2016 Post-Construction Bat Mortality Monitoring Report Wildcat Wind Farm

Madison and Tipton Counties, Indiana

Project #193704633

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CERTIFICATION

Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate and complete in all material respects.

Signature: _____

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2016 POST-CONSTRUCTION BAT MORTALITY MONITORING REPORT
WILDCAT WIND FARM
MADISON AND TIPTON COUNTIES, INDIANA

Table of Contents

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LIST OF TABLES

LIST OF FIGURES

Stantec

LIST OF APPENDICES

APPENDIX A SAMPLE DATA SHEETS

APPENDIX B REPRESENTATIVE CARCASS PHOTOS

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1.0   Introduction

1.1   PROJECT DESCRIPTION AND HISTORY

The Wildcat Wind Farm (Project or Wildcat) developed by Wildcat Wind Farm I, LLC (WWF) is located in Madison and Tipton counties, immediately north of the town of Elwood, Indiana. The Project consists of 125 GE 1.6 megawatt (MW) wind turbine generators and associated access roads and collector line system for a total capacity of 200 MW (Figure 1). The Project is located on lands leased from private landowners who continue their existing use of the land. Land use in the area is predominantly agricultural.

Wildcat is located within the range of both the federally endangered Indiana bat (*Myotis sodalis*) and federally threatened northern long-eared bat (*Myotis septentrionalis*). A Post-Construction Mortality Minimization and Monitoring Proposal (MMMP) was developed in June 2012 and revised in June 2015 (Stantec 2015), and is consistent with methods and the recommendations of the U.S. Fish and Wildlife Service (USFWS) Land-Based Wind Energy Guidelines (USFWS 2012). From 2013 through June 2015, the Project operated under the terms of a Technical Assistance Letter (TAL) dated 18 June 2012, that established an operational scenario under which no take of Indiana bats was expected to occur (i.e. 6.9 meters per second [m/s] cut-in speed during the fall migration period [1 August – 15 October]).

From July 2015 through 18 August 2016 the Project operated under the terms of a second TAL secured on 2 July 2015 that established a revised operational scenario under which no take of Indiana bats or northern long-eared bats is expected to occur. This second TAL required curtailment to 6.9 m/s during the fall migration period (1 August – 15 October) and 5.0 m/s during the spring migration period (15 March – 15 May). On 19 August 2016, the Project obtained an Incidental Take Permit (ITP) from the USFWS, allowing operations under the terms of the Project's Habitat Conservation Plan (HCP), which covers the Indiana bat and northern long-eared bat (or covered species), requires curtailing to 5.0 m/s during the fall migration period (1 August – 15 October), and outlines the requirements for post-construction monitoring to ensure permit compliance. The ITP authorizes the take of 162 Indiana bats and 81 northern long-eared bats over the 27 years of project operations, or an average of 6 Indiana bats and 3 northern long-eared bats per year.

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Legend

- ⊕ Phase I As-Built Turbine Locations
- ▭ Full Plot Survey Turbine
- ▭ Road and Pad Search Turbine
- ▭ Phase I Project Boundary

Data Sources: Stantec, E.ON, USGS, Esri, 2014 NAIP

Figure No.
1
Title
Turbine and Survey Locations
Client/Project
E.ON Climate and Renewables
Wildcat Wind Farm
Project Location
Tipton and Madison
Counties, Indiana

0   0.75   1.5 Miles

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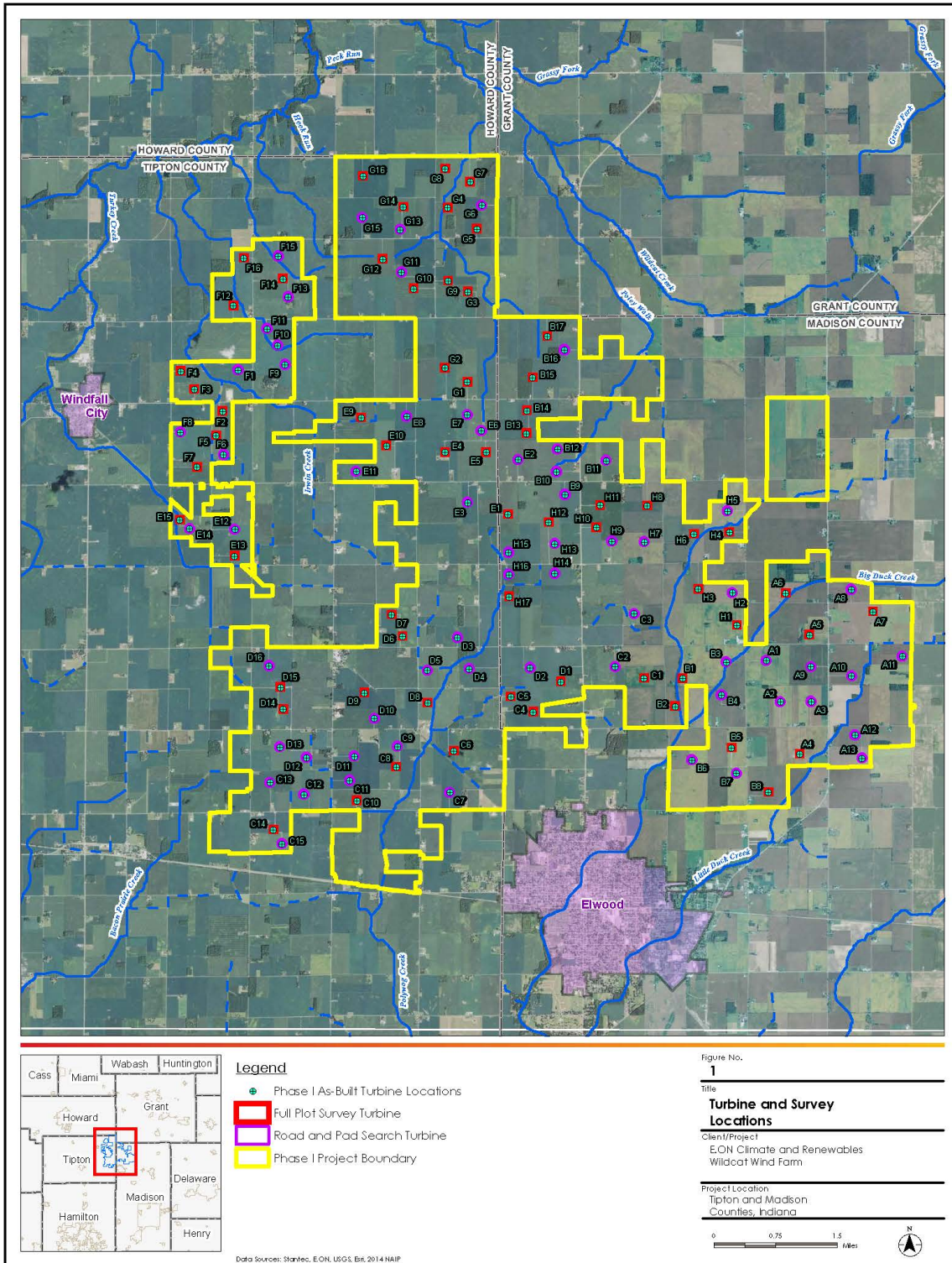
1.2   PURPOSE AND OBJECTIVES OF THE STUDY

Spring monitoring was conducted as required by the TAL to document the effectiveness of the avoidance and minimization measures implemented during the spring (i.e., 5.0 m/s cut-in speed).

