of Concern exist on or within 1 mile of the project area or several hibernacula occur within 1 mile of the project area.
- 2) A hibernaculum with >5000 bats is on or within 5 miles of the project area.
- 3) Any known occurrence supporting breeding or hibernating state-listed threatened or endangered species is present on or within 5 miles of the project area.

#### **Pre-construction work required:**

- 1) Consultation with PGC required for state-listed bat occurrences.
- 2) Site-specific surveys include: spring migration and/or fall telemetry of a maximum of 10 or more individuals as determined by the PGC to determine areas of high use and travel corridors.
- 3) One season (April 1-November 15) of acoustic monitoring to determine activity levels of bats within the project area.
- 4) One season of mist netting following USFWS guidelines to determine the presence of Indiana bats and potential use of the area as maternity colonies. Work is conducted by approved bat consultants that are prepared to adhere with the transmitter requirements.

#### **Post-construction work required:**

- 1) Two years of mortality monitoring with possible extension based on severity of impacts.
- 2) Post-construction acoustic monitoring for one season (April 1 – November 15) and concurrent with mortality monitoring.

### **B. Moderate Priority Sites:**

- 1) Hibernacula of Concern exist between 1 and 5-mile radius of project area.
- 2) Any hibernacula on or within 5 miles of the project area contains between 1,000 and 5,000 bats.
- 3) One hibernaculum containing between 100 and 1000 bats on or within 1 mile of the project area.

**Pre-construction work required:**

- 1) Pre-construction acoustic monitoring for a spring (April 1- April 30) and fall season (July 15 – November 15), and concurrent with mortality monitoring.

**Post-construction work required:**

- 1) Two years of mortality monitoring.
- 2) Post-construction acoustic monitoring for a spring (April 1- April 15) season and a fall season (July 15 – November 15), and concurrent with mortality monitoring.

**C. Low Priority Sites: Criteria**

- 1) No known presence of state-listed bats on or within 5 miles of the project area.
- 2) No known Hibernacula of Concern on or within 5 miles of the project area.
- 3) No hibernaculum with more than 100 bats exists in the project area.

**Pre-construction requirements:** Acoustic monitoring from July 15-October 15.

**Post-construction:** Standard post-construction mortality monitoring.

**II. Protocols for Locating and Surveying Potential Hibernacula**

Hibernacula (natural caves, mines, tunnels, and other underground workings) within the project area should be located using mineral literature (The Pennsylvania Cave Database, maps and records from the Office of Surface Mining, and the PA Bureau of Abandoned Mines) and properly investigated by a USFWS approved bat consultant.

Due to the increased bat activity around such sites and/or the presence of threatened and endangered species, Hibernacula of Concern on or within five miles of a proposed wind development site triggers bat monitoring efforts. The Pennsylvania Game Commission (PGC) will notify the developer if such a hibernaculum is known on or within five miles of the proposed project and the developer should enter into consultation with the PGC to determine if additional protection or investigation will be useful to siting turbines. The PGC may conduct a survey in or around the project area for potential hibernacula that are not currently known and survey them for the developer. In the event that the PGC survey results confirm a previously unknown hibernaculum the PGC will notify the Cooperator and further coordination will be required. If a mine is located and contains multiple entrances, then all the bats captured at each entrance will be added together to determine if the site qualifies as a Hibernaculum of Concern.

The following progression of action should generally be followed in order to meet the agreement, as fits the site classification hierarchy above:

- 1) A consultant/cooperator will perform a literature search for potential hibernacula within project area.
- 2) Following the literature review, a consultant will conduct ground searches to examine each identified potential hibernaculum, record the location with a GPS, and search for unknown openings (mine collapse, abandoned tunnels, new caves, etc) within the project area.
- 3) Consult with PGC to determine if any sites have ever been surveyed for bats.
- 4) PGC may conduct literature and ground searches for a potential hibernaculum located up to 5 miles from the project area.
- 5) PGC may survey hibernacula up to 5 miles from the project area.
- 6) Newly discovered sites, and sites that have not been investigated within 10 years, will be surveyed via the methods and protocols set forth in the USFWS mine sampling protocol.
- 7) Bat consultants from the USFWS approved list must be hired to examine any potential hibernacula within the project area.
- 8) If a state-listed species is located within the project area, the bat consultant will consult with the Cooperator and PGC to discuss telemetry protocols, effort levels and site specific details.
- 9) If the federally endangered Indiana bat is known to exist at any time within 5 miles, telemetry may be requested, and areas of use are to be determined. Buffer areas around the Indiana bat location should not be included in the project area.
- 10) Data must be entered on provided sheets (Appendix A) and submitted to the PGC before construction. Maps should indicate all turbines, hibernacula surveys, and results of telemetry if applicable.
- 11) All captures of state-listed bats must be photo documented as described in Appendix A.
- 12) Genetic samples (wing punches) and hair sample collection need to be taken on all individual state listed species. Each individual will also be banded with a unique band of appropriate size (Indiana bat bands must be obtained by the consultant from the PGC). Consultants should contact the PGC prior to performing work.