Fall monitoring was conducted as part of the baseline monitoring process under the HCP post-construction monitoring plan to:

1. Provide a means of monitoring and ensuring the Project's compliance with the take limits authorized in the ITP
2. To assess the effectiveness of the HCP in meeting the biological objective of minimizing direct morality of Indiana and northern long-eared bats

2.0   Methods

Both the spring and fall studies included the following components:

1. Standardized carcass surveys to systematically search plots at all turbines for bat casualties attributable to the turbines
2. Searcher efficiency trials to estimate the percentage of bat casualties that were found by the searcher(s)
3. Carcass removal trials to estimate the persistence time of carcasses on-site before scavengers removed them

2.1   MORTALITY STUDY

Carcass surveys were conducted in spring (15 March to 15 May) and fall (1 August to 15 October) during the 2016 year of Project operation. This is the fourth year of monitoring during Project operation. The Project was operating under the following conditions:

1. Spring (15 March – 15 May): 5.0 m/s cut-in speed
2. Fall (1 August – 18 August): 6.9 m/s cut-in speed (prior to ITP issuance)
3. Fall (19 August – 15 October): 5.0 m/s cut-in speed (post-ITP issuance)

Post-construction monitoring was conducted during each of the time periods listed above.

2.1.1   Sample Size

Post-construction monitoring was conducted at 100% of the turbines. This study design provides full coverage of the facility and will serve as a control to which subsequent monitoring results can be compared.

2.1.2   Survey Plot Size

During the spring season, searches included roads and pads out to 262 feet (ft) (80 meters [m]) from each turbine at 100% of the turbines (n=125). During the fall season, searches consisted of

roads and pads (out to 262 feet (ft) (80 meters [m]) at 50% of the turbines (n=63), and cleared plots (262-ft x 262-ft (80-m x 80-m) centered around each turbine) using a full-coverage transect method at the remaining 50% (n=62). This hybrid approach targets the areas shown to support the highest searcher efficiency while greatly reducing the financial and logistical constraints associated with clearing and searching large study plots, enabling much broader coverage of the facility.

Previous studies have indicated that the majority of bat carcasses typically fall within 100 ft (30 m) of the turbine or within 50% of the maximum height of the turbine (Kerns and Kerlinger 2004, Arnett at el. 2005, Young et al. 2009, Jain et al. 2007, Piorkowski and O'Connell 2010, USFWS 2012). The plot size used for this study exceeds one-half the maximum turbine rotor height of the Project turbines (246 ft [75 m]). The subset of full-coverage plots in the fall provided a reference for estimating the number of fatalities which may have fallen outside of the search area at the road and pad search turbines. This mixed sampling method is consistent with other post-construction monitoring studies being conducted (e.g., Good et al. 2011) and will enable comparison of study results.

2.1.3   Survey Schedule

The search interval for spring surveys at all turbines was once weekly. An individual turbine was searched on the same day each week when conditions allowed. Within a day, the turbine search schedule and order were randomized, so that each turbine's search plot was sampled at differing periods during the day. A weekly search interval for fatality monitoring was deemed adequate by Kunz et al. (2007), and studies have demonstrated that a weekly search interval provides effective mortality monitoring and adequately estimates impacts from wind energy facilities (Gruver et al. 2009, Young et al. 2009), such that the added effort associated with more frequent intervals is not warranted. In addition, previous spring surveys over the past three years at the site have demonstrated a minimum carcass persistence of at least seven days on roads and pads.

For the fall surveys, all turbines were searched twice weekly, with approximately three to four days between surveys when conditions allowed. This change was implemented based on the 2014 and 2015 fall monitoring results, which indicated a carcass persistence of less than seven days on roads and pads for the fall. Additionally, prior to the fall monitoring period, all search plots (full plots and roads and pads) were cleared of carcasses the last week of July, and all bats found that week were coded as incidental finds, as they were not found during either the spring or fall monitoring periods.

2.1.4   Carcass Surveys

Carcass surveys were conducted by searchers experienced and/or trained in fatality search methods, including proper handling and reporting of carcasses. Searchers were familiar with and able to accurately identify bat species likely to be found in the project area, and photos of any unknown bat discovered were sent to an permitted bat biologist for positive identification, and carcasses were kept on-site. During surveys, searchers walked at a rate of approximately 2 miles per hour (mph) (45 to 60 m per minute) while searching 10 ft (3 m) on either side of each transect.

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For each carcass found, the following data were recorded (a sample data form is included in Appendix A):

- Date and time
- Initial species identification
- Sex, age, and reproductive condition (when possible)
- Global positioning system (GPS) location
- Distance and bearing to turbine
- Substrate/ground cover conditions
- Condition (intact, scavenged, decomposed)
- Any notes on presumed cause of death

A digital photograph of each carcass found was taken before the carcass was handled and removed. Representative digital photographs are included in Appendix B. All carcasses were labeled with a unique number, bagged, and stored in a freezer (with a copy of the original data sheet) at the Project Operations and Maintenance Building. Bat carcasses were collected and retained under Indiana Department of Natural Resources Special Purpose Salvage Permit No. 16-044.

Bat carcasses found in non-search areas and any bird carcasses found were coded as incidental finds, and documented in a similar fashion to those found in standardized surveys when possible. This included carcasses found during non-search times, including the week prior to the fall monitoring period when all survey plots were searched for any carcasses that had occurred between the spring and fall monitoring periods, carcasses found on 1 August (which had been killed prior to the night of 1 August) and decomposed carcasses found on 2 August that could be confirmed to have not been killed the prior night (1 August). Maintenance personnel were informed of the standardized surveys, and were trained in collision event reporting protocol in the case of an incidental find. Bird carcasses were photographed and data collected, but the carcass was left in place and not collected; incidental bat carcasses were collected and stored in the freezer with the carcasses found during standardized surveys. Incidental finds were not included in the mortality estimates.

2.1.5   Species Identification

Preliminary bird and bat species identifications were made in the field by qualified staff. When carcass condition allowed, sex, age, and reproductive condition of the carcass were recorded. For bat carcasses, forearm length was recorded to facilitate species identification. Any unknown bat, or potential Indiana or northern long-eared bat, was identified by a permitted bat biologist. In addition to the carcass, photographs and data collected for each carcass were used to verify the species identification.

2.2   SEARCHER EFFICIENCY TRIALS

Searcher efficiency trials were used to estimate the probability of bat carcass detection by the searchers. A total of three searcher efficiency trials were conducted: one during the spring and

two during the fall monitoring period (one for each searcher conducting surveys). Searchers did not know when during the monitoring periods the trials were being conducted, at which turbines trial carcasses were placed, or the location or number of trial carcasses placed in any given search plot. Commercially-available brown mouse carcasses were used as trial carcasses to represent bats.

All searcher efficiency trial carcasses were randomly placed by the field lead within the search plots. These were placed the morning prior to the carcass surveys for that day. The number of trial carcasses found by searchers during the mortality surveys in each plot was recorded and compared to the total number of trial carcasses placed in the plot and not scavenged prior to the mortality search. A sample data form is included in Appendix A.

2.3   CARCASS REMOVAL TRIALS

Carcass removal trials were conducted to estimate the average length of time carcasses remained in the search plots (i.e., were available to find) before being removed by scavengers. Carcass removal trials were conducted following the searcher efficiency trials; one during the spring and one during the fall monitoring periods. Mouse carcasses used during the searcher efficiency trials were left in place and their locations were discretely marked. Searchers monitored the trial carcasses over a period of up to 30 days. During each carcass removal trial, carcasses were checked every day for the first week, and then on days 10, 14, 20 and 30.

The condition of each carcass was recorded during each trial check. The conditions recorded were defined as follows:

- Intact – complete carcass with no body parts missing
- Scavenged – carcass with some evidence or signs of scavenging
- Fur spot – no carcass, but fur spot remaining
- Missing – no carcass or fur remaining

A sample data form is included in Appendix A. Any carcasses remaining at the end of the 30-day trial period were removed from the field.

2.4   STATISTICAL METHODS FOR MORTALITY ESTIMATES

In an effort to make results comparable with other post-construction mortality studies, the method used to calculate the mortality estimates largely follows the estimator proposed by Erickson et al. (2003), as modified by Young et al. (2009). The estimate of the total number of turbine-related casualties was based on three components: (1) observed number of casualties, (2) searcher efficiency, and (3) carcass removal rates. The 90% confidence intervals were calculated using bootstrapping methods (Erickson et al. 2003 and Manly 1997 as presented in Young et al. 2009).

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2.4.1   Mean Observed Number of Casualties (c)

The estimated mean observed number of casualties (c) per turbine per monitoring period was calculated as:

$$c = \frac{\sum_{j=1}^{n} c_j}{n}$$

where n is the number of turbines searched, and c_j is the number of casualties found during mortality searches. Incidental carcass finds (those found outside of the surveyed areas or at times other than during mortality surveys) were not included in this calculation, or in the estimated fatality rate. Mean number of observed casualties was calculated separately for each survey type (roads and pads, full plots) and each survey period.

2.4.2   Estimation of Searcher Efficiency Rate (p)

Searcher efficiency (p) represents the average probability that a carcass was detected by surveyors. The searcher efficiency rate was calculated by dividing the number of trial carcasses observers found by the total number which remained available during the trial (non-scavenged). Searcher efficiency was calculated separately for each search type (roads and pads, full plots), searcher, and season.

2.4.3   Estimation of Carcass Removal Rate (t)

Carcass removal rates were estimated to adjust the observed number of casualties to account for scavenger activity at the site. Mean carcass removal time (t) represents the average length of time a trial carcass remained at the site before it was removed by scavengers. Mean carcass removal time was calculated as:

$$t = \frac{\sum_{i=1}^{S} t_i}{s - s_c}$$

where s is the number of carcasses placed in the carcass removal trials and s_c is the number of carcasses remaining at day 30. This estimator is the maximum likelihood (conservative) estimator assuming the removal times follow an exponential distribution, and there is right-censoring of the data. Any trial carcasses remaining after 30 days were collected, yielding censored observations at 30 days. Carcass removal rates were calculated separately for each survey type (roads and pads, full plots) and season.

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2.4.4   Estimation of the Probability of Carcass Availability and Detection (π)

Searcher efficiency and carcass removal rates were combined to represent the overall probability (π) that a casualty incurred at a turbine was reflected in the mortality survey results. This probability was calculated as:

$$\pi = \frac{t \cdot p}{I} \cdot \left[\frac{\exp(^I/_t) - 1}{exp\ (^I/_t) - 1 + p} \right]$$

where I is the interval between searches. The estimation of the probability of carcass availability and detection was calculated separately for each survey type (roads and pads, full plots) and season. For the fall, the number was then averaged for the study using a weighted average as:

$$\pi = (0.5 * \pi_{RP}) + (0.5 * \pi_{FP})$$

2.4.5   Area Adjustment (A)

2.4.5.1   Spring Season

Due to the use of 100% roads and pads during the spring monitoring period, the average of the previous three years of post-construction monitoring area adjustments was used for the 2016 period. This number had been calculated using the following equation:

$$A_{RP} = \frac{\frac{C_{FP}}{\pi_{FP}}}{\frac{C_{RPFP}}{\pi_{RP}}} * A_{FP}$$

where π_{FP} is the π value calculated for full plot searches. C_{FP} is the number of observed casualties on full plots, π_{RP} is the π value calculated for roads and pads searches, and C_{RPFP} is the number of observed casualties on roads and pads of the full plot turbines.

The value for A_{FP} used was equal to the correction factor calculated for the Fowler study (A_{FP}=1.305) as the Fowler study estimated that 23.4% of fatalities fall outside of the 262-foot x 262-foot (80-m x 80-m) square plots.

2.4.5.2   Fall Season

Approximation of A, the adjustment for areas which were not surveyed, was calculated following methods and data collected during post-construction monitoring studies at Fowler Ridge Wind Farm in Indiana (Good et al. 2011). For this study, A was calculated to represent the adjustment for the proportion of carcasses which likely fell outside of the area surveyed at all studied turbines.

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The value for A was approximated using the following equation:

$$A = \frac{\frac{C_{RP}}{\pi_{RP} * S_{RP}} + \frac{C_{FP}}{\pi_{FP} * S_{FP}}}{\frac{C_{RP}}{\pi_{RP}} + \frac{C_{FP}}{\pi_{FP}}} * A_{FP}$$

where C_{RP} is the number of observed casualties on roads and pads, C_{FP} is the number of observed casualties on full plots, π_{RP} is the probability of carcass availability and detection on roads and pads, π_{FP} is the probability of carcass availability and detection on full plots, S_{RP} is the proportion of roads and pads surveyed across all study turbines, S_{FP} is the proportion of full plots searched across all study turbines, and A_{FP} was set at 1.305. For this study, $S_{RP} = 0.5$ and $S_{FP} = 0.5$, as only roads and pads will be surveyed at approximately 50% of the study turbines and full plot surveys will be conducted at the remaining 50% of the study turbines.

2.4.6   Estimation of Facility-Related Mortality (m)

Mortality estimates were calculated using the estimator proposed by Erickson et al. (2003), as modified by Young et al. (2009). The estimated mean number of bat casualties/turbine/monitoring period (m) was calculated by dividing the mean observed number of bat casualties/turbine/monitoring period (c) by π, an estimate of the probability a carcass was not removed by scavengers and was detected by surveyors, and then multiplying by A, the adjustment for the area within which bats may have fallen but which was not surveyed.

$$m = A * \frac{c}{\pi}$$

Where A is the area adjustment, C is the number of carcasses found per turbine, and π is the probability of carcass detection and availability. For the spring, this equation used all values from the road and pad searches, whereas for the fall season, the probability of carcass availability and detection was the weighted average based on approximately 50% of surveys being roads and pads and 50% of surveys being full plots, while the area adjustment and mean observed number of casualties was facility-wide.

2.5   TAKE ESTIMATION FOR COVERED SPECIES

The Evidence of Absence (EOA) software developed by Dalthorp et al. (2014) was used to estimate the probability of detection (g). This value represents the probability of detecting a carcass of either covered species that occurs at the site based on the post-construction monitoring effort performed that season. For 2016, this was applied only to the period between 19 August and 11 October, when take of the covered species was expected to occur (if it occurred at all).

The estimate of the overall probability of detection (g) is a function of several factors, including carcass persistence, searcher efficiency, area adjustment, search interval, and other factors (Dalthorp et al. 2014). These bias correction factors were calculated utilizing the methods

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described in Section 2.4, and input into the EOA model to calculate a probability of detection (g). The HCP set a goal of having a detection probability (g) between 0.25 and 0.30 during baseline monitoring.