### **III. Protocols for Mist Netting Surveys**

The length of the project area (or summation of all roads, whichever is longer) will be tallied. There will be 1 mist netting station per kilometer of the project area. For projects that are not linear in design, a polygon surrounding the entire project area will be tallied and there will be 2 stations per square kilometer.

- 1) Mist netting shall follow USFWS guidelines in terms of both level of effort and sampling protocol except for the below additions:
- 2) All bat consultants to perform this work must be on the USFWS approved Indiana bat list and obtain a special use permit from the PGC.
- 3) Proposals should be submitted and approved by PGC before work commences and include a map of the project area, locations of the turbines, and estimated locations targeted for net deployment.
- 4) All captures of Indiana bats should be photo-documented with profile shots of the head and shots of the foot and keeled calcar for Indiana bats as shown in Appendix A. Photos of small-footed bats should clearly show the entire facial mask and foot as well.

- 5) Genetic samples (wing punches) and hair samples should be collected and marked for all Indiana, small-footed, red, hoary, and silver-haired bats. Consultants should be prepared to attach a unique band to each of these species and should consult with the PGC prior to the commencement of work, with all data recorded on data sheets provided (Appendix A).
- 6) The bat consultant should have transmitters prepared for all captures of small-footed and Indiana bats in order to locate roost trees. Transmitters should be capable of operating for 21 days on the state frequency of 172 MHz. The PGC must be notified no later than 72 hours post capture and attachment of the transmitter.

#### **IV. Protocols for Standardized Acoustic Monitoring of Bats**

The recommendations following for acoustical monitoring are geared towards assessing temporal and spatial activity of bats, with an emphasis on the migratory tree bats.

- 1) All met towers installed on site should be equipped with acoustic monitoring devices as close to rotor zone as possible. It is suggested to have contractor attach equipment before tower is raised.
- 2) If possible, Met towers should be maintained for at least one year following construction in order to complete acoustic monitoring.
- 3) All projects should use the same type of detector throughout the study.
- 4) Detectors should record from 30 minutes prior to sunset to 30 minutes following sunrise every day.
- 5) Acoustical monitoring will record the number of bat passes per hour and will be entered on data sheet provided.
- 6) All recorded calls should be permanently archived for possible research needs and submitted with final report.
- 7) Provide data regarding wind speed, humidity, and ambient temperature every 10 minutes from the project area and concurrent with acoustic and mortality monitoring surveys.
- 8) All met tower locations must be recorded with GPS unit (decimal degrees, NAD 27 preferred) and should be reported on project maps.
- 9) All information gathered must be entered on Pennsylvania Game Commission survey forms (Appendix A).
- 10) Copies of all acoustic data sheets will be submitted in conclusive end-of-year reports to the PGC Harrisburg, PA at the end of every calendar year.

**APPENDIX A**  
**COMMONWEALTH OF PENNSYLVANIA**  
Pennsylvania Game Commission, Bureau of Law Enforcement, Technical Services Division  
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

**Procedure and format for permittee reports to the PA Game Commission when conducting  
wind turbine pre-construction bat netting and bat detector surveys.**

The report is divided into five sections which include: (1) Cover page, (2) Site Survey Record, (3) Bat Measurement and Capture Data Forms, (4) Maps and (5) Photo Documentation.

**Section 1 - Cover**

A separate cover page should be provided for each project with the accompanying data of Sections 2 through 5 contained within. An example is provided.

**Section 2 - Bat Netting/Acoustic Survey Record**

*(FORM Wind-70008-PRE)*

This is a **mandatory** two-page summary of site(s) surveyed, captures and bat detector tallies of bat passes. It should be completed for all sites surveyed, including those with no captures. If an additional technique other than mist netting and bat detector work is conducted, it should be described in remarks. Complete 1 for each site survey night (If site is trapped twice, 2 site survey records are required, etc.).