Then, utilizing the EOA "Multi-Year Total" tool, the probability of detection (g) and the number of covered carcasses found (X) are input to determine, with a certain degree of confidence, that the number of fatalities of a covered species did not exceed the cumulative total authorized take, and to calculate the annual take rate. These estimates (cumulative total take and average annual take rate) are then used to determine whether any of the following three adaptive management triggers outlined in the Project's HCP have been triggered:

1. Short-term trigger – is actual average annual take rate larger than expected? This trigger would be an annual take rate of 6 Indiana bats or 3 northern long-eared bats or more, and is calculated using significance level of a=0.01.

2. Reversion trigger – is actual average annual take rate small enough to safely reverse an existing operational constraint? This trigger would be an annual take rate of less than 1.5 Indiana bats and less than 0.75 northern long-eared bats.

3. Long-term trigger – does total cumulative take exceed the long-term authorized amount? This trigger would be an estimated cumulative mortality of 162 Indiana bats or 81 northern long-eared bats or more, and is calculated using significance level of a=0.50.

The short-term and reversion triggers cannot be applied to the 2016 monitoring results, as they utilize a 3-year running average, which cannot yet to be calculated as 2016 was the first year of monitoring under the HCP.

3.0   Results

3.1   SUMMARY OF SURVEYS

A total of 1,083 carcass searches were conducted over 9 weeks in the spring, and 2,563 carcass surveys were conducted over 11 weeks in the fall (Table 1). Due to weather and maintenance at turbines, the average time between surveys was 7.06 days during the spring monitoring period and 3.63 days during the fall monitoring period (Table 1).

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Table 1. Summary of standardized surveys during the 2016 post-construction monitoring study at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

Season	Date Range	Length (Weeks)	Road and Pad Turbines	Full Plot Turbines	Total number of searches conducted	Search Interval	Bat Carcasses Found[1]
Spring	15 March – 15 May	9	125	0	1,083	7.06	6
Fall	1 August – 18 August	3	63	62	358	3.6	15
	19 August – 15 October	8			2,205		76

[1]This includes all carcasses found during standardized searches (within the plots on a scheduled search day), including live bats found within the plots.

A total of 97 individual bat carcasses were found during standardized carcass searches, 6 during the spring surveys (6.2%) and 91 during the fall surveys (93.8%). During the fall, 15 bat carcasses were found prior to ITP issuance (16.5%), and 76 were found after ITP issuance (83.5%). These totals include two live bats found in the spring and one live bat found in the fall, all of which were transferred to a licensed wildlife rehabilitator, but included in the standardized search summary since they may have been injured by the turbines. An additional 31 incidental bat carcasses were also found, all during the fall.

3.1.1   Species Composition

A summary of all bat carcasses found incidentally and during the standardized carcass surveys during post-construction monitoring is shown in Table 2. Of the 128 bat carcasses found at the site, silver-haired bat (*Lasionycteris noctivagans)* was the most common species detected (n=44; 34.4% of all bat carcasses found). Eastern red bat (*Lasiurus borealis*) was the next most common species (n=42; 32.8%), followed by hoary bat (*Lasiurus cinereus*; n=24; 18.8%), big brown bat (*Eptesicus fuscus*; n=17; 13.3%), and Seminole bat[1] (*Lasiurus seminolus*; n=1; 0.8%). Species composition did vary by season, with silver-haired bats comprising 66.7% of all spring fatalities (n=4), and only 34.4% of all fall fatalities. No bat species listed as threatened or endangered under the Endangered Species Act of 1973 (ESA), as amended, or by the State of Indiana, were found during the surveys, and all bat carcasses were identified to the species level. The silver-haired bat, eastern red bat, and hoary bat are all listed by the State of Indiana as special concern, but do not receive any legal protection under the Nongame and Endangered Species Conservation Act.

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[1] The project area is outside the known range of the Seminole bat, but the species identification was confirmed by a permitted bat biologist.

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Table 2. Summary of bat carcasses found during the 2016 post-construction monitoring study at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

Species	Spring (15 March – 15 May)	Fall (1 August – 15 October)	Incidentals		Total
			Killed Prior to 1 August	Outside Plots (Fall)	
Silver-haired Bat	4 (66.7%)	39 (42.9%)	0 (0.0%)	1 (50.0%)	44 (34.4%)
Eastern Red Bat	1 (16.7%)	27 (29.7%)	14 (48.3%)	0 (0.0%)	42 (32.8%)
Hoary Bat	0 (0.0%)	16 (17.6%)	8 (27.6%)	0 (0.0%)	24 (18.8%)
Big Brown Bat	1 (16.7%)	8 (8.8%)	7 (24.1%)	1 (50.0%)	17 (13.3%)
Seminole Bat	0 (0.0%)	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (0.8%)
Total	6	91	29	2	128

3.1.2   Age and Sex

A summary of the age and sex of all bat carcasses found during the standardized post-construction monitoring is shown in Table 3. Of the 97 bat carcasses found during the standardized searches, 10 were adult females (10.3%), 2 were juvenile females (2.1%), 6 were females of unknown age (6.2%), 16 were adult males (16.5%), 2 were juvenile males (2.1%), 6 were males of unknown age (6.2%), 13 were adults of unknown sex (13.4%), and 42 were bats of unknown age and unknown sex (43.3%; Table 3).

Table 3. Sex and age of bat carcasses found during standardized surveys (fall numbers presented in the table, with spring numbers in parenthesis) for the 2016 post-construction monitoring study at the Wildcat Wind Farm, Tipton and Madison counties, Indiana. Ages include adults (A), juveniles (J) and unknown (U).

Species	Female			Male			Unknown		
	A	J	U	A	J	U	A	J	U
Silver-haired Bat	3(1)	2	2	6	1	5	5(3)	0	15
Eastern Red Bat	3	0	2	3(1)	0	0	1	0	18
Hoary Bat	3	0	2	3	0	0	1	0	7
Big Brown Bat	0	0	0	1 (1)	1	1	3	0	2
Seminole Bat	0	0	0	1	0	0	0	0	0
Total	9 (1)	2	6	14 (2)	2	6	10 (3)	0	42

3.1.3   Temporal Patterns

Of the 97 bat carcasses found during standardized searches, 6 were found during the spring (6.2%) and 91 were found during the fall (93.8%).

During the spring, no bats were found during the first six weeks of searches, with the first bat being found on 25 April. Two bats were found each of the last three weeks of searches (Figure 2). The two bats found during week seven were both live bats, which were transferred to a wildlife rehabilitator.

Figure 2. Bat carcasses found by week during the spring season of standardized surveys during the 2016 post-construction monitoring study (15 March through 15 May) at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.
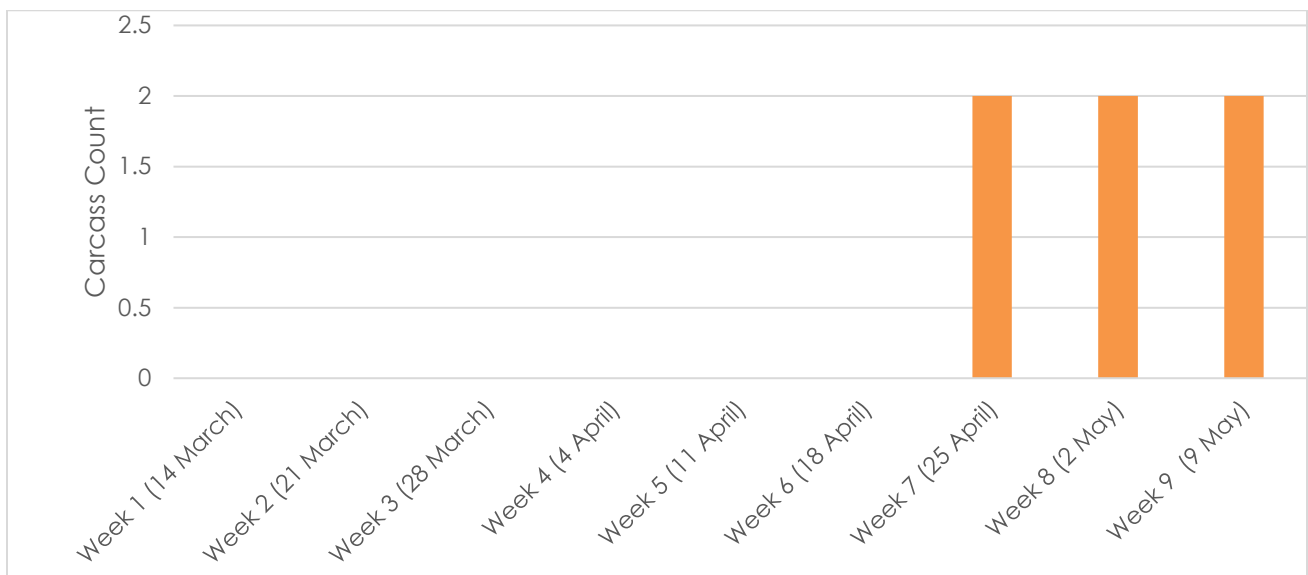
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During the fall, bats were found every week of searches (Figure 3), with the greatest number of bats found in a single week occurring the week of 3 October (15 bats found) and the fewest number of bats found in a single week occurring the week of 15 August (1 bat found, Note - project was curtailed at 6.9 m/s).

Figure 3. Bat carcasses found by week during the fall season of standardized surveys during the 2016 post-construction monitoring study (1 August through 15 October) at the Wildcat Wind Farm, Tipton and Madison counties, Indiana. The Project was operating at a 6.9 m/s cut-in speed between 1 August and 18 August and at a 5.0 m/s cut-in speed starting on 19 August.
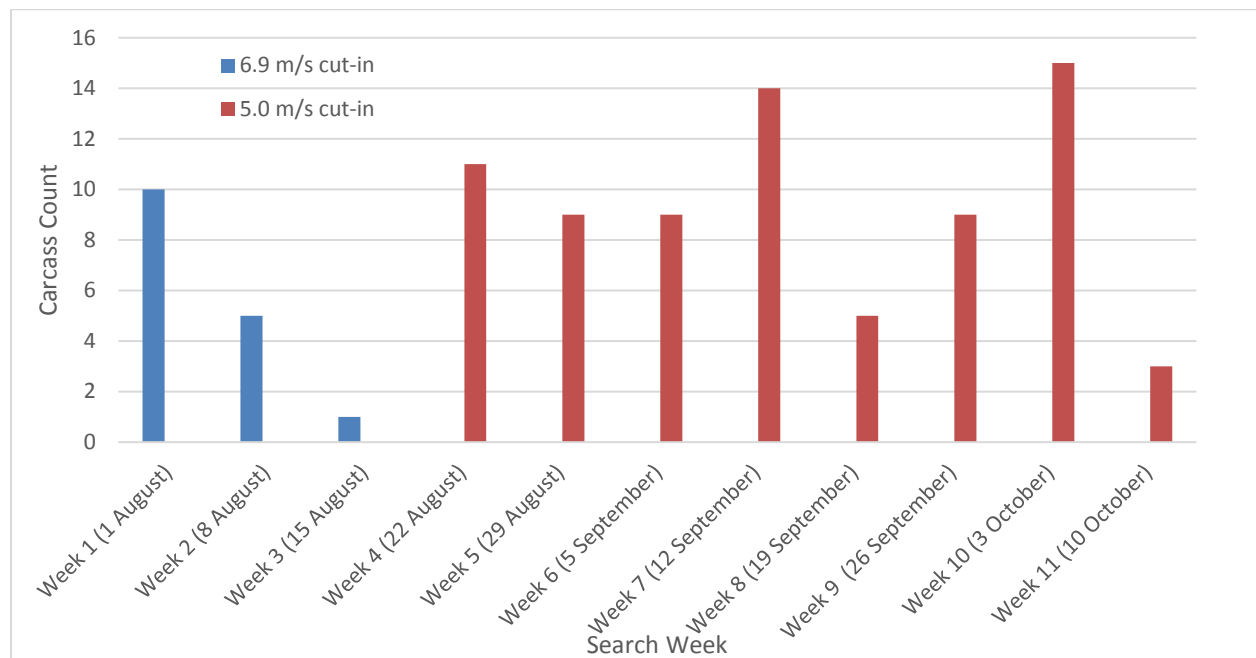
3.1.4 Spatial Patterns

During the spring, search effort was equal among all 125 turbines since all were road and pad turbines searched once weekly. Each of the six bat carcasses was found at a different turbine, such that carcasses were found at 4.8% of the 125 turbines.

During the fall, bats were found at 57 of the 125 turbines (45.6%). Of the 91 carcasses found, 72 (79.1%) were found at full plot turbines and 19 (20.9%) were found at road and pad search turbines.

Of the 63 turbines at which roads and pads only were searched in the fall, the 19 carcasses were found at 16 different turbines (25.4%), with two carcasses found at three of the turbines and one at the remaining 13.

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Of the 62 turbines at which full plot searches were conducted in the fall, carcasses were found at 41 (66.1%). The number of carcasses found per turbine varied from one to six, with the following breakdown:

- 6 carcasses – 1 turbine
- 5 carcasses – 1 turbine
- 4 carcasses – 4 turbines
- 3 carcasses – 1 turbine
- 2 carcasses – 8 turbines
- 1 carcass – 26 turbines

Carcasses were found at turbines located throughout the project area.

3.2   SEARCHER EFFICIENCY TRIALS

A total of three searcher efficiency trials were conducted; one in the spring and two in the fall. Only one trial was conducted during the spring because there was only one searcher. For the fall, one trial was conducted for each of the two searchers during the monitoring period, but the results were averaged due to equal search effort between searchers (each turbine was searched once weekly by each searcher, so a straight average was applicable).

A total of 30 mouse carcasses were placed for the searcher efficiency trial during the spring monitoring period. In the fall period, 45 carcasses were placed (22 for one searcher, and 23 for the other). Scavengers did not remove any of the trial carcasses prior to the searcher efficiency trial in the spring; however, 15 carcasses were scavenged prior the fall trials. Searcher efficiency in the spring was 90% (Table 4). In the fall, searcher efficiency ranged from approximately 60% on full plots to 90% on roads and pads (Table 4).