**This form may not be modified for reporting because it is used for data entry. If necessary, supplemental pages may be added to report unique data.**

**Section 3 - Bat Measurement and Capture Data Form**

*(FORM P-70008-M)*

This form is **mandatory** for:

1. *Myotis sodalis* captures
2. *Myotis leibii* captures
3. Bats you are banding and all band recaptures
4. All radio-tagged bats (describe transmitter in remarks)
5. Bat species not usually found in Pennsylvania\*.

\* Pennsylvania species: *Myotis lucifugus*, *Myotis septentrionalis*, *Myotis leibii*, *Myotis sodalis*, *Eptesicus fuscus*, *Pipistrellus subflavus*, *Lasiurus borealis*, *Lasiurus cinereus*, and *Lasionycteris noctivagans*

**This form may not be modified for reporting because it is used for data entry.**

*The surveyor also has the option to use this form for measuring and reporting all bats. All measurements should follow North American collector standards (Nagorsen, D. W. and R. L. Peterson. 1980. Measurements and Weights. Pp. 22-26 in Mammal Collectors' Manual. Royal Ontario Museum, Publications in Life Sciences). Banded bat information will be maintained in a database and future recaptures of your bands will be reported to you.*

**Section 4 - Maps**

An example is provided. All survey sites will be reported on a map (preferably a 7.5' USGS Topographic Map) so that locations can be accurately located and coordinates verified.

**Section 5 - Photo Documentation**

An example is provided. It is required that photographs be taken of identification characteristics of all *M.sodalis*, *M.leibii*, and species not usually found in PA. The photos should be labeled with the site, date and capture number.

**Return reports to address on the heading of this page within 90 days of project completion.**

COMMONWEALTH OF PENNSYLVANIA  
Pennsylvania Game Commission  
Bureau of Law Enforcement, Technical Services Division  
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

**Section 1 - Cover**

WIND FARM PERMITTEE  
BAT CAPTURE / ACOUSTIC MONITORING PRE-CONSTRUCTION SURVEY REPORT

Permit Number \_\_\_\_\_

Project Name: \_\_\_\_\_

Company/  
Organization/  
Permittee Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Phone:** (\_\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_ **Fax:** (\_\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

**E-Mail:** \_\_\_\_\_

Project Supervisor Name: \_\_\_\_\_

Supervisor Contact: Phone: (\_\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

E-Mail: \_\_\_\_\_

If this is contracted work, provide the name & address of the individual/organization work is being performed for:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**BAT -NETTING/ACOUSTIC SITE SURVEY RECORD**

1. Survey Date: \_\_\_\_\_ 2. Company Name: \_\_\_\_\_

3. Reporter: \_\_\_\_\_ 4. Assistants: \_\_\_\_\_

5. Site Name and/or Number: \_\_\_\_\_

6. Site is (circle one): hibernation site          summer habitat

7a. If hibernation site circle one: limestone mine, coal mine, limestone cave, sandstone cave, RR tunnel,  
other structure, describe - \_\_\_\_\_.

7b. If summer habitat, describe area being sampled (e.g. forested stream or forest clearing with stream):  
\_\_\_\_\_

8. County: \_\_\_\_\_ 9. 7.5' Quad.: \_\_\_\_\_

10. Was site GPS'd (required)      YES - NO

11. Geographic Coordinates (D-M-S): Latitude: \_\_\_\_\_°-\_\_\_\_\_'-\_\_\_\_\_”N, Longitude: \_\_\_\_\_°-\_\_\_\_\_'-\_\_\_\_\_”W

Datum (circle one): NAD27 (Preferred), NAD83, WGS84, Other: \_\_\_\_\_

12. Ownership and Access: (Who owns site or controls access? Give name and address.) \_\_\_\_\_  
\_\_\_\_\_

13. Time (military) & Temperature: Start Time \_\_\_\_\_ h Stop Time \_\_\_\_\_ h Total Minutes: \_\_\_\_\_  
Start Temp. \_\_\_\_\_ °C End Temp. \_\_\_\_\_ °C

14. General Weather (circle one): Clear; Partly Cloudy; Mostly Cloudy; Cloudy; Drizzle; Intermittent Rain;  
Steady Rain; Thunderstorms; Snow; Other: \_\_\_\_\_.