Table 4. Searcher efficiency by season (Spring: 15 March through 15 May and Fall: 1 August through 15 October) and search type (full 80x80m plots or roads and pads) for the 2016 post-construction monitoring study at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

	Spring Monitoring Period	Fall Monitoring Period	
	Roads and Pads	Full Plots	Roads and Pads
Number of Carcasses	30	23	22
Number of Carcasses Scavenged Prior to Search	0	5	10
Number of Carcasses	30	18	12
Number of Carcasses	27	11	11
(p) Searcher Efficiency Mean (90% CI)	0.9 (0.8, 1.0)	0.6 (0.4, 0.8)	0.9 (0.8, 1.0)

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3.3 CARCASS REMOVAL TRIALS

Mouse carcasses used in the searcher efficiency trials were left for up to 30 days, and checked each day for the first week and then on days 10, 14, 20, and 30 of the trial. Thirty (30) mouse carcasses were used during the spring monitoring period, and 40 carcasses were used during the fall monitoring period. Carcasses persisted for an average of 9.5 days in the spring, and 7.3 days for roads and pads and 9.3 days for full plots in the fall (Table 5).

Table 5. Carcass removal by season (Spring: 15 March through 15 May and Fall: 1 August through 15 October) during the 2016 post-construction monitoring study at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

	Spring Monitoring Period	Fall Monitoring Period	
	Roads and Pads	**Full Plots**	**Roads and Pads**
Number of Carcasses	30	22	18
Number of Carcasses Scavenged within 30	27	20	17
Mean Carcass Persistence time in days (90% CI)	**9.5** (6.3, 14.0)	**9.3** (6.0, 14.4)	**7.3** (4.2, 11.8)

3.4 PROBABILITY OF CARCASS AVAILABILITY AND DETECTION

In the spring, based upon the searcher efficiency rate of approximately 90% and the carcass persistence time of 9.5 days, the probability of carcass availability and detection was estimated to be 80.4% (90% Confidence Interval (CI): 71.8% to 86.5%).

In the fall, based upon the searcher efficiency rate of approximately 90% on roads and pads and 60% on full plots, the mean carcass persistence time of 7.3 days on roads and pads and 9.3 days on full plots, and an average search interval of 3.06 days, the probability of carcass availability and detection was estimated to be:

- 76.2% on roads and pads (90% CI: 62.9% to 85.0%)
- 68.7% on full plots (90% CI: 53.0% to 80.0%)

Thus, the average carcass availability and detection used for mortality estimates was 72.0% (90% CI: 62.2% to 79.5%).

3.5 ADJUSTED MORTALITY ESTIMATES

Mortality rate estimates were calculated based upon the carcasses found during the mortality surveys, and did not include any incidental finds. Observed bat mortality estimates were

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adjusted to account for searcher efficiency, carcass removal, and an area adjustment using the methods described in Section 2.4. Results are summarized in the sections below by season.

3.5.1 Spring

Over the spring migratory period (15 March – 15 May), the estimated bat mortality was 0.27 bats/turbine, or 33.8 bats over the entire facility (Table 6).

Table 6. Bat mortality estimates for the spring 2016 post-construction monitoring study at the Wildcat Wind Farm, Tipton and Madison counties, Indiana. The Project was operating at a cut-in speed of 3.5 m/s during this time period.

	Estimate
(c) Observed bats/turbine	**0.05**
(A) Area Adjustment[1]	**4.7**
(m) Estimated bats/turbine (90% CI)	**0.27** (0.10, 0.48)
Estimated bats/MW (90% CI)	**0.17** (0.06, 0.30)
Estimated bats/facility (90% CI)	**33.8** (12.5, 60.0)

[1]Average of previous 4 years' area adjustments for roads and pads

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3.5.2   Fall

Over the entire fall migratory period (1 August – 15 October), the estimated bat mortality was 2.65 bats/turbine, or 331.3 bats over the entire facility (Table 7).

Table 7. Bat mortality estimates for the fall 2016 post-construction monitoring study at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

	Estimate
(c) Observed bats/turbine	**0.73**
(A) Area Adjustment	**2.61**
(m) Estimated bats/turbine (90% CI)	**2.65** (2.05, 3.41)
Estimated bats/MW (90% CI)	**1.66** (1.28, 2.13)
Estimated bats/facility (90% CI)	**331.3** (256.3, 426.3)

Of the 91 bat carcasses found during the fall period, 15 were found prior to the issuance of the ITP (19 August), while the project was operating at 6.9 m/s, while 76 were found after ITP issuance when the project was operating at 5.0 m/s. Bat mortality was estimated separately for these two time periods, as shown in Table 8.

Table 8. Bat mortality estimates before ITP issuance (under 6.9 m/s cut-in speed) and after ITP issuance (under 5.0 m/s cut-in speed) for the 2016 fall post-construction monitoring study at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

	Prior to ITP Issuance (6.9 m/s)	**After ITP Issuance (5.0 m/s)**
(c) Observed bats/turbine/season	**0.12**	**0.61**
(m) Estimated bats/turbine (90% CI)	**0.43** (0.23, 0.69)	**2.20** (1.70, 2.83)
Estimated bats/MW (90% CI)	**0.27** (0.14, 0.43)	**1.38** (1.06, 1.33)
Estimated bats/facility (90% CI)	**53.8** (28.8, 86.3)	**275.0** (212.5, 353.8)

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3.6   INCIDENTAL FINDS

3.6.1   Bats

No incidental bats were found during the 2016 spring monitoring period. During the 2016 fall monitoring period 31 incidental bats were discovered prior to or during surveys. Of these, 29 bats were determined to have been killed prior to the night of 1 August (either found prior to that date or decomposed such that the biologists could confirm that the time of death had been prior to the night of 1 August) and 2 bats were found during the monitoring period (1 August through 15 October) but outside of the plots. All incidental bats are summarized in Table 2, and the sex and age of incidental bat carcasses is summarized below in Table 9.

Table 9. Sex and age of incidental bat carcasses found during the 2016 post-construction monitoring study (15 March through 15 May and 1 August through 15 October) at the Wildcat Wind Farm Phase I, Tipton and Madison counties, Indiana.
Ages include adults (A), juveniles (J) and unknown (U).

Species	Female			Male			Unknown		
	A	J	U	A	J	U	A	J	U
Silver-haired Bat	0	0	0	**1**	0	0	0	0	0
Eastern Red Bat	0	0	**1**	**2**	0	0	**3**	0	**3**
Hoary Bat	0	0	0	**1**	0	0	**1**	0	**4**
Big Brown Bat	0	0	0	**1**	0	0	0	0	**2**
Total	0	0	1	5	0	0	4	0	9

3.6.2   Birds

A total of 19 bird carcasses were found during the 2016 post-construction studies. Of those, three (16%) were found during the spring monitoring period. One bird carcass (5%) was found during the plot-clearing survey (July 25 through July 28) prior to the fall surveys. The remaining 15 bird carcasses (79%) were found during the fall monitoring period. The bird carcasses found during the survey are summarized in Table 10.