15. General Wind Conditions (circle one): Calm, Breezy (Leaves Rustling), Windy (trees swaying).

16. Capture Setup at Site (Minimum of 2 sets required at each site):

Set #	Type	Count	Dimensions	Description	TOTAL AREA (m)
1	Nets	4	12m x 2.6m	Stacked over trail	124.8 sq. m

Total Capture Area: \_\_\_\_\_ sq. m



(Site Survey Record – Continued) Site Name/No.: \_\_\_\_\_ Date: \_\_\_\_\_

17. Describe habitat 150 m around site: (topography and vegetation including dominant tree species.)

18. Was reproductive status checked? YES / NO (if “NO” only enter numbers in **Total** columns)

**\*CAPTURE RESULTS**

Species	Number of Adult Females				No. Juv. Fem.	Total No. Fem.	Number of Adult Males		No. Juv. Male	Total No. Males	Species Totals	
	NR	PG	L	PL			SCR	NR				
												<i>Eptesicus fuscus</i>
<i>Myotis lucifugus</i>												
<i>Myotis septentrionalis</i>												
<i>Myotis leibii</i>												
<i>Myotis sodalis</i>												
<i>Eptesicus fuscus</i>												
<i>Pipistrellus subflavus</i>												
<i>Lasiurus borealis</i>												
<i>Lasiurus cinereus</i>												
<i>Lasionycteris noctivagans</i>												
Other – specify:												
Other – specify:												
Reproductive Status: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen. <b>*Complete Measurement and Capture Data Form for all:</b> (1) <u>Myotis sodalis</u> , (2) <u>Myotis leibii</u> , (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA.											Grand Total	

Comments:

DATE: \_\_\_\_\_

19. ACOUSTIC MONITORING: (Tallies of bat passes / hour. Use military time and record sunset/sunrise times in comments.)

Hour # _____	Hour # _____	Hour # _____	Hour # _____	Hour # _____
Start Time: _____ h	Start Time: _____ h	Start Time: _____ h	Start Time: _____ h	Start Time: _____ h
Start Temp: _____ °C	Start Temp: _____ °C	Start Temp: _____ °C	Start Temp: _____ °C	Start Temp: _____ °C
Start Time: _____ h	Start Time: _____ h	Start Time: _____ h	Start Time: _____ h	Start Time: _____ h
End Temp: _____ °C	End Temp: _____ °C	End Temp: _____ °C	End Temp: _____ °C	End Temp: _____ °C
<i>For bat detector passes where calls can be identified by Genus and/or species, record identification data below by call tallies</i>				
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____
Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____

Comments:

**Bat Measurement and Capture Data Form**

(Complete for all (1) *Myotis sodalis*, (2) *Myotis leibii*, (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA)