Table 10. Summary of bird carcasses found during the 2016 post-construction monitoring study (15 March through 15 May and 1 August through 15 October) at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

Date	Species	Turbine
21 March	Red-tailed hawk (*Buteo jamaicensis*)	E3
23 March	Red-tailed hawk	B4
26 April	Sharp-shinned hawk (*Accipiter striatus*) [Special Concern]	B16
26 July	Killdeer (*Charadrius vociferus*)	H17

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Date	Species	Turbine
1 August	Horned Lark (*Eremophila alpestris*)	E13
3 August	Killdeer	E13
5 August	Turkey Vulture (*Cathartes aura*)	G2
8 August	Killdeer	H17
30 August	Unknown bird species	D4
31 August	Unknown bird species	A5
1 September	Killdeer	C5
14 September	Killdeer	A3
19 September	Black-throated blue warbler (*Setophaga caerulescens*)	G2
20 September	Killdeer	C6
27 September	Swamp sparrow (*Melospiza georgiana*)	D4
29 September	Killdeer	A5
4 October	Marsh wren (*Cistothorus palustris*) [State Endangered]	C14
4 October	Horned Lark (*Eremophila alpestris*)	C4
9 October	Blue-headed vireo (*Vireo solitaries*)	E11

The most commonly found bird species was the killdeer (*Charadrius vociferus*), which made up 36.8% of all bird fatalities (n=7), followed by horned lark (*Eremophila alpestris*) and red-tailed hawk (*Buteo jamaicensis*) which each made up 10.5% of all bird fatalities (n=2 for each). A single individual carcass was found of the remaining six species, along with two unknown carcasses (Table 9). One state-endangered species (marsh wren; *Cistothorus palustris*) and one special concern species (sharp-shinned hawk; *Accipiter striatus*) were found.

The 19 bird fatalities occurred at 14 turbines (Table 9), with 5 turbines having 2 fatalities each and the remaining 9 turbines having 1 fatality each. No bird fatalities were found at the other 111 turbines.

3.7   ESTIMATED TAKE OF INDIANA BATS AND NORTHERN LONG-EARED BATS

No carcasses of Indiana bats or northern long-eared bats were found during the 2016 post-construction monitoring surveys. Based upon operation under the terms of the TAL, it is assumed that no take of Indiana bats or northern long-eared bats occurred during the spring (when operating at 5.0 m/s) or prior to 19 August (when operating at 6.9 m/s). After ITP issuance on 19 August, the overall bat fatalities at the Project were estimated at 275.0 bats (90% CI: 212.5 to 353.8).

The following inputs were used to calculate the probability of detection (g) within the EOA software:

- Searcher efficiency: 0.75
- Coverage (a): 0.38

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- Search interval: 3.6
- Factor by which searcher efficiency changes with each search (k): 0.8 (EOA default)
- Persistence Distribution: exponential with a mean persistence of 8.3 days
- Prior distribution: uniform with a maximum fatality of 200 (EOA default)
- Arrival function: uniform (EOA default)

This resulted in a probability of detection (g) of 0.265 (95% CI: 0.252 to 0.278).

The "Multi-Year Total" tool was then used, with the following inputs for the first year:

- Carcasses found = 0
- Probability of detection = 0.265 (95% CI: 0.252 to 0.278)
- Confidence level = 0.5

This was used to calculate the cumulative total take:

- Cumulative Total Take = 2 Indiana bats and 2 northern long-eared bats

Since neither the Indiana bat nor northern long-eared bat have been found at the Project, the estimates are the same for both species.

As discussed in Section 2.5.2 above, the short-term and reversion triggers cannot be applied to the 2016 monitoring results, as they utilize a 3-year running average, which cannot yet to be calculated as 2016 was the first year of monitoring under the HCP.

4.0 Summary and Conclusions

4.1 SUMMARY

- A total of 3,646 carcass surveys were conducted over 20 weeks encompassing two survey periods in 2016.

- A total of 97 bat carcasses were found during standardized searches, with additional incidental finds totaling 31 bat carcasses and 19 bird carcasses.

- No bird or bat species listed as threatened or endangered under the ESA were found during this study.

- No state-endangered bat species, and three special concern species (silver-haired bat, eastern red bat, and hoary bat) were found during this study.

- One state-endangered bird species (march wren) and one special concern species (sharp-shinned hawk) were found during this study.

- Bat species found during standardized surveys included silver-haired bat (43), eastern

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red bat (28), hoary bat (16), big brown bat (9) and seminole bat (1).

- Estimated facility-wide bat mortality in the spring (15 March to 15 May) was 33.8 bats (90% CI: 12.5 to 60.0), compared to an estimated bat mortality in the fall (1 August to 15 October) of 331.3 bats (90% CI: 256.3 to 426.3).

- Estimated facility-wide bat mortality in the fall prior to ITP issuance (1 August to 18 August) was 53.8 bats (90% CI: 28.8 to 86.3), compared to an estimated bat mortality after ITP issuance (19 August to 15 October) of 275.0 bats (90% CI: 212.5 to 353.8).

- No Indiana bat or northern long-eared bat carcasses were found during the 2016 study.

4.2   COMPARISON TO PREVIOUS STUDIES

Post-construction monitoring has been conducted for 4-years at the Project. While the surveys differed in level of effort (search interval, search area) and bias correction factors (searcher efficiency, carcass persistence, area adjustments), all surveys had overall fatality estimates corrected for these differences, allowing for comparison of results. In addition, the Project operated under different cut-in speed adjustments between years based on the TAL or ITP requirements.

4.2.1   Spring Migration Season

For the first three years of Project operations the turbines operated at the manufacturer's cut-in speed of 3.5 m/s. The mean bat fatality estimate ranged from 88 to 137.5 bats during the spring period, compared to 33.8 bats during the 2016 spring season, when the project was operating at a cut-in speed of 5.0 m/s (Table 11).

Table 11. Bat mortality estimates by year for the spring migratory period (1 April – 15 May) at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

	Year and Cut-in Speed			
	2013 (3.5 m/s)	2014 (3.5 m/s)	2015 (3.5 m/s)	2016 (5.0 m/s)[1]
(m) Estimated bats/turbine	0.7	1.1	1.0	0.3
Estimated bats/MW	0.4	0.7	0.6	0.2
Estimated bats/facility	88	138	119	34

[1]2016 season began on 15 March per USFWS request, so the search season was two weeks longer than prior years, though no bats were found during that time period, so it did not change the overall fatality estimate.

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4.2.2   Fall Migration Season

For the first three years of Project operations the turbines operated under the terms of TALs, with a cut-in speed of 6.9 m/s. The mean bat fatality estimate ranged from 88 to 188 bats during the fall period, compared to 331 bats during the 2016 fall season, when the project was operating at a cut-in speed of 5.0 m/s after 19 August (Table 12).

Table 12. Bat mortality estimates by year for the fall migratory period (1 August – 15 October) at the Wildcat Wind Farm, Tipton and Madison counties, Indiana.

	Year and Cut-in Speed				
	2013 (6.9 m/s)	**2014** (6.9 m/s)	**2015** (6.9 m/s)	**2016**	
				(6.9 m/s until 19 August)	**(5.0 m/s after 19 August)**
(m) Estimated bats/turbine	0.7	1.0	1.5	0.43	2.2
Estimated bats/MW	0.4	0.6	0.9	0.27	1.38
Estimated bats/facility	88	125	188	53.8	275.0

4.3   CONCLUSIONS

No Indiana bat or northern long-eared bat fatalities were detected during 2016, and the long-term trigger was not reached for either species when analyzed using EOA. As described in the HCP, the short-term trigger does not apply until after the third year of Baseline Monitoring under uniform operating parameters. Thus, no adaptive management actions will be implemented in 2017. The bias-correction parameters from 2016 (e.g., searcher efficiency, carcass persistence, area adjustment, etc.) will be used in the design of protocols for 2017 monitoring.

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APPENDIX A

Sample Data Sheets

Carcass Search Data Sheet

WILDCAT WIND FARM 193704633

DATE: _____   BIOLOGIST: _____

LABEL CARCASSES AND PHOTO WITH DATE-TURBINE -CARCASS NUMBER (e.g., 2009Apr01-T04-C07, to describe carcass #7 found at turbine 4 on April 1, 2009).

Turbine No.[1]	Plot Type [2]	Carcass No. [3]	From Turbine – Distance (m)	From Turbine – Azimuth (degrees)	On Road/Pad?	GPS Coordinates	Species [4]	Forearm length of bat (mm)	Age[5]	Sex[6]	Cause of Death [7]	Condition[8]	Check if Comments (write on back)[9]
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Turbine No.[1]	Plot Type [2]	Carcass No. [3]	From Turbine		On Road/Pad?	GPS Coordinates	Species [4]	Forearm length of bat (mm)	Age[5]	Sex[6]	Cause of Death [7]	Condition[8]	Check if Comments (write on back)[9]
			Distance (m)	Azimuth (degrees)									
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												/	
												/	
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[1] TURBINE – ENTER NUMBER OF TURBINE. ALSO SEARCH THE TURBINE PAD AND ACCESS ROAD IN ADDITION TO THE STUDY PLOT.

[2] PLOT TYPE – R=ROADS AND PADS, F=FULL PLOT

[3] CARCASS NO. – NUMBER CARCASSES IN THE ORDER THEY ARE FOUND.

[4] SPECIES – IF UNKNOWN, SPECIFY UNKNOWN BAT OR UNKNOWN BIRD.

[5] AGE – IF IDENTIFIABLE: ADULT = A; JUVENILE = J; UNKNOWN = U

[6] SEX – IF IDENTIFIABLE: FEMALE = F; MALE = M, UNKNOWN = U

[7] CAUSE OF DEATH – COLLISION WITH TURBINE = T; PREDATION = P; UNKNOWN = U (ADD EXPLANATION IN COMMENTS IF NECESSARY).

[8] CONDITION – ENTER F=FRESH OR D=DECOMPOSED AND WHOLE =W; MOST OF BODY WITH SOME MISSING = M; PIECES = P (E.G., WING ONLY); FEATHER SPOT = F (EXAMPLE: F/W)

[9] COMMENTS – INCLUDING: REPRODUCTIVE CONDITION, IF IDENTIFIABLE: PREGNANT = P; LACTATING = L; POST-LACTATING = PL; NON-REPRODUCTIVE = NR; TESTES DESCENDED = T; UNKNOWN = U; B= BREEDING (BIRDS).

BAND COLOR/NO. – IF BANDED, RECORD COLOR OF BAND (OR METAL), AND NUMBER.

OTHER COMMENTS. INCLUDE CARCASS NUMBER NEXT TO ALL COMMENTS.

PHOTOS: WHERE POSSIBLE, PHOTOGRAPH FOR BATS: BACK, BREAST, MUZZLE, TRAGUS, RULER BEHIND EAR, RULER NEXT TO FOREARM, FOOT, TOEHAIRS, CALCAR (IF EXPOSED).

FOR BIRDS: BACK, BREAST, HEAD, FEET, UNDERSIDE OF WINDS (FOR RAPTORS).

ADDITIONAL COMMENTS (record carcass number next to associated comment; include any identifiers and bands, if present):

_____

_____

_____

CARCASS SEARCH SUMMARY SHEET

WILDCAT WIND FARM 193704633

DATE: _____ **BIOLOGIST:** _____

WEATHER: % CLOUD COVER _____ **TEMPERATURE (˚F)** _____ **PRECIP** _____

WIND _____ **SITE DESCRIPTION/COMMENTS:** _____

_____

TURBINE NUMBER	PLOT TYPE (Full or Roads/Pads)	SURVEY TIME (MILITARY)		CARCASSES FOUND (#BIRD, #BAT, NONE)
		START	END	

Page____of_____

SCAVENGER REMOVAL TRIAL LOG
Wildcat Wind Farm 193704633

Trial (spring, fall)_____   **Start Date_____**

Carcasses are labeled with date-turbine- carcass number as they were originally found (e.g., 2009Apr01-T04-C07, to describe carcass #7 found at turbine 4 on April 1, 2009).

| Carcass ID[1] | Placement | | | | Species | Condition[4] When Checked, Checked By[5] | | | | | | | | | | |
	GPS Coordinates	Time (Military)	Turbine[2]	Placed By[3]		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 10	Day 14	Day 20	Day 30

| Carcass ID[1] | Placement | | | | Species | Condition[4] When Checked, Checked By[5] | | | | | | | | | | |
	GPS Coordinates	Time (Military)	Turbine[2]	Placed By[3]		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 10	Day 14	Day 20	Day 30

[1] Carcass ID – Identification number marked inside carcass.
[2] Turbine – Turbine number where carcass placed.
[3] Placed By – Initials of the person who placed the carcass.
[4] Condition – Record the condition the carcass was in when checked. Intact = I, Signs of scavenging = S, Feather/Fur Spot = F, Missing or < 10 feathers = 0
[5] Checked by – Record the initials of the person who checked on the carcass.

Comments:_____
_____
_____
_____
_____
_____

More data on back?   Yes   No

SEARCHER EFFICIENCY TRIAL LOG
Wildcat Wind Farm 193704633

Trial (spring, fall)_____   **Trial Date_____**

Carcasses are labeled with date-turbine- carcass number as they were originally found (e.g., 2009Apr01-T04-C07, to describe carcass #7 found at turbine 4 on April 1, 2009).

Carcass ID[1]	Placement				GPS Coordinates	From Turbine		Species	Trial Result		
	Time (Military)	Turbine[2]	Placed By[3]	On Road/Pad?		Distance (m)	Azimuth (degrees)		Found By[4]	Not Found	Scavenged Prior to Search

Carcass ID[1]	Placement				GPS Coordinates	From Turbine		Species	Trial Result		
	Time (Military)	Turbine[2]	Placed By[3]	On Road/Pad?		Distance (m)	Azimuth (degrees)		Found By[4]	Not Found	Scavenged Prior to Search

Comments (record carcass number next to associated comment, include any identifiers and bands, if present):

_____
_____
_____
_____
_____
_____

[1] Carcass ID – Use carcass ID from when it was originally found. If no ID, just number.
[2] Turbine – Turbine should be labeled with the turbine number where it was placed.
[3] Placed By – Initials of the person who placed the carcass.
[4] Found By – Record the initials of the person who found the carcass.

More data on back?   Yes   No

APPENDIX B

Representative Carcass Photos

Photo 1. Eastern red bat (*Lasiurus borealis*) pictured with calipers measuring forearm length during the post construction surveys at the Wildcat Wind Farm. (August 24, 2016)

Photo 2. Representative example of a hoary bat (*Lasiurus cinerus*) found during full plot surveys at turbine C4 at the Wildcat Wind Farm. (September 6, 2016)

**Photo 3. Representative example of a big brown bat (*Eptesicus fuscus*)
found during full plot surveys at turbine E13 at the Wildcat Wind Farm.
(September 7, 2016)**

**Photo 4. Representative example of a silver-haired bat (*Lasionycteris
noctivagans*) found during surveys at turbine F15 at the Wildcat Wind
Farm. (September 22, 2016)**

Photo 5. Photo of a seminole bat (*Lasiurus seminolis*) found during fall surveys at the Wildcat Wind Farm. The species was positively identified by a Stantec bat biologist. (September 22, 2016)

Photo 6. Turkey vulture (*Cathartes aura*) found during fall surveys at the Wildcat Wind Farm post-construction monitoring surveys. This bird was found at turbine G2. (August 5, 2016)