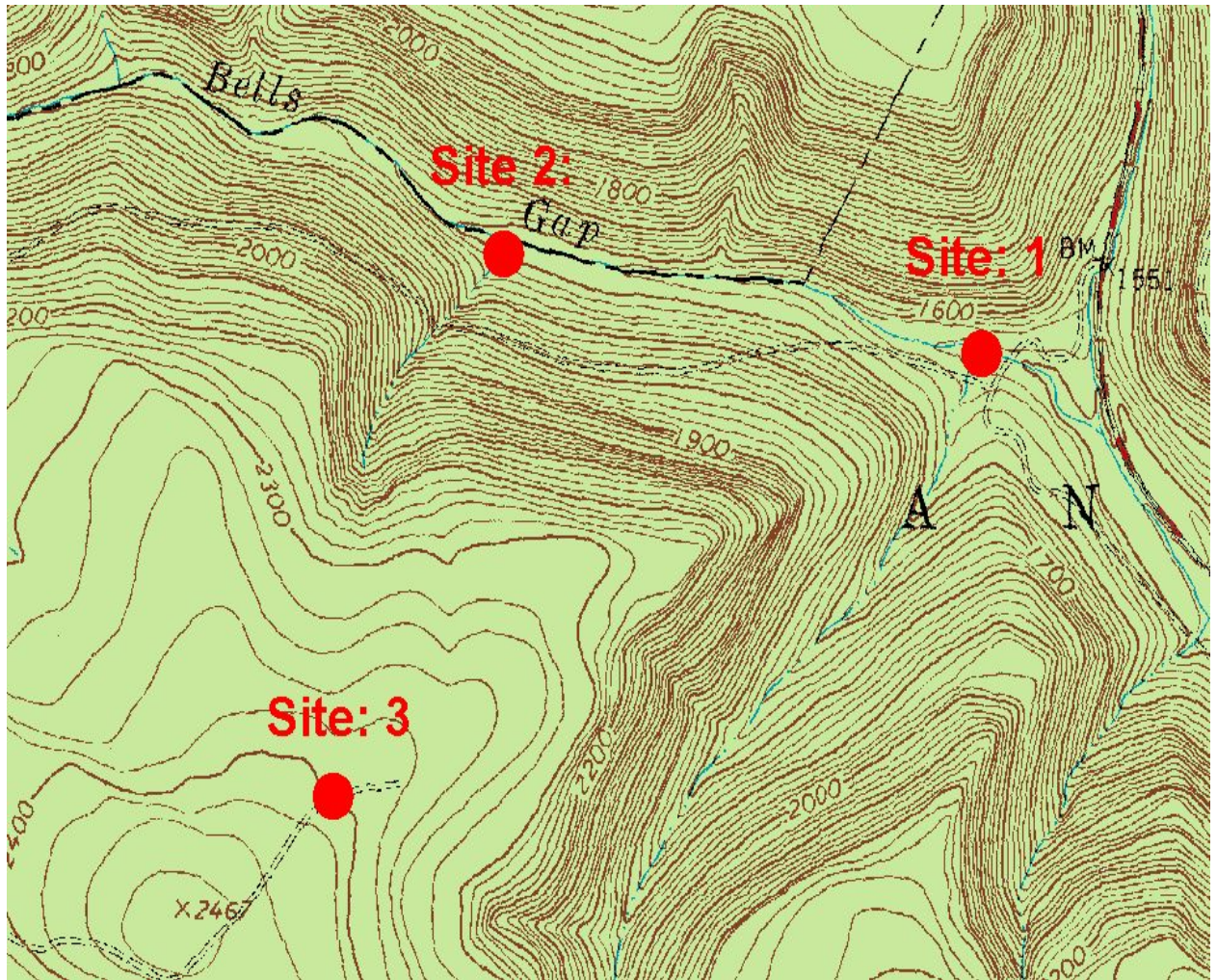
Site Name Or Number:				Date:			Set No. Captured In:			Name of Person Identifying the Bat:				*Capture Number:
Height in meters captured above ground surface: _____ m				Body Measurements (grams and millimeters)					Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)					Transmitter Attached? If so: Frequency (mHz)
<u>Species</u>	<u>Sex</u>	<u>Age</u>	<u>Repro. Condition</u>	<u>Wt. (g)</u>	<u>Ear</u>	<u>Tragus</u>	<u>Fore- arm</u>	<u>Hind Foot</u>		<u>Recapture Yes/No</u>	<u>Band Material</u>	<u>Band Color</u>	<u>Band Inscription</u>	<u>Band on Left/Right</u>
<u>Time of Capture</u>	<u>Photo Taken</u> Yes / No	Remarks:												
<i>Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen</i>														
Site Name Or Number:				Date:			Set No. Captured In:			Name of Person Identifying the Bat:				*Capture Number:
Height in meters captured above ground surface: _____ m				Body Measurements (grams and millimeters)					Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)					Transmitter Attached? If so: Frequency (mHz)
<u>Species</u>	<u>Sex</u>	<u>Age</u>	<u>Repro. Condition</u>	<u>Wt. (g)</u>	<u>Ear</u>	<u>Tragus</u>	<u>Fore- arm</u>	<u>Hind Foot</u>		<u>Recapture Yes/No</u>	<u>Band Material</u>	<u>Band Color</u>	<u>Band Inscription</u>	<u>Band on Left/Right</u>
<u>Time of Capture</u>	<u>Photo Taken</u> Yes / No	Remarks:												
<i>Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen</i>														
Site Name Or Number:				Date:			Set No. Captured In:			Name of Person Identifying the Bat:				*Capture Number:
Height in meters captured above ground surface: _____ m				Body Measurements (grams and millimeters)					Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)					Transmitter Attached? If so: Frequency (mHz)
<u>Species</u>	<u>Sex</u>	<u>Age</u>	<u>Repro. Condition</u>	<u>Wt. (g)</u>	<u>Ear</u>	<u>Tragus</u>	<u>Fore- arm</u>	<u>Hind Foot</u>		<u>Recapture Yes/No</u>	<u>Band Material</u>	<u>Band Color</u>	<u>Band Inscription</u>	<u>Band on Left/Right</u>
<u>Time of Capture</u>	<u>Photo Taken</u> Yes / No	Remarks:												

\*Capture Number = number in sequence by site.

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**Section 4 - Maps** (example)

Blair Co., Blandburg Quadrangle, Bells Gap Area.  
Location of Sites 1, 2, and 3 for Project PA-24





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**Section 5 - Photos** (example)

Male *Myotis sodalis* captured at **Site 1**  
Capture date: **7/18/01**  
Capture Number: **06**

Portrait



Keeled Calcar

